

NEWBURGH ECSD

TECHNOLOGY PLAN

[2009–2012]



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Mission Statement

To be nationally recognized for excellence in preparing our diverse population for a technologically advanced and ever-changing society.

Vision Statement

We have created this plan to enhance learning for our whole community through information and communication technologies and have agreed upon the following overarching criteria:

- Preparing all students to be life-long learners in an ever-changing world.
- Recognizing and honoring the knowledge and wisdom of children.
- Learning takes place within and beyond school walls.
- Focusing on learning that addresses the needs of all students.
- Sharing outside resources to facilitate real life learning and problem solving.
- Risk taking, risk management, and accountability.
- Equitable access to information and communication technologies for all members of our community.
- Networking our schools and community to access the world's resources.
- Committing to and accepting changing roles as both learners and facilitators of learning.
- Establishing coalitions with parents, business, higher education and community groups.
- Sharing the responsibility to create, communicate, and implement this evolving plan.

The vision of this plan is to enhance learning for our whole community through information and communication technologies based upon the following goals, outcomes, and strategies.

GOALS

Goals for Education/Technology Integration

Goal One: To maximize the potential of every student as an effective life-long learner.

Every student will:

- Be actively engaged in the learning process, both individually and collaboratively.
- Demonstrate their own potential as a life-long learner, and recognize that of others.
- Use critical thinking strategies in the learning process.
- Be a risk taker in learning.
- Gather, analyze, and synthesize information from various sources and communicate his understanding of it effectively (literate in the use of technology as a tool).
- 'Make a difference' by participating in and collaborating with others in Real World problem-solving situations.

Strategies for accomplishing these outcomes:

- Encourage students to be explorers, teachers, and producers of information as they construct meaning.
- Utilize flexible grouping practices to assist students in taking on new roles as learners.
- Use performance-based and portfolio assessment practices.
- Apply flexible and innovative scheduling and use of time, space, and personnel.
- Develop goal-setting strategies in students, both individually and collectively.
- Provide students opportunities to make choices; to become partners in learning.
- Develop an understanding of diversity among cultures, persons with disabilities, and other differences among individuals/groups within and beyond our school community.
- Use meta-cognition (thinking about thinking) strategies, such as reflective journals and processing activities.
- Outline specific critical thinking strategies for the NECSD curricula.

- Establish classroom and school guidelines for demonstrating respect for self and others.
- Encourage students to share their ideas and express their viewpoints in class.
- Encourage students to explore and challenge themselves to use new technologies as tools in learning (e.g., multimedia presentations, assistive technologies).
- Use multiple sources for collecting data--human, print, CD-ROM, on-line, etc.
- Use multiple means for presenting information--print, video, multimedia, WWW, etc.
- Make presentations to 'authentic' audiences and discuss new ideas with them.
- Select activities that are meaningful to students in their own community and beyond.
- Develop team building skills and conflict management strategies.
- Provide ongoing opportunities for students to develop and practice skills.
- Implement multiple intelligences strategies in guiding students.
- Develop appropriate technological skills in relation to the learning process.
- Establish opportunities for students with diverse needs to develop social skills to support meaningful peer relationships.
- Encourage students to challenge themselves to use new technologies as tools in learning (e.g., multimedia presentations, assistive technologies).
- Enhance the independent functioning of students with special needs through the use of a variety of assistive technology systems.
- Provide ongoing opportunities for students to integrate assistive technologies by creating and adapting curriculum/materials for themselves and/or others.
- Utilize a variety of assistive technology systems with students who require assistance in accessing information and communicating effectively with others.

Goal Two: To use information and communication technologies as an integral part of the teaching and learning process.

Our school community will:

- Create a more adaptable and flexible environment for all learners.
- Utilize technology as a tool to enhance learning throughout the curriculum; including critical thinking strategies and problem-based learning practices.
- Utilize a variety of existing and emerging information and communication technologies within and beyond our school walls to enhance teaching and learning. Applications that are SIF compliant would receive strong consideration. (See Appendix A)

Strategies for accomplishing these outcomes:

- Implement flexible scheduling in Library Media Centers and Computer Labs.
- Implement flexible scheduling and block scheduling options in classrooms.
- Expand opportunities for dual language classrooms, area clustering for bi-lingual students, mainstreaming, and inclusion.
- Offer ongoing professional development and support in creating and sustaining new learning environments.
- Participate in collaborative on-line and electronic experiences such as electronic assessments, video conferencing, wiki servers, electronic portfolios, video streaming, electronic communication, simulations, technological challenges, web design, multimedia presentations, etc.
- Utilize a variety of technologies (Wireless, camcorders, interactive white boards, Personal Digital Assistants, e-mail, Internet, distance learning, scanners, etc.) to collect and analyze data.
- Provide ongoing professional development and support in strategies for developing engaged learning units/projects with students and in fully utilizing technology tools.
- Provide access within classrooms for Local Area Network (LAN) including wireless linkage within a school building.
- Provide Wide Area Network (WAN) linkage between our schools.
- Offer services to the students as well as the community.
- Offer ongoing professional development and support in assistive technology systems (no tech, low tech, high tech).
- Provide open and/or guided opportunities for staff to create and adapt materials for students who require assistance in accessing information and communicating effectively with others.

- Develop guidelines and procedures related to assistive technologies (common language, mandates, implementation requirements, referrals, etc.)
- Provide professional development opportunities for teams to build skills in determining assistive technology (no tech, low tech, high tech) needs for students who require assistance accessing information and communicating effectively with others.

Goal Three: To create a positive, supportive, and continually evolving learning community.

Our school community will:

- Increase the bandwidth/network infrastructure services for information and increased organization leading to a more productive, efficient, and dynamic method of communication and learning.

Strategies for accomplishing these outcomes:

- Provide and maintain an inter- and intra-building network with capacities and services throughout the district and available to all staff for information exchange.
- Increase the number of web based services to allow for greater access to resources as well as decreasing the district's overall costs related to support and maintenance.
- Providing a centralized source of resources for staff, students, and community; such ideas include accessing library materials online, accessing homework assignments online and access to recommendations for accelerating students learning.
- Providing professional development videos / digital tutorials that can be accessed from the classroom or from home to build skills or meet state recommendations.
- Develop improved communications with Voice over IP Phones, Video conferencing stations and streaming technologies.
- Establish instructional strategies, policies and procedures to ensure proper use of the services.
- Provide inter-communication solutions to allow for district wide collaboration.
- Recognize and address the human need for time and support to adjust to change and to learn new ways of operating.
- Maintain and improve the functionality of the NECSD Website.
- Continually review, reshape, and improve this plan based upon changing needs and availability of resources using School 2.0 to explore new visions. (See Appendix B)
- Provide opportunities for families and NECSD community members to develop and practice using appropriate assistive technologies for all students who require assistance regardless of their technical ability in accessing information and communicating effectively with others.
- Maintain a computer replacement plan to remain current with hardware and software.
- Develop and support user-friendly links that reflect our vision and contribute to the NECSD, the community, and worldwide assistive technology databases.

Goal Four: To build and maintain productive coalitions for learning throughout our wider community.

Our District along with the wider community will:

- Participate in working collaboratively for advancement and progression.
- Continually learn to use existing and emerging information and communication technologies.
- Establish equitable, not necessarily equal, access to information and communication technologies for all stakeholders.

Strategies for accomplishing these outcomes:

- Continue and build upon the strength of collaboration amongst a representative group of stakeholders such as government, business entities, higher education, parents, not for profits, staff and media.
- Continue and expand the community collaborative dialogue and network.
- Support leadership teams from the community to maintain coalitions, partnerships, and an exchange of ideas.
- Support community steering committee to pursue resources and support for fully linking our wider community.
- Establish information and communication technologies-related links with local, state, and federal agencies and (govt.) policy makers.
- Establish networks (human and electronic) of individuals and organizations willing to lend their expertise in designing and adapting systems for students who require assistance accessing information and communicating effectively with others.
- Establish networks (human and electronic) among districts, agencies, and other interested parties for the purpose of staying current with best practice and for the sharing of resources for students who require assistance in accessing information and communicating effectively with others.
- Provide public awareness and opportunities for involvement in promoting the understanding and use of assistive technologies, information exchange, and community pride.
- An in depth description of the NECSD Curriculum Frameworks for technology is provided, (see Appendix C)

In order to attain the aforementioned goals, the following infrastructure needs to be implemented and maintained.

ASSESSMENT

NECSD – NETWORK

The Districts wide area network is comprised of “hub” and “spoke” network topology provided by Time Warner Cable. The NECSD network consists of 250 voice and data switches, 75 Windows servers, AS400 and Unix servers.

Upgrading and updating the network infrastructure is a priority in order to preserve the Districts current commitment to technology-rich learning environment. In addition, increased capability to use web-based resources will be added. “Domain Servers” will be upgraded to increase the utility and consistency of user interfaces to the network.

3 Year Plan

- Replace %50 of networking switches which will reach "end of maintenance" and "end of life" status within 3 years resulting in end of support.
- Implement and manage a UPS battery replacement plan. The district will be exposed if a policy isn't in place to address the concerns of failing UPS units and dead batteries.
- UPS upgrades to compensate for the increased power consumption on its wiring closets.
- Increase bandwidth to the desktop from 10/100MB to gigabit by upgrading outdated or failing switches and routers with gigabit capabilities. This will keep in pace with the districts plans for video, voice, and data.
- Increase the network “backbone” within each building to 10 gigabit (wiring closets). This upgrade will allow the districts to increase its server capacity to the classroom.
- Expand the cabling effort by adding network drops. The district will add at least 4 network drops in each classroom to for computers, wireless access points, phones, projectors, and printers.
- Maintain the Cisco SMARTNet 8x5xNBD agreement on Cisco equipment to retain access to technical support, IOS upgrades, and hardware replacement.

These network updates will increase the computing power to student and teacher desktops and to make more efficient the use of district instructional and telecommunications resources that reside on district servers.

Equipment Lease Replacement Project -

By the end of summer 2008, nearly one-third of all computer equipment currently in use in the district will be replaced by new equipment per the conditions of the ongoing technology equipment leasing program. The placement of all equipment will be done in conjunction with school-level planning meetings that identified the highest priority needs for the equipment.

The inventory of all technology equipment will be formally updated once each year (early spring), with continuous updating of the database, as needed. Guidelines and instructions on maintaining information in the inventory database will be developed and distributed to all appropriate school-level staff by January 2009.

NECSD – WIRELESS

NECSD has deployed a “pervasive” Cisco wireless network in several instructional buildings (802.11a/b/g). The WLAN consists of 300 Cisco “lightweight” 1131 and 1242 (LWAPP) access points which are centralized for management by 3 Cisco 4400 wireless LAN controllers and 1 Cisco WCS server.

3 Year Plan

The districts long-term plan is to place a wireless access points in each classroom with corresponding wireless controllers for central management and gigabit switches. The move to pervasive wireless access across the district will greatly enable desktop computing and instruction. These additions were planned in conjunction with school level planning meetings to ensure the installations are deployed in response to areas of need, as expressed by school level instructional leaders.

- 1) Standardized on IEEE 802.11n wireless for its high-speed data rates and increased reliability.
- 2) Phase out 802.11g wireless standard and unmanaged wireless access points.
- 3) Implement a wireless security model with network access control, virus protection, and intrusion detection.

These updates will address client mobility issues and bandwidth along with the growing demand for laptop carts in the classroom.

NECSD – INTERNET

The districts internet connection is provided by Lighttower formally known as Hudson Valley DataNET. The districts 20M internet bandwidth usage has increased exponentially due to several factors such as online subscriptions, remote access, video conferencing, and other web-based resources.

3 Year Plan

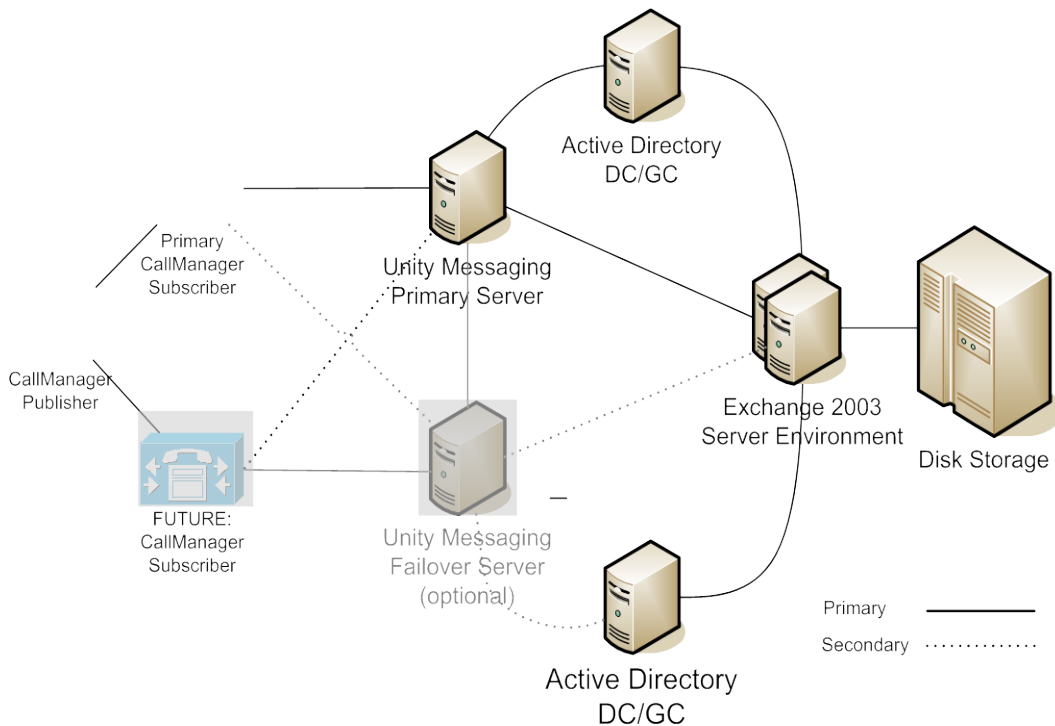
- In order to keep up with the demand the district will need to upgrade its internet connection to 100M.
- The district will need to make a commitment to securing the internet and network infrastructure by implementing a security model.
- Purchase services and hardware to implement an enterprise-level firewall, network access control, intrusion detection system, and traffic “shaping” technology.
- Maintain Internet safety by using the FCC’s Children Internet Protection Act (“CIPA”) guidelines and the districts acceptable use policy (see Appendix D)

NECSD – VOICE

NECSD has made a substantial investment in Voice over IP. YR8 ERate funding provided the district with the resources to migrate from a traditional PBX phone system to a Voice over IP network. The district's newly deployed Voice network has retained previous functionality (dial-tone, voicemail, fax, call transferring, conferencing, and 911) along with additional features such as Unified Communication while drastically reducing the phone bill and operating expenses.

The Voice network consists of 2200 network drops, 2 Cisco Call Managers at version 4.2.(3) ("CM"), 1 Cisco Unity voice mail server version 4.2.(1), 2 Emergency Responders ("CER") at revision 1.3(1a), for E911, 1600 Cisco phones, 65 Cisco ATA's ("Analog Telephone Adapter"), and 5 Voice Gateways which provide analog services to phone and faxes), 2 PSTN 3825 routers, PSTN service provided by PAETEC with 2 PRI's each with 3 T1 systems each capable of 24 channels, and 17 Survival Remote Site Telephony ("SRST") 2851 routers, and Cisco "SMARTNet" 8x5xNBD coverage. There is no upgrade path available from these revision levels.

Voice Diagram



3 Year Plan

Short-term - The district will need to invest in a third Communication Manager also known as a "subscriber" to facilitate an upgrade path and meet future phones and voicemail requests as well as full support for 911 emergency provisions in support of health and safety issues.

Long-term – The Voice network will require a complete overhaul of its all components. This involves replacing all of the hardware and licensing for CM, UNITY, and CER. In addition, the district will also need to contract technical support services to ensure a smooth transition to the updated voice components without significant downtime.

Voice Initiatives for 2008-2011

- 1) Add a 3RD Call Manager
- 2) Upgrade and replace all of the voice components (excluding phones and ATA's)
- 3) Expand the cabling by adding network drops at the building-level to compensate for end-user adds, moves, and changes.
- 4) Hire additional voice support staff and contract technical support as needed.
- 5) Provide staff development to utilize the advanced features of Unified Communications and Email.
- 6) Purchase additional phones, ATA's, and expansion modules.
- 7) Update the SMARTNet 8x5xNBD maintenance agreements.

NECSD - Digital Video Surveillances

Digital video surveillances (“DVS”) are a health and safety priority of the district. The district has made significant investments in DVS equipment at the 3 junior high schools - Heritage, South, and North, and high school -Newburgh Free Academy. The DVS equipment includes 300 cameras, 40 encoders, 6 DVS achievers with “Insight” technology. The 3 year plan will be to rollout digital video surveillance to all of NECSD's facilities.

NECSD - Video on Demand (VoD) / Video Streaming

After considerable research the district has made an investment in Video on Demand technology by Safari Montage. Safari Montage server marks the start of the deployment of a digital, on-demand video streaming capability for the district that will be used for instructional purposes. Safari Montage is running on a Linux server with 1.4TB of storage. The district purchased Safari licensing for 10 sites and hosts the hardware onsite to reduce internet bandwidth.

The features of Safari are its “LDAP” integration which permits it to communicate with our Microsoft Active Directory server without requiring a 3rd party vendor. Safari Montage's has one of the most comprehensive sets of NY State based curriculum in digital form. Furthermore, Safari Montage has special features such as “point-to-point” video streaming which will replace the districts current method used (MATV) to broadcast digital content between buildings. The real-time video streaming and publishing of district owned will play an important role in the future classroom. Video on demand technology will modernizing and strengthening the districts capacity to deliver instructional resources to the classroom.

Video on Demand Initiatives for 2008-2011:

- 1) Fully deploy and implement Safari Montage's digital content offerings at the three junior high schools and high school.
- 2) Develop a comprehensive set of training “tools” for teachers and education technology staff in order to fully integrate digital content into the curriculum and enhance learning. The plan consists of onsite technical training by Safari along with

the districts Technology Liaisons, ½ and full day workshops, offsite tutorials in the form of webcasts or podcasts, and other documentation made available on district's website.

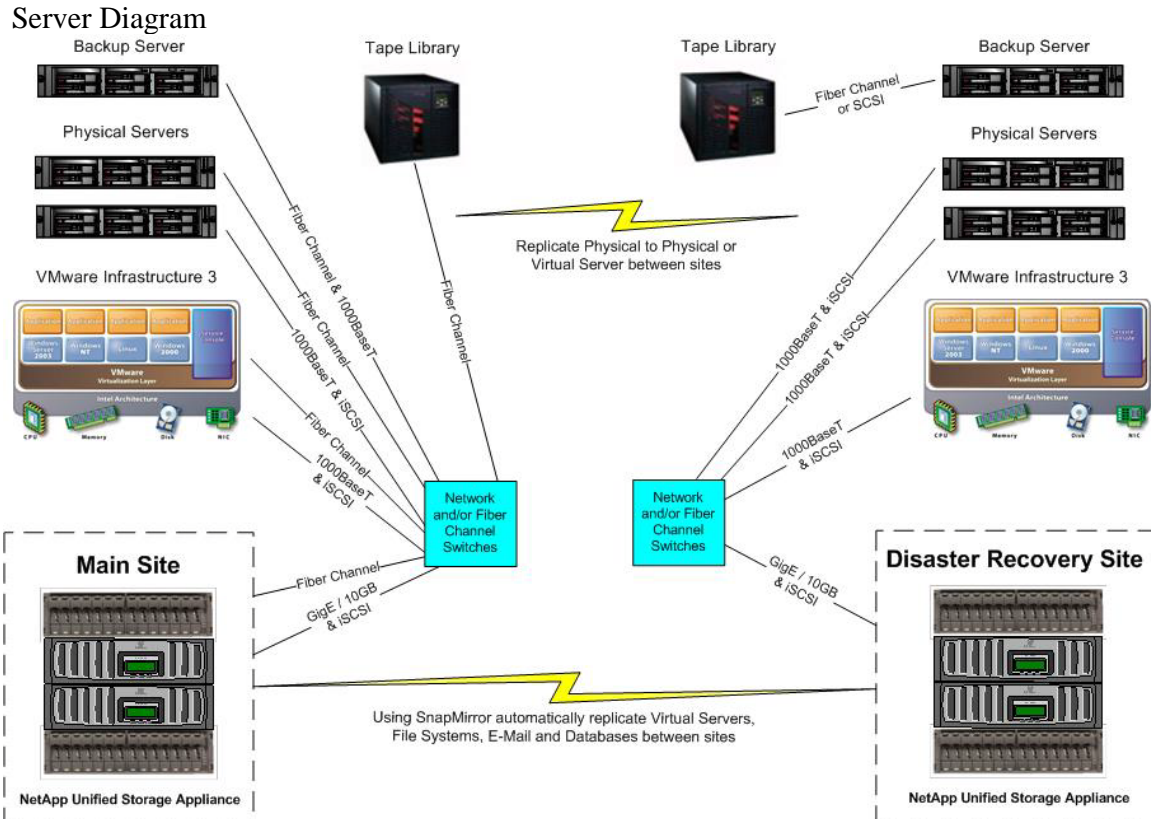
- 3) Develop a committee of key personnel representing all levels of education with the charge of planning, developing, and deploying digital content in the curriculum and instruction. Including the responsibility to select content from Safari's library, and create standards and policies for educators.
- 4) Provide the capability stream video between buildings as a replacement to current methods in order to facilitate communication September 2009; the high school will implement this technology to communicate to remote campus for morning announcements.
- 5) Purchase additional Safari VoD servers at the high usage sites.
- 6) Purchase additional Safari site licensing and digital content

NECSD – Storage, Backup, and Recovery

The increasing demand for storage, servers, and applications has forced the district to look toward other technologies to solve these challenges such as “Virtualization” also known as virtual machines. The principle behind a virtual infrastructure is to host multiple operating systems and applications on shared hardware (servers and storage); with the intent on reducing overall technical support requirements, physical servers and storage, and a more reliable and stable server environment.

The virtualization platform will provide a way for the district to face the challenge of personnel, servers, and storage. The 3 year detailed plan is to implement a virtual datacenter. Purchase an enterprise level data storage (“SAN”) with high-end servers running virtualization software. The reasons to move to a virtual datacenter include:

- Server Consolidation and Infrastructure Optimization: Virtualization makes it possible to achieve significantly higher resource utilization by pooling common infrastructure resources and breaking the legacy “one application to one server” model.
- Physical Infrastructure Cost Reduction: With virtualization, you can reduce the number of servers and related IT hardware in the data center. This leads to reductions in real estate, power and cooling requirements, resulting in significantly lower IT costs.
- Improved Operational Flexibility & Responsiveness: Virtualization offers a new way of managing IT infrastructure and can help IT administrators spend less time on repetitive tasks such as provisioning, configuration, monitoring and maintenance.
- Increased Application Availability & Improved Continuity: Eliminate planned downtime and recover quickly from unplanned outages with the ability to securely backup and migrate entire virtual environments with no interruption in service.



Server, Storage, and Backup initiatives for 2008-2011

- 1) Implement a virtual datacenter in order to provide a reliable and stable environment to handle future demands.
- 2) Identify mission critical applications (Exchange, SQL, eScholar) to place in a “high availability” virtual environment.
- 3) Setup and implement a disaster recovery site using virtualization principles on the NECSD network
- 4) Create an offsite backup strategy.

Exchange 2007 E-mail Replacement System - This work will improve and standardize e-mail across the district and integrate shared resource applications such as calendaring and voice messaging.

PROFESSIONAL DEVELOPMENT

Current Considerations

In order to continue the past and implement future technology goals, the NECSD needs to meet the ongoing challenge of a changing technological field. Technology is constantly changing and in order to keep pace with these changes we as a school community need to continue to meet challenges in the following areas:

- Curriculum appropriate educational technologies: Teachers and other key staff will have adequate time to develop a greater understanding of the value of technology-based resources with respect to supporting their curriculum areas and will have an opportunity to enhance their capacity to access and use appropriately designed educational technologies.
- Data Driven Instruction: In order to provide the best possible educational decisions for the NECSD school community, we must have a continuous flow of the best possible data to drive instructional decisions. This must include a new student management system that centralizes the districts data in the areas of student achievement, student demographics, reporting functions, educational decision-making processes, and human resource management. Key teachers and staff will be trained on how to gather, read, analyze and assess data in order to provide sound educational instruction for students.
- Utilizations of “Best Practices”: The use of technology integration is vital in fulfilling many of the district’s goals. Technology should not only be used but it should be integrated into the technology or “Best Practices” that are currently being utilized in education. Teachers and staff need PD in the learning and utilizations of “Best Practices” in the area of educational technology. These strategies should focus on the integration of technology to support and facilitate the learning standards outlined by NYS and our district curriculum maps. This is to be accomplished through grant funding, Model Schools, technology integration coaches, district technology staff, and others.

EVALUATION

Review and Evaluation

Our primary purpose is to positively impact the learning opportunities and the school environment for the students and staff of The NECSD.

- We have developed specific Action Plans for achieving our goals, as outlined through the NECSD curriculum frameworks for technology.
- We will continue to use data collection tools and online assessment services to monitor how our students are performing. This is achieved through the use of benchmark assessments, state assessments, and electronic portfolios. Currently we use tools such as NY LEARNS and VISTA express.
- We will continue to work with our stakeholders to implement and execute strategies and projects that will allow the district to gauge it's strength amongst other districts through out the world.
- We will continue to work with higher education and its students to create opportunities that will give our faculty, staff, and students the opportunity to grow, excel and re-design concepts to create new ideas.

Technology Plan Component	Assessment/Rubric	Evaluation Timeframe	Comments
<p><u>Goals:</u></p> <p>A cross-section committee consisting of Technology Director, Network Engineer, Faculty and Parent member, Telephone/Communication specialist, data programmer and others relevant members will meet at the end of each year to discuss and assess the goals of the District Technology Plan</p>	<p>The following assessment choices will be made for each District Technology Plan goal:</p> <ul style="list-style-type: none"> ▪ Completed ▪ In progress ▪ Not yet started (expected dates) ▪ Revised (explanation) 	<p>Annually</p>	
<p><u>Network Infrastructure:</u></p> <p>Network Backbone</p> <p>Wireless strategy</p> <p>Backup Strategy</p> <p>Bandwidth Capacity</p> <p>File Storage Capacity</p> <p>Website</p> <p>Emergency Notification</p>	<p>Inventory</p> <p>Find and eliminate all “un-wired” wireless locations</p> <p>Have a written (digital) disaster recovery plan for each server with all applicable software/hardware in place and operational. Chart and graph all internet and network bandwidth with focus on usage and trends</p> <p>Chart and graph all file storage with focus on usage and trends</p> <p>Monitor and record amount of traffic/access/hits on a monthly basis with focus on growth.</p> <p>Track and record number of instances Connect Ed is utilized.</p>	<p>Annually</p> <p>Annually</p> <p>Annually</p> <p>Annually</p> <p>Annually</p> <p>Annually</p> <p>Annually</p>	

Newburgh Enlarged City School District- Technology Budget

Created Dec 2008

	2008-09	2009-10	2010-11
Description			
Technology Expenses			
Repair Sevices- Telephones	\$ 110,250.00	\$ 115,762.50	\$ 121,275.00
Telephone	\$ 628,425.00	\$ 659,846.25	\$ 691,267.50
Central Data Processing	\$ 1,902,030.00	\$ 1,997,131.50	\$ 2,092,233.00
Curriculum Development	\$ 2,053,184.00	\$ 2,155,843.20	\$ 2,258,502.40
Computer Aided Instruction	\$ 1,546,052.00	\$ 1,623,354.60	\$ 1,700,657.20
District Technology Budget	\$ 6,239,941.00	\$ 6,551,938.05	\$ 6,863,935.10
		\$ -	\$ -
Telecommunications		\$ -	\$ -
Local/Long distance service	\$ 300,000.00	\$ 315,000.00	\$ 330,000.00
Wide Area Network	\$ 180,000.00	\$ 189,000.00	\$ 198,000.00
Cellular Paging Services	\$ 80,000.00	\$ 84,000.00	\$ 88,000.00
Telephone lease/ maintenance	\$ 650,000.00	\$ 682,500.00	\$ 715,000.00
Equipment purchases /Installation	\$ 120,000.00	\$ 126,000.00	\$ 132,000.00
Other Telcom expenses	\$ 110,000.00	\$ 115,500.00	\$ 121,000.00
		\$ -	\$ -
Internet Access and Web services		\$ -	\$ -
Internet access and services	\$ 25,500.00	\$ 26,775.00	\$ 28,050.00
Email services	\$ 30,000.00	\$ 31,500.00	\$ 33,000.00
Web hosting services	\$ 20,000.00	\$ 21,000.00	\$ 22,000.00
Web development	\$ 65,000.00	\$ 68,250.00	\$ 71,500.00
Equipment purchases and installation	\$ 50,000.00	\$ 52,500.00	\$ 55,000.00
Equipment leasing and installation	\$ 1,050,000.00	\$ 1,102,500.00	\$ 1,155,000.00
Other Internet expenses	\$ 50,000.00	\$ 52,500.00	\$ 55,000.00
		\$ -	\$ -
Internal Networking services		\$ -	\$ -
System Lease/maintenance	\$ 222,855.00	\$ 233,997.75	\$ 245,140.50
Infrastructure support and retrofitting	\$ 260,000.00	\$ 273,000.00	\$ 286,000.00
Other network expenses	\$ 157,000.00	\$ 164,850.00	\$ 172,700.00
		\$ -	\$ -
Personnel and training		\$ -	\$ -
Technology Suport personnel-direct	\$ 1,152,244.00	\$ 1,209,856.20	\$ 1,267,468.40
Technology Suport personnel-benefits	\$ 494,462.00	\$ 519,185.10	\$ 543,908.20
Staff Development/curriculum integration	\$ 2,072,783.00	\$ 2,176,422.15	\$ 2,280,061.30
		\$ -	\$ -
Other technology expenses	\$ 1,551,595.00	\$ 1,629,174.75	\$ 1,706,754.50
Total	\$ 8,641,439.00	\$ 9,073,510.95	\$ 9,505,582.90

Expectations for Technology Use

The ISTE National Educational Technology Standards (NETS•S) and Performance Indicators for Students

1. Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

- a. apply existing knowledge to generate new ideas, products, or processes.
- b. create original works as a means of personal or group expression.
- c. use models and simulations to explore complex systems and issues.
- d. identify trends and forecast possibilities.

2. Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students:

- a. interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- b. communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- c. develop cultural understanding and global awareness by engaging with learners of other cultures.
- d. contribute to project teams to produce original works or solve problems.

3. Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students:

- a. plan strategies to guide inquiry.
- b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- c. evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
- d. process data and report results.

4. Critical Thinking, Problem Solving, and Decision Making

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students:

- a. identify and define authentic problems and significant questions for investigation.
- b. plan and manage activities to develop a solution or complete a project.
- c. collect and analyze data to identify solutions and/or make informed decisions.
- d. use multiple processes and diverse perspectives to explore alternative solutions.

5. Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students:

- a. advocate and practice safe, legal, and responsible use of information and technology.
- b. exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
- c. demonstrate personal responsibility for lifelong learning.
- d. exhibit leadership for digital citizenship.

6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:

- a. understand and use technology systems.
- b. select and use applications effectively and productively.
- c. troubleshoot systems and applications.
- d. transfer current knowledge to learning of new technologies.

The ISTE National Educational Technology Standards (NETS•T) and Performance Indicators for Teachers

Effective teachers model and apply the National Educational Technology Standards for Students (NETS•S) as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community. All teachers should meet the following standards and performance indicators. Teachers:

1. Facilitate and Inspire Student Learning and Creativity

Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments. Teachers:

- a. promote, support, and model creative and innovative thinking and inventiveness
- b. engage students in exploring real-world issues and solving authentic problems using digital tools and resources
- c. promote student reflection using collaborative tools to reveal and clarify students' conceptual understanding and thinking, planning, and creative processes
- d. model collaborative knowledge construction by engaging in learning with students, colleagues, and others in face-to-face and virtual environments

2. Design and Develop Digital-Age Learning Experiences and Assessments

Teachers design, develop, and evaluate authentic learning experiences and assessments incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS•S. Teachers:

- a. design or adapt relevant learning experiences that incorporate digital tools and resources to promote student learning and creativity
- b. develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress
- c. customize and personalize learning activities to address students' diverse learning styles, working strategies, and abilities using digital tools and resources
- d. provide students with multiple and varied formative and summative assessments aligned with content and technology standards and use resulting data to inform learning and teaching

3. Model Digital-Age Work and Learning

Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society. Teachers:

- a. demonstrate fluency in technology systems and the transfer of current knowledge to new technologies and situations
- b. collaborate with students, peers, parents, and community members using digital tools and resources to support student success and innovation
- c. communicate relevant information and ideas effectively to students, parents, and peers using a variety of digital-age media and formats
- d. model and facilitate effective use of current and emerging digital tools to locate, analyze, evaluate, and use information resources to support research and learning

4. Promote and Model Digital Citizenship and Responsibility

Teachers understand local and global societal issues and responsibilities in an evolving digital culture and exhibit legal and ethical behavior in their professional practices. Teachers:

- a. advocate, model, and teach safe, legal, and ethical use of digital information and technology, including respect for copyright, intellectual property, and the appropriate documentation of sources
- b. address the diverse needs of all learners by using learner-centered strategies and providing equitable access to appropriate digital tools and resources
- c. promote and model digital etiquette and responsible social interactions related to the use of technology and information

- d. develop and model cultural understanding and global awareness by engaging with colleagues and students of other cultures using digital-age communication and collaboration tools

5. Engage in Professional Growth and Leadership

Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources. Teachers:

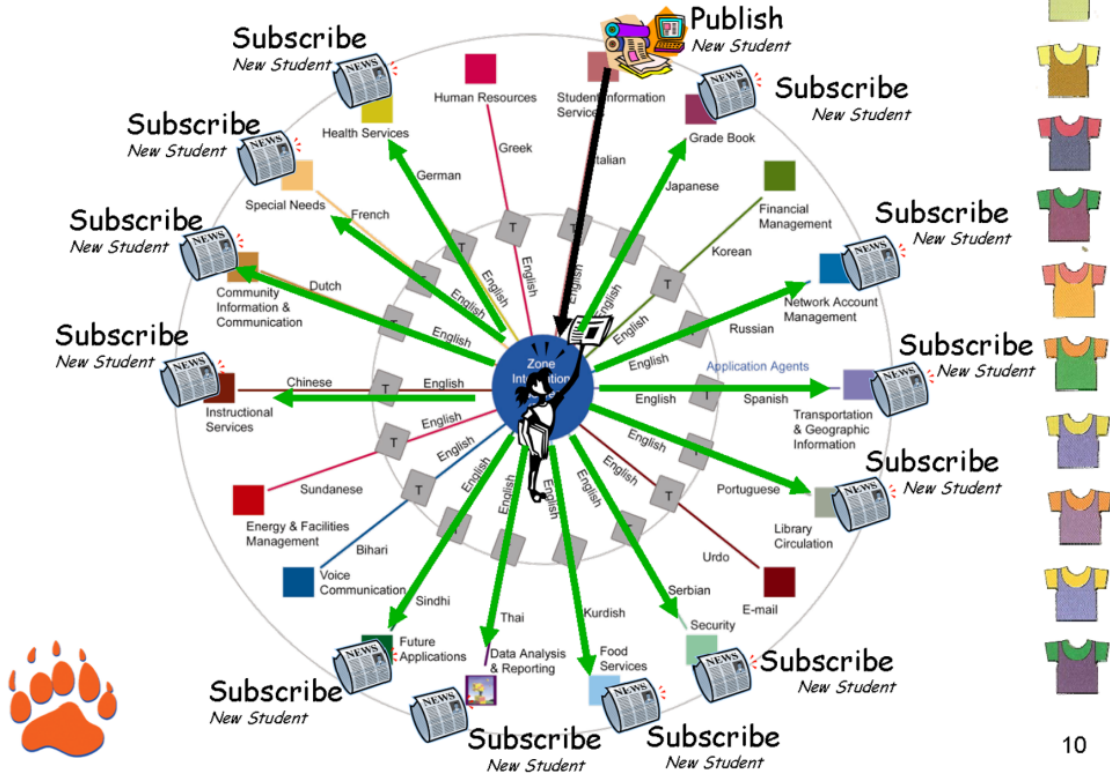
- a. participate in local and global learning communities to explore creative applications of technology to improve student learning
- b. exhibit leadership by demonstrating a vision of technology infusion, participating in shared decision making and community building, and developing the leadership and technology skills of others
- c. evaluate and reflect on current research and professional practice on a regular basis to make effective use of existing and emerging digital tools and resources in support of student learning
- d. contribute to the effectiveness, vitality, and self-renewal of the teaching profession and of their school and community

Appendix A

School Interoperability Framework (“SIF”)

Why Interoperability?

SIF (School Interpretability Framework) Enabled



Rather than have each application vendor try to create a separate connection to every other application, SIFA has defined the set of rules and definitions to share data within a SIF Zone (below). A SIF Zone is a logical grouping of applications, in which software application agents communicate with each other through a central communication point - the Zone Integration Server (ZIS). Data is shared between applications through a series of standardized messages, queries and events written in XML and sent using Internet protocols. These events are defined by the SIF Specification. SIF Agents are extensions of each application that serve as the intermediary between the software application and the SIF Zone. The ZIS keeps track of the Agents registered in the Zone and manages transactions between Agents, enabling them to provide data and respond to requests. The ZIS is responsible for all access control and routing and security within the system. Because the behavior of the Agents and ZIS are standard functionality can be added to a Zone over time by simply adding SIF-enabled applications. Vertical interoperability is a situation in which SIF agents at different levels of an organization communicate using a SIF Zone. Vertical interoperability involves data collection from multiple agents (upward) or publishing of information to multiple agents (downward). For example, a state department data warehouse may listen for changes in district level data warehouses and update its database on a regular basis. Or, a state department may wish to publish teacher certification data to districts.

**NEWBURGH ENLARGED CITY SCHOOL DISTRICT
CURRICULUM FRAMEWORKS
for
TECHNOLOGY**

Newburgh's Frameworks for technology reflect the belief that all students must be prepared to meet the technological challenges of the twenty-first century. Students can and must develop the necessary skills and knowledge for taking advantage of modern technology to enhance their learning and to prepare for the future. Meeting technological challenges requires sophisticated awareness of technological capabilities, skills in information processing, and application to problem solving. In addition to applying technology, it is important for students to gain knowledge about technological systems, processes, and their evolution; some experience in designing, constructing, managing, and evaluating technology systems; and the ability to recognize the positive and negative impacts of technology on individuals, society, and the environment.

Newburgh's technology programs are designed to integrate technology into all other content areas, as well as to develop specific knowledge and skills. In this technology-dependent world, students must be prepared to both compete for an individually fulfilling future and to contribute to our future success as a society.

We must prepare our students to take their place in society, and to fill jobs that do not even exist today. This will be one of our greatest challenges!

PRE-KINDERGARTEN/KINDERGARTEN TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

By the end of Grade K, students will:

- Use a computer and a couple of software packages to enter information and to draw.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

By the end of Grade K, students will:

- Describe objects, imaginary or real that might be modeled or made differently.

5.3 Key Idea: Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

By the end of Grade K, students will:

- Identify a computer.
- Use a computer and a couple of software packages to enter information and to draw.

GRADE 1 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 1, students will:

- Use a computer and several software packages to enter text and to draw.
- Observe the telecommunication of a message.
- Access information from printed media.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 1, students will:

- Identify some examples of information.
- Understand the meaning of the term information.
- Demonstrate ability to recognize information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 1, students will:

- Identify some examples of information.
- Demonstrate ability to recognize information.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 1, students will:

- Suggest ways in which objects can be changed, fixed, or improved.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 1, students will:

- Explore, use, and process a variety of materials and energy sources to design and construct things.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 1, students will:

- Identify a computer system.
- Observe the use of a computer system to access an Internet site.
- Use a computer and several software packages to enter text and to draw.

GRADE 2 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 2, students will:

- Use a computer and several software packages to enter text and to draw.
- Participate in the class telecommunication of a message with teacher help.
- Access information from printed media and computer software.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 2, students will:

- Identify an example of an information system.
- Identify some forms of information.
- Demonstrate ability to recognize different forms of information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicator

In addition to all previous competencies, by the end of Grade 2, students will:

- Identify an example of an information system.
- Demonstrate ability to recognize different forms of information.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 2, students will:

- Investigate prior solutions and ideas from books, magazines, family, friends, neighbors, and community members.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 2, students will:

- Understand the importance of safety, cost, ease of use, and availability in selecting tools and resources for a specific purpose.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 2, students will:

- Identify the major components of a computer system.
- Participate in a class using a computer system to access an Internet site.
- Use a computer and several software packages to enter text and to draw.

GRADE 3 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Use a variety of equipment and software packages to enter, display, and communicate information using text, pictures, and sound.
- Participate in a small team telecommunication of a message with teacher help.
- Access information from printed media and electronic databases.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Identify some examples of an information system.
- Understand that computers store information.
- Understand that some information is reliable and some information is not reliable and that some information is useful and some information is not useful.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Identify some examples of an information system.
- Understand that some information is reliable and some information is not reliable and that some information is useful and some information is not useful.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Generate ideas for possible solutions, individually and through group activity; apply age-appropriate mathematics and science skills; evaluate the ideas and determine the best solution; and explain reasons for the choices.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Develop basic skills in the use of hand tools.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Identify the major components of a computer system and their function.
- Participate in a small team using a computer system to access various Internet sites.
- Use a variety of equipment and software packages to enter, display, and communicate information using text, pictures, and sound.
- Use a computer system to record information.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Identify familiar examples of technological systems that are used to satisfy human needs and wants, and select them on the basis of safety, cost, and function.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 3, students will:

- Participate in small group projects and in structured group tasks requiring planning, financing, production, quality control, and follow-up.

GRADE 4 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Use a variety of equipment and software packages to enter, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to others in the school district with teacher help.
- Access needed information from printed media and electronic databases.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Identify some locations where information systems are used.
- Understand that computers are used to store personal information.
- Demonstrate ability to identify some reliable information and some unreliable information and some useful information and some information that is not useful.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Identify some locations where information systems are used.
- Demonstrate ability to identify some reliable information and some unreliable information and some useful information and some information that is not useful.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Plan and build, under supervision, a model of the solution of a problem using familiar materials, processes, and hand tools.
- Discuss how best to test the solution; perform the test under teacher supervision; record and portray results through numerical and graphic means; discuss orally why things worked or did not work; and summarize results in writing, suggesting ways to make the solution better.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Use simple manufacturing processes (e.g. assembly, multiple stages of production, quality control) to produce a product.
- Use appropriate graphic and electronic tools and techniques to process information.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Identify the major components of a computer system and their function.
- Use a computer system to connect to and access information from an Internet site.
- Use computer hardware and software to draw prototypical designs.
- Use a computer system to record and organize information.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Assemble and operate simple technological systems, including those with interconnecting mechanisms to achieve different kinds of movement.
- Understand that larger systems are made up of smaller component subsystems.

5.5 Key Idea: Technology has been the driving force in the evolution of society from an agricultural, to an industrial, to an information base.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Identify technological developments that have significantly accelerated human progress.

5.6 Key Idea: Technology can have positive and negative impacts on individuals, society, and the environment; and humans have the capability and responsibility to constrain or promote technological development.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Describe how technology can have positive and negative effects on the environment, and on the way people live and work.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 4, students will:

- Speculate on, and model possible technological solutions that can improve the safety and quality of the school or community environment.

GRADE 5 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Use a variety of equipment and software packages to enter, display, and communicate information, using text, tables, pictures, and sound.
- Telecommunicate a message to others in the school district with teacher help.
- Access needed information from printed media and electronic databases.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Describe a use of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Understand that information varies over a range of reliability and usefulness.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Describe a use of information systems in homes and schools.
- Understand that information varies over a range of reliability and usefulness.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Identify needs and opportunities for technical solutions from an investigation of situations of general or social interest.
- Locate and utilize a range of printed, electronic, and human information resources to obtain ideas.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Identify the major components of a computer system and their function.
- Use a computer system to connect to and access needed information from an Internet site.
- Use computer hardware and software to draw prototypical designs.
- Use a computer system to monitor an external event.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Select appropriate technological systems on the basis of safety, function, cost, ease of operation, and quality of post-purchase support.

5.5 Key Idea: Technology has been the driving force in the evolution of society from an agricultural, to an industrial, to an information base.

Performance Indicators

In addition to all previous competencies, by the end of Grade 5, students will:

- Describe how the evolution of technology led to the shift in society from an agricultural base, to an industrial base, to an information base.

GRADE 6 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media and electronic databases.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Describe a use of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to identify examples of information of differing degrees of reliability and usefulness; and appropriately characterize the reliability and usefulness of each example.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Describe a use of information systems in homes and schools.
- Demonstrate ability to identify examples of information of differing degrees of reliability and usefulness, and appropriately characterize the reliability and usefulness of each example.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Consider constraints, and generate several ideas for alternative solutions, using group and individual ideation techniques (group discussion, brainstorming, forced connections, role play); defer judgment until a number of ideas have been generated; evaluate (critique) ideas; and explain why the chosen solution is optimal.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Choose and use resources for a particular purpose based upon an analysis and understanding of their properties, costs, availability, and environmental impact.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Connect 2 computer system components together.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw prototypical designs.
- Use a computer system to monitor an external project.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Assemble, operate, and explain the operation of simple open- and closed-loop electrical, electronic, mechanical, and pneumatic systems.

5.5 Key Idea: Technology has been the driving force in the evolution of society from an agricultural, to an industrial, to an information base.

Performance Indicators

In addition to all previous competencies, by the end of Grade 6, students will:

- Understand the contributions of people of different genders, races, and ethnic groups to technological development.

GRADE 7 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media, electronic databases, and community resources.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Describe the uses of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to evaluate information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Describe the uses of information systems in homes and schools.
- Demonstrate ability to evaluate information critically.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Develop plans, including drawings with measurements and details of construction, and construct a model of the solution, exhibiting a degree of craftsmanship.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Use a variety of hand tools and machines to change materials into new forms through forming, separating, and combining processes, and processes that cause internal change to occur.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Connect several computer system components together.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw prototypical designs.
- Use a computer system to monitor an external project.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Describe how subsystems and system elements (inputs, processes, outputs) interact within systems.

5.5 Key Idea: Technology has been the driving force in the evolution of society from an agricultural, to an industrial, to an information base.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Describe how new technologies have evolved as a result of combining existing technologies (e.g. photography combined optics and chemistry; the airplane combined kite and glider technology with a lightweight gasoline engine).

5.6 Key Idea: Technology can have positive and negative impacts on individuals, society, and the environment; and humans have the capability and responsibility to constrain or promote technological development.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Describe how outputs of a technological system can be desired, undesired, expected, or unexpected.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 7, students will:

- Manage time and financial resources in a technological project.
- Provide examples of products that are well (and poorly) designed and made; describe their positive and negative attributes, and suggest measures that can be implemented to monitor quality during production.

GRADE 8 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media, electronic databases, and community resources.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Describe the uses of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to evaluate information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Describe the uses of information systems in homes and schools.
- Demonstrate ability to evaluate information critically.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- In a group setting, test their solution against design specifications, present and evaluate results, describe how the solution might have been modified for different or better results, and discuss tradeoffs that might have to be made.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Combine manufacturing processes with other technological processes to produce, market, and distribute a product.
- Process energy into other forms and information into more meaningful information.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Connect several computer system components together.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw prototypical designs.
- Use a computer system to monitor an external project.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Describe how system control requires sensing information, processing it, and making changes.

5.6 Key Idea: Technology can have positive and negative impacts on individuals, society, and the environment; and humans have the capability and responsibility to constrain or promote technological development.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Describe through examples how modern technology reduces manufacturing and construction costs, and produces more uniform products.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 8, students will:

- Assume leadership responsibilities within a structured group activity.

GRADE 9 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media, electronic databases, and community resources.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Describe the uses of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to evaluate information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Describe the uses of information systems in homes and schools.
- Demonstrate ability to evaluate information critically.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Initiate and carry out a thorough investigation of an unfamiliar situation, and identify needs and opportunities for technological invention or innovation.
- Identify, locate, and use a wide range of information resources, including subject experts, library references, magazines, videotapes, films, electronic data bases and on-line services, and discuss and document through notes and sketches how findings relate to the problem.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Test, use, and describe the attributes of a range of material (including synthetic and composite materials), information, and energy sources.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Assemble a computer system including keyboard, central processing unit and disc drives, mouse, modem, printer, and monitor.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw and dimension prototypical designs.
- Use a computer as a modeling tool.
- Use a computer system to monitor and control external events and/or systems.

5.6 Key Idea: Technology can have positive and negative impacts on individuals, society, and the environment; and humans have the capability and responsibility to constrain or promote technological development.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Explain that, although technological effects are complex and difficult to predict accurately, humans can control the development and implementation of technology.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 9, students will:

- Develop and use computer-based scheduling and project tracking tools, such as flow charts and graphs.

GRADE 10 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media, electronic databases, and community resources.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Describe the uses of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to evaluate information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Describe the uses of information systems in homes and schools.
- Demonstrate ability to evaluate information critically.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Generate creative solution ideas, break ideas into significant functional elements, and explore possible refinements.
- Predict possible outcomes using mathematical and functional modeling techniques; choose the optimal solution to the problem, clearly documenting ideas against design criteria and constraints; and explain how human values, economics, ergonomics, and environmental considerations have influenced the solution.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Select appropriate tools, instruments, and equipment; and use them correctly to process materials, energy, and information.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Assemble a computer system including keyboard, central processing unit and disc drives, mouse, modem, printer, and monitor.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw and dimension prototypical designs.
- Use a computer as a modeling tool.
- Use a computer system to monitor and control external events and/or systems.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Explain why making tradeoffs among characteristics, such as safety, function, cost, ease of operation, quality of post-purchase support, and environmental impact, is necessary when selecting systems for specific purposes.

5.5 Key Idea: Technology has been the driving force in the evolution of society from an agricultural, to an industrial, to an information base.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Explain how technological inventions and innovations have caused global growth and interdependence, stimulated economic competitiveness, created new jobs, and made other jobs obsolete.

5.6 Key Idea: Technology can have positive and negative impacts on individuals, society, and the environment; and humans have the capability and responsibility to constrain or promote technological development.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Explain how computers and automation have changed the nature of work.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 10, students will:

- Explain how computers and automation have changed the nature of work.

GRADE 11 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media, electronic databases, and community resources.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Describe the uses of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to evaluate information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Describe the uses of information systems in homes and schools.
- Demonstrate ability to evaluate information critically.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Develop work schedules and plans that include optimal use and cost of materials, processes, time, and expertise.
- Construct a model of the solution, incorporating developmental modifications, while working to a high degree of quality (craftsmanship).

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Explain tradeoffs made in selecting alternative resources in terms of safety, cost, properties, availability, ease of processing, and disposability.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Assemble a computer system including keyboard, central processing unit and disc drives, mouse, modem, printer, and monitor.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw and dimension prototypical designs.
- Use a computer as a modeling tool.
- Use a computer system to monitor and control external events and/or systems.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Model, explain, and analyze the performance of a feedback control system.

5.6 Key Idea: Technology can have positive and negative impacts on individuals, society, and the environment; and humans have the capability and responsibility to constrain or promote technological development.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Explain how national security is dependent upon both military and non-military applications of technology.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and built safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 11, students will:

- Discuss the role technology has played in the operation of successful U.S. businesses; and under what circumstances they are competitive with other countries.
- Explain how technological inventions and innovations stimulate economic competitiveness, and how, in order for an innovation to lead to commercial success, it must be translated into products and services with marketable demand.

GRADE 12 TECHNOLOGY

New York State Standard 2: Information technology is used to retrieve, process, and communicate information, and as a tool to enhance learning.

New York State Standard 5: Students will apply technological knowledge and skills to design, construct, use and evaluate products and systems to satisfy human and environmental needs.

New York State Standard 1: Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

New York State Standard 6: Students will understand the relationships and common themes that connect mathematics, science, and technology; and apply the themes to these and other areas of learning.

New York State Standard 7: Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems, and make informed decisions.

2.1 Key Idea: Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Use a variety of equipment and software packages to enter, process, display, and communicate information using text, tables, pictures, and sound.
- Telecommunicate a message to a distant location with teacher help.
- Access needed information from printed media, electronic databases, and community resources.

2.2 Key Idea: Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Describe the uses of information systems in homes, schools, and businesses.
- Understand that computers are used to store personal information.
- Demonstrate ability to evaluate information.

2.3 Key Idea: Information technology can have positive and negative impacts on society, depending upon how it is used.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Describe the uses of information systems in homes and schools.
- Demonstrate ability to evaluate information critically.

5.1 Key Idea: Engineering design is an interactive process involving modeling and optimization used to develop technological solutions to problems within given constraints.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- In a group setting, devise a test of the solution relative to the design criteria, and perform the test.
- Record, portray, and logically evaluate performance test results through quantitative, graphic, and verbal means; and use a variety of creative verbal and graphic techniques effectively and persuasively to present conclusions.
- Predict impacts and new problems, and suggest and pursue modifications.

5.2 Key Idea: Technological tools, materials, and other resources should be selected on the basis of safety, cost, availability, appropriateness, and environmental impact; technological process change energy, information, and material resources into more useful forms.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Describe and model methods (including computer-based methods) to control system processes and monitor system outputs.

5.3 Key Idea (Computer Technology): Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Assemble a computer system including keyboard, central processing unit and disc drives, mouse, modem, printer, and monitor.
- Use a computer system to connect to and access needed information from various Internet sites.
- Use computer hardware and software to draw and dimension prototypical designs.
- Use a computer as a modeling tool.

- Use a computer system to monitor and control external events and/or systems.

5.4 Key Idea: Technological systems are designed to achieve specific results and produce outputs, such as products, structures, services, energy, or other systems.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Explain how complex technological systems involve the confluence of numerous other systems.

5.7 Key Idea: Project management is essential to ensuring that technological endeavors are profitable, and that products and systems are of high quality and build safely, on schedule, and within budget.

Performance Indicators

In addition to all previous competencies, by the end of Grade 12, students will:

- Describe new management techniques (e.g., computer-aided engineering, computer-integrated manufacturing, total quality management, just-in-time manufacturing); and explain how they have reduced the length of design-to-manufacture cycles, resulting in more flexible factories, and improved quality and customer satisfaction.
- Help to manage a group engaged in planning, designing, implementation, and evaluation of a project to gain understanding of the management dynamics.

Appendix D

Children's Internet Protection Act

Background

The Children's Internet Protection Act (CIPA) is a federal law enacted by Congress to address concerns about access to offensive content over the Internet on school and library computers. CIPA imposes certain types of requirements on any school or library that receives funding for Internet access or internal connections from the E-rate program – a program that makes certain communications technology more affordable for eligible schools and libraries. In early 2001, the FCC issued rules implementing CIPA. More recently, Congress enacted additional protections for children using the Internet.

What CIPA Requires

- Schools and libraries subject to CIPA may not receive the discounts offered by the E-rate program unless they certify that they have an Internet safety policy and technology protection measures in place. An Internet safety policy must include technology protection measures to block or filter Internet access to pictures that are: (a) are obscene, (b) child pornography, or (c) harmful to minors (for computers that are accessed by minors).
- Schools and libraries must also certify that, as part of their Internet safety policy, they are educating minors about appropriate online behavior, including cyberbullying awareness and response and interacting with other individuals on social networking sites and in chat rooms.
- Schools subject to CIPA are required to adopt and enforce a policy to monitor online activities of minors.
- Schools and libraries subject to CIPA are required to adopt and implement a policy addressing: (a) access by minors to inappropriate matter on the Internet; (b) the safety and security of minors when using electronic mail, chat rooms, and other forms of direct electronic communications; (c) unauthorized access, including so-called "hacking," and other unlawful activities by minors online; (d) unauthorized disclosure, use, and dissemination of personal information regarding minors; and (e) restricting minors' access to materials harmful to them.

Schools and libraries are required to certify that they have their safety policies and technology in place before receiving E-rate funding.

- CIPA does not affect E-rate funding for schools and libraries receiving discounts only for telecommunications, such as telephone service.
- An authorized person may disable the blocking or filtering measure during any use by an adult to enable access for bona fide research or other lawful purposes.

