



Information Technology Career Cluster Cluster Knowledge and Skill Statements

The following Cluster (Foundation) Knowledge and Skill Chart provides statements that apply to all careers in the Information Technology Cluster. Persons preparing for careers in the Information Technology Cluster should be able to demonstrate these skills in addition to those found on the Essential Knowledge and Skills Chart. The Pathway Knowledge and Skill Charts are available in separate documents.

Cluster Topic ITC01	ACADEMIC FOUNDATIONS: <i>Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.</i> <i>No additional statements in this topic beyond those found in the Essential Knowledge and Skills Chart.</i>
Cluster Topic ITC02	COMMUNICATIONS: <i>Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.</i>
ITC02.01	Develop positive customer relations to build and maintain a customer base in the IT industry.
ITC02.01.01	Demonstrate knowledge of organization's offerings and of customers' importance to the organization.
<i>Sample Indicators</i>	Identify organization's products and services (including own strengths as an agent of the company). Recognize the importance of all customers to the business.
ITC02.01.02	Demonstrate ability to assist customers in a professional manner.
<i>Sample Indicators</i>	Determine customers' individual needs. Project a professional business image (e.g., appearance, voice, grammar, word usage, enunciation, nonverbal communication). Interact with customers and colleagues in a professional manner (e.g., prompt, friendly, courteous, respectful, helpful, knowledgeable, understandable). Ensure that your assistance promotes the best interests of the company.
ITC02.01.03	Effectively use organizational protocols and systems to fulfill customer service requirements.
<i>Sample Indicators</i>	Comply with established business protocols and company policies. Communicate company policies to customers. Handle merchandise returns in accordance with customer service policy. Handle customer complaints in accordance with customer service policy.
ITC02.01.04	Facilitate customer service through the maintenance of key information systems.
<i>Sample Indicators</i>	Ensure that customers' needs are met to maintain a customer base. Follow through on commitments made to customers(e.g., special orders, delivery specifications, new items). Maintain customer base.
ITC02.02	Perform scheduling functions to meet customer needs.
ITC02.02.01	Schedule customer appointments.
<i>Sample Indicators</i>	Create calendars/schedules. Maintain appointment calendars. Process requests for appointments. Verify appointments.



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ITC02.02.02 Notify customers of changes in schedule.
 Manage scheduling conflicts.
 Document results of customer appointments.
Sample Indicators Document results.

Cluster Topic **PROBLEM-SOLVING AND CRITICAL THINKING: *Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.***
ITC03

ITC03.01 **Use product/service design processes and guidelines to produce a quality IT product/service.**

ITC03.01.01 Summarize the process of IT product/service design.
 Sample Indicators Test products for reliability.
 Initiate predictive maintenance procedures.
 Document a Quality Assurance (QA) program (includes creating a plan and evaluating effectiveness of the program).

ITC03.01.02 Plan for products/services using reliability factors.
 ITC03.01.03 Create products/services using reliability factors.
 ITC03.01.04 Test new products/services for reliability.
 ITC03.01.05 Maintain the reliability of new products/services.

ITC03.02 **Implement problem-solving processes to evaluate and verify the nature of problems in the IT industry.**

ITC03.02.01 Explain information systems theory and practice.
 Sample Indicators Demonstrate knowledge of the underlying concepts of the information systems discipline.

 Demonstrate knowledge of methods for achieving productivity in knowledge work.
 Apply general systems theory to the analysis and development of an information system.
 Identify procedures for formal problem-solving.
 Demonstrate knowledge of the fundamental concept of information theory and organizational system processes.
 Identify the essential properties of information systems.

ITC03.02.02 Explain information systems problem-solving techniques and approaches.
 ITC03.02.03 Evaluate information systems problem-solving techniques and approaches.

ITC03.03 **Employ organization and design principles to sort and group information used in the IT industry.**

ITC03.03.01 Demonstrate the use of information organization principles.
 Sample Indicators Demonstrate knowledge of group support technology for common knowledge requirements.
 Demonstrate knowledge of the information analysis process.
 Demonstrate knowledge of Information Technology solutions.

 Demonstrate knowledge of methods for achieving productivity in knowledge work.

ITC03.03.02 Demonstrate the use of design and color principles.



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Cluster Topic ITC04

INFORMATION TECHNOLOGY APPLICATIONS: *Use information technology tools specific to the career cluster to access, manage, integrate, and create information.*

No additional statements in this topic beyond those found in the Essential Knowledge and Skills Chart.

Cluster Topic ITC05

SYSTEMS: *Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.*

Analyze and summarize the use of IT in business to enhance effectiveness.

ITC05.01

ITC05.01.01

Sample Indicators

Integrate IT into various types of business models.

Determine how business activities interface with data processing functions.

Differentiate between the role of information systems within a company and their role in a global environment.

Measure increases in productivity realized by the implementation of information systems.

ITC05.02

Implement cross-functional teams to achieve IT project goals.

ITC05.02.01

Sample Indicators

Summarize the importance of cross-functional teams in achieving IT project goals.

Consider the benefits of using a cross-functional team in policy and procedure development.

Identify desired group and team behavior in an IT context.

Explain technical concepts to various audiences in non-technical terms.

ITC05.02.02

Describe strategies for maximizing productivity in a high tech environment.

ITC05.03

Employ project management knowledge to oversee IT projects.

ITC05.03.01

Sample Indicators

Implement project methodologies to manage information system projects.

Define the project's contribution to business needs.

Define the scope of the project.

Identify stakeholders and decision makers.

Identify escalation procedures.

Develop task list (work breakdown structures).

Evaluate project requirements.

Identify required resources and budget.

Estimate time requirements.

Develop initial project management flowchart.

Identify interdependencies.

Identify critical milestones.

Evaluate risks.

Prepare contingency plan.

Manage the change control process.

Track critical milestones.

Participate in project phase review.

Report project status.



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- ITC05.03.02
Sample Indicators
 - Utilize project management software.
 - Develop a method of evaluation.
- ITC05.03.03
Sample Indicators
 - Define scope of work to achieve individual and group goals.
 - Assess the task's contribution to overall business needs.
 - Identify size and specifics of the task.
 - Formulate task sequence.
 - Plan multiple tasks simultaneously.
 - Identify potential problems.
 - Develop contingency plans.
- ITC05.03.03
Sample Indicators
 - Develop time and activity plans to achieve objectives.
 - Coordinate plan with team, cross-functional groups, or individuals.
 - Formulate a task strategy.
 - Prioritize tasks according to business needs.
 - Manage multiple tasks simultaneously.
 - Devise plan of action.

Cluster Topic ITC06 **SAFETY, HEALTH AND ENVIRONMENTAL:** *Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.*

No additional statements in this topic beyond those found in the Essential Knowledge and Skills Chart.

Cluster Topic ITC07 **LEADERSHIP AND TEAMWORK:** *Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.*

No additional statements in this topic beyond those found in the Essential Knowledge and Skills Chart.

Cluster Topic ITC08 **ETHICS AND LEGAL RESPONSIBILITIES:** *Know and understand the importance of professional ethics and legal responsibilities.*

ITC08.01 **Apply standard practices and behaviors that meet legal and ethical responsibilities and exhibit positive cyber-citizenry to understand legal issues faced by IT professionals.**

- ITC08.01.01
Sample Indicators
 - Explain legal issues faced by IT professionals.
 - Demonstrate knowledge of the legal issues that face Information Technology professionals.
 - Identify issues and trends affecting computers and information privacy.
 - Explain legal issues involved in a company security policy.
 - Identify legal issues involved concerning a security breach.

ITC08.01.02 Summarize the rights and responsibilities of IT workers.

ITC08.01.03 Identify ethical issues common to the IT field.

Cluster Topic ITC09 **EMPLOYABILITY AND CAREER DEVELOPMENT:** *Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.*



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Identify and explain the implications IT has on business transformation and development to demonstrate an understanding of the impact on business.

ITC09.01

- ITC09.01.01 Demonstrate understanding of the impact of IT on businesses.
Sample Indicators Demonstrate knowledge of how both PCs and larger computer systems impact people and are used in business/industry/government and other institutions.
 Demonstrate knowledge of the impact of computers on career pathways in business/industry (e.g., how computers have eliminated and created jobs).
 Demonstrate knowledge of the impact of computers on access to information and information exchange worldwide.
- Demonstrate knowledge of ethical issues that have surfaced in the information age.

Cluster Topic ITC10 **TECHNICAL SKILLS: Use the technical knowledge and skills required to pursue the targeted careers for all pathways in the career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster.**

Demonstrate knowledge of the hardware components associated with information systems.

ITC10.01

- ITC10.01.01 Explain the fundamentals of operating systems.
Sample Indicators Identify major operating system fundamentals and components.
- ITC10.01.02 Explain the role of number systems in information systems.
Sample Indicators Identify the role the binary and hexadecimal system in information systems.
 Demonstrate knowledge of number systems and internal data representation.
- ITC10.01.03 Identify computer classifications and hardware.
Sample Indicators Identify major hardware components and their functions.
 Identify the hardware associated with telecommunications functions.
 Identify types of computer storage devices.
- ITC10.01.04 Describe elements and types of information processing.
Sample Indicators Identify the elements of the information processing cycle (i.e., input, process, output, and storage).
 Identify types of processing (e.g., batch, interactive, event-driven, object-oriented).
- ITC10.01.05 Use available reference tools as appropriate.
Sample Indicators Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts).
- ITC10.01.06 Describe the function of CPUs.

Compare classes of software associated with the development and maintenance information systems to develop software and maintain computer systems.

ITC10.02

- ITC10.02.01 Explain the key functions and applications of software.
Sample Indicators Demonstrate knowledge of the key functions of systems software.
 Demonstrate knowledge of widely used software applications (e.g., word processing, database management, spreadsheet development).
 Demonstrate knowledge of the function and operation of compilers and interpreters.
- ITC10.02.02 Describe the range of languages used in software development.



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Sample Indicators Demonstrate knowledge of the range of languages used in software development.

ITC10.02.03 Summarize how data is organized in software development.

Sample Indicators Demonstrate knowledge of how data is organized in software development.

ITC10.02.04 Explain new and emerging classes of software.

Sample Indicators Identify new and emerging classes of software.

Identify and compare new IT trends and technologies to build an understanding of their potential influence on IT practices.

ITC10.03

Explain measurement techniques for increased productivity due to information support implementation.

ITC10.03.01

Measure increases in productivity realized by the implementation of information systems.

Sample Indicators

ITC10.03.02 Identify new IT technologies.

Sample Indicators

Identify new technologies relevant to information technology.

Assess the importance of new technologies to future developments and to future knowledge worker productivity.

Identify new and emerging drivers and inhibitors of Information Technology change.

Assess the potential importance and impact of new IT technologies in the future.

ITC10.03.03

Summarize basic data communications components and trends to maintain and update IT systems.

ITC10.04

ITC10.04.01 Explain data communications procedures, equipment and media.

Sample Indicators

Demonstrate knowledge of key communications procedures.

Demonstrate knowledge of the uses of data communication equipment.

Demonstrate knowledge of types of communications media.

ITC10.04.02 Explain data transmission codes and protocols.

Sample Indicators

Demonstrate knowledge of data transmission codes and protocols.

ITC10.04.03 Explain the differences between local and wide area networks.

Sample Indicators

Distinguish between local area networks and wide-area networks.

ITC10.04.04 Summarize data communication trends and issues.

Sample Indicators

Identify data communication trends.

Identify major current issues in data communications.

Demonstrate technical knowledge of the Internet to develop and maintain IT systems.

ITC10.05

ITC10.05.01 Describe Internet protocols.

Sample Indicators

Demonstrate knowledge of the Transmission Control Protocol/Internet Protocol (TCP/IP) suite.

Demonstrate knowledge of management protocols, applications and procedures (e.g., SNMP, intrusion detection, and reporting issues).

Explain the concept of routing.

ITC10.05.02 Explain Domain Name Server (DNS).

Sample Indicators

Demonstrate knowledge of the Domain Name System (DNS).

Explain the DNS hierarchy.

Identify elements of DNS (e.g., zones, server types).

Summarize Internet security issues and systems available for addressing them.

ITC10.05.03

Sample Indicators

Demonstrate knowledge of the Domain Name System (DNS).



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Explain the DNS hierarchy.
Identify elements of DNS (e.g., zones, server types).

Access and use Internet services when completing IT related tasks to service and update IT systems.

ITC10.06

- ITC10.06.01 Demonstrate the use of an Internet connection.
Sample Indicators Configure a small home office Internet connection using cable, DSL, wireless or satellite connection.
Test Internet connection using tools such as ping, trace route, net stat, host, dig, and nslookup.
- ITC10.06.02 Troubleshoot Internet connection problems.
- ITC10.06.03 Explain the components of Internet software.
Sample Indicators Demonstrate knowledge of the components of Internet software.
- ITC10.06.04 Install Internet software for use on an operating system.
Sample Indicators Identify common browser features.
Install Internet software.
Differentiate between Web-based applications and applications installed on a local computer.
Download software upgrades and shareware from the Internet.
Unpack files using compression software.
- ITC10.06.05 Describe virus protection procedures.
Sample Indicators Demonstrate acute awareness of virus protection techniques.
Identify types and capabilities of popular virus protection software.
Explain spyware, adware, and malware.

Identify how to avoid spyware, adware, and malware and how to recover from infection.
- ITC10.06.06 Explain cookies and adware on an internet connected computer system.
Sample Indicators Demonstrate knowledge of cookies and their use on an internet-connected computer system.
Identify types and consequences of pop-ups and ad-ware.

Install and configure software programs to maintain and update IT systems.

ITC10.07

- ITC10.07.01 Verify that hardware and software system components are compatible prior to performing installation.
Sample Indicators Identify hardware requirements (e.g., processor, memory, disk space, communications, printers, monitors).
Determine compatibility of hardware and software.
- ITC10.07.02 Verify that software to be installed is licensed prior to performing installation.
Sample Indicators Verify conformance to licensing agreement.
Understand the concept of an End User License Agreement (EULA).
Differentiate between open source and proprietary licenses.
Explain the concept of open source.
Identify common characteristics of open source licensing agreements, including the GNU General Public License (GPL).
- ITC10.07.03 Perform installation accurately and completely, using available resources as needed.
Sample Indicators Install given application/system software on various platforms in accordance with manufacturer's procedures.



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Disable/uninstall software that may interfere with installation of new software.
Differentiate between procedures for an upgrade and for a new installation.
Differentiate between stand-alone and network installation procedures.
Select appropriate installation options (e.g., default, customized).
Configure software to appropriate operating system settings.
Configure macros, tools, and packages to accomplish simple organizational and personal tasks.
Convert data files if required.
Verify software installation and operation

ITC10.07.04 Resolve problems with installation if they occur.
Sample Indicators Troubleshoot unexpected results.
Access needed help using manufacturers' technical help lines or Internet sites.
Formulate new installation procedure if needed.

ITC10.07.05 Perform customization as requested.
Sample Indicators Customize software to meet user preferences.

ITC10.07.06 Document procedures, using clear and effective notes, for future use.
Sample Indicators Document step-by-step installation and configuration procedures.

Demonstrate knowledge of Web page basics to build an understanding of Web page design and functioning.

ITC10.08

ITC10.08.01 Explain the features and functions of Web browsing software.
Sample Indicators Demonstrate knowledge of the role of browsers in reading files on the World Wide Web (text-only, hypertext).
Identify how different browsers affect the look of a web page.
Demonstrate knowledge of the characteristics and uses of plug-ins.

ITC10.08.02 Explain the features and functions of Web page design software.
Sample Indicators Compare/contrast the features and functions of software editors available for designing web pages.

ITC10.08.03 Compare and contrast clients and servers.
Sample Indicators Differentiate between a client and a server.

Explain how traditional and modern Internet clients exploit the client/server relationship.

ITC10.08.04 Describe how bandwidth affects data transmission and on-screen image.
Sample Indicators Demonstrate knowledge of how bandwidths affect data transmission and on-screen image.

ITC10.08.05 Compare the benefits of internal and external Web hosting.
Sample Indicators Compare the advantages and disadvantages of internal external web hosting.

Employ IT knowledge and procedures when configuring or modifying an operating system to ensure optimal system functioning.

ITC10.09

ITC10.09.01 Configure/modify system as needed.
Sample Indicators Secure needed supplies and resources.
Review automated scheduling software.
Identify data requirements.
Identify scheduling priority in programming.
Build system software command structures using operating system macro facilities for computer systems.

ITC10.09.02 Use operating system principles to ensure optimal system function.
Sample Indicators Apply basic commands of operating system software.



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Apply appropriate file and disk management techniques.
Employ desktop operating skills.
Handle materials and equipment in a responsible manner.
Follow power-up and log-on procedures.
Interact with/respond to system messages using console device.
Run applications/jobs in accordance with processing procedures.
Follow log-off and power-down procedure(s).

ITC10.09.03

Use available reference tools as appropriate.

Sample Indicators

Access needed information using appropriate reference materials.

ITC10.09.04

Document procedures and actions.

Sample Indicators

Develop audit trails.

ITC10.09.05

Configure systems to provide optimal system interfaces.

Perform standard computer backup procedures to protect IT information.

ITC10.10

ITC10.10.01

Explain the need for regular backup procedures.

Sample Indicators

Recognize the need for regular backup procedures.

ITC10.10.02

Configure, perform and maintain backup procedures.

Sample Indicators

Load backup software.
Load compression drive backup software.
Install surge suppression protection.
Identify battery backup equipment.
Maintain battery backup system
Identify hot and warm site backup concepts.

Recognize and analyze potential IT security threats to develop and maintain security requirements.

ITC10.11

ITC10.11.01

Describe potential security threats to information systems.

Identify the range of security needs and the problems that can occur due to security lapses.

ITC10.11.02

ITC10.11.03

Assess security threats.

Sample Indicators

Maximize threat reduction.
Assess exposure to security issues.
Implement countermeasures.
Ensure compliance with security rules, regulations, and codes.
Demonstrate knowledge of virus protection strategy.
Implement security procedures in accordance with business ethics.

ITC10.11.04

Develop plans to address security threats.

ITC10.11.05

Implement plans to address security procedures.

Sample Indicators

Maintain confidentiality.
Load virus detection and protection software.
Identify sources of virus infections.
Remove viruses.
Report viruses in compliance with company standards.
Implement backup and recovery procedures.
Follow disaster plan.
Provide for user authentication and restricted access (e.g., assign passwords, access level).

ITC10.11.06

Document security procedures.



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- ITC10.12 Maintain computer systems to ensure optimal IT system functioning.**
- ITC10.12.01**
Sample Indicators
- Implement queries and reports to provide access to critical system information.
 - Create a query to extract information from a file.
 - Create a query to extract information from multiple files.
 - Create reports from queries.
 - Create and use logical files.
 - Develop a display screen for use with high-level language program.
 - Access needed information using appropriate reference materials.
- ITC10.12.02**
Sample Indicators
- Ensure that system is functioning optimally.**
 - Monitor system status and performance.
 - Run diagnostics.
 - Respond to system messages.
 - Perform preventive maintenance procedures on computer and peripheral devices.
 - Handle materials and equipment in a responsible manner.
 - Optimize windows environment to maximize performance of desktop resources.
 - Review automated scheduling software.
- ITC10.12.03**
Sample Indicators
- Fix and document system problems.**
 - Fix recoverable problems.
 - Restore system.
 - Document computer system malfunction(s).
 - Document software malfunction(s).
- ITC10.12.04**
Sample Indicators
- Configure systems to provide optimal system interfaces.**
 - Define hardware-software interface issues for a computer system.
 - Identify standards and issues related to I/O programming and design of I/O interfaces.
 - Interface peripheral devices/controllers in the computer system (e.g., software and hardware interrupts, exceptions, Direct Memory Addressing [DMA], bus structures).
 - Apply concepts of privileged instructions and protected mode programming.
 - Configure peripheral device drivers (e.g., disk, display, printer, modem, keyboard, mouse, network).
 - Apply advanced I/O concepts (e.g., disk caching, data compression, extended memory, magnetic disk/CD-ROM storage and formats).
 - Allocate disk space, non-sharable resources, and I/O devices.
- ITC10.13 Provide IT support and training to maintain proper network functioning.**
- ITC10.13.01**
Sample Indicators
- Provide Help Desk service to computer users within the organization.
 - Operate help desk.
 - Employ desktop productivity tools.
 - Support computer users.
- ITC10.13.02**
Sample Indicators
- Provide training for basic computer use within the organization.
 - Train computer users.
- ITC10.14 Identify and describe quality assurance concepts to develop an understanding of the requirements for quality IT products/services.**



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ITC10.14.01 Explain the history and standards of key quality management initiatives.
Demonstrate knowledge of the historical evolution of quality assurance/total quality management (e.g., Deming, ISO 9000).

Sample Indicators

Demonstrate knowledge of changes brought about by quality leaders in the world.
Demonstrate knowledge of the ISO 9000 process.

Demonstrate knowledge of the standards/requirements for the Baldrige award.
Demonstrate knowledge of successful efforts by industry to improve quality and/or reduce costs.

ITC10.14.02 Explain the terminology, role and benefits of quality within an organization.
Demonstrate knowledge of quality management terminology.

Sample Indicators

Identify the role of quality within the organization.
Identify the features and benefits of quality planning.

ITC10.14.03 Summarize the elements of a quality management system.

Sample Indicators

Demonstrate knowledge of the control devices used in functional areas (e.g., SPC, equipment).
Demonstrate knowledge of the relationship among organizational structures, policies, procedures, and quality assurance.
Identify internal and external customers.
Differentiate between prevention and detection.
Differentiate between variable and attribute data.
Identify types of control charts.
Demonstrate knowledge of how statistical techniques used to control quality (e.g., SPC, DOE, CR).

ITC10.15

Describe the use of computer forensics to prevent and solve information technology crimes and security breaches.

ITC10.15.01 Describe the role of computer forensic investigators.

Sample Indicators

Define computer forensics.
List some of the basic skills and knowledge a computer forensics specialist should possess.
Identify the circumstances under which computer forensics evidence is typically used, who typically uses such evidence, and how it is used.

ITC10.15.02 Demonstrate the effective use of basic computer applications relating to forensics investigations.

Sample Indicators

Identify and attempt to retrieve possible evidence that may exist on a computer system.
List what should and should not be done with the computer and evidence during an investigation.

ITC10.15.03 Identify criminal activity in relationship to cyber crime, the Internet, and Internet trafficking.

Sample Indicators

List common internet crimes.
List some prevention actions related to cyber crime.
Describe techniques to identify criminal activity.
Identify how one files a complaint if a cyber crime is suspected or has occurred.



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Information Technology Cluster Statements (Knowledge and Skill & Performance Elements); Information Technology Career Cluster Cluster Knowledge and Skill Statements (Foundation); Information Technology Cluster Information Support and Services Pathway Knowledge and Skill Statements; Information Technology Cluster Network Systems Pathway Knowledge and Skill Statements; Information Technology Cluster Web and Digital Communication Pathway Knowledge and Skill Statements; Information Technology Cluster Programming and Software Development Pathway Knowledge and Skill Statements are based in part on skill statements developed by Education Development Center, Inc., ITWorks! Ohio, the National Workforce Center for Emerging Technologies (formerly the Northwest Center for Emerging Technologies) and the World Organization of Webmasters (WOW).