Information Technology

Program CIP: 11.0101 Computer Technology/Computer Systems Technology

Ordering Information

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The Research and Curriculum Unit (RCU), located in Starkville, MS, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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Dr. Hank M. Bounds, Executive Secretary
Mr. Claude Hartley, Chair
Mr. William Harold Jones, Vice Chair
Mr. Howell "Hal" N. Gage
Dr. O. Wayne Gann
Ms. Rebecca Harris
Mr. Charles McClelland
Ms. Sondra Parker Caillavet
Ms. Rosetta Richards
Dr. David Sistrunk

Mike Mulvihill, Interim Associate State Superintendent of Education for the Office of Vocational Education and Workforce Development, at the Mississippi Department of Education assembled an oversight committee to provide input throughout the development of the *Information Technology Curriculum Framework and Supporting Materials.* Members of this task force are as follows:

CPOC Committee

Dr. Kay Berry, Simpson County School District
Dr. Sam Bounds, Mississippi Association of School Superintendents
Kevin F. Gilbert, Mississippi Association of Educators
David Campbell, Mississippi Association of Middle Level Educators
Tommye Dale Favre, Mississippi Department of Employment Security
Mary Hardy, Mississippi PTA
Anna Hurt, Mississippi Association of School Administrators
Jay Moon, Mississippi Manufacturers Association
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Michael Ray, Western Line School District
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Mike Thomas, North American Coal Corporation
Pete Walley, Institutions of Higher Learning
Clarence Ward—Boys and Girls Clubs of the Gulf Coast
Debra West, State Board for Community and Junior Colleges

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Angela Kitchens, Program Coordinator, Office of Vocational Education and Workforce Development, Mississippi Department of Education, Jackson, MS

Finally, standards in the *Information Technology Curriculum Framework and Supporting Materials* are based on the following:

Skill Standards for Information Technology
The *Skill Standards for Information Technology* was developed by a team of IT professionals from many companies across the nation and internationally. Funding for development of the standards was provided by the National Science Foundation. In addition to industry-specific technical skills, knowledge, and abilities, the standards include foundation skills required of all workers as well as technical skills common to all jobs within a career cluster across all industries. Reprinted with permission from the National Workforce Center for Emerging Technologies. Copyright © 2003. All rights reserved.

Applied Academic Credit Benchmarks
Mississippi Department of Education 2007 Mississippi Mathematics Framework Revised

21st Century Skills and Information and Communication Technologies Literacy Standards
In defining 21st century learning, the Partnership for 21st Century Skills has embraced five content and skill areas that represent the essential knowledge for the 21st century: Global awareness; civic engagement; financial, economic, and business literacy; learning skills that encompass problem-solving, critical-thinking, and self-directional skills; and Information and Communication Technology (ICT) literacy.

National Educational Technology Standards for Students
Reprinted with permission from *National Educational Technology Standards for Students: Connecting Curriculum and Technology*, Copyright © 2007, ISTE (International Society for Technology in Education), (800) 336-5191 (U.S. and Canada) or (541) 302-3777 (International), iste@iste.org, www.iste.org. All rights reserved. Permission does not constitute an endorsement by ISTE.

ACT College Readiness Standards

The College Readiness Standards are sets of statements intended to help students understand what is expected of them in preparation for the ACT. These standards are integrated into teaching and assessment strategies throughout the curriculum framework.

Preface

Secondary vocational–technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act IV, 2007; and No Child Left Behind Act of 2001).

Information Technology Executive Summary

Program Description

The Information Technology program is designed to provide the basic foundation, skills, and knowledge for computer networking, applications, and support, along with an introduction to programming. Students will develop the skills necessary to prepare for certification exams and will learn how to develop, support, and integrate computing systems. They will acquire network planning and management skills and the ability to provide technical support. The program will provide hands-on experience in computer systems support and skill in network setup and maintenance.

Industry standards referenced are from the *Skill Standards for Information Technology* published by the National Workforce Center for Emerging Technologies. Program competencies are designed to prepare students for A+ certification. Additional research data used in the development of this publication were collected from a review of related literature and from surveys of local experts in business, industry, and education.

Industry Certification

Program competencies are designed to prepare students for A+ certification by integrating certification skills throughout the curriculum. *Skill Standards for Information Technology* is also referenced to assist in student preparation for IT careers.

Assessment

Students will be assessed using the Information Technology MS-CPAS2 test. The MS-CPAS2 blueprint can be found at http://info.rcu.msstate.edu/services/curriculum.asp. If there are questions regarding assessment of this program, please contact the Business instructional design specialists at the Research and Curriculum Unit at 662.325.2510.

Student Prerequisites

In order for students to be able to experience success in the Information Technology program, the following student prerequisites are in place:

1. C or higher in Pre-Algebra
   or
2. TABE Math Computation and TABE Math Applied Score (eighth grade or higher)
   or
3. Instructor Approval

Proposed Applied Academic Credit

The academic credit is still pending for this curriculum.

Licensure Requirements

The 954 license is needed to teach the Information Technology program. The requirements for the 954 license endorsement are listed below:

1. Applicant must have an associate's or higher degree and must have at least 2 years for an AA and 1 year for BS or higher of verifiable occupational experience in the past 10 years. Experience must be appropriate to the subject to be taught.
2. Applicant must enroll immediately in the Vocational Instructor Preparation (VIP) or the Redesign Education Program (REP).
3. Applicant must complete the individualized Professional Development Plan (PDP) requirements of the VIP or REP prior to the expiration date of the 3-year vocational license.
4. Applicant must possess and maintain A+ certification.
5. Applicant must successfully complete an MDE-approved computer literacy certification exam.
6. Applicant must successfully complete certification for an online learning workshop, module, or course that is approved by the MDE.
7. Applicant must successfully complete an information technology certification workshop, module, or course that is approved by the MDE.

Note: If an applicant meets all requirements listed above, that applicant will be issued a 954 endorsement—a 5-year license. If an applicant does not meet all requirements, the applicant will be issued a 3-year endorsement license, and all requirements stated above must be satisfied prior to the ending date of that license.

Professional Learning

The professional learning itinerary for the middle school or individual pathways can be found at http://redesign.rcu.msstate.edu. If you have specific questions about the content of each training session provided, please contact the Research and Curriculum Unit at 662.325.2510 and ask for the Professional Learning Specialist.

Course Outlines

Program CIP Code: 11.0101

The Information Technology pathway is offered in two options as outlined below.

Option 1—Four One-Carnegie-Unit Courses

Course Description: Introduction to Information Technology includes the foundation skills required for building computer systems. Program competencies are designed to prepare students for A+ certification by integrating certification skills throughout the course.

Course Description: Computer Fundamentals provides an introduction to computer networking concepts. Program competencies are designed to prepare students for A+ certification by integrating certification skills throughout the course.

Course Description: Network Fundamentals includes advanced computer networking concepts including planning, design, and security. Program competencies are designed to prepare students for A+ certification by integrating certification skills throughout the course.

Course Description: Programming and Web Design provides instruction in Web page design, programming concepts, IT career opportunities, and emerging technologies in the field. Program competencies are designed to prepare students for A+ certification by integrating certification skills throughout the course.

Introduction to Information Technology (One Carnegie Unit) - Course Code: 992202

Unit		Title	Hours
1		Introduction to Information Technology	40
2		Introduction to Computer Hardware and Operating Systems	70
			110

Computer Fundamentals (One Carnegie Unit) - Course Code: 992203

Unit		Title	Hours
3		Basic Electricity and Data Communications	45
4		Computer Assembly, Configuration, and Diagnostics	60
			105

Network Fundamentals (One Carnegie Unit) - Course Code: 992204

Unit		Title	Hours
5		Network Concepts	40
6		Network Planning and Design	60
7		Network Security	40
			140

Programming and Web Design (One Carnegie Unit) - Course Code: 992205

Unit		Title	Hours
8		Web Design	45
9		Visual Basic	30
10		Career Development	30
			105

Option 2—Two Two-Carnegie-Unit Courses

Course Description: Information and Technology I provides the foundation skills necessary for IT professionals including an introduction to computer hardware and operation systems; data communications; and computer assembly, configuration, and diagnostics. The program also provides an introduction to computer programming.

Course Description: Information and Technology II provides opportunities for students to develop advanced networking skills, Web design skills, and employability skills. This course should be taken only upon successful completion of Information Technology I.

Information Technology I (Two Carnegie Units) - Course Code: 992200

Unit		Title	Hours
1		Introduction to Information Technology	40
2		Introduction to Computer Hardware and Operating Systems	70
3		Basic Electricity and Data Communications	45
4		Computer Assembly, Configuration, and Diagnostics	60
			215

Information Technology II (Two Carnegie Units) - Course Code: 992201

Unit		Title	Hours
5		Network Concepts	40
6		Network Planning and Design	60
7		Network Security	40
8		Web Design	45
9		Visual Basic	30
10		Career Development	30
			245

Blueprint

You will find the blueprint that corresponds to this document at: http://redesign.rcu.msstate.edu/curriculum/

Professional Organizations

Association for Supervision and Curriculum Development - ASCD
1703 North Beauregard Street
Alexandria, VA 22311-1714
800-933-ASCD
http://www.ascd.org

Association for Career and Technical Education - ACTE
1410 King Street
Alexandria, VA 22314
800-826-9972
http://www.acteonline.org

Mississippi Association for Career and Technical Education – MSACTE
http://www.mississippiacte.com/

Mississippi Association for Supervision and Curriculum Development - MASCD
P.O. Box 13576
Jackson, MS 39236
601-591-2210
http://www.mascd.com

Mississippi Department of Education - MDE
Office of Vocational Education and Workforce Development
P.O. Box 771
Jackson, MS 39205
601-359-3940
http://www.mde.k12.ms.us/vocational/news/

Using This Document

Unit Number and Title

Suggested Time on Task
An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75–80% of the time in the course.

Competencies and Suggested Objectives
A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Suggested Teaching Strategies
This section of each unit indicates research-based strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies that reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

Suggested Assessment Strategies
This section indicates research-based strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

Integrated Academic Topics, 21st Century Skills and Information and Communication Technology Literacy Standards, ACT College Readiness Standards, and Technology Standards for Students
This section identifies related academic topics as required in the Subject Area Testing Program (SATP) in Algebra I, Biology I, English II, and U.S. History from 1877, which are integrated into the content of the unit. Research-based teaching strategies also incorporate ACT College Readiness standards. This section also identifies the 21st Century Skills and Information and Communication Technology Literacy skills. In addition, national technology standards for students associated with the competencies and suggested objectives for the unit are also identified.

References
A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested, and the list may be modified or enhanced based on needs and abilities of students and on available resources.

Information Technology

Unit 1: Introduction to Information Technology

Competency 1: Research educational, occupational, and leadership opportunities in information technology.

Suggested Enduring Understandings

1. Rules exist for the benefit of everyone.
2. School and program policies, procedures, and expectations reflect the standards of industry.
3. Student organizations provide leadership opportunities.

Suggested Essential Questions

1. What are the rules for the local school, and how do they benefit students?
2. How do school and program policies, procedures, and expectations mirror those found in industry?
3. What student organizations are available at the local school?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Review student rules and regulations for the local school. (DOK 1) NE1	a. Use a multimedia presentation to review and discuss student rules and regulations for the local school. Have students use the **Venn Diagram** to compare and contrast rules and regulations in the IT classroom to rules and regulations in other classrooms. Have students summarize their Venn diagrams. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M2 M5 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	a. Assess student knowledge of school rules and regulations through the use of a written test. Evaluate the Venn diagram for format, correctness, and creativity. Post student work on the wall to motivate students to turn in quality work.
b. Compare and contrast local program policies, procedures, and expectations to industry policies, procedures, and expectations. (DOK 2) NE1	b. Discuss the importance of professionalism in the workplace. Invite guest speakers to discuss qualities they look for in job applicants. Have students interview an IT industry member. If possible, have them interview multiple members. The interview should consist of questions related to work expectations, industry policy and procedures, and academic skills needed in the industry. Have students create a blog, wiki, or piece of artwork summarizing their findings. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M2 M5 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	b. Assess student professionalism weekly using the **Work Ethic Grade Chart**. Assess student blogs, wikis, or pieces of artwork for content, creativity, and format.
c. Identify and describe leadership opportunities available from student youth organizations in	c. Describe the vocational student organization (VSO) associated with the program, and provide an overview of opportunities to participate in leadership activities, community service projects, and competitive events.	c. Monitor group work throughout the unit to ensure that each member participates.

	the school and community. (DOK 1) NE1	Have students work in pairs to explore the VSO Web site and develop a presentation, brochure, or display that includes the motto, creed, emblem, colors, theme, and history of the organization. Discuss with students the election process used in the VSO; compare and contrast this process with the processes used for local, state, and national elections. Have students define and illustrate terms related to student organizations. Terms may include but are not limited to parliamentary procedures, standing committees, special committees, main motion, secondary motion, adjourn, agenda, amend the motion, bylaws, chair, debate, majority, minutes, motion, quorum, second the motion, table the motion, and the floor. Have students participate in local officer elections modeled after the election process. Have candidates for office campaign and prepare posters and a speech. Have members vote by secret ballot. Have students plan a ceremony to install officers and induct members. Have students work in teams to develop club goals and service projects for the year. Have each student select and participate in a competitive event appropriate to his or her skills, aptitudes, and abilities. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M2 M5 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	Evaluate the VSO presentation. Evaluate campaign posters using the **Poster Assessment Rubric**. Use the Blackboard Learning System to administer a quiz for terminology.
d.	Preview the school technology acceptable use policy. (DOK 1)	d. Review and discuss the school technology acceptable use policy. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M2 M5 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	d. Assess student knowledge of school technology acceptable use policy through the use of a written test.

Competency 2: Identify, discuss, and apply safety procedures in the computer classroom and lab.

Suggested Enduring Understandings	Suggested Essential Questions
1. Safety procedures are put in place to protect both people and equipment.	1. What are the proper classroom and personal safety procedures needed to protect both people and equipment?
2. Computer hardware must be cared for and used correctly.	2. When would you use a fire extinguisher?
3. Computer equipment can potentially pose health hazards.	3. How can computer components be protected from electrostatic discharge?

4. What are the potential health hazards when working with computer equipment?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the proper classroom and personal safety procedures to include fire extinguishers, electrical, clothing, jewelry, eye protection, and so forth. (DOK 1) CE8	a. Discuss the impact of safety in the workplace. Pre-assess student knowledge of workplace safety by asking them to describe potential computer-related health problems and workplace safety issues. Invite a guest speaker from industry to discuss potential computer-related health hazards. If this is not possible, have students interview two to three industry members about job safety, safety tips, and safety procedures that are computer related. From the interview, have students use technology productivity tools and the writing process to write a paragraph summarizing their qualitative research. Invite a guest speaker from the local fire department to discuss fire safety. Have students locate all of the fire extinguishers in the school. Have each student determine the type of extinguisher and the last date of inspection. Have students write a summary of their findings. Have students state why they feel the specific types of extinguishers were used in the location they found them in. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M7 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Assess each student's safety knowledge with a unit test administered via the Blackboard Learning System, and file the completed test for documentation. Each student must score 100% accuracy before being allowed to participate in lab activities. Evaluate the student summaries for content, grammar, and format.
b. Care for and use computer hardware correctly. (DOK 2) CE3 CE4 CE8 CE11	b. Discuss electrostatic discharge (ESD) and how to protect equipment from ESD. Discuss power issues and how to determine if the computer is having problems related to power (i.e., burnt parts or odor, computer that reboots constantly, etc.). Have students create a safety cartoon that shows four frames of how to use equipment safely. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M7 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate student cartoons for creativity, content, and grammar.
c. Handle DVDs and CDs correctly. (DOK 1)	c. Demonstrate the proper ways to handle DVDs and CDs correctly. Have students practice handling DVDs and CDs. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M7 R1 R2 R3 R4 R5 S1 S2 S3 W	c. Observe students as they practice handling DVDs and CDs.
d. Identify potential health hazards when	d. Have each student use the Internet or other resource to research safety and PC security issues	d. Evaluate student projects for content,

working on computer equipment. (DOK 2) CE8	and procedures. Have students present findings to the class by writing and producing a play, creating a slide show, leading a panel discussion, or writing a new law. Have students work in teams of two to use the Internet to locate and print OSHA and EPA regulations related to the workplace. Have teams use presentation software to present safety procedures related to the information they researched. Have the class self-evaluate their own work and peer evaluate their classmates' work. Provide students with case studies or scenarios that describe various hazardous situations. Have students work in teams of three or four to analyze the case studies or scenarios, applying the appropriate rules and procedures and developing ways to prevent workplace hazards and apply appropriate first aid procedures. Re-teach as needed. Research proper disposal procedures for computers, monitors, and laptop batteries. Have students create a safety cartoon that shows four frames of how to use equipment safely. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M7 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	grammar, and delivery. Evaluate the project on OSHA and EPA regulations for content and delivery. Lead a discussion in which the class evaluates the solutions to each case study presented by each team. Monitor and reinforce student safety habits throughout the year.

Competency 3: Publish and communicate with peers, experts, and other audiences using technology. ND7

Suggested Enduring Understandings

1. Individuals should implement safety guidelines when using telecommunications and the Internet.
2. Copyright laws are used to protect intellectual properties.
3. Software licenses govern the usage of copyright protected software.
4. Browsers, search engines, and e-mail are essential Internet tools.
5. Discussion boards, blogs, wikis, list servers, and chat rooms provide a variety of ways to communicate on the Web.
6. A Web site's purpose describes the function it must perform.
7. The IT industry has evolved significantly over past decades.

Suggested Essential Questions

1. How do people stay safe online?
2. What steps can a person take to protect himself or herself when online?
3. What are copyright laws, and why are they needed?
4. What is the purpose of software licensing?
5. What is the purpose of and how can one use these online technologies: Browsers, search engines, e-mail, discussion boards, blogs, wikis, list servers, and chat rooms?
6. What is the purpose of a Web page?
7. What are the various types of Web page designs?
8. How has the IT industry changed over the years?
9. What are some of the emerging technologies in the IT industry?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Research safety issues related to telecommunications and the Internet. (DOK 1) CE8	a. Show students video clips about Internet safety for teens from http://www.netsmartz.org/resources/reallife.htm#realamy. Divide students into groups of three to four. Have each group research other safety issues related to telecommunications and the Internet. Have groups lead a class discussion sharing safety concerns, issues, and precautions that can be taken. Have students use cutouts from magazines to summarize and present their research in the form of a collage. Post the collage for other students in the career and technical center to see. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5	a. Create and administer a written assessment based on the information provided in the video clips. b. Assess group participation using the Group Participation Rubric.
b. Develop personal safety guidelines that will be used when using telecommunications and the Internet. (DOK 2) CE8	b. Divide students into groups of four. Have each group visit http://www.getnetwise.org/ to research one of the following topics: • Keeping children safe online • Stopping unwanted e-mail and spam • Protecting your computer from hackers and viruses • Keeping your personal information private Ask each group to become experts on its assigned topic. Have each group teach the class about its topic. As a whole group, have students brainstorm guidelines for teen safety on the Internet. Share with students Web sites such as http://www.missingkids.com/ and http://www.getnetwise.org/. Have students complete a teen safety reference sheet that includes information about the following: • Internet safety guidelines for teens • Strategies to enhance their ability to recognize dangers on the Internet • Information about how to report victimizations to a trusted adult Have students take their teen safety reference sheet home and discuss it with their parents or guardians. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5	b. Evaluate each group's presentation for participation and content. Have students submit the teen safety reference sheet signed by a parent or guardian.
c. Describe legal implications related to the computer industry to include software copyright issues, software	c. Using a multimedia presentation, discuss copyright issues. Use the following prompts to facilitate discussion: CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5 • Have you ever visited a file-sharing Web site such as Napster?	c. Monitor participation in the KWL activity. Assess student presentations of news events

	licensing, and Internet ethics and policies. (DOK 1) CE8	• Have you ever downloaded a song from one of these sites? If you did, did you pay for it? If not, did you purchase the CD that particular song was on? • Do you think people should be allowed to copy items such as songs, movies, and pieces of work without paying for them? Why? Explain. • Do you own a CD burner? • Have you ever copied a CD that a friend purchased? • What does the symbol © mean? Have students brainstorm copyright violations they might have committed, such as copying and distributing compact discs to others or downloading songs from the Internet. Have students complete a class KWL chart. In the "K" column, have students list their collective knowledge regarding copyright and fair use. Next, have students list information that they want to learn more about in the "W" column. Then have students visit and read information on the following Web sites: • 10 Big Myths About Copyright Explained http://www.templetons.com/brad/copymyths.html • Copyright and K-12: Who Pays in the Network Era? http://www.ed.gov/Technology/Futures/rothman.html • Citing Electronic Sources http://www.cyberbee.com/citing.html Have students revisit the KWL chart and list information that they learned from their readings. If students wanted to learn something that was not included in the articles, have students perform an Internet search to find out that information. Divide students into groups of two, and have them use the Internet to research current news events related to such violations and then write a report, a song, or a poem to present their findings. Discuss the purpose of software licensing agreements. Have students use the Internet to research and review copyright agreements. Have them look for unusual terms of use and read them aloud to the class. Discuss Internet ethics and policies and the local Internet policy. Have students sign agreements for Internet usage. Have students list concerns they have about legal implications, and re-teach as necessary.	related to copyright issues using the **Professional Behavior Rubric**. Observe student presentations of unusual terms of use included in copyright agreements.
d.	Use browsers, search engines and e-mail. (DOK 2) CE8, NE5	d. Have students complete a teacher-created Web quest to gain a foundation of knowledge of electronic mail. Make sure that students know the difference between SMTP, POP3, IMAP, and HTTP electronic mail protocols. CS1 CS2 CS3	d. Observe students as they use browsers, search engines, and e-

		CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5 Demonstrate how to use a browser and a search engine to locate and create a free, Web-based e-mail account using filtered e-mail such as Gaggle.net. Have students work in teams of two to practice sending e-mail. Have students review the school/classroom Internet Acceptable Use policy. Have students use the Internet to find information related to using e-mail in the workplace. Have students use a Venn diagram to compare and contrast policies and procedures that business and industry abides by with policies and procedures that are in place at the classroom/district level.	mail.
e.	Post information to discussion boards, blogs, wikis, and so forth. (DOK 2) CE8, NE5	e. Discuss the purpose and use of discussion boards, blogs, wikis, and so forth. Using the Blackboard Learning System, demonstrate the use of each. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5 Have students create a discussion board, blog, and wiki, and have them make posts throughout the school year.	e. Observe students as they post to discussion boards, blogs, and wikis. Evaluate student posts for content.
f.	Join and participate in appropriate, supervised Listservs. (DOK 2) CE8, NE5	f. Discuss the purpose of a Listserve, and show examples. Using the Blackboard Learning System, create a Listserv and have students practice sending e-mail to the members. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5	f. Observe students as they send e-mail using a Listserv.
g.	Use an appropriate, supervised chat room to communicate with peers, experts, and other approved audiences. (DOK 2) CE8, NE5	g. Using the Blackboard Learning System, create a chat room, have students join, and demonstrate the chat room's use. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5	g. Observe students as they participate in a supervised chat room.
h.	Evaluate Web page design techniques. (DOK 2) CE8, NE5	h. Discuss elements of Web page design. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5 Create a Web page in Notepad using HTML. Have each student create a checklist of Web page design elements and then use the checklist to evaluate Web pages located using a search engine. Have students use a phone book, the local newspaper, or the Internet to develop a list of all of the local Internet service providers in the area. Have students research the	h. Evaluate the completed checklists for accuracy and completeness.

		process of developing and publishing a Web site and present information to the class.	
i.	Research, create, and present a presentation/ project on emerging technologies, practices, trends, and issues associated with information technology. CE8, NE5	i. Have students summarize uses of telecommunications, and re-teach as necessary. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M5 R1 R2 R3 R4 R5 S1 S2 W1 W2 W3 W4 W5 Use technology to present information related to current telecommunications trends and issues. Have students create and present a presentation/project about emerging trends or technologies the information technology field.	i. Evaluate presentations for content and delivery.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND7 Perform Security Administration

Applied Academic Credit Standards

CE3 Demonstrate diagnosing and troubleshooting a system.
CE4 Demonstrate the various types of preventive maintenance measures, products, and procedures.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE11 Evaluate diagnosing and troubleshooting methods.
NE 1 Demonstrate career planning and leadership skills.
NE2 Explain components and functions of PC and network hardware.
NE5 Evaluate internetworking media and transmission methods.
NE10 Explore the basics of network management and monitoring.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M3 Numbers: Concepts and Properties
M4 Expressions, Equations, and Inequalities
M5 Graphical Representations
M6 Properties of Plane Figures
M7 Measurement
M8 Functions
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships

R4	Meaning of Words
R5	Generalizations and Conclusions
S1	Interpretation of Data
S2	Scientific Investigation
S3	Evaluation of Models, Inferences, and Experimental Results
W1	Expressing Judgments
W2	Focusing on the Topic
W3	Developing a Position
W4	Organizing Ideas
W5	Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Work Ethic Grade Chart

Behavior (15-point deduction for each instance):

- Off task
- Not following directions
- Disturbing others
- Not prepared to work (includes not turning in homework or projects, etc.)
- Not participating (includes taking notes)
- Sleeping
- Complaining
- Disrespectful/immature behavior or inappropriate language to another student
- Leaving work area messy

Attendance (25-point deduction for each instance):

- Unexcused class absence
- Unexcused tardy

Safety (50-point deduction for each instance):

- Horseplay (wrestling, slapping, shoving, rolling in chair, etc.)
- Improper use of tools

Severe infractions (100-point deduction):

- Office referral
- Cheating
- Plagiarism

Name: _____

Date: _____

Period: _____

Poster Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes 4 to 5 guidelines related to one of the following assigned topics: • Keeping children safe online • Stopping unwanted e-mail and spam • Protecting your computer from hackers and viruses • Keeping your personal information private	The poster includes 3 guidelines related to the assigned topic.	The poster includes 2 guidelines related to the assigned topic.	The poster includes 1 guideline related to the assigned topic.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are 1 to 2 grammatical or mechanical mistakes on the poster.	There are 3 to 4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	
				Total Score	

Name: _____

Date: _____

Period: _____

Group Participation Rubric

	Beginning 1 point	**Developing** 2 points	**Accomplished** 3 points	**Exemplary** 4 points	**Score**
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total Score	

Comments:

Name: _____

Date: _____

Period: _____

Professional Behavior Rubric

Attributes	Above Standard	At Standard	Attribute Still a Goal	Score
Points Possible	**3**	**2**	**1**	
Accuracy	All information submitted was accurate.	Most information submitted was accurate.	Little information submitted was accurate.	
Use of Class Time	Made effective use of time; was always on task and actively involved in the project	Made somewhat effective use of time; was usually on task and actively involved in the project	Did not use time effectively or stay on task	
Content	Content was clear, appropriate, and correct.	Content was mostly clear, appropriate, and correct.	Content was confusing, incorrect, or flawed.	
Project Completion	Completed the project with virtually no intervention from teacher; utilized problem-solving skills to complete the activity	Completed the project with some intervention from teacher; utilized problem-solving skills to complete the activity	Project was not completed or was completed with considerable help from the teacher.	
Teamwork	Consistently worked together as a well-coordinated team; divided large task into a number of smaller tasks; smaller tasks were assigned to team members.	Usually worked together as a coordinated team; usually divided large task into a number of smaller tasks; smaller tasks were usually assigned to team members.	Team did not work together or effectively assign tasks. Outside intervention was needed to help assign work.	
Aesthetics	Assigned portion of the project was attractive and/or appealing, accurate, and grammatically correct.	Assigned portion of the project was adequate and mostly accurate with few grammatical errors.	Assigned portion of the project was poorly planned and somewhat accurate with some grammatical errors.	
Knowledge Gained	Clearly explained guidelines relevant to assigned topic from the following list: • Keeping children safe online • Stopping unwanted e-mail and spam • Protecting your computer from hackers and viruses • Keeping your personal information private	Somewhat explained guidelines relevant to assigned topic	Unable to explain guidelines relevant to assigned topic	
			Total Score	

Name: _____

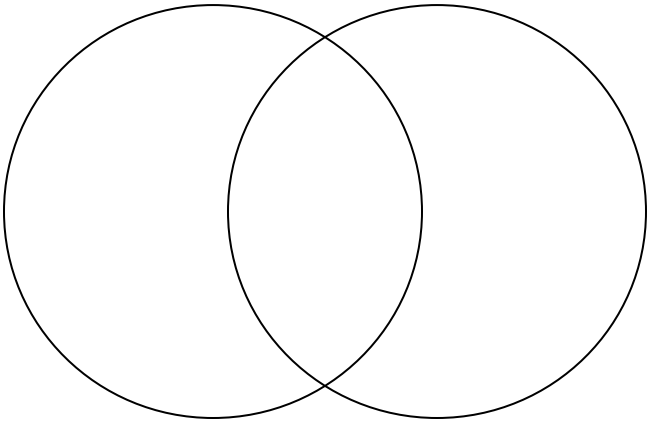
Date: _____

Period: _____

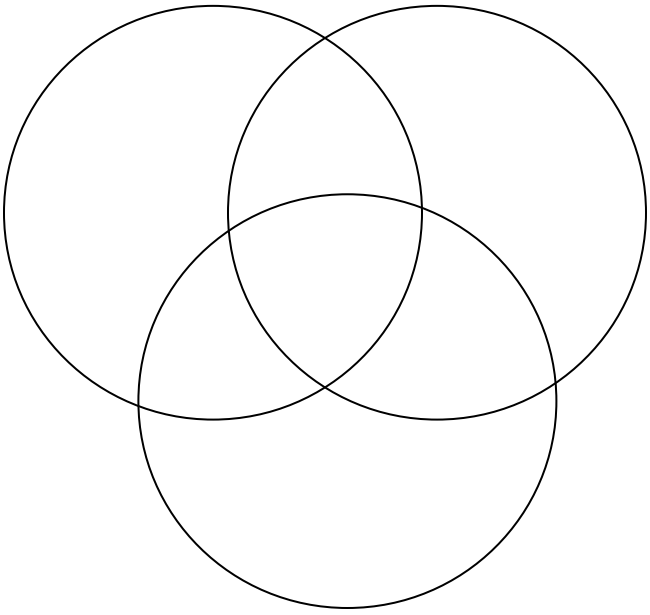
Venn Diagram

Use a Venn Diagram to compare and contrast subjects. Write details that tell how subjects are different in the outer circles and details that tell how the subjects are alike where circles overlap. After you present your ideas in the graphic, organize your ideas into a writing summary.

Use the following Venn Diagram to compare and contrast two subjects:



Use the following Venn Diagram to compare and contrast three subjects:



Unit 2: Introduction to Computer Hardware and Operating Systems

Competency 1: Evaluate and resolve computer hardware and software issues. ND1

Suggested Enduring Understandings

1. Computers require both hardware and software to work.
2. A computer is composed of many different hardware components inside and connected to a computer.
3. System resources help hardware and software communicate.

Suggested Essential Questions

1. What are the types, purposes, and functions of a computer?
2. How are hardware and software different?
3. What are the internal components of a computer, and what are their functions?
4. What are system resources, and what services do they provide a system?
5. What are the peripheral components of a computer, and what are their functions?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and describe computer types, purposes, and functions. (DOK 1) CE2 CE5	a. Use a multimedia presentation to illustrate different types of computers (include microcomputers, minicomputers, mainframes, supercomputers, etc.), purposes, and functions (include input, output, processing, and storage). Have students use computer catalogs, newspaper ads, and magazines to make an illustrated dictionary of computer terms. Terms can include but are not limited to computer, hardware, input device, central processing unit (CPU), memory, output device, Read Only Memory (ROM), Random Access Memory (RAM), hard drive, software, Internet, and computer graphics. Have students investigate the capabilities of home computers. Have students prepare a list of the computer hardware and software that they would like to own based on cost and features. Have students present this information in a summary report. The report should include but is not limited to a budget and budget narrative. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Assess student knowledge of computer types, purposes, and functions through the use of a written test. Observe students as they define terms. Evaluate the report using the **Written Report Rubric**.
b. Differentiate between hardware and software in a computer environment. (DOK 1)	b. Ask students to define hardware and software. Have students make a list of computer devices they use each day. Have students identify each item on the list as hardware or software. Have students discuss how life would be different without these devices. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Observe students as they classify examples of hardware and software and define terms.
c. Identify various pieces of hardware and the function(s) performed by each. (DOK 1) CE2 CE5	c. Have students identify various pieces of hardware and the function(s) performed by each to include PCs, networks, PDAs, laptop computers, and storage devices. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4	c. Observe students as they identify hardware and hardware functions.

			E5 E6 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	Assess student ability to identify various pieces of hardware through the use of a hardware identification test.
d.	Identify and describe the internal components of a computer. (DOK 1) CE2 CE5	d.	Illustrate the basic components of the PC using an electronic presentation. Demonstrate the workings of the internal components to include hard drive, memory, bus, graphics, modem, motherboard, NIC, EIDE, SCSI, ATA, case, power supply, sound cards, integrated motherboard, USB, CD-ROM, CPU, and ports. As part of a whole-group discussion, have students identify each component. Have each student unplug a computer, open the case, and locate the internal component displayed in the presentation. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	d.	Observe students as they identify internal components. Using assessment tools in the Blackboard Learning System, have students list and define the basic internal components of the PC. Assess student knowledge of internal components through the use of a written test. Assess student ability to identify internal components through the use of an internal component identification test.
e.	Identify and describe system resources to include I/O, processing, memory and storage. (DOK 1) CE2 CE5 CE8	e.	Ask students to define the term *logic*. Relate their definitions to the use of the term as it relates to computer systems. Present information related to basic logic. Identify and configure addresses, and set switches and jumpers. Identify available IRQ, DMA, and input/output addresses and procedures. Discuss bus mastering. Use a graphic organizer to compare and contrast the different processor types such as RISC vs. CISC, INTEL, and AMD. Discuss cache memory. Identify different memory types such as SIMM, DIMM, and RIMM. Identify internal and external storage devices. Organize students into groups, and have them use	e.	Assess student presentations using the **Group Presentation Assessment Rubric**. Assess student knowledge of basic logic using a written assessment.

		the Internet to research information and then prepare electronic presentations or posters that depict an assigned basic logic component. Each group will present its information to the class. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	
f.	Identify and describe the various peripheral components of a computer. (DOK 1) CE2 CE5 CE6	f. Illustrate the basic peripheral components of the PC using an electronic presentation. Demonstrate the workings of the peripheral components to include printer, mouse, keyboard, monitor, external SCSI, ZIP, tape drives, disk drives, scanners, and multimedia devices. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	f. Observe students as they identify peripheral components. Using assessment tools in the Blackboard Learning System, have students list and define the basic peripheral components of the PC. Assess student knowledge of peripheral components through the use of a written test. Assess student ability to identify peripheral components through the use of a peripheral component identification test.

Competency 2: Install, configure, and troubleshoot an operating system. ND1 ND4 ND7

Suggested Enduring Understandings

1. Software is the intelligence of a computer, and it enables hardware components to work.
2. Different operating systems support different types of hardware and user needs.
3. An operating system can be installed in different ways.
4. Operating systems provide components and tools to configure, examine, and troubleshoot a computer.

Suggested Essential Questions

1. What is an operating system?
2. What is the function of an operating system?
3. How do PC operating systems and network operating systems differ?
4. What operating systems are available for users?
5. In what ways can an operating system be installed?
6. What are the steps to install an operating system?
7. What tools does an operating system provide to configure and troubleshoot a computer?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and describe the components of an operating system (input, processing, storage, and output). (DOK 1) CE1 CE9 NE2 NE3 NE4	a. Use technology to lead a discussion and demonstration of the functions of an operating system. Have students prepare a diagram outlining the parts and functions of an operating system based on their current knowledge. Have students develop a role-play that demonstrates the components and processes of an operating system. Have each group research and present information on its assigned topic. Have students practice using operating system functions. Have student teams use the Internet to research information related to operating system functions and then create a poster or electronic presentation to be used as a visual aid for an oral presentation. Have students relate new knowledge about an operating system to their prior knowledge by making corrections to their diagrams. Re-teach as needed. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Monitor students as they practice using operating system functions. Assess the presentations using the **Group Presentation Assessment Rubric** or **Poster Assessment Rubric**.
b. Discuss the difference between network operating systems and individual PC operating systems. (DOK 2) CE1 CE2 CE3 CE4 CE8 CE9 CE10 CE11 NE2 NE3 NE4	b. Discuss the various operating systems (i.e., multiprocessing vs. single processing capabilities). Have student teams use the Internet to research information to be used to create a game that compares features of various operating systems. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Assess the game for suitability, creativity, and accuracy of information.
c. Compare and contrast operating systems. (DOK 2) CE1 CE2 CE3 CE4 CE8 CE9 CE10 CE11 NE2 NE3 NE4	c. Have students work in pairs to research Windows 3.1, 9x, ME, 2000, NT, and XP; OS/2; Novell Netware; Linux; and PDA operating systems. Research should include but is not limited to an overview, the history and development, pricing, and industry uses. Have students develop a multimedia presentation explaining why some industries choose one operating system over another. Have them present their research to the class using a multimedia presentation. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2	c. Assess the multimedia presentation using the **Group Presentation Assessment Rubric**. Assess student knowledge of operating systems through the use of

			S3 W1 W2 W3 W4 W5		written tests.
d.	Demonstrate OS installation using various methods including CD installation and downloading. (DOK 2) CE1 CE2 CE3 CE4 CE8 CE9 CE10 CE11 NE2 NE3 NE4	d.	Demonstrate the installation of an operating system using different media. Have students work in pairs to perform installation and configuration procedures. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	d.	Monitor students as they install operating systems.
e.	Perform OS configuration and troubleshooting procedures. (DOK 3) CE1 CE2 CE3 CE4 CE8 CE9 CE10 CE11 NE2 NE3 NE4	e.	Demonstrate troubleshooting procedures. Divide students into two teams. Each team will set up one or more computers for the other team to troubleshoot and repair. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	e.	Monitor students as they configure and troubleshoot operating systems.

Competency 3: Investigate operating systems, programming languages, and application software. ND1 ND4

Suggested Enduring Understandings

1. Programming languages are used to create software.
2. Programming languages are defined by rules that describe their structure and meaning.
3. Application software is a subclass of software.
4. Application software includes database programs, word processors, spreadsheet programs, and video games.
5. Application software is designed to perform a certain type of work.

Suggested Essential Questions

1. What is a programming language?
2. How do programming languages differ?
3. What is application software?
4. How do application software programs differ?

Suggested Performance Indicators		Suggested Teaching Strategies		Suggested Assessment Strategies	
a.	Research programming languages. (DOK 2) CE2 NE2	a.	Administer a pretest evaluating students' knowledge of programming languages and operating software. Use information from this pretest to differentiate instruction and assignments. Discuss and demonstrate various operating platforms and software categories. Call on various students to participate in the demonstration. Guide students as they perform operations with various operating platforms. Have each student list common programming languages and give type, application area, and a statement example for each. Have students use the Internet to research programming languages. Compile a master list of programming languages on	a.	Monitor students as they use various operating platforms. Assess lists for accuracy and completeness. Assess research for accuracy and completeness.

			the board. Assign one language to a group of students. Have each group conduct in-depth research on its assigned language. Research should include but is not limited to the application areas, an example of language, an application, uses in industry, and pricing that accompanies (if applicable). CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1, E2, E3 E4 E5 E6 M1 M4 M5 M8 R3 R4 R5 S1 W1 W2 W3 W4 W5		
b.	Compare and contrast various programming languages. (DOK 2) CE2 NE2	b.	Have each student use a graphic organizer and the writing process to compare and contrast industry uses of different computer languages. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1, E2, E3 E4 E5 E6 M1 M4 M5 M8 R3 R4 R5 S1 W1 W2 W3 W4 W5	b.	Evaluate graphic organizers for mechanics, accuracy, and completeness. Evaluate student knowledge of programming languages through a written test.
c.	Research application software. (DOK 1) CE2 NE2	c.	Demonstrate the use of application software to include word processing, database, spreadsheet, desktop publishing, CAD, and multimedia presentations. Have students research different types of application software and their uses. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1, E2, E3 E4 E5 E6 M1 M4 M5 M8 R3 R4 R5 S1 W1 W2 W3 W4 W5	c.	Monitor students as they research application software. Evaluate research for accuracy and completeness.
d.	Compare and contrast various software applications. (DOK 1) CE2 NE2	d.	Have students use a graphic organizer and the writing process to compare and contrast industry uses of different application software. Have each student complete projects throughout the year using each type of application software demonstrated. Re-teach as needed. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1, E2, E3 E4 E5 E6 M1 M4 M5 M8 R3 R4 R5 S1 W1 W2 W3 W4 W5	d.	Evaluate graphic organizers for mechanics, accuracy, and completeness. Assess projects for accuracy and completeness. Evaluate student knowledge of application software through a written test.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND1 Perform Analysis
ND4 Perform Testing
ND7 Perform Security Administration

Applied Academic Credit Standards

CE1 Demonstrate basic business meeting skills and goal setting.
CE2 Demonstrate installing, configuring, and upgrading a system.
CE3 Demonstrate diagnosing and troubleshooting a system.
CE4 Demonstrate the various types of preventive maintenance measures, products, and procedures.
CE5 Distinguish between the motherboard, processor, and memory components.
CE6 Identify printer technologies, interfaces, and options/upgrades.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE10 Demonstrate the installation, configuration, and upgrading of operating systems.
CE11 Evaluate diagnosing and troubleshooting methods.

NE2 Explain components and functions of PC and network hardware.
NE3 Analyze the evolution and capabilities of operating systems.
NE4 Demonstrate the installation, configuration, and use of operating systems.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M3 Numbers: Concepts and Properties
M4 Expressions, Equations, and Inequalities
M5 Graphical Representations
M6 Properties of Plane Figures

M8 Functions
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R4 Meaning of Words
R5 Generalizations and Conclusions
S1 Interpretation of Data
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Written Report Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
Components	Includes 4 components, including cost, features, budget, and budget narrative	Includes 3 components	Includes 2 components	Includes 1 component	
				Total Score	

Name: _____

Date: _____

Period: _____

Group Presentation Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate and mostly accurate with few grammatical errors	Poorly planned and somewhat accurate with some grammatical errors	Weak and inaccurate with many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Participation	Well-balanced participation by all group members	All group members have significant participation.	Most group members participate.	One main speaker with little participation from other group members	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				Total Score	

Name: _____

Date: _____

Period: _____

Poster Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes 4 items: • A picture of the assigned component • 3 characteristics of the component	The poster includes 3 guidelines related to the assigned topic.	The poster includes 2 guidelines related to the assigned topic.	The poster includes 1 guideline related to the assigned topic.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are 1 to 2 grammatical or mechanical mistakes on the poster.	There are 3 to 4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	
				Total Score	

Unit 3: Basic Electricity and Data Communications

Competency 1: Discuss voltage and current, explain UPS requirements, and troubleshoot transmission media. ND1 ND2 ND3 ND4

Suggested Enduring Understandings

1. Electrical safety procedures are designed to protect both equipment and people.
2. Ohm's law describes how voltage, current, and resistance are interrelated.
3. There is no difference electrically between AC and DC except in terms of how they travel.
4. Electricity-regulating equipment can protect a computer against damaging changes in electrical power.
5. On a network, nodes communicate through some form of transmission media, each with its own advantages and disadvantages.

Suggested Essential Questions

1. What safety procedures should be implemented to protect people and equipment from electricity?
2. What is Ohm's law?
3. How do voltage, current, and resistance relate to one another?
4. What is the difference between alternating and direct current?
5. How do surge protectors, power conditioners, and uninterruptible power supplies regulate power and protect computer equipment?
6. What is transmission media?
7. What are the differences between the various forms of transmission media?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Implement electrical safety procedures. (DOK 2) CE2 CE3 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE8 NE9 NE10	a. Invite an electrician to speak to the class about safety with electricity. Have students work in teams to prepare a poster, produce a commercial, or compose a song related to electrical safety. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Use a checklist to evaluate student-prepared posters, commercials, or songs.
b. Discuss Ohm's law and the power formula. (DOK 2) CE2 CE3 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE8 NE9 NE10	b. Show the video *Physics: A World in Motion: Ohm's Law and Energy* from United Streaming (http://www.unitedstreaming.com). Have students complete the quiz that accompanies the video individually. Have students create and illustrate an analogy or metaphor that explains voltage and current. Have students share their analogies with the class. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate analogies for correct information.
c. Examine alternating and direct current. (DOK 2) CE2 CE3 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE8 NE9 NE10	c. Have each student use the Internet to locate definitions for electrical energy, direct current, and alternating current and share them with the class. Have students create pictorial dictionaries that include words related to voltage and current. Demonstrate the use of a multimeter or power supply tester. Have students work in pairs to	c. Evaluate student definitions for accuracy. Observe as students check power supplies.

	check the power supply using a multimeter or a power supply tester. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	
d. Determine power requirements for the UPS. (DOK 2) CE2 CE3 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE8 NE9 NE10	d. Explain UPS function and requirements for the computer. Have students research and summarize the types and importance of UPSs and present an oral report to the class. Have each student calculate power requirements for the UPS selection. Explain the differences between the AT and ATX power supply form factors. Remind students to never open a power supply. Have students research battery disposal at http://www.epa.gov and prepare a poster depicting proper disposal procedures. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	d. Evaluate oral reports of the importance of UPSs for accuracy of information. Monitor and observe as students calculate power requirements. Observe as students check power supplies. Evaluate student posters depicting proper disposal procedures using the **Poster Assessment Rubric**.
e. Describe the functions of the surge protector. (DOK 1) CE2 CE3 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE8 NE9 NE10	e. Use a multimedia presentation to illustrate how power coming into a computer is regulated through the use of surge protectors, power conditioners, and uninterruptible power supplies. Discuss the terms *swells*, *spikes*, *brownouts*, and *sags*. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	e. Assess student knowledge of power regulation devices through the use of a written test.
f. Explore transmission media to include optics, copper wire, wireless/remote access, connectors, and circuits. (DOK 2) CE2 CE3 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE8 NE9 NE10	f. Have students use the MAGNOLIA database (http://www.lib.usm.edu/~magnolia/index.htm; contact your school media specialist for a password) to find an academic journal, magazine article, and newspaper article related to transmission media. Have students use technology tools to organize, summarize, and illustrate information from the articles. Lead a class discussion related to transmission media. Have students take notes from the discussion. Have students organize and summarize their notes.	f. Monitor student responses to class discussion and matching of terms related to transmission media to include optics, copper wire, wireless/remote access, connectors, and circuits.

	Have students play a game in which they match media-related terms and media. Have students create patch cables and connect workstations to a network. Have students create a "tips" sheet to use when creating and connecting patch cables. Have students solve case studies related to data transmission issues. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	Observe and monitor as students connect workstations to a network. Have students peer evaluate case studies for accuracy and appropriateness and discuss proposed resolutions with the class. Evaluate student knowledge of transmission media with a written test.

Competency 2: Apply basic networking concepts. ND1 ND2 ND3 ND4 ND5 ND6 ND7

Suggested Enduring Understandings

1. A network is a group of computers and other devices connected by some type of transmission media.
2. Networks enable multiple users to share data and devices.
3. Two fundamental network models exist: Peer-to-peer and client–server.
4. Protocols allow for communication between network devices.
5. A network's topology describes the physical layout of the network.

Suggested Essential Questions

1. What is a computer network?
2. What are the advantages of computer networks?
3. What is the difference between a peer-to-peer network and a client–server network?
4. What is a protocol?
5. How do protocols differ from each other?
6. What are the various network topologies?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify basic networking terminology. (DOK 1) CE2 CE3 CE4 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE 7 NE8 NE9 NE10	a. Use multimedia presentation equipment to introduce terminology related to networking and discuss a typical network and the advantages of using a network. Present definitions of basic networking terminology to include topology, protocols, and Windows networking commands. Divide students into groups according to results of a learning style inventory. Have one group list characteristics and advantages of a peer-to-peer network and the other list characteristics and advantages of a client–server network. Have students debate the use of each network.	a. Use assessment tools from the Blackboard Learning System to evaluate student knowledge of terminology and general understanding of networking. Assess the student game, song, or poem for accuracy and originality.

		Have students take notes and then work in teams to create a game, song, or poem that reinforces terminology. Demonstrate various networking concepts to include cabling, installing, and configuring network cards and so forth Discuss protocols. Discuss and demonstrate file and print sharing and so forth. Have students work in teams to create a concept map or flowchart of star, bus, and ring topologies. Have teams present and describe their illustrations to the class. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	Evaluate illustrations based on accuracy and completeness.
b.	Use networking capabilities of an operating system. (DOK 3) CE2 CE3 CE4 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE 7 NE8 NE9 NE10	b. Tour the network in your lab, building, and/or district. Have students prepare a visual aid to demonstrate the connections in your lab, building, or district. After the tour, have students illustrate a LAN or WAN using technology productivity tools or bulletin board paper and markers. Have students design a simple LAN for a given, chosen, or student-developed business or industry. Have students draw a simple floor plan of the business or industry and design the layout for the server and clients. Have students present and explain the designs to the class. Have students connect power and peripherals for server and client, make patch cable(s), install punch-down equipment, and connect server and client through a hub/switch. Have students access shared files and printers. Give students scenarios or case studies of possible problems related to networks. Have students determine solutions to the networking problems. Have students use the writing process to summarize the scenario or case study and the solution. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	b. Evaluate the illustration for accuracy and completeness. Evaluate presentations using the **Presentation Assessment Rubric**. Assess student ability to make patch cables through a hands-on test. Observe students as they connect equipment. Evaluate summaries for mechanics, accuracy, and completeness.
c.	Apply Internet concepts and capabilities. (DOK 3) CE2 CE3 CE4 CE7 CE8 CE11 CE12 NE2 NE5 NE6 NE 7 NE8 NE9 NE10	c. Have each student configure a PC for both network and dial-up access. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 W1 W2 W3 W4 W5	c. Monitor students as they configure PCs.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND1 Perform Analysis
ND2 Design Network
ND3 Configure and Deploy Network
ND4 Perform Testing
ND5 Manage Network
ND6 Maintain Network and Manage Growth
ND7 Perform Security Administration

Applied Academic Credit Standards

CE2 Demonstrate installing, configuring, and upgrading a system.
CE3 Demonstrate diagnosing and troubleshooting a system.
CE4 Demonstrate the various types of preventive maintenance measures, products, and procedures.
CE7 Identify the common types of network cables, their characteristics, and connectors.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE11 Evaluate diagnosing and troubleshooting methods.
CE12 Explore network designs.

NE2 Explain components and functions of PC and network hardware.
NE5 Evaluate internetworking media and transmission methods.
NE6 Analyze specific network architectures.
NE8 Explore various network designs.
NE9 Analyze network planning and design.
NE10 Explore the basics of network management and monitoring.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach

R2	Supporting Details
R3	Sequential, Comparative, and Cause–Effect Relationships
R4	Meaning of Words
R5	Generalizations and Conclusions
S1	Interpretation of Data
W1	Expressing Judgments
W2	Focusing on the Topic
W3	Developing a Position
W4	Organizing Ideas
W5	Using Language

References

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Poster Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Required Content	The poster includes 4 battery disposal procedures.	The poster includes 3 battery disposal procedures.	The poster includes 2 battery disposal procedures.	The poster includes 1 battery disposal procedure.	
Labels	All items of importance on the poster are clearly labeled with labels that are easy to read.	Almost all items of importance on the poster are clearly labeled with labels that are easy to read.	Many items of importance on the poster are clearly labeled with labels that are easy to read.	Labels are too small to read, or no important items are labeled.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout, and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed.	
Grammar	There are no grammatical or mechanical mistakes on the poster.	There are 1 to 2 grammatical or mechanical mistakes on the poster.	There are 3 to 4 grammatical or mechanical mistakes on the poster.	There are more than 4 grammatical or mechanical mistakes on the poster.	
				Total Score	

Name: _____

Date: _____

Period: _____

Presentation Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clearly and correctly explains UPS functions, requirements, types, and importance	Mostly clearly and correctly explains UPS functions, requirements, types, and importance	Explanation of UPS functions, requirements, types, and importance is somewhat confusing, incorrect, or flawed.	Explanation of UPS functions, requirements, types, and importance is confusing, incorrect, or flawed.	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate and mostly accurate with few grammatical errors	Poorly planned and somewhat accurate with some grammatical errors	Weak and inaccurate with many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				Total Score	

Unit 4: Computer Assembly, Configuration, and Diagnostics

Competency 1: Assemble a computer, install components and diagnose hardware problems and install and configure operating system, application, web browser and virus protection software. ND1 ND2 ND3 ND4

Suggested Enduring Understandings

1. A PC is a collection of parts working together as a system.
2. A PC must have an operating system installed in order to run application software.
3. A networked PC is vulnerable to malicious attacks, and it must have software installed to reduce this threat.

Suggested Essential Questions

1. What parts are required in order to build a functioning PC?
2. What software must be installed on a fully functioning computer?
3. What are some techniques for troubleshooting a computer system?
4. What steps should a technician take to properly maintain a computer system?
5. What are some possible threats to a computer system connected to the Internet, and how would you reduce these threats?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Build a computer, install additional components, and diagnose hardware problems. (DOK 4) CE2 CE3 CE5 CE8 CE11 NE2	a. Demonstrate computer assembly while leading the class in a review of computer hardware components. After the demonstration, have students work in pairs to complete the assembly of a computer from components provided by the instructor. Once the computer is assembled, have the students test the computer and diagnose any problems they encounter. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 W2 W4 W5	a. Observe students as they assemble computers, install peripherals, and run hardware diagnostic utilities.
b. Install, configure, and upgrade operating system and diagnose OS software issues. (DOK 4) CE2 CE3 CE10	b. Demonstrate the installation, configuration, and upgrade of an operating system. Explain how to diagnose common operating system problems. Have students install various operating systems on lab computers, obtain and install the required device drivers, and test the operating system once it is configured. Have students diagnose any problems encountered. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 W2 W4 W5	b. Observe students as they install and configure various operating systems and perform diagnostic tests.
c. Install and configure application, Web browser, and virus protection software. (DOK 3)	c. Discuss the importance of protecting a computer from malicious software and attacks and what can be done to reduce this threat. Introduce students to alternative (non-Microsoft) Web browsers and other common application software. Have students install and configure application software on the computer. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 W2 W4 W5	c. Observe students as they install and configure software to protect the computer from malicious software and attacks. Observe students as they install and configure alternative Web browsers and selected software applications on the computer.

d.	Examine causes, treatment, and prevention of viruses, and implement appropriate virus solutions. (DOK 1)	d.	Have students research viruses and malicious software using the Internet and prepare a report or presentation of their findings. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 W2 W4 W5	d.	Assess student presentations using the **Group Participation Rubric**.
e.	Perform preventive maintenance procedures for a hard drive. (DOK 2)	e.	Explain the importance of running Scandisk, Disk Defragmenter, and antivirus software on a regular basis. Demonstrate how to run these utilities, and have students run them on the lab computers. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R3 R4 R5 S1 S2 W2 W4 W5	e.	Observe students as they run preventive maintenance utilities.

Standards

Applied Academic Credit Standards

CE2 Demonstrate installing, configuring, and upgrading a system.
CE3 Demonstrate diagnosing and troubleshooting a system.
CE4 Demonstrate the various types of preventive maintenance measures, products, and procedures.
CE5 Distinguish between the motherboard, processor, and memory components.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE10 Demonstrate the installation, configuration, and upgrading of operating systems.
CE11 Evaluate diagnosing and troubleshooting methods.

NE2 Explain components and functions of PC and network hardware.
NE3 Analyze the evolution and capabilities of operating systems.
NE4 Demonstrate the installation, configuration, and use of operating systems.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R3 Sequential, Comparative, and Cause–Effect Relationships
R4 Meaning of Words
R5 Generalizations and Conclusions
S1 Interpretation of Data
S2 Scientific Investigation
W2 Focusing on the Topic
W4 Organizing Ideas
W5 Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Group Participation Rubric

	Beginning 1 point	**Developing** 2 points	**Accomplished** 3 points	**Exemplary** 4 points	**Score**
Group Discussions	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
On-Task Behavior	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
Helping Others	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
Listening	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
				Total Score	

Comments:

Unit 5: Network Concepts

Competency 1: Examine network hardware and software. ND2

Suggested Enduring Understandings

1. A network is a collection of hardware and software working together as a system to transport data from point to point.
2. Businesses, schools, and individuals rely heavily on computer networks for daily activities such as e-mail, instant messaging, and e-commerce activity.
3. A network operating system (NOS) should be selected based on the intended function of the server.

Suggested Essential Questions

1. What are the minimum necessary items to construct a basic network?
2. Why should you carefully choose a network operating system (NOS) for your network?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Define terminology related to networks. (DOK 1) CE9 NE2	a. Lead students in a discussion of different sets of terminology (text messaging terms, sports terms, video game terms) they use each day. Emphasize the importance of using the correct terminology in each situation. Provide a **Technology Terms** list, and have students define the terms using reference books or the Internet. Have students play a quiz game using networking terms as a class review. CS1 CS2 CS4, T4 T5 T6, E3 E5 E6 M1 R1 R2 R4 R5 S1 S2 W2 W5	a. Evaluate student network definitions for accuracy. Observe the quiz game as students play.
b. Identify hardware components needed to network two or more computers, such as a network interface card, various cables, hubs, switches, and server. (DOK 1) NE2	b. Provide a variety of network components (NIC cards, network cables, switches, etc.), and explain to students the name and demonstrate the use of each component in a simple network. Have students touch, work with each network component, ask questions, and so forth. Have students correctly identify examples of network hardware by matching terms to photographs or digital images. CS1 CS2 CS4, T4 T5 T6, E3 E5 E6 M1 R1 R2 R4 R5 S1 S2 W2 W5	b. Evaluate matching of terms to actual network components for accuracy.
c. Identify the various operating systems for networks such as Novell, Windows NT, Windows XP, Windows Vista, UNIX, Linux, and Mac OS. (DOK 1) CE9 NE3 NE4	c. Provide students with screenshots or hands-on experience with various network operating systems. Discuss why different NOS would be used in a particular situation. Provide students with computers to install various network operating systems. Have them compare and contrast various NOS based on practicality of use in particular situations. CS1 CS2 CS4, T4 T5 T6, E3 E5 E6 M1 R1 R2 R4 R5 S1 S2 W2 W5	c. Observe as students install operating systems. Evaluate student comparisons of NOS for suitability.

Competency 2: Relate characteristics, theories, and components of networks. ND1 ND2 ND3 ND4

Suggested Enduring Understandings

1. The use of models provides a means for students to comprehend the abstract concepts of computer networking.
2. Network topologies describe the way networks are structured, either physically or logically.

Suggested Essential Questions

1. What network topologies are used most frequently in modern networks?
2. Why has the TCI/IP protocol emerged as the de facto network standard since the mid-1990s?
3. How do models help explain networking concepts?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss examples of recognized network topologies. (DOK 1) CE1 CE7 CE8 CE12 NE1 NE5 NE6 NE7 NE8 NE9	a. Use technology to present information regarding network characteristics, theories, and components. Have students take information from discussions and include in a graphic organizer. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M5 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Use formative assessment such as questioning or guided notes to check for understanding.
b. Compare network topologies. (DOK 1) CE1 CE7 CE8 CE12 NE1 NE5 NE6 NE7 NE8 NE9	b. Have students work in teams to illustrate types of network topologies. Divide students into two groups. Have groups research and debate the advantages and disadvantages of standard accepted network topologies. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M5 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate the team presentation of network topologies for content, accuracy, and clarity using the **Presentation Assessment Rubric**.
c. Discuss protocols. (DOK 1) CE1 CE7 CE8 CE12 NE1 NE5 NE6 NE7 NE8 NE9	c. Use technology presentation tools to lead a class discussion designed to define, identify, and discuss various protocols such as the IP addressing scheme. Have students summarize the class discussion into notes or a summary report. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M5 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	c. Use formative assessment techniques such as questioning or guided notes to check for understanding.
d. Discuss network models (OSI vs. protocol-specific, i.e. TCP/IP, IPX/SPX). (DOK 3) CE1 CE7 CE8 CE12 NE1 NE5 NE6 NE7 NE8 NE9	d. Using technology presentation tools or a poster, lead a discussion to present definitions and comparisons of the layers of various network models. Have students label and define the layers graphically on a handout or using technology productivity tools. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M5 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	d. Observe students as they label and define the layers of the network models and make oral presentations.

Competency 3: Examine transmission media, and establish connections to transmit information. ND1 ND2 ND3 ND4

Suggested Enduring Understandings

1. Network media enables information to travel from host to client.

Suggested Essential Questions

1. What determines the best network media to use for a particular network application?

2. Network media may consist of wires, radio waves, or even light.	2. Why are standards important in network cabling and wireless networking? 3. What tools and techniques are used to troubleshoot networks?	

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Compare transmission media to include coax, twisted pair, fiber optics, and wireless. (DOK 1) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE5 NE6 NE8	a. Post the following words on the board as students walk into the classroom: • Coax • Twisted pair • Fiber optics • Wireless Have students brainstorm and write the first thought that comes to mind when they see these words. Ask the class to hypothesize why these terms would be used in the IT industry. Use technology presentation tools to lead a class discussion on various transmission media. CS2 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 M5 M7 M8 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Have students work individually or in groups to create charts or graphic organizers showing the properties, application, and advantages and disadvantages of various transmission media. Evaluate the charts of graphic organizers for content, format, and creativity.
b. Demonstrate cabling termination techniques. (DOK 2) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE5 NE6 NE8	b. Using twisted-pair cabling, RJ-45 plugs, and a crimping tool, demonstrate how to properly terminate a patch cable using EIA/TIA 568a or 568b standards. CS2 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 M5 M7 M8 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Observe as each student attempts to properly terminate a patch cable using the demonstrated techniques. Re-teach when necessary, and have students rework the process of terminating a patch cable using the demonstrated technique until they do it properly.
c. Test and troubleshoot wired and wireless connections. (DOK 3) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE5 NE6 NE8	c. Using appropriate testing tools, demonstrate how to properly test a patch cable. Have students work in pairs to terminate and test patch cables. CS2 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 M5 M7 M8 R5 S1 S2 S3 W1 W2 W3 W4 W5	c. Observe as students test their patch cables to ensure they are using the correct procedures.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND1 Perform Analysis
ND2 Design Network
ND3 Configure and Deploy Network
ND4 Perform Testing

Applied Academic Credit Standards

CE1 Demonstrate basic business meeting skills and goal setting.
CE2 Demonstrate installing, configuring, and upgrading a system.
CE3 Demonstrate diagnosing and troubleshooting a system.
CE7 Identify the common types of network cables, their characteristics, and connectors.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE9 Explain the operating system fundamentals.
CE10 Demonstrate the installation, configuration, and upgrading of operating systems.
CE11 Evaluate diagnosing and troubleshooting methods.
CE12 Explore network designs.

NE 1 Demonstrate career-planning and leadership skills.
NE2 Explain components and functions of PC and network hardware.
NE3 Analyze the evolution and capabilities of operating systems.
NE4 Demonstrate the installation, configuration, and use of operating systems.
NE5 Evaluate internetworking media and transmission methods.
NE6 Analyze specific network architectures.
NE7 Analyze protocol models.
NE8 Explore various network designs.
NE9 Analyze network planning and design.
NE10 Explore the basics of network management and monitoring.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy

E4	Sentence Structure and Formation
E5	Conventions of Usage
E6	Conventions of Punctuation
M1	Basic Operations and Applications
M5	Graphical Representations
M7	Measurement
R1	Main Ideas and Author's Approach
R2	Supporting Details
R3	Sequential, Comparative, and Cause–Effect Relationships
R4	Meaning of Words
R5	Generalizations and Conclusions
S1	Interpretation of Data
S2	Scientific Investigation
S3	Evaluation of Models, Inferences, and Experimental Results
W1	Expressing Judgments
W2	Focusing on the Topic
W3	Developing a Position
W4	Organizing Ideas
W5	Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Technology Terms

CD Key
Heatsink
CIPA
Virtual computing
Imaging
Router
Switch
Hub RJ-45
NIC
RAM
ROM
CRT
LCD
PS/2 Port
Transformer
Rectifier
SATA
PATA/IDE
DNS
DHCP
Directory service
Wi-Fi
PCI-E
AGP
Content filtering
Mounting a drive
Drag-and-drop
Social networking
Social engineering
Hacking vs. cracking
Phishing
Spam
Smishing
GUI
Minicomputer
UPS
Browser plug-in
FireWire
Bluetooth
IrDA
USB
Domain
AUP
EULA
DVI
VGA
Command-line interface
KVM switch
Browser
HTML
Protocols
Architecture
Piracy
Form factor
Digital
Analog
Motherboard
Resolution
Hyperthreading
Optical media
Ethernet
Fiber optics
Secure Web page
File hosting

Name: _____

Date: _____

Period: _____

Presentation Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear, appropriate, and correct; includes advantages and disadvantages of network topologies	Mostly clear, appropriate, and correct; includes advantages and disadvantages of network topologies	Somewhat confusing, incorrect, or flawed; does not include advantages and disadvantages of network topologies	Confusing, incorrect, or flawed; does not include advantages and disadvantages of network topologies	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate and mostly accurate with few grammatical errors	Poorly planned and somewhat accurate with some grammatical errors	Weak and inaccurate with many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				Total Score	

Unit 6: Network Planning and Design

Competency 1: Outline the physical and logical aspects of a local area network (LAN), and then plan and construct a LAN. ND1 ND2 ND3 ND4

Suggested Enduring Understandings

1. A local area network (LAN) is made up of hardware and software components and provides interconnectivity between PC users, printers, servers, and external networks in a limited, defined geographic area such as an office building or school campus.
2. A LAN can be segmented into smaller units called subnets.
3. Servers running network operating systems (NOS) typically are used on LANs to provide login authentication services, security, file sharing, e-mail, and printing services.

Suggested Essential Questions

1. What factors would determine the appropriate topologies and protocols to be deployed on a LAN?
2. What are some common hardware devices and software typically used on a LAN?
3. What are some considerations when designing a network with regard to the use of network addressing and subnetting?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Investigate appropriate topology and protocols for a local area network. (DOK 1) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	a. Have students use classroom resources to define and illustrate terminology related to networking topologies. Have students write a short report and give an oral presentation of their findings. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	a. Evaluate the report using the **Written Report Rubric**. Have students peer evaluate and self-evaluate using the same rubric.
b. Identify hardware components of a LAN. (DOK 1) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	b. Have students identify the function of each hardware component of a LAN. Using technology presentation tools, have students divide into teams and play Network Jeopardy available at http://teach.fcps.net/trt10/PowerPoint.htm. Have the teams use diagrams or definitions to prepare the game and follow Jeopardy scoring rules. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	b. To evaluate understanding of each component, observe as students play the game. Re-teach as necessary.
c. Identify software components of a LAN. (DOK 1) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	c. Have students identify the function of each software component of a LAN. Have students work in groups to research a particular network operating system and present their findings to the class. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	c. Observe as students identify software components. Re-teach as necessary. Evaluate presentations using the **Presentation Assessment Rubric**.

d.	Examine network models. (DOK 1) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	d.	Lead a class discussion of network models. Have students use technology tools to create a Venn diagram to compare and contrast various network models. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	d.	Have students present their diagrams to the class. Observe students as they summarize and illustrate their comparisons. Re-teach as necessary.
e.	Define classes of network addresses and subnetworks. (DOK 3) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	e.	Use technology presentation tools to define and explain classes of network addresses and subnetting. Have students plan an appropriate network addressing solution and solve simple subnetting exercises for a hypothetical company or school. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	e.	Evaluate students' solutions for accuracy and appropriateness. Re-teach as necessary.
f.	Examine routing tables. (DOK 1) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	f.	Discuss the function of a router and how routing tables work. Have students use Think-Pair-Share to review router functions and the use of routing tables. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	f.	Use questioning and formative techniques to probe for areas of misunderstanding. Re-teach as necessary.
g.	Plan, design, construct, and test a LAN. (DOK 4) CE1 CE2 CE3 CE7 CE8 CE11 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	g.	Give students a specific networking scenario, and have students work in groups to plan and design a LAN using the most appropriate topology, hardware, and software components. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M3 M4 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4	g.	Observe students as they plan their design, and evaluate the final product using the **Presentation Assessment Rubric**.

Competency 2: Discuss the physical and logical components and protocols used in a wide area network (WAN), and then plan and design a WAN. ND1 ND2

Suggested Enduring Understandings

1. A wide area network (WAN) connects small networks (LANs) with other networks.
2. The Internet is a WAN that connects users via Internet service providers (ISPs) using dial-up, broadband, and wireless connections.
3. WANs are typically made up of point-to-point links between smaller networks using dedicated circuits.

Suggested Essential Questions

1. In what way is the hardware used in wide area networking different from that used in local area networking?
2. How has the importance of wide area networking changed over the past 20 years? What impact has the Internet, a wide area network, had on common activities such as using the telephone, banking, and mailing letters, and what new opportunities has the Internet created?

Suggested Performance Indicators		Suggested Teaching Strategies		Suggested Assessment Strategies	
a.	Examine domains	a.	Explain the concept of domain names, DNS, and	a.	Have students

	and service providers. CE1 CE7 CE8 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9		Internet service providers (ISPs).	research and then compare and contrast various Internet connection methods, including DSL, dial-up, cable Internet, satellite, and cellular, and prepare a chart or electronic slide presentation of their findings. Use the **Presentation Assessment Rubric** to evaluate student work.
b.	Identify hardware components of a WAN. CE1 CE7 CE8 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	b.	Using technology presentation tools, show and explain various hardware components of a WAN and how they are used.	b. Use questioning techniques to probe for areas of misunderstanding. Give students a written test.
c.	Discuss the logical components of and various protocols used in a WAN. CE1 CE7 CE8 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	c.	Discuss the four major categories of WANs: Telephony, leased data connections, private data connections, and public switched networks. Identify protocols and signaling methods used by each. Divide the students into four groups, have them research and become experts on one of the four major categories of WANs, and teach their category to the class.	c. Evaluate the accuracy and completeness of the local components and various protocols used in WAN presentations.
d.	Plan and design a WAN, and present a proposal. CE1 CE7 CE8 CE12 NE1 NE2 NE5 NE6 NE7 NE8 NE9	d.	Using technology presentation tools, give a walk-through of the steps involved in designing a typical WAN.	d. Given a specific networking scenario, have the students work in small groups to design a wide area network, including specifications for hardware and communications components. Assess the proposal project for completeness, accuracy, and inclusion of all necessary components using the **Written Report Rubric**.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND1 Perform Analysis
ND2 Design Network
ND3 Configure and Deploy Network
ND4 Perform Testing

Applied Academic Credit Standards

CE1 Demonstrate basic business meeting skills and goal setting.
CE2 Demonstrate installing, configuring, and upgrading a system.
CE3 Demonstrate diagnosing and troubleshooting a system.
CE7 Identify the common types of network cables, their characteristics, and connectors.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE9 Explain the operating system fundamentals.
CE11 Evaluate diagnosing and troubleshooting methods.
CE12 Explore network designs.

NE 1 Demonstrate career planning and leadership skills.
NE2 Explain components and functions of PC and network hardware.
NE5 Evaluate internetworking media and transmission methods.
NE6 Analyze specific network architectures.
NE7 Analyze protocol models.
NE8 Explore various network designs.
NE9 Analyze network planning and design.
NE10 Explore the basics of network management and monitoring.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation

M1	Basic Operations and Applications
M3	Numbers: Concepts and Properties
M4	Expressions, Equations, and Inequalities
M5	Graphical Representations
M7	Measurement
R1	Main Ideas and Author's Approach
R2	Supporting Details
R3	Sequential, Comparative, and Cause–Effect Relationships
R4	Meaning of Words
R5	Generalizations and Conclusions
S1	Interpretation of Data
S2	Scientific Investigation
S3	Evaluation of Models, Inferences, and Experimental Results
W1	Expressing Judgments
W2	Focusing on the Topic
W3	Developing a Position
W4	Organizing Ideas

References

Dean, T. (2006). *Network+ guide to networks* (4th ed.). Boston, MA: Thomson Course Technology.

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Simpson, T., & Simpson, M. (2004). *Guide to Novell NetWare 6.0/6.5 administration, enhanced edition.* Boston, MA: Thomson Course Technology.

Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Written Report Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Includes appropriate information related to the network operating system selected	Includes mostly appropriate information related to the network operating system selected	Includes somewhat appropriate information related to the network operating system selected	Does not include appropriate information related to the network operating system selected	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total Score	

Name: _____

Date: _____

Period: _____

Presentation Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear, appropriate, and correct; includes a LAN design using the most appropriate topology, hardware, and software components	Mostly clear, appropriate, and correct; includes a LAN design using mostly appropriate topology, hardware, and software components	Somewhat confusing, incorrect, or flawed; includes a LAN design using somewhat appropriate topology, hardware, and software components	Confusing, incorrect, or flawed; does not include a LAN design with appropriate topology, hardware, and software components	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate and mostly accurate with few grammatical errors	Poorly planned and somewhat accurate with some grammatical errors	Weak and inaccurate with many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				Total Score	

Unit 7: Network Security

Competency 1: Investigate and implement fundamental security principles. ND1 ND5 ND6 ND7

Suggested Enduring Understandings

1. An effective security policy should include software protection, physical network security, and efforts to educate network users in matters of password management and social engineering threats.
2. Wireless networks are inherently less secure than wired networks and are banned from use from some networks such as those used in the banking industry.

Suggested Essential Questions

1. How much security is enough to reasonably safeguard a network from common security breaches and vulnerabilities?
2. What are some considerations when developing a security plan?
3. Why do some businesses' networks require more security than others?
4. In what ways has the Internet made network security more difficult to achieve and maintain?
5. Why should networks containing sensitive data avoid using wireless networking?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify, describe, and discuss hardware and software security to include hardware deconstruction, smart cards/biometrics, authentication technologies, malicious software protection, software firewalls, and file system security. (DOK 2) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	a. Discuss network security using classroom lecture and multimedia presentation. Have students write, organize, and summarize notes from the lecture. Have students work in pairs and use technology to research and prepare a report on security devices such as firewalls and sniffers. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Evaluate the report using the **Written Report Rubric**.
b. Investigate security software and common security breaches and vulnerabilities. (DOK 2) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	b. Discuss different levels of security and several risks that can be mitigated by employing security software tools. Have students research examples of security software, along with features and prices, and then present their findings to the class. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M2 M3 M5 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate security software and common security breaches and vulnerabilities presentations for accuracy and completeness.
c. Identify, describe, and discuss data and physical security to include wireless encryption, client	c. Lead a class discussion of the importance of encryption and wireless security in particular applications, such as online banking and paid Wi-Fi service. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	c. Monitor and use questioning techniques to probe for areas of misunderstanding.

	configuration, and access points. (DOK 1) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10			
d.	Identify, describe, and discuss data and physical security to include data access, encryption, backups, data migration, data removal, password management, and locking the workstation. (DOK 2) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	d.	Discuss the importance of data and physical security techniques. Have students define terms related to data and physical security. Terms may include but are not limited to data access, encryption, backups, data migration, data removal, password management, and locking the workstation. Have students use the Internet to research an assigned topic related to security (e.g., network security threats and attacks, legislation that addresses information security, security policies, security standards and organizations, and ethics). Have them prepare a presentation to present to the class. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	d.	Use the **Presentation Assessment Rubric** to evaluate the data and physical security presentation.
e.	Explain the importance and process of incidence reporting. (DOK 1) E1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	e.	Use classroom lecture to explain the importance and process of incidence reporting to include unauthorized intrusion into an IT system (hacking), compromise or corruption of information, intentional or accidental introduction of viruses to a network, and intentional or accidental disruption to service or damage to or loss of equipment. Have students brainstorm scenarios in which each of these incidents might occur. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	e.	Monitor and use questioning techniques to probe for areas of misunderstanding.
f.	Recognize and determine appropriate responses to social engineering situations. (DOK 3) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	f.	Pose questions to students such as the following: • What is social engineering? • How does it relate to the IT industry? • Is social engineering good or bad? Use lecture and discussion to introduce students to the concept of social engineering. Have students take notes and organize major concepts throughout the lecture and discussion. Have students brainstorm social engineering techniques and develop preventive methods and ways to recognize social engineering techniques. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	f.	Observe students as they brainstorm techniques and preventive methods.
g.	Install, configure, upgrade, and optimize hardware,	g.	Discuss data security solutions using classroom lecture or technology presentation tools.	g.	Monitor and observe as students complete network security

	software, and data security. (DOK 2) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	Have students research, download, and install network security utilities. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	activities.
h.	Create user accounts and edit user properties according to best practices for assigning and modifying rights, password creation and expiration, and security groups. (DOK 2) CE1 CE2 CE4 CE8 CE11 CE12 NE1 NE5 NE6 NE7 NE8 NE9 NE10	h. Have students interview different IT industry members about creating and editing user properties. Have students ask industry members if there are certain rules and regulations in user management they use as procedure. Lead a class discussion about the different types of users (system admin, user, etc.). Demonstrate procedures used to set up user accounts and properties. Have students set up user accounts and edit user properties. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6	h. Monitor and observe as students set up accounts and edit user properties. Give students an application test to ensure they can create and edit users properly.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND1 Perform Analysis
ND5 Manage Network
ND6 Maintain Network and Manage Growth
ND7 Perform Security Administration

Applied Academic Credit Standards

CE1 Demonstrate basic business meeting skills and goal setting.
CE2 Demonstrate installing, configuring, and upgrading a system.
CE4 Demonstrate the various types of preventive maintenance measures, products, and procedures.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE11 Evaluate diagnosing and troubleshooting methods.
CE12 Explore network designs.

NE 1 Demonstrate career planning and leadership skills.
NE5 Evaluate internetworking media and transmission methods.
NE6 Analyze specific network architectures.
NE7 Analyze protocol models.
NE8 Explore various network designs.
NE9 Analyze network planning and design.
NE10 Explore the basics of network management and monitoring.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
M2 Probability, Statistics, and Data Analysis
M3 Numbers: Concepts and Properties
M5 Graphical Representations
R1 Main Ideas and Author's Approach

R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R4 Meaning of Words
R5 Generalizations and Conclusions
S1 Interpretation of Data
S2 Scientific Investigation
S3 Evaluation of Models, Inferences, and Experimental Results
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Written Report Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total Score	

Name: _____

Date: _____

Period: _____

Presentation Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate and mostly accurate with few grammatical errors	Poorly planned and somewhat accurate with some grammatical errors	Weak and inaccurate with many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				Total Score	

Unit 8: Web Design

Competency 1: Use Web page design technologies, evaluate existing designs, and design and maintain a Web page.

Suggested Enduring Understandings

1. In the 21st century, Web pages are essential.
2. Web pages are created by a variety of means.
3. The elements of a Web page determine if it is well or poorly designed.
4. A Web site's purpose describes the function it must perform.
5. HTML employs commonly used tags found in all Web pages.

Suggested Essential Questions

1. What would life be like without Web pages?
2. What languages, tools, and components are related to Web page design and maintenance?
3. What are the various types of Web page designs?
4. What is the purpose of a Web page?
5. What characterizes a well-designed Web page?
6. Which HTML tags are commonly used in Web page design?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Investigate trends and markup languages related to advanced Web page design. (DOK 2) CE8	a. Discuss new and emerging technologies, practices, trends, and issues associated with the field, using videos and a multimedia presentation if available. Ask students how developments throughout history have impacted how people live and work. Have each student use concept mapping software to develop a timeline that shows the history of the Internet, markup languages, and Web design.	a. Evaluate each group's timeline for content, clarity, presentation, and length.
b. Evaluate Web page designs. (DOK 3) CE8	b. Discuss elements of effective Web page design, including navigation, organization, accessibility, the use of color, and fonts. Use technology to display examples of well-designed and poorly designed Web sites. Compare various sites, explaining why each is well designed or poorly designed. Call on students to provide suggestions for improving poorly designed sites. Have students work in teams to develop a checklist to be used for evaluating a Web site. Have each student use a search engine to locate two Web sites—one that could be considered a well-designed site and one that could be considered a poorly designed site. Have each student use the team checklist to evaluate each of the selected Web sites and present his or her findings to the class. Have students work individually to re-create one of the poorly designed Web sites into a well-designed Web site.	b. Evaluate the completed checklists for usability. Assess student presentations of Web site evaluations.
c. Create a basic Web	c. Introduce students to **common HTML tags** using	c. Assess student

	page using commonly used HTML tags. (DOK 3) [CE8]	the classroom presentation station. Show students how to right click on a Web page and "view source." Have students review the source and compare the tags that are used to the common HTML tags listed in the curriculum. Give students a Web page HTML source with errors in it. For example, leave off the backslash (/) in certain areas, leave off the end tags, and include tags that are truly not needed. Have students work in groups to find the errors in the code and correct it. Using commonly used HTML tags, have each student design and maintain a Web page related to a specific project selected by the student and approved by the teacher.	knowledge through the use of an application test. The test should include a Web page HTML source with errors in it. Students should work individually to find the errors, correct them, and display a properly coded and formatted Web page. Assess student-created Web pages according to effective elements of design as presented in the unit.
d.	Develop a Web page using Web-authoring software. (DOK 3) [CE8]	d. Introduce students to Web-authorizing software terminology and acronyms. Terms and acronyms could include but are not limited to the following: **Server-Side (Server Models)** • **PHP** = PHP: Hypertext Preprocessor • **ASP** & **ASP.NET** (or .NET) = Active Server Pages • **CFML** or **CFM** or **CF** = ColdFusion • **JSP** = Java Server Pages **Server-Side (others)** • **SQL** = Structured Query Language • **CGI** = Common Gateway Interface • **SSI** = Server-Side Include **Client-Side** • **XHTML** = Extensible HyperText Markup Language • HTML = HyperText Markup Language • **CSS** = Cascading Style Sheets • **XML** = Extensible Markup Language • **JS** = JavaScript • DOM = Document Object Model • DHTML = Dynamic HTML • XSL = Extensible Stylesheet Language • XSLT = Extensible Stylesheet Language Transformations • SGML = Standard Generalized Markup Language (father to XHTML/XML) **General Web Technology Terms** • **DB** = Database • **HTTP** = HyperText Transfer Protocol	d. Assess student-created Web pages according to effective elements of design as presented in the unit. Use the **Web Page Rubric**.

- **HTTPS** = HyperText Transmission Protocol, Secure
- SMTP = Simple Mail Transfer Protocol
- POP or POP3 = Post Office Protocol
- **DTD** = Document Type Definition
- **URL** (or URI) = Uniform Resource Locator (Universal Resource Identifier) ... Web address/links
- **SSL** = Secure Sockets Layer
- WWW = World Wide Web
- FTP = File Transfer Protocol
- **DOM** = Document Object Model
- IP number = Internet address
- TCP/IP = Transmission Control Protocol over Internet Protocol
- RTSP = Real Time Streaming Protocol
- VoIP = Voice over IP
- **MIME** = Multipurpose Internet Mail Extensions
- **W3C** = World Wide Web Consortium
- (web slang) ul = upload
- (web slang) dl = download
- P2P = Peer-to-Peer

Web Browser (popular) nicknames

- **FF** = Firefox
- **IE** = Internet Explorer
- **Moz** = Mozilla
- **NN** = Netscape (Navigator)
- AOL = America Online (not a browser but considered one)

Have students complete Web-authoring software tutorials found at http://www.adobe.com/support/dreamweaver/tutorial_index.html.

Using Web-authoring software, have each student design and maintain a Web page related to a specific project selected by the student and approved by the teacher.

Standards

Applied Academic Credit Standards

CE8 Demonstrate communication, problem-solving, and team-building skills.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R4 Meaning of Words
R5 Generalizations and Conclusions
W2 Focusing on the Topic
W3 Developing a Position
W4 Organizing Ideas
W5 Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

Web Page Rubric

	4 points	3 points	2 points	1 point	Score
Background	Background is exceptionally attractive and consistent across pages, adds to the theme or purpose of the site, and does not detract from readability.	Background is attractive and consistent across pages, adds to the theme or purpose of the site, and does not detract from readability.	Background is consistent across pages and does not detract from readability.	Background detracts from the readability of the site.	
Color Choices	Colors of background, fonts, and unvisited and visited links form a pleasing palette, do not detract from the content, and are consistent across pages.	Colors of background, fonts, and unvisited and visited links do not detract from the content and are consistent across pages.	Colors of background, fonts, and unvisited and visited links do not detract from the content.	Colors of background, fonts, and unvisited and visited links make the content hard to read or otherwise distract the reader.	
Fonts	The fonts are consistent and easy to read, and point size varies appropriately for headings and text. Use of font styles (italic, bold, underline) is used consistently and improves readability.	The fonts are consistent and easy to read, and point size varies appropriately for headings and text.	The fonts are consistent, and point size varies appropriately for headings and text.	A wide variety of fonts, styles, and point sizes is used.	
Graphics	Graphics are related to the theme/purpose of the site, are thoughtfully cropped, are of high quality, and	Graphics are related to the theme/purpose of the site, are of good quality, and enhance reader interest or	Graphics are related to the theme/purpose of the site and are of good quality.	Graphics seem randomly chosen, are of low quality, OR distract the reader.	

	enhance reader interest or understanding.	understanding.			
Links	All links point to high-quality, up-to-date, credible sites.	Almost all links point to high-quality, up-to-date, credible sites.	Most links point to high-quality, up-to-date, credible sites.	Less than 3/4 of the links point to high-quality, up-to-date, credible sites.	
Spelling and Grammar	There are no errors in spelling, punctuation, or grammar in the final draft of the Web site.	There are 1 to 3 errors in spelling, punctuation, or grammar in the final draft of the Web site.	There are 4 to 5 errors in spelling, punctuation, or grammar in the final draft of the Web site.	There are more than 5 errors in spelling, punctuation, or grammar in the final draft of the Web site.	
Content	The site has a well-stated clear purpose and theme that are carried out throughout the site.	The site has a clearly stated purpose and theme but may have one or two elements that do not seem to be related to it.	The purpose and theme of the site are somewhat muddy or vague.	The site lacks a purpose and theme.	
Layout	The Web site has an exceptionally attractive and usable layout. It is easy to locate all important elements. White space, graphic elements, and/or alignment are used effectively to organize material.	The Web pages have an attractive and usable layout. It is easy to locate all important elements.	The Web pages have a usable layout but may appear busy or boring. It is easy to locate most of the important elements.	The Web pages are cluttered looking or confusing. It is often difficult to locate important elements.	
Navigation	Links for navigation are clearly labeled, consistently placed, allow the reader to easily move from a page to related pages (forward and back), and take the reader where he or she expects to go. A user does not become lost.	Links for navigation are clearly labeled and allow the reader to easily move from a page to related pages (forward and back), and internal links take the reader where he or she expects to go. A user rarely becomes lost.	Links for navigation take the reader where he or she expects to go, but some needed links seem to be missing. A user sometimes gets lost.	Some links do not take the reader to the sites described. A user typically feels lost.	
Content	All information provided by the	Almost all the information	Almost all of the information	There are several inaccuracies in the	

Accuracy	student on the Web site is accurate, and all the requirements of the assignment have been met.	provided by the student on the Web site is accurate, and all requirements of the assignment have been met.	provided by the student on the Web site is accurate, and almost all of the requirements have been met.	content provided by the students, OR many of the requirements have not been met.	
				Total Score	

Comments:

Unit 9: Visual Basic

Competency 1: Create programs using Visual Basic Software. (DOK3) ND1 ND2 ND3 ND4

Suggested Enduring Understandings

1. A programming language controls the behavior of a computer.
2. Programmers follow the steps in the program development cycle to create a computer program.
3. Visual Basic allows programmers to create GUI applications.

Suggested Essential Questions

1. What is a programming language?
2. What is the program development cycle?
3. How do programming languages work?
4. How does Visual Basic differ from other programming languages?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe the program development cycle to include input/output, processing, and storage. (DOK 1) CE8	a. Discuss the purpose of programming languages and compilers including the difference between machine/binary code and programming languages, input and output, and processing and storage. Have students take and organize notes from the discussion. Divide the students into groups, and have each group use the textbook or the Internet to find information on one part of the programming development cycle and then jigsaw information with the other groups. Provide a sample program for the students to debug and run to acquire an understanding of the Visual Studio .NET program environment. CS1 CS2 CS3 CS4 CS5, T4 T6, M1 M2 M3 M4 M5 M8 S1 S2	a. Observe students working in groups and the quality of information shared with other groups. Observe students running the computer, keying in programs, and producing debug programs. Evaluate student knowledge of programming languages with a written test.
b. Create, run, and debug an original program to input data, process data, and print a report. (DOK 3) CE8	b. Allow students to produce an original program to input, process data, and output a printed report. Re-teach as needed. CS1 CS2 CS3 CS4 CS5, T4 T6, M1 M2 M3 M4 M5 M8 S1 S2	b. Evaluate the completed original program.
c. Create programs that perform calculations using arithmetic operations to include addition, subtraction, multiplication, division, and exponentiation. (DOK 3) CE8	c. Discuss the meanings of computational and logical operations, and classify components into each. Divide the students into groups, and have them translate algebraic formulas into programming statements using the Visual Basic .NET syntax to produce a usable program. Have students peer evaluate work and make suggestions for improvement. CS1 CS2 CS3 CS4 CS5, T4 T6, M1 M2 M3 M4 M5 M8 S1 S2	c. Monitor student contributions to the discussion. Observe students translating algebraic formulas into programming statements. Evaluate the complete program containing

				computational and logical operations.
d.	Create programs that include decision, selection, and iteration statements to include IF/THEN statements, Case statements, Do loops and For/Next loops. (DOK 3) CE8	d.	Use a multimedia presentation to discuss the use of and show examples of IF/THEN statements and controlled loops. Be sure to include information about different industries that use these programs. Have handouts for students so they can record notes from the lecture. Develop a script that executes an IF/THEN statement and a controlled loop in front of the class. Explain each component of the script as it is developed. Have students put into their own words each component/line of the script. Have students construct programs that illustrate the power of the computer to do repetitive processes in a short period of time. Sample programs may include a program that does the following: • Finds the sum of a given number of integers • Finds the product of a given number of real numbers • Finds the average of a dynamically set number of test scores • Finds the sum of some integers until a specific number is entered • Finds the product of some real numbers until a specific number is entered or computes the average of some test grades until a specific value is entered Have students peer evaluate programs and give suggestions for improvement. CS1 CS2 CS3 CS4 CS5, T4 T6, M1 M2 M3 M4 M5 M8 S1 S2	d.	Evaluate programs constructed using IF/THEN statements and controlled loops.
e.	Create programs that use array/table structures. (DOK 3) CE8	e.	Use a multimedia presentation to discuss the use of and show examples of processing arrays. Be sure to include information about different Industries that use processing arrays programs. Have handouts for students so they can record notes from the lecture. Develop a script that executes a processing array in front of the class. Explain each component of the script as it is developed. Have students put into their own words each component/line of the script. Have students develop and peer evaluate one- and two-dimensional array programs. Have students debug programs that process arrays,	e.	Have students submit a one- and two-dimensional array program for evaluation. Observe students as they debug programs that process arrays.

	which may include use of ASCII to sort and/or string function processing. This is not limited to single-dimension arrays. Have students peer evaluate programs and give suggestions for improvement. CS1 CS2 CS3 CS4 CS5, T4 T6, M1 M2 M3 M4 M5 M8 S1 S2	

Standards

Applied Academic Credit Standards

CE8 Demonstrate communication, problem-solving, and team-building skills.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T4 Critical Thinking, Problem Solving, and Decision Making
T6 Technology Operations and Concepts

ACT College Readiness Standards

M1 Basic Operations and Applications
M2 Probability, Statistics, and Data Analysis
M3 Numbers: Concepts and Properties
M4 Expressions, Equations, and Inequalities
M8 Functions
S1 Interpretation of Data
S2 Scientific Investigation

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Unit 10: Career Development

Competency 1: Demonstrate career development skills. (DOK2) ND1 ND5 ND6 ND7

Suggested Enduring Understandings

1. Keeping informed of the job market will ensure that you have every opportunity to obtain the best jobs available.
2. Well-prepared job candidates perform much better in the job application and interview process and are more likely to be hired for desirable positions.

Suggested Essential Questions

1. How should you prepare for a job interview?
2. Where are several places to find job openings in an IT career field?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Investigate career opportunities and emerging technologies in information technology. (DOK 1) CE1 CE8 NE1	a. At the beginning of the unit, use the **KWL Chart** to determine what students Know and what they Want to know about careers and emerging technologies in information technology. At the end of the unit, use K-W-L to review by having students recall what they have Learned. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Assess student understanding by observing contributions to class discussions and participation in activities. Provide feedback to students regarding their performance on activities and assignments. To ensure mastery, provide opportunities for them to review their work and make revisions.
b. Search resources for a job opening in an IT career field. (DOK 2) CE1 CE8 NE1	b. Have students use the online *Occupational Outlook Handbook* (http://www.bls.gov/oco/) to select an area of occupational interest. Have them research salary and educational requirements for the chosen career and then prepare a one-page summary of the information using word processing software. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate career summaries for content and format.
c. Prepare, in an acceptable format, a cover letter, a resume, and a follow-up letter using word processing software. (DOK 3) CE1 CE8 NE1	c. Use technology to show students exemplary and poor-quality examples of resumes, cover letters, and follow-up letters. Identify the components of a business letter and a resume. Have students identify errors in the examples. Have students create cover letters, resumes, and follow-up letters. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	c. Evaluate resumes using the **Resume Assessment Rubric**. Evaluate business letters using the **Business Letter Assessment Rubric**.

d. Demonstrate appropriate job interview skills, including completing a job application. (DOK 3) CE1 CE8 NE1	d. Lead a discussion of appropriate job interview skills including proper dress, punctuality, and behavior. Recruit volunteers to act as interviewers, and have students participate in mock interviews. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	d. Evaluate interviews using the **Job Interview Scoring Rubric**.

Competency 2: Use appropriate communication skills and professional behavior when communicating with clients and co-workers.

Suggested Enduring Understandings

1. You never get a second chance to make a first impression.
2. Treat your customers with respect.
3. A knowledgeable technician who uses good communication skills will always be in demand in the job market.

Suggested Essential Questions

1. Why should a technician be prepared to deal with customers who may be inexperienced and have difficulty explaining the problem or who are angry or rude?
2. Why is customer satisfaction important? What are some ways to improve customer satisfaction?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Practice appropriate communication skills including speaking clearly and concisely, using tact and discretion, avoiding jargon, asking pertinent questions, and exercising listening skills. (DOK 3) CE1 CE8 NE1	a. Demonstrate appropriate communication skills to the class, and have students discuss what was presented. Pair students, and have them write scenarios to be used to practice appropriate communications skills. Provide guidance and appropriate feedback as they practice. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Evaluate students' ability to demonstrate appropriate communication skills.
b. Practice appropriate professional behavior including maintaining a positive attitude and tone of voice, avoiding arguments or defensiveness, and respecting clients' privacy and property. (DOK 2) CE1 CE8 NE1	b. Have students define a list of professional behavior skills, and lead a class discussion incorporating the students' definitions. Pair students, and have them develop and perform skits to demonstrate appropriate professional behavior skills. Provide guidance and appropriate feedback as they develop and demonstrate the skits. CS1 CS2 CS3 CS4 CS5, T1 T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 M1 M2 M3 M4 M5 M6 M7 M8 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate performances according to appropriate standards of professional behavior.

Competency 3: Research opportunities related to information technology, and participate in field experiences or simulations. ND1 ND2 ND3 ND4 ND5 ND6 ND7

Suggested Enduring Understandings

1. Trade organizations and associations can be valuable resources for information regarding hiring trends and job opportunity outlook.
2. Industry certification is an important tool used to validate knowledge and skills, and it can provide increased employment opportunity.

Suggested Essential Questions:

1. What are some entry-level industry certifications related to information technology?
2. What are several major industry associations that serve the information technology industry?
3. What college degrees are available in the information technology field at colleges you are considering attending?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Investigate educational opportunities related to information technology. (DOK 2) CE1 CE8 NE1	a. Have students visit selected college and university Web sites to discover what courses are taught and what majors are offered in the field of information technology. Have students share their findings with the class using electronic presentation software. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	a. Use the **Presentation Assessment Rubric** to evaluate the presentation.
b. Describe national standards and certification/licensing procedures related to information technology. (DOK 2) CE1 CE8 NE1	b. Give a presentation listing various certifications that are available in the information technology industry. Have students research one industry certification and prepare a report to include certification requirements, the sponsoring organization, the skills required to obtain the certification, and the potential benefits of obtaining that particular certification. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	b. Evaluate using the **Written Report Rubric**.
c. Describe the role of trade organizations, associations, and unions related to information technology. (DOK 2) CE1 CE8 NE1	c. Give a presentation listing various trade organizations, associations, and unions related to information technology. Assign small groups to research and prepare a presentation on trade organizations, associations, and unions related to information technology. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	c. Evaluate using the **Presentation Assessment Rubric**.
d. Participate in a school-to-careers activity (shadowing, mentoring, simulations, career fair, etc.). (DOK 2) CE1 CE8 NE1	d. Lead a class discussion to make students aware of various school-to-careers activities available to them. Have them participate in activities such as shadowing, mentoring, simulations, and career fairs.	d. Observe as students participate in discussion to determine sources of misunderstanding.

	As students participate in various school-to-careers activities, have them write a reflective essay about their experiences. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	Evaluate essays for content, accuracy, grammar, and format.
e. Visit an industry/computer center, and analyze the hardware/ software usage and needs, the educational training for personnel, the tasks performed by personnel, and the future outlook for those jobs. (DOK 3) CE1 CE8 NE1	e. Accompany students on a field trip to visit local businesses or industries related to information technology. Have students write a reflective essay about their experiences on the field trip. CS1 CS2 CS3 CS4 CS5, T2 T3 T4 T5 T6, E1 E2 E3 E4 E5 E6 R1 R2 R3 R4 R5 S1 S2 S3 W1 W2 W3 W4 W5	e. Evaluate using the **Reflective Writing Rubric**.

Standards

National Workforce Center for Emerging Technologies Skill Standards for Information Technology
Network Design and Administration

ND1 Perform Analysis
ND2 Design Network
ND3 Configure and Deploy Network
ND4 Perform Testing
ND5 Manage Network
ND6 Maintain Network and Manage Growth
ND7 Perform Security Administration

Applied Academic Credit Standards

CE1 Demonstrate basic business meeting skills and goal setting.
CE8 Demonstrate communication, problem-solving, and team-building skills.

NE 1 Demonstrate career planning and leadership skills.

21st Century Learning Standards

CS1 Flexibility and Adaptability
CS2 Initiative and Self-Direction
CS3 Social and Cross-Cultural Skills
CS4 Productivity and Accountability
CS5 Leadership and Responsibility

National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

ACT College Readiness Standards

E1 Topic Development in Terms of Purpose and Focus
E2 Organization, Unity, and Coherence
E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
E4 Sentence Structure and Formation
E5 Conventions of Usage
E6 Conventions of Punctuation
R1 Main Ideas and Author's Approach
R2 Supporting Details
R3 Sequential, Comparative, and Cause–Effect Relationships
R4 Meaning of Words
R5 Generalizations and Conclusions
S1 Interpretation of Data
S2 Scientific Investigation
W1 Expressing Judgments
W2 Focusing on the Topic
W3 Developing a Position

W4 Organizing Ideas
W5 Using Language

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Suggested Rubrics and Checklists

Name: _____

Date: _____

Period: _____

KWL Chart

Know	Want to Know	What I Learned

Name: _____

Date: _____

Period: _____

Resume Assessment Rubric

	Excellent 25 Points	Well Done 20 Points	Meets Standards 15 Points	Beginning 10 Points	No Evidence 0 Points	Score
Format	Resume contains name, address, objective, education, experience, and references. All words are spelled correctly.	Contains at least six of the criteria; no more than two spelling errors	Contains at least five of the criteria; no more than four spelling errors	Contains minimal information; more than four spelling errors	Assignment not submitted	
Education	Education includes all schools attended, graduation dates, diploma/degree awarded, and major field of study.	Education includes three of the criteria.	Education includes two of the criteria.	Education includes one of the criteria.	Assignment not submitted	
Experience	Experience includes internships, entry-level jobs, and current position.	Experience includes two of the criteria.	Experience includes one of the criteria.	Experience includes current position only.	Assignment not submitted	
Factual	Contains factual names and dates and is believable.	Contains fairly believable factual names or dates.	Resume has unrealistic dates or names.	Resume is unrealistic and contains conflicting information.	Assignment not submitted	
					Total Score	

Name: _____

Date: _____

Period: _____

Business Letter Assessment Rubric

	Excellent 4 Points	Proficient 3 Points	Needs Improvement 2 points	Unsatisfactory 1 Point	Score
Layout/Design	Creatively designed and easily read; excellent business letter	Attractive and easy to read; good business letter	Appears busy or boring and difficult to read; needs improvement	Unattractive or inappropriate and very difficult to read; not acceptable	
Information, Style, Audience, and Tone	Accurate and complete information; very well written and presented	Well written and interesting to read	Some information provided but is limited or inaccurate	Poorly written, inaccurate, or incomplete	
Accurate Parts	Complete with all required parts	Some elements may be missing.	Most elements are missing or out of place.	Proper form for a letter not used	
Grammar, Punctuation, and Wording	Excellent presentation, style, grammar, and punctuation	Fair presentation, style, grammar, and punctuation	Missing information; inaccurate punctuation and/or grammar	Poor grammar, punctuation, and wording	
Following Directions and Guidelines	Always on task, always followed directions	Followed directions with some guidance	Required a good bit of extra guidance	Did not follow directions and did not ask for extra help	
				Total Score	

Name: _____

Date: _____

Period: _____

Job Interview Scoring Rubric

Competency	Needs Work 1 Point	Better 2 Points	Best 3 Points	Score
First Impressions	Shows up late for the interview, does not shake hands, and/or chews gum; does not bring a copy of the resume or references	Shows up on time for the interview with a copy of the resume in hand	Shows up early for the interview with a copy of the resume in hand	
Preparation	Knows nothing about the company or seems to make up information as he or she goes along	Knows some general information about the company and/or its purpose	Has researched the company and the position thoroughly and is apparent by answers given in response to questions	
Personal Attributes	Overbearing, overaggressive, egotistical; or shy, reserved, and overly nervous	Somewhat nervous, some lapses in eye contact; speaks too loudly or softly	Good eye contact and poise during interview; confident	
General Attitude	Lack of interest and enthusiasm about the position; passive and indifferent; or overly enthusiastic	Seems interested in the position but could be better prepared or informed on certain topics	Interested in the position and enthusiastic about the interview	
Personal Appearance	Dressed way below what is expected for someone in that position or "overdoes it" (too much makeup, jewelry, cologne, etc.)	Dressed similar to what employees in that position would wear or in business casual clothes	Dressed in appropriate business attire; no sandals, tennis shoes, T-shirts, shorts, short skirts, and so forth	
			Total Score	

Name: _____

Date: _____

Period: _____

Written Report Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear thesis and focus that remain apparent	Thesis and focus that remain apparent	Addresses subject matter with minimal support	Does not focus on topic	
Grammar	Correct and effective use of grammar and mechanics	Occasional errors in use of grammar and mechanics	Problems in use of grammar and mechanics	Repeated errors in use of grammar and mechanics	
Organization	Ideas flow smoothly and logically with clarity and coherence.	Logical order and appropriate sequencing of ideas with adequate transition	Some evidence of an organizational plan or strategy	Lacks organization	
				Total Score	

Name: _____

Date: _____

Period: _____

Presentation Assessment Rubric

	Exemplary 4 Points	Accomplished 3 Points	Developing 2 Points	Beginning 1 Point	Score
Content	Clear, appropriate, and correct	Mostly clear, appropriate, and correct	Somewhat confusing, incorrect, or flawed	Confusing, incorrect, or flawed	
Clarity	Logical, interesting sequence	Logical sequence	Unclear sequence	No sequence	
Presentation	Clear voice and precise pronunciation	Clear voice and mostly correct pronunciation	Low voice and incorrect pronunciation	Mumbling and incorrect pronunciation	
Visual Aids	Attractive, accurate, and grammatically correct	Adequate and mostly accurate with few grammatical errors	Poorly planned and somewhat accurate with some grammatical errors	Weak and inaccurate with many grammatical errors	
Length	Appropriate length	Slightly too long or short	Moderately too long or short	Extremely too long or short	
Eye Contact	Maintains eye contact, seldom looking at notes	Maintains eye contact most of time but frequently returns to notes	Occasionally uses eye contact but reads most of information	No eye contact because reading information	
				Total Score	

Student Competency Profile (Year 1)

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Introduction to Information Technology

_____ 1. Research educational, occupational, and leadership opportunities in information technology.

_____ 2. Identify, discuss, and apply safety procedures in the computer classroom and lab.

_____ 3. Publish and communicate with peers, experts, and other audiences using technology.

Unit 2: Introduction to Computer Hardware and Operating Systems

_____ 1. Evaluate and resolve computer hardware and software issues.

_____ 2. Install, configure, and troubleshoot an operating system.

_____ 3. Investigate operating systems, programming languages, and application software.

Unit 3 : Basic Electricity and Data Communications

_____ 1. Discuss voltage and current, explain UPS requirements, and troubleshoot transmission media.

_____ 2. Apply basic networking concepts.

Unit 4: Computer Assembly, Configuration, and Diagnostics

_____ 1. Assemble a computer, install components and diagnose hardware problems and install and configure operating system, application, web browser and virus protection software.

Unit 5: Network Concepts

_____ 1. Examine network hardware and software.

_____ 2. Relate characteristics, theories, and components of networks.

_____ 3. Examine transmission media, and establish connections to transmit information.

Unit 6: Network Planning and Design

_____ 1. Outline the physical and logical aspects of a local area network (LAN), and then plan and construct a LAN.

_____ 2. Discuss the physical and logical components and protocols used in a wide area network (WAN), and then plan and design a WAN.

Unit 7: Network Security

_____ 1. Investigate and implement fundamental security principles.

Unit 8: Web Design

1. Use Web page design technologies, evaluate existing designs, and design and maintain a Web page.

Unit 9: Visual Basic

1. Create programs using Visual Basic Software.

Unit 10: Career Development

1. Demonstrate career development skills.
2. Use appropriate communication skills and professional behavior when communicating with clients and co-workers.
3. Research opportunities related to information technology, and participate in field experiences or simulations.

Appendix A: 21st Century Skills Standards

CLS1 Flexibility and Adaptability
CLS2 Initiative and Self-Direction
CLS3 Social and Cross-Cultural Skills
CLS4 Productivity and Accountability
CLS5 Leadership and Responsibility

Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

CS 1 Flexibility and Adaptability

- Adapting to varied roles and responsibilities
- Working effectively in a climate of ambiguity and changing priorities

CS 2 Initiative and Self-Direction

- Monitoring one's own understanding and learning needs
- Going beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
- Demonstrating initiative to advance skill levels toward a professional level
- Defining, prioritizing and completing tasks without direct oversight
- Utilizing time efficiently and managing workload
- Demonstrating commitment to learning as a lifelong process

CS 3 Social and Cross-Cultural Skills

- Working appropriately and productively with others
- Leveraging the collective intelligence of groups when appropriate
- Bridging cultural differences and using differing perspectives to increase innovation and the quality of work

CS 4 Productivity and Accountability

- Setting and meeting high standards and goals for delivering quality work on time
- Demonstrating diligence and a positive work ethic (e.g., being punctual and reliable)

CS 5 Leadership and Responsibility

- Using interpersonal and problem-solving skills to influence and guide others toward a goal
- Leveraging strengths of others to accomplish a common goal
- Demonstrating integrity and ethical behavior
- Acting responsibly with the interests of the larger community in mind

Appendix B: Mississippi Academic Standards[1]

Computer Engineering I and II

CE1 Demonstrate basic business meeting skills and goal setting.
CE2 Demonstrate installing, configuring, and upgrading a system.
CE3 Demonstrate diagnosing and troubleshooting a system.
CE4 Demonstrate the various types of preventive maintenance measures, products, and procedures.
CE5 Distinguish between the motherboard, processor, and memory components.
CE6 Identify printer technologies, interfaces, and options/upgrades.
CE7 Identify the common types of network cables, their characteristics, and connectors.
CE8 Demonstrate communication, problem-solving, and team-building skills.
CE9 Explain the operating system fundamentals.
CE10 Demonstrate the installation, configuration, and upgrading of operating systems.
CE11 Evaluate diagnosing and troubleshooting methods.
CE12 Explore network designs.

Network Essentials

NE 1 Demonstrate career planning and leadership skills.
NE2 Explain components and functions of PC and network hardware.
NE3 Analyze the evolution and capabilities of operating systems.
NE4 Demonstrate the installation, configuration, and use of operating systems.
NE5 Evaluate internetworking media and transmission methods.
NE6 Analyze specific network architectures.
NE7 Analyze protocol models.
NE8 Explore various network designs.
NE9 Analyze network planning and design.
NE10 Explore the basics of network management and monitoring.

[1] *Mississippi Department of Education – Business and Technology Framework.* (2004). Retrieved October 17, 2008, from http://www.mde.k12.ms.us/ACAD/ID/Curriculum/BusTech/2004_Business_Technology_Framework.pdf

Appendix C: ACT College Readiness Standards

English

E1 Topic Development in Terms of Purpose and Focus

- Identify the basic purpose or role of a specified phrase or sentence.
- Delete a clause or sentence because it is obviously irrelevant to the essay.
- Identify the central idea or main topic of a straightforward piece of writing.
- Determine relevancy when presented with a variety of sentence-level details.
- Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal.
- Delete material primarily because it disturbs the flow and development of the paragraph.
- Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement.
- Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence or to determine the need to delete plausible but irrelevant material.
- Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation.
- Determine whether a complex essay has accomplished a specific purpose.
- Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay.

E2 Organization, Unity, and Coherence

- Use conjunctive adverbs or phrases to show time relationship in simple narrative essays (e.g., *then, this time*, etc).
- Select the most logical place to add a sentence in a paragraph.
- Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., *first, afterward, in response*).
- Decide the most logical place to add a sentence in an essay.
- Add a sentence that introduces a simple paragraph.
- Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., *therefore, however, in addition*).
- Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic.
- Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward.
- Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs.
- Rearrange sentences to improve the logic and coherence of a complex paragraph.
- Add a sentence to introduce or conclude a fairly complex paragraph.
- Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay.

E3 Word Choice in Terms of Style, Tone, Clarity, and Economy

- Revise sentences to correct awkward and confusing arrangements of sentence elements.
- Revise vague nouns and pronouns that create obvious logic problems.
- Delete obviously synonymous and wordy material in a sentence.
- Revise expressions that deviate from the style of an essay.
- Delete redundant material when information is repeated in different parts of speech (e.g., *alarmingly startled*).

- Use the word or phrase most consistent with the style and tone of a fairly straightforward essay.
- Determine the clearest and most logical conjunction to link clauses.
- Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence.
- Identify and correct ambiguous pronoun references.
- Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay.
- Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., *an aesthetic viewpoint* versus *the outlook of an aesthetic viewpoint*).
- Correct vague and wordy or clumsy and confusing writing containing sophisticated language.
- Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole.

E4 Sentence Structure and Formation

- Use conjunctions or punctuation to join simple clauses.
- Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences.
- Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences.
- Decide the appropriate verb tense and voice by considering the meaning of the entire sentence.
- Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers).
- Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems.
- Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence.
- Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs.
- Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole.
- Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses.

E5 Conventions of Usage

- Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives.
- Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject–verb and pronoun–antecedent agreement, and which preposition to use in simple contexts.
- Recognize and use the appropriate word in frequently confused pairs such as *there* and *their*, *past* and *passed*, and *led* and *lead*.
- Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., *long for, appeal to*).
- Ensure that a verb agrees with its subject when there is some text between the two.
- Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences.
- Identify the correct past and past participle forms of irregular and infrequently used verbs and form present–perfect verbs by using *have* rather than *of*.
- Correctly use reflexive pronouns, the possessive pronouns *its* and *your*, and the relative pronouns *who* and *whom*.
- Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject–verb order is inverted or when the subject is an indefinite pronoun).
- Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas.
- Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb.

E6 Conventions of Punctuation

- Delete commas that create basic sense problems (e.g., between verb and direct object).
- Provide appropriate punctuation in straightforward situations (e.g., items in a series).
- Delete commas that disturb the sentence flow (e.g., between modifier and modified element).
- Use commas to set off simple parenthetical phrases.
- Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause).
- Use punctuation to set off complex parenthetical phrases.
- Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by *and*).
- Use apostrophes to indicate simple possessive nouns.
- Recognize inappropriate uses of colons and semicolons.
- Use commas to set off a nonessential/nonrestrictive appositive or clause.
- Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical).
- Use an apostrophe to show possession, especially with irregular plural nouns.
- Use a semicolon to indicate a relationship between closely related independent clauses.
- Use a colon to introduce an example or an elaboration.

Math

M1 Basic Operations and Applications

- Perform one-operation computation with whole numbers and decimals.
- Solve problems in one or two steps using whole numbers.
- Perform common conversions (e.g., inches to feet or hours to minutes).
- Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent.
- Solve some routine two-step arithmetic problems.
- Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average.
- Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour).
- Solve word problems containing several rates, proportions, or percentages.
- Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in geometry settings).

M2 Probability, Statistics, and Data Analysis

- Calculate the average of a list of positive whole numbers.
- Perform a single computation using information from a table or chart.
- Calculate the average of a list of numbers.
- Calculate the average, given the number of data values and the sum of the data values.
- Read tables and graphs.
- Perform computations on data from tables and graphs.
- Use the relationship between the probability of an event and the probability of its complement.
- Calculate the missing data value, given the average and all data values but one.
- Translate from one representation of data to another (e.g., a bar graph to a circle graph).
- Determine the probability of a simple event.
- Exhibit knowledge of simple counting techniques.*
- Calculate the average, given the frequency counts of all the data values.
- Manipulate data from tables and graphs.

- Compute straightforward probabilities for common situations.
- Use Venn diagrams in counting.*
- Calculate or use a weighted average.
- Interpret and use information from figures, tables, and graphs.
- Apply counting techniques.
- Compute a probability when the event and/or sample space is not given or obvious.
- Distinguish between mean, median, and mode for a list of numbers.
- Analyze and draw conclusions based on information from figures, tables, and graphs.
- Exhibit knowledge of conditional and joint probability.

M3 Numbers: Concepts and Properties

- Recognize equivalent fractions and fractions in lowest terms.
- Recognize one-digit factors of a number.
- Identify a digit's place value.
- Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor.
- Find and use the least common multiple.
- Order fractions.
- Work with numerical factors.
- Work with scientific notation.
- Work with squares and square roots of numbers.
- Work problems involving positive integer exponents.*
- Work with cubes and cube roots of numbers.*
- Determine when an expression is undefined.*
- Exhibit some knowledge of the complex numbers.†
- Apply number properties involving prime factorization.
- Apply number properties involving even and odd numbers and factors and multiples.
- Apply number properties involving positive and negative numbers.
- Apply rules of exponents.
- Multiply two complex numbers.†
- Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers .
- Exhibit knowledge of logarithms and geometric sequences.
- Apply properties of complex numbers.

M4 Expressions, Equations, and Inequalities

- Exhibit knowledge of basic expressions (e.g., identify an expression for a total as b + g).
- Solve equations in the form x + a = b, where a and b are whole numbers or decimals.
- Substitute whole numbers for unknown quantities to evaluate expressions.
- Solve one-step equations having integer or decimal answers.
- Combine like terms (e.g., 2x + 5x).
- Evaluate algebraic expressions by substituting integers for unknown quantities.
- Add and subtract simple algebraic expressions.
- Solve routine first-degree equations.
- Perform straightforward word-to-symbol translations.
- Multiply two binomials.*
- Solve real-world problems using first-degree equations.
- Write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions).
- Identify solutions to simple quadratic equations.
- Add, subtract, and multiply polynomials.*

- Factor simple quadratics (e.g., the difference of squares and perfect square trinomials).*
- Solve first-degree inequalities that do not require reversing the inequality sign.*
- Manipulate expressions and equations.
- Write expressions, equations, and inequalities for common algebra settings.
- Solve linear inequalities that require reversing the inequality sign.
- Solve absolute value equations.
- Solve quadratic equations.
- Find solutions to systems of linear equations.
- Write expressions that require planning and/or manipulating to accurately model a situation.
- Write equations and inequalities that require planning, manipulating, and/or solving.
- Solve simple absolute value inequalities.

M5 Graphical Representations

- Identify the location of a point with a positive coordinate on the number line.
- Locate points on the number line and in the first quadrant.
- Locate points in the coordinate plane.
- Comprehend the concept of length on the number line.*
- Exhibit knowledge of slope.*
- Identify the graph of a linear inequality on the number line.*
- Determine the slope of a line from points or equations.*
- Match linear graphs with their equations.*
- Find the midpoint of a line segment.*
- Interpret and use information from graphs in the coordinate plane.
- Match number line graphs with solution sets of linear inequalities.
- Use the distance formula.
- Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point.
- Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle).†
- Match number line graphs with solution sets of simple quadratic inequalities.
- Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax2 + c$.
- Solve problems integrating multiple algebraic and/or geometric concepts.
- Analyze and draw conclusions based on information from graphs in the coordinate plane.

M6 Properties of Plane Figures

- Exhibit some knowledge of the angles associated with parallel lines.
- Find the measure of an angle using properties of parallel lines.
- Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°).
- Use several angle properties to find an unknown angle measure.
- Recognize Pythagorean triples.*
- Use properties of isosceles triangles.*
- Apply properties of 30°-60°-90°, 45°-45°-90°, similar, and congruent triangles.
- Use the Pythagorean theorem.
- Draw conclusions based on a set of conditions.
- Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas.
- Use relationships among angles, arcs, and distances in a circle.

M7 Measurement

- Estimate or calculate the length of a line segment based on other lengths given on a geometric figure.
- Compute the perimeter of polygons when all side lengths are given.

- Compute the area of rectangles when whole number dimensions are given.
- Compute the area and perimeter of triangles and rectangles in simple problems.
- Use geometric formulas when all necessary information is given.
- Compute the area of triangles and rectangles when one or more additional simple steps are required.
- Compute the area and circumference of circles after identifying necessary information.
- Compute the perimeter of simple composite geometric figures with unknown side lengths.*
- Use relationships involving area, perimeter, and volume of geometric figures to compute another measure.
- Use scale factors to determine the magnitude of a size change.
- Compute the area of composite geometric figures when planning or visualization is required.

M8 Functions

- Evaluate quadratic functions, expressed in function notation, at integer values.
- Evaluate polynomial functions, expressed in function notation, at integer values.†
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths.†
- Evaluate composite functions at integer values.†
- Apply basic trigonometric ratios to solve right-triangle problems.†
- Write an expression for the composite of two simple functions.†
- Use trigonometric concepts and basic identities to solve problems.†
- Exhibit knowledge of unit circle trigonometry.†
- Match graphs of basic trigonometric functions with their equations.

Notes

- Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other ranges.
- Standards followed by an asterisk (*) apply to the PLAN and ACT Mathematics Tests only.
- Standards followed by a dagger (†) apply to the ACT Mathematics Test only.

Reading

R1 Main Ideas and Author's Approach

- Recognize a clear intent of an author or narrator in uncomplicated literary narratives.
- Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages.
- Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages.
- Infer the main idea or purpose of straightforward paragraphs in more challenging passages.
- Summarize basic events and ideas in more challenging passages.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages.
- Infer the main idea or purpose of more challenging passages or their paragraphs.
- Summarize events and ideas in virtually any passage.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage.
- Identify clear main ideas or purposes of complex passages or their paragraphs.

R2 Supporting Details

- Locate basic facts (e.g., names, dates, events) clearly stated in a passage.
- Locate simple details at the sentence and paragraph level in uncomplicated passages.
- Recognize a clear function of a part of an uncomplicated passage.

- Locate important details in uncomplicated passages.
- Make simple inferences about how details are used in passages.
- Locate important details in more challenging passages.
- Locate and interpret minor or subtly stated details in uncomplicated passages.
- Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages.
- Locate and interpret minor or subtly stated details in more challenging passages.
- Use details from different sections of some complex informational passages to support a specific point or argument.
- Locate and interpret details in complex passages.
- Understand the function of a part of a passage when the function is subtle or complex.

R3 Sequential, Comparative, and Cause–Effect Relationships

- Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages.
- Recognize clear cause–effect relationships described within a single sentence in a passage.
- Identify relationships between main characters in uncomplicated literary narratives.
- Recognize clear cause–effect relationships within a single paragraph in uncomplicated literary narratives.
- Order simple sequences of events in uncomplicated literary narratives.
- Identify clear relationships between people, ideas, and so forth in uncomplicated passages.
- Identify clear cause–effect relationships in uncomplicated passages.
- Order sequences of events in uncomplicated passages.
- Understand relationships between people, ideas, and so forth in uncomplicated passages.
- Identify clear relationships between characters, ideas, and so forth in more challenging literary narratives.
- Understand implied or subtly stated cause–effect relationships in uncomplicated passages.
- Identify clear cause–effect relationships in more challenging passages.
- Order sequences of events in more challenging passages.
- Understand the dynamics between people, ideas, and so forth in more challenging passages.
- Understand implied or subtly stated cause–effect relationships in more challenging passages.
- Order sequences of events in complex passages.
- Understand the subtleties in relationships between people, ideas, and so forth in virtually any passage.
- Understand implied, subtle, or complex cause–effect relationships in virtually any passage.

R4 Meaning of Words

- Understand the implication of a familiar word or phrase and of simple descriptive language.
- Use context to understand basic figurative language.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages.
- Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages.
- Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts.
- Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage.

R5 Generalizations and Conclusions

- Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives.
- Draw simple generalizations and conclusions about people, ideas, and so forth in uncomplicated passages.

- Draw generalizations and conclusions about people, ideas, and so forth in uncomplicated passages.
- Draw simple generalizations and conclusions using details that support the main points of more challenging passages.
- Draw subtle generalizations and conclusions about characters, ideas, and so forth in uncomplicated literary narratives.
- Draw generalizations and conclusions about people, ideas, and so forth in more challenging passages.
- Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so forth.
- Draw complex or subtle generalizations and conclusions about people, ideas, and so forth, often by synthesizing information from different portions of the passage.
- Understand and generalize about portions of a complex literary narrative.

Science

S1 Interpretation of Data

- Select a single piece of data (numerical or nonnumerical) from a simple data presentation (e.g., a table or graph with two or three variables, a food web diagram).
- Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels).
- Select two or more pieces of data from a simple data presentation.
- Understand basic scientific terminology.
- Find basic information in a brief body of text.
- Determine how the value of one variable changes as the value of another variable changes in a simple data presentation.
- Select data from a complex data presentation (e.g., a table or graph with more than three variables, a phase diagram).
- Compare or combine data from a simple data presentation (e.g., order or sum data from a table).
- Translate information into a table, graph, or diagram.
- Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table).
- Compare or combine data from a complex data presentation.
- Interpolate between data points in a table or graph.
- Determine how the value of one variable changes as the value of another variable changes in a complex data presentation.
- Identify and/or use a simple (e.g., linear) mathematical relationship between data.
- Analyze given information when presented with new, simple information.
- Compare or combine data from a simple data presentation with data from a complex data presentation.
- Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data.
- Extrapolate from data points in a table or graph.
- Compare or combine data from two or more complex data presentations.
- Analyze given information when presented with new, complex information.

S2 Scientific Investigation

- Understand the methods and tools used in a simple experiment.
- Understand the methods and tools used in a moderately complex experiment
- Understand a simple experimental design.
- Identify a control in an experiment.
- Identify similarities and differences between experiments.
- Understand the methods and tools used in a complex experiment.
- Understand a complex experimental design.
- Predict the results of an additional trial or measurement in an experiment.
- Determine the experimental conditions that would produce specified results.

- Determine the hypothesis for an experiment.
- Identify an alternate method for testing a hypothesis.
- Understand precision and accuracy issues.
- Predict how modifying the design or methods of an experiment will affect results.
- Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results.

S3 Evaluation of Models, Inferences, and Experimental Results

- Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model.
- Identify key issues or assumptions in a model.
- Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a simple hypothesis or conclusion and why.
- Identify strengths and weaknesses in one or more models.
- Identify similarities and differences between models.
- Determine which model(s) is/are supported or weakened by new information.
- Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion.
- Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model.
- Determine whether new information supports or weakens a model and why.
- Use new information to make a prediction based on a model.
- Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a complex hypothesis or conclusion and why.

Writing

W1 Expressing Judgments

- Show a little understanding of the persuasive purpose of the task but neglect to take or to maintain a position on the issue in the prompt.
- Show limited recognition of the complexity of the issue in the prompt.
- Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt but may not maintain that position.
- Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer's position.
- Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt.
- Show some recognition of the complexity of the issue in the prompt by doing the following:
    - Acknowledging counterarguments to the writer's position
    - Providing some response to counterarguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion.
- Show recognition of the complexity of the issue in the prompt by doing the following:
    - Partially evaluating implications and/or complications of the issue, and/or
    - Posing and partially responding to counterarguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion.
- Show understanding of the complexity of the issue in the prompt by doing the following:
    - Examining different perspectives, and/or
    - Evaluating implications or complications of the issue, and/or
    - Posing and fully discussing counterarguments to the writer's position

W2 Focusing on the Topic

- Maintain a focus on the general topic in the prompt through most of the essay.
- Maintain a focus on the general topic in the prompt throughout the essay.
- Maintain a focus on the general topic in the prompt throughout the essay, and attempt a focus on the specific issue in the prompt.
- Present a thesis that establishes focus on the topic.
- Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a thesis that establishes a focus on the writer's position on the issue.
- Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a critical thesis that clearly establishes the focus on the writer's position on the issue.

W3 Developing a Position

- Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas.
- Show little or no movement between general and specific ideas and examples.
- Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas.
- Show little movement between general and specific ideas and examples.
- Develop ideas by using some specific reasons, details, and examples.
- Show some movement between general and specific ideas and examples.
- Develop most ideas fully, using some specific and relevant reasons, details, and examples.
- Show clear movement between general and specific ideas and examples.
- Develop several ideas fully, using specific and relevant reasons, details, and examples.
- Show effective movement between general and specific ideas and examples.

W4 Organizing Ideas

- Provide a discernible organization with some logical grouping of ideas in parts of the essay.
- Use a few simple and obvious transitions.
- Present a discernible, though minimally developed, introduction and conclusion.
- Provide a simple organization with logical grouping of ideas in parts of the essay.
- Use some simple and obvious transitional words, though they may at times be inappropriate or misleading.
- Present a discernible, though underdeveloped, introduction and conclusion.
- Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas.
- Use some simple and obvious, but appropriate, transitional words and phrases.
- Present a discernible introduction and conclusion with a little development.
- Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas.
- Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas.
- Present a somewhat developed introduction and conclusion.
- Provide unity and coherence throughout the essay, often with a logical progression of ideas.
- Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas.
- Present a well-developed introduction and conclusion.

W5 Using Language

- Show limited control of language by doing the following:
    - Correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes significantly impede understanding
    - Using simple vocabulary
    - Using simple sentence structure

- Correctly employing some of the conventions of standard English grammar, usage, and mechanics, but with distracting errors that sometimes impede understanding
- Using simple but appropriate vocabulary
- Using a little sentence variety, though most sentences are simple in structure
- Correctly employing many of the conventions of standard English grammar, usage, and mechanics, but with some distracting errors that may occasionally impede understanding
- Using appropriate vocabulary
- Using some varied kinds of sentence structures to vary pace
- Correctly employing most conventions of standard English grammar, usage, and mechanics with a few distracting errors but none that impede understanding
- Using some precise and varied vocabulary
- Using several kinds of sentence structures to vary pace and to support meaning
- Correctly employing most conventions of standard English grammar, usage, and mechanics with just a few, if any, errors
- Using precise and varied vocabulary
- Using a variety of kinds of sentence structures to vary pace and to support meaning

Appendix D: National Industry Standards

NATIONAL WORKFORCE CENTER FOR EMERGING TECHNOLOGIES SKILL STANDARDS FOR INFORMATION TECHNOLOGY NETWORK DESIGN AND ADMINISTRATION

ND1 Perform Analysis

- Gather data to identify customer requirements.
- Identify, interpret, and evaluate system network and security requirements.
- Define scope of work.
- Review network architecture, topology, interdependencies, and constraints.
- Research technical alternatives and analyze technical options.
- Develop a project plan.

ND2 Design Network

- Participate in design reviews.
- Prepare an integration plan for new processes, protocols, and equipment.
- Recommend selection of architecture, topology, hardware, and software.
- Prepare capacity and throughput plan.
- Specify servers and supporting hardware.
- Specify wired and wireless facilities.
- Integrate network components.

ND3 Configure and Deploy Network

- Plan and document system configuration.
- Implement new system configuration.
- Perform workstation configuration and software loading.
- Support, track, and document change implementation.
- Implement deployment.
- Manage contract personnel.
- Install hardware.
- Perform network fault management.

ND4 Perform Testing

- Define and document test specifications.
- Develop test plan and procedures.
- Schedule and perform testing.
- Document, interpret, and report test results.
- Perform final tests, and gain customer acceptance.
- Perform functional verifications and system audits.

ND5 Manage Network

- Set up and maintain user accounts.
- Coordinate, communicate, and document changes.
- Manage inventory.
- Analyze system performance to baseline.
- Monitor and report component and connectivity problems.
- Make recommendations for system optimization, improvement, and security.
- Generate and present reports.
- Monitor capacity to ensure required service levels.
- Manage and implement contingency and emergency recovery plans.

ND6 Maintain Network and Manage Growth

- Develop maintenance and upgrade plans.
- Coordinate maintenance for the computer, Web server, and telecommunications networks.
- Apply maintenance upgrades, security enhancements, and process changes.
- Perform system backups, and restore data.
- Troubleshoot and maintain client, server, and network systems.
- Develop growth and capacity plans, and make recommendations.
- Implement growth plans and long-range solutions.

ND7 Perform Security Administration

- Gather and document security requirements.
- Design and document security plan.
- Implement and enforce system and user security requirements.
- Maintain, improve, and enhance security in response to industry developments and user experience.
- Detect, monitor, and report security problems.
- Contribute to and develop recommendations for long-range security plans.

Appendix E:
National Educational Technology Standards for Students

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

T1 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.

T2 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.

T3 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.

T4 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.

T5 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.

T6 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.