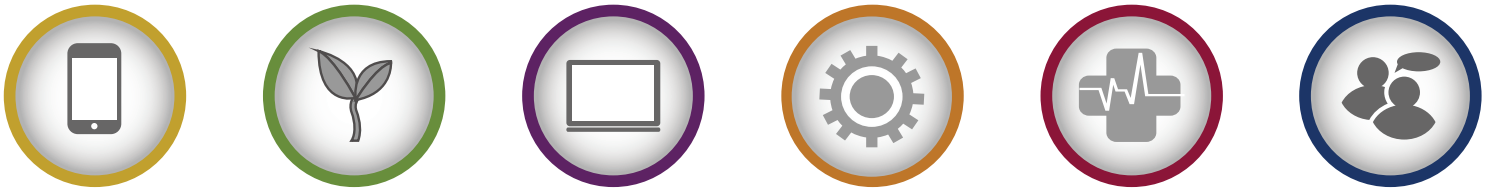
IOWA
CAREER AND TECHNICAL EDUCATION STANDARDS

FINAL REPORT 2019



BUSINESS, MANAGEMENT & ADMINISTRATION • AGRICULTURE, FOOD & NATURAL RESOURCES • INFORMATION SOLUTIONS • APPLIED SCIENCES, TECHNOLOGY, ENGINEERING & MANUFACTURING • HEALTH SCIENCES • HUMAN SERVICES

IOWA DEPARTMENT OF EDUCATION

Foundational Standards for Information Technology
Cluster Topic 1: IT 1 Core-Business Skills
IT 1 Core-Business Skills Cluster Knowledge and Skill Statement: **Understand business concepts, tools, and creativity necessary in the workplace.**
Performance Elements:
IT 1.1 Demonstrate ability to utilize computing devices (e.g., printers, phone, digital cameras, multi-media equipment, video and scanners).
Measurement Criteria:
IT 1.1.1 Demonstrate touch keyboarding and use computer functions to create documents and visualizations/tables. (3A-DA-11)
IT 1.1.2 Select and use appropriate digital tools for solving problems.
IT 1.1.3 Demonstrate the functionality of computing devices and identify proper usage.
IT 1.2 Demonstrate workplace expectations (e.g. dress, promptness, attendance, interpersonal skills, completion of assigned tasks).
Measurement Criteria:
IT 1.2.1 Identify and list workplace expectations.
IT 1.2.2 Compare school expectations to work expectations.
IT 1.2.3 Demonstrate punctuality.
IT 1.2.4 Demonstrate teamwork skills.
IT 1.2.5 Explain the relationship between team and individual performance.
IT 1.2.6 Demonstrate appropriate electronic etiquette.
IT 1.3 Identify IT organizational structures and roles.
Measurement Criteria:
IT 1.3.1 Identify the organizational structure of an IT department.
IT 1.3.2 Identify various roles in IT (e.g. help desk, system administrator, programmers, analyst, project managers).
IT 1.3.3 Identify examples of chains of command and the communication channels within an Organization.
IT 1.4 Describe current trends in technology.
Measurement Criteria:
IT 1.4.1 Discuss new technologies (e.g. cloud computing outsourcing, mobile, artificial intelligence, data analytics, digital currency).
IT 1.4.2 Describe how artificial intelligence drives many software and physical systems. (3B- AP-09)
IT 1.4.3 Describe types of businesses and how technology impacts their operations.
IT 1.4.4 Compare and contrast online vs. brick and mortar enterprises.
IT 1.4.5 Explain the importance of security.
IT 1.5 Discuss and understand challenges and opportunities facing the IT Industry.
Measurement Criteria:
IT 1.5.1 Discuss the pace of change in technology and how it affects business.
IT 1.5.2 Understand the difference between in-house IT and outsourced IT and how to work with removed workers.
IT 1.5.3 Understand the IT employment opportunities and job growth and how it affects the IT student futurereadyiowa.gov.

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IT 1.5.4 Demonstrate an awareness of potential government compliance requirements (e.g. patient privacy, confidentiality, security).
IT 1.6 Demonstrate the ability to understand business information.
Measurement Criteria:
IT 1.6.1 Demonstrate understanding of core business processes (marketing, finance, sales, and operations).
IT 1.6.2 Demonstrate understanding of reporting tools (dashboards, spreadsheets, and charts).
IT 1.7 Recognize legal, social, cultural and ethical issues related to information technology. (3A-IC-24)
Measurement Criteria:
IT 1.7.1 Research the Code of Ethics for a professional IT organization such as Association for Information Technology Professionals.
IT 1.7.2 Identify illegal and unethical activities and practices.
IT 1.7.3 Research the penalties for software copyright violations and intellectual property laws. (3A-IC-28)
IT 1.7.4 Understand ownership of information. (3A-AP-20)
IT 1.7.5 Debate laws and regulations that impact the development and use of software. (3B-IC-28)
IT 1.8 Demonstrate an understanding of the need for security from a workplace standpoint.
Measurement Criteria:
IT 1.8.1 Research recent security events that have affected the workplace and discuss their impact.
IT 1.8.2 Identify common security threats such as hacking, viruses, phishing, malware, and physical Security. (3A-NI-05)
IT 1.8.3 Demonstrate best practices as a user to prevent security breaches.
IT 1.8.4 Understand privacy concerns (social media, online banking, passwords, confidential information). (3A-IC-29) (3A-IC-30)
IT 1.8.5 Compare various security measures, considering tradeoffs between the usability and security of a computer system. (3A-NI-06)
IT 1.8.6 Explain tradeoffs when selecting and implementing cybersecurity recommendations. (3A-NI-07) (3A-NI-08)
IT 1.8.7 Compare ways software developers protect devices and information from unauthorized access. (3B-NI-04)
IT 1.9 Understand basic software applications

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Measurement Criteria:
IT 1.9.1 Demonstrate operation of e-mail, word processing, spreadsheets, presentation software, and database application software.
IT 1.9.2 Show working knowledge of collaborative tools and online resources.
IT 1.9.3 Demonstrate a working knowledge of different search engines.
Cluster Topic 2: IT 2 Core-Technical Skills
IT 2 Core-Technical Skills Cluster Knowledge and Skill Statement: **Understand the basic skills necessary to work in the IT industry.**
Performance Elements:
IT 2.1 Demonstrate an understanding of the role and functions of an operating system.
Measurement Criteria:
IT 2.1.1 Demonstrate the understanding of directory structures (folders, files, etc.).
IT 2.1.2 Demonstrate an understanding how to configure devices.
IT 2.1.3 Understand the roles of users in an operating system.
IT 2.1.4 Demonstrate knowledge of the different types of operating systems (e.g. Windows, Apple, Linux, IOS, Android, Chrome). (3B-CS-01)
IT 2.1.5 Describe the difference between applications and operating systems and how the dependencies of each work.
IT 2.1.6 Evaluate the scalability and reliability of networks by describing the relationship between routers, switches, servers, topology, and addressing network functionality. (3A-NI-04) (CB-NI-03)
IT 2.1.7 Translate between different bit representations of real-world phenomena, such as characters, numbers and images. (3A-DA-09)
IT 2.1.8 Evaluate the tradeoffs in how data elements are organized and where data is stored. (3A-DA-10)
IT 2.2 Use logic to solve problems and demonstrate trouble-shooting skills. (3A-CS-03)
Measurement Criteria:
IT 2.2.1 Develop a plan to troubleshoot an identified technical issue.
IT 2.2.2 Demonstrate initiative to independently solve problems and trouble-shoot.
IT 2.2.3 Understand the resources available to troubleshoot an issue.
IT 2.2.4 Demonstrate the ability to obtain information from a user to identify the root cause of an issue.
IT 2.2.5 Implement steps to prevent the issue from happening in the future.
IT 2.3 Demonstrate knowledge of the hardware components associated with Information Systems. (3A-CS-02)
Measurement Criteria:
IT 2.3.1 Demonstrate a knowledge of the difference between hardware and software.

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IT 2.3.2 Compare and contrast the difference between a virtual machine and a physical machine.
IT 2.3.3 Define the different components of a computing device (CPU, memory, hard drive).
IT 2.3.4 Identify common peripherals (printers, cameras, back-up devices, scanners).
IT 2.3.5 Discuss the basic elements of cloud computing.
IT 2.3.6 Demonstrate the ability to create a virtual machine (VMWare, Xen).
IT 2.4 Demonstrate math skills.
Measurement Criteria:
IT 2.4.1 Demonstrate the relationship between different numbering systems (binary, decimal, hex).
IT 2.4.2 Demonstrate the ability to use a spreadsheet to create formulas and graphical representations of the data.
IT 2.5 Demonstrate the ability to use technical documents.
Measurement Criteria:
IT 2.5.1 Demonstrate the ability to use the internet to research and find answers to technical issues.
IT 2.5.2 Assess the reliability of online documentation.
IT 2.5.3 Demonstrate the working knowledge of a flow chart or decision tree documentation.
IT 2.5.4 Evaluate the ability of models and simulations to test and support and make predictions on selected processes to test the hypotheses. (3A-DA-12)
IT 2.5.5 Use data sets to support a claim or communicate information. (3B-DA-06)
IT 2.5.6 Use tools to identify patterns in data representing complex systems. (3A-DA-10) (3B- DA-05) (3B-AP-15)
IT 2.6 Demonstrate the basic design process of a project.
Measurement Criteria:
IT 2.6.1 Create a prototype that uses algorithms to solve computational problems by leveraging prior student knowledge and personal interests. (3A-AP-13)
IT 2.6.2 With a team, design, and develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions and with working as a team. (3A-AP-16) (3A-AP-18) (3A-AP-22)
IT 2.6.3 Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables. (3A-AP-14)
IT 2.6.4 Demonstrate the function and purpose of the project you are designing using constructs such as procedures, modules, and/or objects. (3A-AP-17) (3B-AP-14)
IT 2.6.5 Evaluate and refine computational artifacts to make them more usable and accessible. (3A-AP-21)
IT 2.6.6 Document design decisions using text, graphics, presentations, and/or demonstration in the development of complex programs. (3A-AP-23)
IT 2.6.7 Demonstrate the ability to describe the business requirements and how the solution satisfies the

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business theme and how it could possibly be used in other disciplines.
IT 2.6.8 Describe a methodology of testing your project. (3B-DA-07)
IT 2.6.9 Describe how improvements or user feedback would be incorporated in the project.
IT 2.6.10 Understand the unique needs of accessibility to all users.
IT 2.7 Understand computational systems.
Measurement Criteria:
IT 2.7.1 Understand the integration of a computer system within other devices and discuss how they work together.
IT 2.8 Utilize algorithms to understand computer programming and processes.
Measurement Criteria:
IT 2.8.1 Illustrate the flow of execution of a recursive algorithm.
IT 2.8.2 Construct solutions to problems using student-created components such as procedures, modules and or objects.
IT 2.8.3 Demonstrate code reuse by creating programming solutions using libraries and APIs. (3B-AP-16)
IT 2.8.4 Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices. (3A-AP-15)
IT 2.8.5 Plan and develop programs for broad audiences using a software life cycle process. (3B- AP-17)
IT 2.8.6 Develop programs for multiple computing problems. (3B-AP-10) (3B-AP-19)
IT 2.8.7 Use version control systems, integrated development environment (IDEs), and collaborative tools and practices (code documentation) in a group software project. (3B- AP-20)
IT 2.8.8 Compare multiple programming languages and discuss how their features them suitable for solving different types of problems. (3A-IC-26) (3B-AP-24)
IT 2.8.9 Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem. (3B-AP-09)
IT 2.8.10 Evaluate algorithms in terms of their efficiency, correctness and clarity. (3B-AP-11)
IT 2.8.11 Compare and contrast fundamental data structures and their uses. (3B-AP-12)
IT 2.8.12Illustrate the flow of execution of a recursive algorithm. (3B-AP-13)
Cluster Topic: IT 3 Core-Communication Skills
IT 3 Core-Communication Skills Knowledge and Skill Statement: Understand concepts, strategies and methods needed to interact and collaborate with others.
Performance Elements:
IT 3.1 Understand customer interaction requirements.
Measurement Criteria:
IT 3.1.1 Explain the importance of maintaining communication with the customer.

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IT 3.1.2 Identify customer expectations in a given situation.
IT 3.1.3 Create a basic requirements document and technical response document that addresses the user needs.
IT 3.1.4 Demonstrate the ability to prioritize tasks.
IT 3.1.5 Demonstrate the ability to plan according to people and resource needs and constraints and follow through to ensure you have met customer expectations.
IT 3.2 Demonstrate the ability to communicate technical issues in a non-technical manner.
Measurement Criteria:
IT 3.2.1 Create concise documentation and reports.
IT 3.2.2 Explain the importance of obtaining feedback from your audience and adjust presentation accordingly. (3A-AP-19)
IT 3.2.3 Describe a technical topic to a non-technical person.
IT 3.3 Demonstrate ability to train users.
Measurement Criteria:
IT 3.3.1 Understand the different learning styles of your audience.
IT 3.3.2 Identify user's knowledge level and plan training accordingly.
IT 3.3.3 Demonstrate ability of how to use various technologies.
IT 3.3.4 Assess training outcomes.
IT 3.4 Demonstrate the ability to work as a team member.
Measurement Criteria:
IT 3.4.1 Offer contrasting viewpoints.
IT 3.4.2 Define and communicate workload limits.
IT 3.4.3 Understand the importance of communicating with others.
IT 3.4.4 Understand conflict resolution in a team setting.
IT 3.4.5 Understand cultural differences in communication. (3A-IC-27)
IT 3.4.6 Test and refine computational artifacts to reduce bias and equity deficits. (3A-IC-25) (3B-IC-25)(3B-IC-26)
IT 3.4.7 Predict how computational innovations that have revolutionized aspects of our culture might evolve. (3B-IC-27)
IT 3.5 Demonstrate ability to communicate professionally both verbally in writing (e.g. resumes, cover letters, reports, interviews, e-mails).
Measurement Criteria:
IT 3.5.1 Role play interviews for requirements gathering for a project.

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IT 3.5.2 Write a short report covering the issues, gathered requirements requiring solutions, with a cover letter asking for approval to proceed with the project, and resumes of team members participating in the project.
IT 3.5.3 Recognize when to or not to use an e-mail for communication.
IT 3.5.4 Demonstrate the ability to write a professional e-mail.

Networking Systems
Cluster Topic 4: IT 4-Networking Systems Pathway
IT 4-Networking Systems Pathway Cluster Knowledge and Skill Statement: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.
Performance Elements:
IT 4.1 Demonstrate an understanding of common operating systems used in the industry.
Measurement Criteria:
IT 4.1.1 Understand the history of operating systems and their progression.
IT 4.1.2 Understand basic commands of different systems.
IT 4.1.3 Understand the types of software that runs on each operating system.
IT 4.1.4 Explain how the operating system should be configured to maximize performance. (3B-NI-03)
IT 4.2 Use operating system principles to ensure optimal system function.
Measurement Criteria:
IT 4.2.1 Apply basic commands of operating system software.
IT 4.2.2 Apply appropriate file and disk management techniques.
IT 4.2.3. Employ desktop operating skills.
IT 4.2.4 Handle materials and equipment in a responsible manner.
IT 4.2.5 Follow power-up and log-on procedures.
IT 4.2.6 Interact with/respond to system messages using console device.
IT 4.2.7 Run applications/jobs in accordance with processing procedures.
IT 4.2.8 Follow log-off and power-down procedure(s).
IT 4.3 List network devices and functions (e.g. repeater, bridge, switch, router).
Measurement Criteria:
IT 4.3.1 Define the difference between a router and a firewall.
IT 4.3.2 Define the difference between a hub and a switch.
IT 4.3.3 Define what a host intrusion prevention system does.
IT 4.3.4 Define what a network intrusion prevention system does.
IT 4.3.5 Define the difference between Intrusion Detection vs. Intrusion Prevention.
IT 4.3.6 Define the differences between a layer 2 and a layer 3 switch.
IT 4.4 Identify types of networks and their capabilities (e.g. LAN, WAN, MAN, Wi-Fi).
Measurement Criteria:
IT 4.4.1 Demonstrate understanding of types of networks deployed in a home, small office, office buildings, industrial settings, schools, college campus, multi-site organizations and the primary difference between each.

Networking Systems
IT 4.4.2 Demonstrate an understanding of the costs associated with each type of network and what drives the cost differences.
IT 4.4.3 Identify the different types of risks associated with each type of network.
IT 4.5 Summarize basic data communications components and trends to maintain and update IT Systems.
Measurement Criteria:
IT 4.5.1 Explain data communications procedures, equipment and media.
IT 4.5.1.a Demonstrate knowledge of key communications procedures.
IT 4.5.1.b Demonstrate knowledge of the uses of data communication equipment.
IT 4.5.1.c Demonstrate knowledge of types of communications media.
IT 4.5.2 Explain data transmission codes and protocols.
IT 4.5.2.a Demonstrate knowledge of data transmission codes and protocols.
IT 4.5.3 Explain the differences between local and wide area networks.
IT 4.5.3.a Distinguish between local area networks and wide-area networks.
IT 4.5.4 Summarize data communication trends and issues.
IT 4.5.4.a Identify data communication trends.
IT 4.5.4.b Identify major current issues in data communications.
IT 4.6 Explain the importance of security of data (e.g. privacy of information, confidentiality, restricted use by authorized personnel).
Measurement Criteria:
IT 4.6.1 Demonstrate an awareness of technological advances and availability of resources.
IT 4.6.2 Understand the need for confidentiality.
IT 4.6.3 Identify sources of security problems with data. (3B-AP-18)
IT 4.6.4 Identify methods of data protection.
IT 4.6.5 Understand the lifecycle of data protection (e.g. the creation of data, management of data, storage of data).
IT 4.6.6 Understanding the different methods to encrypt data (e.g. volume level encryption, file encryption, or database encryption).
IT 4.7 Identify network topologies and protocols.
Measurement Criteria:
IT 4.7.1 Demonstrate knowledge of the OSI layers 1, 2, and 3.
IT 4.7.2 Define what Internet Protocol is.
IT 4.7.3 Define what TCP is.
IT 4.7.4 Define what UDP is.
IT 4.7.5 Define what the different is between a switched network and a hub network.

Networking Systems
IT 4.7.6 Define what the difference is between Telnet and SSH.
IT 4.7.7 Define what the difference is between FTP and SFTP.
IT 4.8 Identify and list networking media.
Measurement Criteria:
IT 4.8.1 Define what an RJ 45 connection is.
IT 4.8.2 Define what a co-ax connection is.
IT 4.8.3 Define the differences between cat 5, 5E and6.
IT 4.8.4 Define what a “point to point circuit” is and how that differs from the internet.
IT 4.8.5 Define what the difference is between WiFi and leased line circuits.
IT 4.8.6 Define the difference between WiFi and Satellite technology.
IT 4.9 Demonstrate technical knowledge of the Internet to develop and maintain IT systems.
Measurement Criteria:
IT 4.9.1 Describe Internet protocols.
IT 4.9.1.a Demonstrate knowledge of the Transmission Control Protocol/Internet Protocol (TcP/IP) suite.
IT 4.9.1.b Demonstrate knowledge of management protocols, applications and procedures (e.g., SNMP, intrusion detection, and reporting issues).
IT 4.9.1.c Explain the concept of routing.
IT 4.9.2 Demonstrate a basic understanding of Domain Name System(DNS).
IT 4.10 Access and use Internet services when completing IT related tasks to service and update IT systems.
Measurement Criteria:
IT 4.10.1 Demonstrate the use of an Internet connection.
IT 4.10.1.a Configure a small home office Internet connection using cable, DSL, wireless or satellite connection.
IT 4.10.1.b Test Internet connection using tools such as ping, trace route, net stat, host, dig, and DNS lookup.
IT 4.10.2 Troubleshoot Internet connection problems.
IT 4.10.3 Explain the functions of the Internet software components.
IT 4.10.3.a Demonstrate knowledge of the components of Internet software.
IT 4.10.4 Install Internet software for use on an operating system.
IT 4.10.4.a Identify common browser features.
IT 4.10.4.b Install Internet software.
IT 4.10.4.c Differentiate between Web-based applications and applications installed on a local computer.
IT 4.10.4.d Download software upgrades and shareware from the Internet.

Networking Systems
IT 4.10.4.e Unpack files using compression software.
IT 4.10.5 Describe virus protection procedures.
IT 4.10.5a Demonstrate acute awareness of virus protection techniques.
IT 4.10.5b Identify types and capabilities of popular virus protection software.
IT 4.10.5c Explain spyware, adware, and malware.
IT 4.10.5d Identify how to avoid spyware, adware, and malware and how to recover from infection.
IT 4.10.6 Explain cookies and adware on an Internet connected computer system.
IT 4.10.6.a Demonstrate knowledge of cookies and their use on an internet-connected computer system.
IT 4.10.6.b Identify types and consequences of pop-ups and adware.
IT 4.11 Install and configure software programs to maintain and update IT systems.
Measurement Criteria:
IT 4.11.1 Verify that software to be installed is licensed prior to performing installation.
IT 4.11.1.a Verify conformance to licensing agreement.
IT 4.11.1.b Understand the concept of an End User License Agreement (EULA).
IT 4.11.1.c Differentiate between open source and proprietary licenses.
IT 4.11.1.d Explain the concept of open source.
IT 4.11.1.e Identify common characteristics of open source licensing agreements, including the GNU General Public License (GPL).
IT 4.12 Recognize and analyze potential IT security threats to develop and maintain security Requirements.
Measurement Criteria:
IT 4.12.1 Describe potential security threats to information systems.
IT 4.12.2 Identify the range of security needs and the problems that can occur due to security lapses.
IT 4.12.3 Assess security threats.
IT 4.12.3.a Maximize threat reduction.
IT 4.12.3.b Assess exposure to security issues.
IT 4.12.3.c Implement countermeasures.
IT 4.12.3.d Ensure compliance with security rules, regulations, and codes.
IT 4.12.3.e Demonstrate knowledge of virus protection strategy.
IT 4.12.3.f Implement security procedures in accordance with business ethics.
IT 4.12.4 Develop plans to address security threats.
IT 4.12.5 Implement plans to address security procedures.
IT 4.12.5.a Maintain confidentiality.
IT 4.12.5.b Load virus detection and protection software.
IT 4.12.5.c Identify sources of virus infections.
IT 4.12.5.d Remove viruses.
IT 4.12.5.e Report viruses in compliance with company standards.
IT 4.12.5.f Implement backup and recovery procedures.
IT 4.12.5.g Follow disaster plan.
IT 4.12.5.h Provide for user authentication and restricted access (e.g., assign passwords, access level).

Networking Systems
(3B-NI-04)

Programming and Software Development
IT Cluster Topic 5: IT 5-Programming and Software Development Pathway
IT 5 Programming and Software Development Pathway Knowledge and Skill Statement: Understand the concept of design, development, implementation, and maintenance of computer software.
Performance Elements:
IT 5.1 Demonstrate a fundamental understanding of programming.
Measurement Criteria:
IT 5.1.1 Write a small modular program using variables.
IT 5.1.2 Describe a class and objects.
IT 5.1.3 Describe the key differences between procedural programming, object-oriented programming, event driven programming and functional programming.
IT 5.1.4 List the key differences between a Waterfall life cycle and an Agile lifecycle.
IT 5.2 Demonstrate the ability to design an application.
Measurement Criteria:
IT 5.2.1 Gather data to identify customer requirements.
IT 5.2.2 Design a process map to illustrate a decision flow end to end.
IT 5.2.3 Demonstrate the ability to storyboard a user experience of the application.
IT 5.3 Demonstrate an understanding of how to create and develop software.
Measurement Criteria:
IT 5.3.1 Demonstrate the ability to code a program/application.
IT 5.3.2 Understand the difference between development, quality assurance and production.
IT 5.3.3 Demonstrate the ability to develop documentation and incorporate comments within the code.
IT 5.3.4 Develop a minimum viable product to obtain end-user feedback.
IT 5.3.5 Use Peer Review to assess application code.
IT 5.4 Demonstrate the ability to test an application for functionality.
Measurement Criteria:
IT 5.4.1 Demonstrate the ability to edit for any invalid data/input.
IT 5.4.2 Demonstrate an application/program will successfully with both valid and invalid data/input. (CB-CS-02)
IT 5.4.3 Demonstrate the ability of the application to recover after invalid data has been input or processed (exception testing).
IT 5.4.4 Explain the development of test data necessary to run tests on software.
IT 5.4.5 Apply test data to program code.
IT 5.4.6 Demonstrate knowledge of user acceptance testing.
IT 5.4.7 Develop end-user training plan and documentation.
IT 5.5 Understand the concepts regarding secure application design.
Measurement Criteria:
IT 5.5.1 Research programming standards (i.e. OWASP).
IT 5.5.1 Demonstrate knowledge of SQL injections.

Programming and Software Development
IT 5.5.3 Demonstrate knowledge of cross-site scripting (XSS).
IT 5.5.4 Demonstrate knowledge of how to intercept, capture and change HTML pages.
IT 5.6 Understand the concepts of version and change control.
Measurement Criteria:
IT 5.6.1 Demonstrate an understanding of Change Management.
IT 5.5.2 Research tools that are available to assist with version control and repositories.
IT 5.7 Understand the concepts of future improvements and upgrades to software.
Measurement Criteria:
IT 5.7.1 Prioritize change requests.
IT 5.7.2 Explain the risks and benefits of incorporating changes into the existing codebase.
IT 5.7.3 Develop a plan for ongoing maintenance and support.

Information Support and Services
IT Cluster Topic 6: IT 6-Information Support and Services Pathway
IT 6 Information Support and Services Pathway Cluster Knowledge and Skill Statement: Understand hardware and software support issues that affect the company.
Performance Elements:
IT 6.1 Explain the cost of implementing day-to-day information support and services operations and how it affects the company's bottom-line.
Measurement Criteria:
IT 6.1.1 Estimate the cost to run a small help desk with 3 employees for a year.
IT 6.1.2 Design a help desk service in your local school and support costs associated with the start-up of a help desk.
IT 6.1.3 Observe an existing help desk in the community or online.
IT 6.1.4 Evaluate the current help desk service provided in the district.
IT 6.2 Explain the importance of backing up data and maintaining data integrity.
Measurement Criteria:
IT 6.2.1 Identify possible sources of data lost.
IT 6.2.2 Identify methods and technologies for preserving data.
IT 6.2.3 List the steps required for effective backup and recovery.
IT 6.2.4 Design a recovery plan for what happens if there is a disaster and how you would get everything back up and running.
IT 6.3 Understand how changes that are made in one part of the system affects the others.
Measurement Criteria:
IT 6.3.1 Explain the importance of preserving the privacy of data.
IT 6.3.2 Predict how changes to one area might impact another area.
IT 6.3.3 Understand the concept of regression testing.
IT 6.4 Explain the importance of security of data (e.g. privacy of information, confidentiality, encryption, and restricted access by authorized personnel).
Measurement Criteria:

Information Support and Services
IT 6.4.1 Demonstrate an awareness of technological advances in securing data.
IT 6.4.2 Understand the requirement for confidentiality.
IT 6.4.3 Identify methods of data protection.
IT 6.4.4 Understand the importance of user roles.
IT 6.4.5 Explain the difference between Admin and non-Admin roles.
IT 6.5 Understand best practices in regards to cyber security.
Measurement Criteria:
IT 6.5 1 Explain why hacks happen.
IT 6.5.2 Understand the consequences of Cyber Security breaches.
IT 6.5.3 Understand the tools available to minimize the risks for Cyber Security breaches.
IT 6.5.4 Explain a process that could be used in response to a breach.
IT 6.6 Be able to install and support applications commonly used in the district.
Measurement Criteria:
IT 6.6.1 Understand how to properly install applications.
IT 6.6.2 Understand the difference between network installations and local installations.
IT 6.6.3 Understand Cloud based applications and how they differ from local applications.
IT 6.7 Demonstrate effective customer services skills (e.g., patience, courtesy, identify customer expectations, promptness).
Measurement Criteria:
IT 6.7.1 Role play customer help-desk scenarios.
IT 6.7.2 Understand the importance of a positive attitude.
IT 6.7.3 Understand the different types of personalities and how to communicate with each.
IT 6.7.4 Explore the support ticket systems available for use by help desks.
IT 6.7.5 Demonstrate a conflict-resolution strategy to de-escalate an unsatisfied customer.
IT 6.8 Demonstrate the ability to convey information regarding technical material (non-technical explanations for technical terms).
Measurement Criteria:
IT 6.8.1 Explain clearly the instructions for a computer task to another individual.
IT 6.8.2 Conduct task specific training and coach others to apply related concepts.
IT 6.8.3 Demonstrate ability to train others to use common applications.
IT 6.8.4 Demonstrate ability to document a process or solution.

Web and Digital Communications: Web Design
Cluster Topic 7: IT 7-Web and Digital Communications Sub Topic: Web Design
IT 7-1 Web and Digital Communications/Web Design Pathway - Knowledge and Skill Statement: Iterate through the design and development process to create a uniform Web/digital product.
Performance Elements:
IT 7-1.1 Participate in iterative development with clients and team members.
Measurement Criteria:
IT 7-1.1.1 Manage the change control process.
IT 7-1.1.2 Identify and track critical milestones.
IT 7-1.1.3 Report project status.
IT 7-1.1.4 Identify optimal strategies for successful interactions with clients and team members.
IT 7-2 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Participate in a user focused design and development process to produce Web and digital communications solutions.**
Performance Elements:
IT 7-2.1 Analyze Usability and Accessibility as it pertains to customer needs.
Measurement Criteria:
IT 7-2.1.1 Demonstrate knowledge of 508 ADA Compliance.
IT 7-2.1.2 Demonstrate knowledge of web metrics and governance (policies and stylebooks).
IT 7-2.1.3 Demonstrate knowledge of cultural implications on design and deployment of digital communication products.
IT 7-2.1.4 Engage in user testing throughout the design and development process. (3B-AP-21)
IT 7-3 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Design and employ the use of graphics to create a visual Web/digital design.**
Performance Elements:
IT 7-3.1 Implement functional design criteria.
Measurement Criteria:
IT 7-3.1.1 Identify, utilize and create reusable components.
IT 7-3.1.2 Create and produce content.
IT 7-3.1.3 Create and refine design concepts.
IT 7-3.2 Create product visual design.
Measurement Criteria:
IT 7-3.2.1 Apply principles and elements of design.
IT 7-3.2.2 Apply color theory to select appropriate colors.
IT 7-3.2.3 Create and/or implement the look and feel of the product.
IT 7-3.2.4 Create graphical images and videos.
IT 7-3.2.5 Apply knowledge of typography.
IT 7-3.2.6 Alter digitized images using an image manipulation program.
IT 7-3.2.7 Evaluate visual appeal.
IT 7-4 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Gather and analyze digital communication customer requirements to best meet consumer needs.**
Performance Elements:
IT 7-4.1 Gather data to identify customer requirements.

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Measurement Criteria:
IT 7-4.1.1 Gather information using interviewing strategies.
IT 7-4.1.2 Determine client's needs and expected outcomes.
IT 7-4.2 Collect requirements data from customers and competing Web sites.
Measurement Criteria:
IT 7-4.2.1 Determine purpose of the digital communication project.
IT 7-4.2.2 Determine the target audience.
IT 7-4.2.3 Determine the digital communication elements to be used.
IT 7-4.2.4 Determine client's privacy policy and expectations.
IT 7-4.3 Evaluate requirements data that has been collected.
IT 7-4.4 Demonstrate how to create sand receive approval for a Web Site Plan.
IT 7-4. 5 Convey technical concepts from Web design to anon-technical audience.
IT 7-5 Web and Digital Communications/Web Design Pathway - Cluster Knowledge and Skill Statement: Define the scope of digital communication work in a written form to summarize and meet customer requirements.
Performance Elements:
IT 7-5.1 Define scope of work to meet customer requirements.
Measurement Criteria:
IT 7-5.1.1 Develop a design brief.
IT 7-5.1.2 Determine the target audience requirements (such as web accessibility).
IT 7-5.1.3 Identify available media and content sources.
IT 7-5.1.4 Develop timeline for completion.
IT 7-5.1.5 Determine staffing resources – internal and external – required to complete project.
IT 7-5.1.6 Develop preliminary project budget.
IT 7-5.1.7 Write scope of work document.
IT 7-5.1.8 Obtain client approval on scope of work.
IT 7-6 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Prepare digital communication product specifications to communicate specifications with various audiences.**
Performance Elements:
IT 7-6.1 Prepare functional specifications.
Measurement Criteria:
IT 7-6.1.1 Develop flowchart/navigational blueprints.
IT 7-6.1.2 Develop storyboards.
IT 7-6.1.3 Determine delivery platform(s).
IT 7-6.1.4 Design user interface.
IT 7-6.1.5 Design navigational schema.

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IT 7-6.2 Prepare visual design specifications.
Measurement Criteria:
IT 7-6.2.1 Apply principles of design (color theory and schemes, proximity, alignment, repetition, web graphics, optimization, typography).
IT 7-6.2.2 Identify technical constraints.
IT 7-6.2.3 Create sample design showing placement of content, buttons, graphics and suggested color Scheme.
IT 7-6.3 Create final project plan.
Measurement Criteria:
IT 7-6-3.1 Identify and obtain tools and resources to do the job.
IT 7-6-3.2 Identify and evaluate risks.
IT 7-6-3.3 Develop detailed task list.
IT 7-6-3.4 Identify critical milestones.
IT 7-6-3.5 Identify interdependencies.
IT 7-7 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Demonstrate the effective use of tools for digital communication production, development and project management to complete web/digital communication projects.**
Performance Elements:
IT 7-7.3 Select and use appropriate software tools.
Measurement Criteria:
IT 7-7.3.1 Demonstrate proficiency in use of digital imaging, digital video techniques, and equipment.
IT 7-7.3.2 Demonstrate knowledge of available graphics, video, motion graphics, web software programs.
IT 7-7.3.3 Demonstrate knowledge of available project management and collaborative tools.
IT 7-7.3.4 Demonstrate knowledge of integrated development environments.
IT 7-7.3.5 Demonstrate use of image altering software.
IT 7-7.3.6 Identify how different user agents (browsers, devices) affect the digital communication product.
IT 7-8 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Employ knowledge of Web design, programming, and administration to develop and maintain Web applications.**
Performance Elements:
IT 7-8.1 Implement functional design criteria.
Measurement Criteria:
IT 7-8.1.1 Identify, utilize and create reusable components.
IT 7-8.1.2 Create and produce content.
IT 7-8.1.3 Create and refine design concepts.
IT 7-8.2 Create product visual design.
Measurement Criteria:
IT 7-8.2.1 Apply principles and elements of design.
IT 7-8.2.2 Apply color theory to select appropriate colors.

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IT 7-8.2.3 Create and/or implement the look and feel of the product.
IT 7-8.2.4 Create graphical images and/or video elements.
IT 7-8.2.5 Apply knowledge of typography.
IT 7-8.2.6 Alter digitized images using an image manipulation program.
IT 7-8.2.7 Evaluate visual appeal.
IT 7-8.3 Use basic Web development skills.
Measurement Criteria:
IT 7-8.3.1 Demonstrate knowledge of HTM, HTML and CSS.
IT 7-8.3.2 Demonstrate knowledge of version control and why it is important.
IT 7-8.3.3 Demonstrate knowledge of basic web application security.
IT 7-8.3.4 Demonstrate that website meets the validation process and is compatible across multiple browsers and devices.
IT 7-8.4 Summarize Internet architecture elements.
Measurement Criteria:
IT 7-8.4.1 Demonstrate knowledge of transfer protocols (FTP, WebDAV).
IT 7-8.4.2 Demonstrate knowledge of Internet standards bodies.
IT 7-8.4.3 Keep up-to-date with new and emerging trends related to the Internet.
IT 7-8.5 Employ basic web programming knowledge.
Measurement Criteria:
IT 7-8.5.1 Demonstrate knowledge of client-side processing and its advantages/disadvantages.
IT 7-8.5.2 Identify standards scripting languages such as JavaScript.
IT 7-8.5.3 Demonstrate knowledge of website testing.
IT 7-8.5.4 Demonstrate knowledge of the uses and advantages/disadvantages of various scripting Languages.
IT 7-9 Web and Digital Communications/Web Design Pathway - **Cluster Knowledge and Skill Statement: Test a digital communication product to evaluate its functionality.**
Performance Elements:
IT 7-9.1 Develop a test plan for the digital communication product.
Measurement Criteria:
IT 7-9.1.1 Perform usability tests.
IT 7-9.1.2 Modify an existing program to add additional functionality and discuss intended and unintended implications. (3B-AP-22)
IT 7-9.1.3 Assess product effectiveness.
IT 7-9.1.4 Test product for reliability using code review and other methods. (3B-AP-23)
IT 7-9.1.5 Plan and coordinate customer acceptance testing.
IT 7-9.2 Implement a test plan for the digital communication product.
Measurement Criteria:
IT 7-9.2.1 Define the problem.
IT 7-9.2.2 Identify/test possible solutions.
IT 7-9.2.3 Develop resolution plan.

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IT 7-9.2.4 Implement solution.
IT 7-9.2.5 Evaluate problem-solving processes and outcomes.
IT 7-9.3 Resolve product problems.
IT 7-10 Web and Digital Communications/Web Design Pathway - Cluster Knowledge and Skill Statement: consider intellectual property issues when creating Web pages.
Performance Elements:
IT 7-10.1 Explain the concept of intellectual property.
IT 7-10.2 Differentiate between copyright and trademarks.
IT 7-10.3 Describe the function of non-disclosure agreement(NDA).

Web and Digital Communications: Graphic Design
IT Cluster Topic 8: IT 8-Web and Digital Communications Sub Topic: Graphic Design
IT 8-1 Web and Digital Communications/Graphic Design - Cluster Knowledge and Skill Statement: Demonstrate knowledge of the Graphics Industry.
Performance Elements:
IT 8-1.1 Demonstrate knowledge of the history of the graphic design field.
Measurement Criteria:
IT 8-1.1.1 Research technologies that advanced graphic design.
IT 8-1.1.2 Describe past, present, and future styles in the graphic design field.
IT 8-1.1.3 Identify art movements that impacted graphic arts.
IT 8-1.1.4 Describe the importance of graphic design's influence on society.
IT 8-1.1.5 Identify factors that contribute to the success of media businesses and freelance/contract providers.
IT 8-1.1.6 Examine how the relationship among marketing, sales and production affects profitability.
IT 8-1.2 Communicate ideas using appropriate industry terminology.
Measurement Criteria:
IT 8-1.2.1 Formulate written and verbal communications using industry standard terms.
IT 8-1.2.2 Prepare and deliver a visual presentation utilizing appropriate Cluster Knowledge.
IT 8-2 Web and Digital Communications/Graphic Design - Cluster Knowledge and Skill Statement: Apply elements and principles of design to communicate visually.
Performance Elements:
IT 8-2.1 Utilize computer applications to manage media.
Measurement Criteria:
IT 8-2.1.1 Use appropriate electronic publishing software and output devices.
IT 8-2.1.2 Apply essential commands and knowledge of computer operating systems.
IT 8-2.1 3 Apply computer file management techniques.
IT 8-2.1.4 Use the internet for file transfer.
IT 8-2.1.5 Select the format for digital delivery.
IT 8-2.1.6 Use and care for equipment and related accessories.
IT 8-2.1.7 Describe the functionality of the internet, intranet, and extranet in the media environment.
IT 8-2.1.8 Explain methods of protecting a computer against computer threats.

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IT 8-2.2 Apply knowledge of data capture and manipulation.
Measurement Criteria:
IT 8-2.2.1 Identify software that supports data capture for media devices (i.e. digital camera, video input device, graphics tablet, graphics expansion boards).
IT 8-2.2.2 Select appropriate resolutions for data capture.
IT 8-2.2.3 Capture and transfer still image, audio, and moving image content.
IT 8-B.2.4 Archive and manage data for media applications.
IT 8-2.3 Identify and apply the elements of design.
Measurement Criteria:
IT 8-2.3.1 Identify the applications of color, line, shape, texture, size, and value in samples of graphic work.
IT 8-2.3.2 Analyze the use of color, line, shape, texture, size and value in samples of graphic work.
IT 8-2.3.3 Incorporate color, line, shape, texture, size and value in student-generated graphic work.
IT 8-2.3.4 Demonstrate the elements of design through manual sketching.
IT 8-2.3.5 Demonstrate the elements of design through digital sketching.
IT 8-2.4 Identify and apply the principles of design.
Measurement Criteria:
IT 8-2.4.1 Analyze the principles of balance, contrast alignment, rhythm, repetition, movement, harmony, emphasis, and unity in samples of graphic works.
IT 8-2.4.2 Incorporate principles of balance, contrast, alignment, rhythm, repetition, movement, harmony, emphasis and unity in student-generated graphic works.
IT 8-2.4.3 Demonstrate the principles of design through various drawing techniques.
IT 8-2.5 Identify and apply the principles of typography.
Measurement Criteria:
IT 8-2.5.1 Identify the anatomical components and qualities of type (i.e., x-height, ascenders, descenders, counters, etc.).
IT 8-2.5.2 Apply and adjust formatting to type.
IT 8-2.5.3 Construct graphic works utilizing and manipulating type.
IT 8-2.6 Apply principles and elements of design to layout.
Measurement Criteria:
IT 8-2.6.1 Apply effective use of negative space, composition, message structure, graphics, etc. to graphic works.
IT 8-2.6.2 Create graphic works utilizing grids.
IT 8-2.6.3 Create graphic works utilizing templates.
IT 8-2.6.4 Demonstrate layout skills for print collaterals (i.e. business cards, newspapers, packaging, etc.).
IT 8-2.6.5 Demonstrate layout skills for digital media.
IT 8-2.6.6 Explain the importance of consistency of design.
IT 8-2.6.7 Explain the importance of usability.
IT 8-2.6.8 Explain the importance of core messaging.
IT 8-2.6.9 Apply measurement tools and ratio analysis to image positioning in graphic works.
IT 8-2.6.10 Solve aspect ratio proportion measurement in video and animation development.
IT 8-3 Web and Digital Communications/Graphic Design - Cluster Knowledge and Skill Statement: Demonstrate knowledge of the key aspects of production using industry standard software.

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Performance Elements:
IT 8-3.1 Demonstrate knowledge of concept development.
Measurement Criteria:
IT 8-3.1.1 Generate project ideas through the use of thumbnails, roughs, mock-ups, wireframes, etc.
IT 8-3.1.2 Create a storyboard for a project.
IT 8-3.2 Demonstrate knowledge of image creation and manipulation.
Measurement Criteria:
IT 8-3.2.1 Analyze differences and appropriate applications of vector-based and bitmap images.
IT 8-3.2.2 Use a variety of input devices to import photos, images, and other content.
IT 8-3.2.3 Incorporate the use of image manipulation and illustration software into final products.
IT 8-3.2.4 Apply nondestructive image editing techniques such as layering and masking.
IT 8-3.2.5 Practice using different selection tools and techniques to manipulate images.
IT 8-3.2.6 Practice in-camera composition and cropping.
IT 8-3.3 Demonstrate applications of media outputs.
Measurement Criteria:
IT 8-3.3.1 Use appropriate resolution, compression, and file formats for various media outputs including web, video, and print.
IT 8-3.3.2 Incorporate appropriate color modes in graphic works including but not limited to RGB and CMYK.
IT 8-3.4 Demonstrate knowledge of the graphic design workflow to increase success and productivity.
Measurement Criteria:
IT 8-3.4.1 Develop a workflow for a project.
IT 8-3.4.2 Synthesize information collected from communications with various stakeholders.
IT 8-3.4.3 Describe project management.
IT 8-3.4.4 Create projects that define core message.
IT 8-3.4.5 Work in a team to plan a larger project.
IT 8-3.4.6 Identify the target audience for a project.
IT 8-3.5 Identify and apply the design process.
Measurement Criteria:
IT 8-3.5.1 Explain the design process.
IT 8-3.5.2 Apply the design process to generate graphic works.
IT 8-3.6 Demonstrate knowledge of branding and corporate identity.
Measurement Criteria:
IT 8-3.6.1 Analyze branding and corporate identity, its purpose and constituents.
IT 8-3.6.2 Create a visual that contains all the richness of the brand.
IT 8-4 Web and Digital Communications/Graphic Design - Cluster Knowledge and Skill Statement: Demonstrate knowledge of ethical and legal issues related to graphic design.
Performance Elements:
IT 8-4.1 Demonstrate knowledge of copyright and intellectual property law.
Measurement Criteria:
IT 8-4.1.1 Research laws governing copyright, intellectual property (including font usage, photography, illustration, audio and video rights), and software licensing.
IT 8-4.1.2 Research laws governing brand issues, trademark, and other proprietary rights).

Web and Digital Communications: Graphic Design
IT 8-4.1.3 Discuss consequences of violating copyright, privacy, and data security laws.
IT 8-4.1.4 Define and debate fair use including authorships, rights of use for work and likeness, and credit lines.
IT 8-4.1.5 Model fair use in production of graphic works.
IT 8-4.1.6 Describe how diversity (cultural, ethnic, multigenerational) and ethics affect the selecti0n of projects and programs.
Performance Elements:
IT 8-4.2 Demonstrate knowledge of ethical behavior as it relates to the industry.
Measurement Criteria:
IT 8-4.2.1 Research and discuss censorship as it applies to the graphic design industry.
IT 8-4.2.2 Research the purpose of non-disclosure agreements (NDA).
IT 8-4.2.3 Incorporate cultural sensitivity and diversity awareness into the design process.
IT 8-4.2.4 Debate legal versus ethical behaviors.
IT 8-4.2.5 Incorporate ethical behaviors in graphic projects.
IT 8-5 Web and Digital Communications/Graphic Design - Cluster Knowledge and Skill Statement: Create and maintain a personal portfolio.
Performance Elements:
IT 8-5.1 Create and maintain a personal portfolio.
Measurement Criteria:
IT 8-5.1.1 Research and compare the various types of personal portfolios.
IT 8-5.1.2 Develop graphics portfolios that include traditional and digital works).
IT 8-5.1.3 Recognize that portfolios are dynamic and require maintenance.
IT 8-5.2 Demonstrate the process of evaluating portfolios.
Measurement Criteria:
IT 8-5.2.1 Conduct peer and self-evaluations using rubrics.
IT 8-5.2.2 Understand the elements of the critique process, including a respect for peer work and the ability to give and receive dispassionate criticism.

For additional information: https://educateiowa.gov/documents/service-areas-business-marketing/2013/05/it-critical-standards-and-benchmarks

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