Iowa

CONTENT STANDARDS

And

BENCHMARKS

INFORMATION TECHNOLOGY

2009

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Knowledge & Skill Structures

Cluster: **Information Technology Core – Fundamental Standards for all pathways**

Cluster Topic: **Business Skills**

Cluster Knowledge and Skill Statement: **Understand business concepts, tools, and creativity necessary in the workplace**

Performance Elements:

- Utilize basic business machines (e.g., printers, phone, fax machines, digital cameras, data projector, scanners, hand-held computing devices)

  Measurement Criteria:
  1) Demonstrate touch keyboarding and use computer functions to create documents
  2) Select and use appropriate tools for solving problems
  3) List the functionality of business machines and identify proper usage
  4) Ability to describe the differences between cell phones and smart phones and the different uses of each.

- Know and understand the importance of professional ethics and legal responsibilities

  Measurement Criteria:
  1) Explain legal issues faced by IT professionals
  2) Identify issues and trends affecting computers and information privacy
  3) Explain legal issues involved in a company security policy
  4) Identify legal issues involved concerning a security breach
  5) Understand the regulatory requirements of state and federal notification laws and the major regulatory agencies that form those laws.
  6) Understand the differences between sexual, age and religion, discrimination.

- Demonstrate workplace expectations (e.g. dress, promptness, attendance, interpersonal skills, completion of assigned tasks)

  Measurement Criteria:
  1) Identify and list workplace expectations
  2) Compare school expectations to work expectations
  3) Demonstrate punctuality
  4) Demonstrate interpersonal skills through teamwork
  5) Demonstrate an understanding of the different types.
  6) Explain why team and individual performance how it relates to each other.

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- Discuss and understand organization structures and its role in IT

  Measurement Criteria:
  1) Identify the organizational structure of an IT department
  2) Identify the chain of command, the communication channels and protocol within an organizational structure
  3) List types of issues and problems within an IT department
  4) List the different types of IT departments.

- Describe e-business and potential opportunities

  Measurement Criteria:
  1) Define e-business and components
  2) Describe types of e-business (e.g., business to business, business to end customer)
  3) List current e-businesses and products
  4) Compare and contrast good vs. bad e-business models
  5) Define the importance of security and how it might affect the acceptable of a potential e-business opportunity.

- Discuss and understand challenges and opportunities for the IT Industry

  Measurement Criteria:
  1) Understand how quickly hardware changes and its effects
  2) Identify different programming languages for different hardware platforms.
  3) Identify the inter-dependencies of risk, audit and how they create challenges for IT.
  4) Understanding the outsourcing model, the value, the risk, and how to work with remote staff.

- Recognize industry-specific government compliance issues

  Measurement Criteria:
  1) Research the different compliance requirements (Sarbanes Oxley, PCI, HIPPA, etc.

- Demonstrate ability to understand business information (i.e. data, statistical charts, etc.)

  Measurement Criteria:
  1) Demonstrate understanding of Marketing, sales, data
  2) Demonstrate understanding of reports, Dashboards
  3) Demonstrate understanding of finance data, revenues, Profits and changes over time
  4) Demonstrate an understanding of fixed vs. variable costs.

- Recognize legal and ethical issues related to information technology (e.g., hacking, viruses, security, copyright)

  Measurement Criteria:
  1) List damaging hacking activities, viruses and other security problems for a business
  2) Research the penalties for software copyright violations
  3) Research the Code of Ethics for a professional IT organization such as Association for Information Technology Professional
  4) Apply copyright and fair use guidelines of software
  5) Understanding the rights of a patent holder.
  6) How to research or find a patent.

- Demonstrate an understanding of finance (e.g. revenue vs. expenses, etc.

  Measurement Criteria:
  1) Identify standard financial reports (Profit/Loss, Balance Sheet)
  2) Understand the meaning of basic financial terminology (debit/credit, sales, cost of sales, expense, etc)
  3) Understanding the difference of fixed and variable costs and how that impacts the price of a good or service.

- Understand basic software application tools (office, e-mail, etc.)

  Measurement Criteria:
  1) Demonstrate operation of word processing, spreadsheets, database application software
  2) Show working knowledge of networks and online resources
  3) Demonstrate working knowledge of search engines like Google.

- Demonstrate an understanding of the different business segments

  Measurement Criteria
  1) Demonstrate understanding of differences between long lasting (washers, refrigerators) vs. quick perishing goods (flowers, grocery)
  2) Demonstrate understanding of services (CPA, advertising, tech support, software)
  3) Understand the difference between objectives, customer segments and stakeholders for Profit vs. non- profit entities; Public vs. Private
  4) Discuss the pros and cons of Self employment

Cluster Topic: **Technical Skills**

Cluster Knowledge and Skill Statement: **Understand the basic skills necessary to work in the IT industry.**

Performance Elements:

- Demonstrate an understanding of what role an operating system plays

  Measurement Criteria:
  1) Demonstrate the understanding of directory structures (folders, files, etc.)
  2) Demonstrate the understanding of how to configure a printer
  3) Demonstrate an understanding the authentication the operating systems use and be able to explain how it works.
  4) Demonstrate knowledge of the different types of operating systems – e.g. Windows XP, Windows Servers, Linux, ZOS, VMWare etc …

- Use logic to solve problems and demonstrate trouble-shooting skills

  Measurement Criteria:
  1) Explain the impact of the installation plan on the whole system
  2) Evaluate installation processes and suggest continuous improvement
  3) Knowledge of installation requirements
  4) Knowledge of operating environments, office suite applications, networks, hardware tools and online resources
  5) Demonstrate knowledge of end to end workings of the system or application and how to research if a piece of functionality is not working.

- Demonstrate knowledge of the hardware components associated with Information Systems

  Measurement Criteria:
  1) Explain the fundamentals of operating
  2) Explain the role of number systems in information systems
  3) Identify computer classifications and hardware
  4) Describe elements and types of information processing
  5) Use available reference tools as appropriate
  6) Describe the difference between applications and the operating system and how the dependencies of each to work.

- Demonstrate math skills (e.g., binary, hex, decimal)

  Measurement Criteria:
  1) Demonstrate the conversion of binary to decimal and hex and back again
  2) Show the ability to manipulate different numbering systems
  3) Be able to explain the differences between ASCII and EBCIDIC data and which systems use them.
  4) Demonstrate the ability to use a spreadsheet to enter numbers and create graphical representations of those numbers.

- Demonstrate the ability to use technical documents in both written and online forms

  Measurement Criteria:
  1) Demonstrate the ability to use the internet to research and find answers to technical issues.
  2) Demonstrate the ability to use office help
  3) Demonstrate the ability to create, format, or manipulate technical documents for updates.
  4) Demonstrate the working knowledge of a flow chart or decision tree documentation.

- Obtain and demonstrate practical hands-on experience

  Measurement Criteria:
  1) Install off-the-shelf software
  2) Install patches/virus protections
  3) Replace primary components
  4) Remove or fall back from a patch
  5) Demonstrate the ability to trouble shoot a software agent update problem and understanding how agents connect to their servers to update or pull patches.
  6) Demonstrate the ability to backup a windows registry, make changes, and restore the registry from the backup copy.

- Describe available industry certifications for the IT industry

  Measurement Criteria:
  1) Be able to list different areas you can achieve certifications
  2) What does a CISSP mean and what does it concentrate on?
  3) What does a CISA or CISM mean and what does it concentrate on?
  4) What does a CCIE mean and what does it concentrate on?
  5) What does a CGEIT mean and what does it concentrate on?
  6) What does a MCSE mean and what does it concentrate on?

Cluster Topic: **Communication**

Cluster Knowledge and Skill Statement: **Understand concepts, strategies and methods needed to interact and collaborate with others**

Performance Elements:

- Understand customer service skills

  Measurement Criteria:
  1) Explain the importance of obtaining customer approval
  2) Demonstrate the ability to plan according to people and resource needs and constraints
  3) Explain the importance of obtaining customer approval of requirements
  4) Identify customer expectations in a given situation
  5) Create appropriate documentation
  6) Create a basic requirements document and technical response document that addresses the user needs – e.g. time logging etc …

- Create appropriate documentation

  Measurement Criteria:
  1) Use word processing and presentation software to create documentation
  2) Create concise reports
  3) Explain the concept of support boundaries
  4) Use available resources to gather information
  5) Explain how the technology or application meets the business user needs.

- Demonstrate the ability to communicate technical issues in a non-technical manner

  Measurement Criteria:
  1) Explain multiple operating system environments
  2) Describe networks and online resources
  3) Explain the importance of obtaining feedback from customer and adjusting actions accordingly
  4) Read and apply technical documentation
  5) Describe a technical top to a non-technical person. Example of a website URL is resolved to an IP address.

- Demonstrate ability to train users on technical information

  Measurement Criteria:
  1) Explain the principles of networking
  2) Describe operating environments, office suite applications, networks, hardware tools and online resources
  3) Demonstrate ability of how to use applications.
  4) Use office application software tools

- Demonstrate the ability to work as a team member

  Measurement Criteria:
  1) Offer contrasting viewpoints
  2) Identify an ultimate goal
  3) Define and communicate workload limits
  4) Understand the importance of communicating with others
  5) Understand conflict resolution in a team setting

- Determine technical needs of an audience and communicate those needs

  Measurement Criteria:
  1) Explain technology constraints
  2) Ask specific technical questions
  3) Describe data communications and network protocols
  4) Determine when sufficient information has been gathered

- Understand cultural differences in communication

  Measurement Criteria:
  1) Demonstrate understanding of cultural differences in understanding of idioms, language, interpersonal interactions, role of leader/ team member, in a team setting

- Demonstrate ability to communicate professionally both verbally in writing (e.g. global issues, resumes, cover letters, reports, interviews)

  Measurement Criteria:
  1) Role play interviews for requirements gathering for a project
  2) Write a small 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

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Cluster Topic: **Design**

Cluster Knowledge and Skill Statement: **Understand functionality, scalability, and cost effectiveness of project design**

<u>Performance Elements:</u>

- Demonstrate the function and purpose of the system you are designing (e.g. web site, network, application, PowerPoint, game design)

  Measurement Criteria:
  1) Demonstrate the ability to flow chart a simple application as well as a single program.
  2) Demonstrate the ability to document the inputs, edits and output of a program
  3) Demonstrate the ability to describe the business requirements and how the solution satisfies the business needs.

- Demonstrate the design is scalable

  Measurement Criteria:
  1) Understand what is needed to make an application scale (i.e. web site should be able to accept a million hits as well as ten)
  2) Demonstrate and how and what must change to increase capacity and or performance
  3) Understand how the application is used and identify test cases or use cases that mimic end user functionality.

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- Understand how cost affects design

  Measurement Criteria:
  1) Demonstrate understanding of how adding features adds to cost (example – different options in cars, Hybrid vs. gasoline powered cars, HDD capacity vs. Cost)
  2) Develop alternative design for meeting design requirements within an allocated budget
  3) Understand risks associated with not making changes or how it may affect the end customers or businesses.

Cluster: **Information Technology Core – Pathways**

Cluster Topic: **Information Support and Services**

Cluster Knowledge and Skill Statement: **Understand hardware and software support issues that affect end users**

<u>Performance Elements:</u>

- Explain the relationship between cost of implementation and day-to-day operations with the company's bottom line

  Measurement Criteria:
  1) Estimate the cost to run a small help desk with 3 employees for a year
  2) Evaluate the costs of a project in your local school and support costs associated with the project
  3) Discuss total cost of ownership

- Demonstrate effective customer services skills (e.g., patience, courtesy, identify customer expectations, promptness)

  Measurement Criteria:
  1) Role play customer help-desk situations
  2) Demonstrate the proper dress for business situations
  3) Understand the importance of a positive attitude
  4) Understand the different types of personalities and how to communicate with each.

- Demonstrate the ability to convey information regarding technical material

  Measurement Criteria: 1) Explain clearly the instructions for a computer task to another individual
  2) Conduct task specific training and coach others to apply related concepts

- Explain the importance of backing up data and maintaining data integrity

  Measurement Criteria: 1) Identify possible sources of data lost
  2) Identify methods and technologies for preserving data
  3) List the steps required for effective backup and recovery

- Explain the importance of security of data (e.g. privacy of information, confidentiality, restricted use by authorized personnel)

  Measurement Criteria: 1) Demonstrate an awareness of technological advances and availability of resources
  2) Understand the need for confidentiality
  3) Identify sources of security problems with data
  4) Identify methods of data protection

- Be able to install and support typical Office suite applications

  Measurement Criteria: 1) Install office suite application
  2) Demonstrate ability to create, modify, print documents (doc, excel, PowerPoint)
  3) Demonstrate ability to send e-mails with attachments, forward, reply with / without attachments,…
  4) Ability to set up meetings looking at availability in calendars

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Cluster Topic: **Networking Systems**

Cluster Knowledge and Skill Statement: **Understand network analysis, planning and implementation; including design, installation, maintenance and management of network systems.**

<u>Performance Elements:</u>

- Identify types of networks and their capabilities (e.g., LAN, WAN, MAN, Wi-Fi)

  Measurement Criteria: 1) Demonstrate understanding of types of networks deployed in a home, small office, office buildings, schools, college campus, multi site organizations and the primary difference between each.
  2) Demonstrate an understanding of the costs associated with each type of network and what drives the cost differences.
  3) Identify the different types of risks associated with each.

- Identify network topologies and protocols

Measurement Criteria:
1) Demonstrate knowledge of the OSI layers 1, 2, and 3.
2) Define what Internet Protocol is.
3) Define what TCP is.
4) Define what UDP is?
5) Define what is a switched network vs. a hub network
6) Define what the difference is between Telnet and SSH
7) Define what the difference is between FTP and SFTP

- List network devices and functions (e.g. repeater, bridge, switch, router)

Measurement Criteria:
1) Define the difference between a router and a firewall
2) Define the difference between a hub and a switch
3) Define what a host intrusion prevention system does
4) Define what a network intrusion prevention system does
5) Define the difference between Intrusion Detection vs. Intrusion Prevention
6) Define the differences between a layer 2 and a layer 3 switch

- Demonstrate a fundamental understanding of the OSI Model

Measurement Criteria:
1) What does Layer 1 represents.
2) What does Layer 2 represents
3) Define what Layer 3 represents
4) Define what Layer 4 represents
5) Define what Layer 5 represents
6) Define what Layer 6 represents
7) Define what Layer 7 represents
8) Define what layers the application use vs. the layers that network devices use.

- Identify and list networking media

Measurement Criteria:
1) Define what is RJ 45 connection
2) Define what is a coax connection
3) Define the differences between cat 5, 5E and 6
4) Define what is a “point to point circuit” and how that differs from the internet.
5) Define what is the difference between WiFi and leased line circuits
6) Define the difference between WiFi and Satellite technology.

- Understand telecommucations and data communication systems

Measurement Criteria:
1) Understand the history of telecommunications
2) Understand the role of the FCC
3) Understand how State Utility Boards function
4) Define the PSTN (Public Switch Telephone Network)
5) Discuss the projected future of telecommunications with converged voice, data and video

- Explain the importance of security of data (e.g. privacy of information, confidentiality, restricted use by authorized personnel)

  Measurement Criteria:
  1) Demonstrate an awareness of technological advances and availability of resources
  2) Understand the need for confidentiality
  3) Identify sources of security problems with data
  4) Identify methods of data protection
  5) Understand the lifecycle of data protection (e.g. the creation of data, management of data, storage of data)
  6) Understanding the different methods to encrypt data (e.g. volume level encryption, file encryption, or database encryption)

Cluster Topic: **Programming and Software Development**

Cluster Knowledge and Skill Statement: **Understand the concept of design, development, implementation, and maintenance of computer software**

Performance Elements:

- Demonstrate ability to design a flow chart to describe a process end to end

  Measurement Criteria:
  1) Demonstrate the ability to flow chart a simple application
  2) Demonstrate the ability to flow chart a single program

- Demonstrate an understanding of how to design, and implement software

  Measurement Criteria:
  1) be able to list all parts of the development life cycle
  2) Design a simple program/application
  3) Demonstrate the ability to code and test a program/application
  4) Understand the difference between development, quality assurance and production

- Demonstrate the ability to test an application for functionality

  Measurement Criteria:
  1) Demonstrate the ability to edit for any invalid date/input
  2) Demonstrate an application/program will run successfully with both valid and invalid date/input.
  3) Demonstrate the result achieved is truly what was wanted in the design.
  4) Demonstrate the ability of the application to recover after invalid data has been input or processed.

- Understand the concepts regarding secure application design

Measurement Criteria:
1) Research programming standards (i.e. OWASP)
2) Research application requirements (Sarbanes Oxley, PCI)
3) Demonstrate knowledge of SQL injections
4) Demonstrate knowledge of cross-site scripting (XSS)
5) Demonstrate knowledge of how to intercept, capture and change HTML pages

- Explain the importance of testing during periods of product development

Measurement Criteria:
1) Explain the development of test data necessary to run tests on software
2) Apply test data to program code
3 Demonstrate knowledge of user acceptance testing
4) Demonstrate knowledge of exception testing

- Understand the concepts of information assurance and change control

Measurement Criteria:
1) Understand Change Management.
2) Understand how difference areas sign off on each step of the development life cycle.
3) Demonstrate knowledge of hash counts, binary values, and how that provides information assurance during the lifecycle.
4) Demonstrate an understanding of what information assurance is and how it differs from change control or quality assurance testing.

- Demonstrate a fundamental understanding of programming

Measurement Criteria:
1) Write a small modular program using variables
2) Describe a class and objects
3) Describe the differences between sequential programming vs. object-oriented programming

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Cluster Topic: **Web and Digital Communications**

Cluster Knowledge and Skill Statement: **Create, design and produce interactive multimedia projects**

<u>Performance Elements:</u>

- Explain the importance of color in graphic/visual images/presentation

Measurement Criteria:
1) Show a color wheel that represents complementary colors available in computer graphics
2) Compare and contrast good and bad examples of graphic design

- List the capabilities of various media

  Measurement Criteria: 1) List media types and discuss usefulness, appropriateness, reliability and features to complete a design project

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- Create a basic web site

  Measurement Criteria: 1) Demonstrate the use of a web authoring tool to create a web site
  2) List possible objects useful in creating a web site
  3) Use a file transfer software to upload a website to a web server

- Create a beginning level multimedia presentation

  Measurement Criteria: 1) List the capabilities of different multimedia software applications
  2) Use a presentation software application to create an electronic presentation

- Explain capabilities of development applications

  Measurement Criteria: 1) Identify various development applications
  2) Compare and contrast similar development application products

- Understand how to legally reference other organization brands and products

  Measurement Criteria: 1) Demonstrate knowledge of how Copyright, trademark, brands are to be indicated in any written, marketing literature,
  2) Demonstrate knowledge of how permission for using intellectual property in communications needs to be obtained
  3) Demonstrate knowledge of regulations on copying other peoples written IP.

- Understand search engine optimization

  Measurement Criteria: 1) Demonstrate the ability to search on general topics and then enhance the search using parenthesis, commas, plus signs, quotes etc …