OaklandWorks

A School-To-Career Partnership

Information Technology Career Cluster Standards

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WestEd

Participants in Development of the Information Technology Industry Career Cluster Standards

Sandra Williams, Alameda County Office of Education
Ross Millerick, Systems Development Group
Emmanuel Onyeador, Oakland Tech
Jody Terry, Oakland Unified School District
Arlett J. Blueford, Oakland Unified School District
June Lee, WestEd
Mahna Schwager, WestEd

Introduction to the Information Technology Industry

This career cluster area encompasses a variety of occupations. While some workers in this area work in manufacturing (particularly in the computer equipment field), many work in computer software firms, data processing firms, banks, insurance companies, accounting firms, and government agencies. According to labor market forecasts, computer engineers, systems analysts, and electronic data processors are projected to be among the fastest growing occupations in the United States. The demand for those with technology skills is expected to rise as advances in technology lead to new applications for computers. Factory and office automation, advances in telecommunications technology, and scientific research are just a few areas where use of computer systems will expand.

Potential jobs within the career pathway include computer engineer, data analyst, computer operations technician, technical writer, multimedia programmer, microcomputer software specialist, technical support representative, desktop publisher, network security analyst, and Internet developers. Those who go into government work can become computer security consultants, encryption specialists, or federal agents specializing in computer science. Those who enter the business world can become management information systems specialists who analyze, improve, and maintain corporate information systems. College graduates and those who have had courses in computer programming, systems analysis, and other data processing areas show positive prospects for employment. [1]

The OaklandWorks Industry/Education career cluster approach to standards

Career Pathways within the Industry/Education Partnership

The Information Technology Career Cluster Standards are targeted to the following:

- Career academies in the Oakland Unified School District that focus on Computer Science and Technology (Castlemont, McClymonds, Oakland High, Oakland Technical, and Skyline) and Electronic Technology (Fremont)
- Community college programs including:
  - Merritt College, Laney College, Vista College, and College of Alameda - Computer Information Systems
  - Laney College - Hardware Integration
  - Laney College - License and Support
  - Merritt College - Network and Administration
  - Laney College - System Administration
  - Laney College - Programming
- California State University, Hayward programs in following areas:
  - Computer Science
  - Telecommunication Systems (M.S.)
  - Telecommunications MBA option

[1] A California Apprenticeship Trade Program with minimum entry age from 16-18 years old in this cluster is communication technician.

is to identify broad career-technical, rather than job-specific skills, that are common to a group or cluster of similar occupations, highlighting the integration of academic and vocational content. This approach helps to provide students with a general understanding of "all aspects of an industry."

The OaklandWorks Standards Format

The standards in this document identify the core knowledge and skills for the Information Technology Career Cluster for the OaklandsWorks Industry/Education School-to-Work Partnership. The standards specify in broad terms the knowledge and skills necessary for initial success in each program area (grades 13-14). They consist of content standards (specifying what a student should know and be able to do) and examples of performance indicators (products or actions and tasks that provide evidence of success).

The OaklandWorks standards format includes three different types/levels of standards. They include the following:

- *Employability Skills*—These skills and qualities are foundational to occupations in the cluster.
- *Career-Technical Standards*—These standards define general knowledge and skills—not job-specific skills—that are common across the multitude of occupations within the cluster.
- *Academic Standards*—The academic standards represent generic academic skills that support the career cluster. These standards have been synthesized from the district-adopted standards and highlight academic standards identified as important to this career cluster by the development teams The performance indicators are examples of how the general academic skills can be contextualized by career-specific content.

The academic standards adopted by Oakland Unified School District in Language Arts, Mathematics, History/Social Science, and Science have been cross-referenced to related performance indicators to enhance their usability. For example, the sample performance indicator for Employability Skill Standard 2: Higher Level Thinking Skills/Problem Solving, "Approaches problems with awareness of multiple entry points and solutions*",* is cross-referenced to the

district's mathematics standard, Mathematics: Standard 5: Mathematical Reasoning (e.g.,[Mathematics 5]). When more than one topic is identified for a standard an alphanumeric coding system is used (e.g., Language Arts Standard 1: Reading: Topic A: Reading Skills and Fluency is coded as Language Arts 1A). A complete list of the alphanumeric codes related to the district's academic standards appears at the end of this document.

Employability Skill Standards for Information Technology	
Employability Skill Standards	**Sample Performance Indicators**
Standard 1: Information Students will follow the protocols and guidelines for collecting data. They will participate in identifying clients' needs, strengths and problems, and in reporting results.	• Locates, accesses, and retrieves global and accessible information manually and electronically from a variety of formats • Uses appropriate methods and software to analyze and process source documents, data, and transaction information [Mathematics 5] • Analyzes, synthesizes, and organizes information and converts them to multiple formats • Creates, stores, and distributes documentation according to customer requirements • Creates, formats, edits, and produces final documents with a range of tools such as word processing, databases, spreadsheets, presentations, web pages, graphics, and desktop publishing [Language Arts 3B7-8, 5A; Mathematics 5] . Builds on-going strategies to examine data for relevance, accuracy, and precision [Mathematics 5]

Employability Skill Standards for Information Technology	
Employability Skill Standards	**Sample Performance Indicators**
Standard 2: Higher Level Thinking Skills/ Problem Solving Students will exhibit complex reasoning, decision making, and problem solving skills. They will recognize a problem (e.g., what kind, type), evaluate and select information to consider possible solutions to a problem, and then devise and implement a plan of action.	• Demonstrates understanding of the problem and performs appropriate analysis to identify and explain problem cause; restates or redefines the problem [Mathematics 5] • Develops problem statements based on review of situation analysis • Identifies tools, resources, and techniques that are appropriate for implementation of solutions • Utilizes technical manuals and other resources to solve hardware and software problems • Evaluates alternative solutions • Demonstrates awareness of multiple solutions, chooses best options • Demonstrates ability to be versatile and deal with constantly changing work situations • Thinks "out of the box" • Approaches problems with awareness of multiple entry points and solutions [Mathematics 5]

Employability Skill Standards for Information Technology	
Employability Skill Standards	**Sample Performance Indicators**
Standard 3: Communication Skills Students will develop effective communications, both orally and in writing. They will listen attentively to instructions and request clarification or additional information as needed.	• Actively structures communication to achieve specific outcomes [Language Arts 4A-C] • Utilizes multiple communication skills/tools (e.g., creativity, performing arts, projects, portfolios) [Language Arts 3B7-8, 5A] • Presents technical information clearly [Language Arts 3B7-8] • Responds to customer concerns [Language Arts 4A-C] • Communicates ideas effectively both visually and verbally [Language Arts 3B7-8, 4A-C] • Speaks actively and clearly so that it is understandable to the listener [Language Arts 4A-C] • Listens actively with an ear towards meeting clients' needs [Language Arts 4A-C]
Standard 4: Teamwork Students will demonstrate ability to coordinate, manage or develop the work activities of a team. They will understand the roles and responsibilities of individual team members and will interact and collaborate effectively and sensitively with all members of the team.	• Interacts with peers and supervisors in a respectful and considerate manner [Language Arts 4A-C] • Demonstrates shared responsibility in negotiation, planning, processing information, communication, and decision making [Language Arts 4A-C] • Works well with people from culturally diverse backgrounds [Language Arts 4A-C] • Communicates client needs and information within a team in a timely manner [Language Arts 4A-C] • Understands the synergy that is possible in teamwork • Understands the rules and roles in a collaborative group (e.g., at times to be a leader and other times a follower) [Language Arts 4A-C]

Employability Skill Standards for Information Technology	
Employability Skill Standards	**Sample Performance Indicators**
Standard 5: Technology Students will understand the global impact of technology. They will use proper procedures for setup and operation of equipment and prevent, identify, or solve problems with technology.	• Understands the evolution of information technology [History/Social Science 1A, 1E, 1F] • Understands leading edge technology such as the Internet, data mining and warehousing, and speech recognition [Language Arts 5A] • Analyzes situation and creates a list of required tools and resources [Mathematics 5] • Generates or adapts equipment and technology to serve users' and consumers' needs • Analyzes system functions to improve efficiency [Mathematics 5] • Troubleshoots system malfunction and/or failure • Understands the impact of emerging technologies on the classroom (e.g., distance learning, on-line instruction, video courses)

Information Technology Technical Content Standards	
Technical Content Standards	**Sample Performance Indicators**
Standard 1: Information Processing Students will understand information-processing concepts necessary to gather, create, and analyze data and to function in a rapidly changing technological, global society.	• Compiles, codes, categorizes, calculates, tabulates, audits, verifies, or processes information or data [Mathematics 1-8] • Ensures data security and confidentiality by controlling access and release of information [Mathematics 5] • Combines and evaluates information and data to make decisions and solve problems [Mathematics 1-8] • Prioritizes information and chooses the best solution [Mathematics 5]
Standard 2: Administrative Team Support Students will understand support services necessary for the operation of an office in a global society. They will use multiple skills in performing tasks in support of management.	• Provides information to supervisors and fellow workers via face-to-face, writing, or telephone/electronic transfer and the Internet [Language Arts 4A-C] • Tests data processing systems to ensure proper functioning and appropriate security measures [Mathematics 5] • Analyzes software requirements to determine feasibility of design within time and cost constraints [Mathematics 1-5] • Understands the Intranet and the Internet

Information Technology Technical Content Standards	
Technical Content Standards	**Sample Performance Indicators**
Standard 3: Computer Science Students will understand systems and programming concepts related to the science of computer operations. They will apply these concepts in the workplace when using computers.	• Designs programming solutions that are correct, reliable, and efficient; compares and contrasts various programming models [Mathematics 5] • Monitors database performance and designs, implements, maintains, and modifies production databases [Mathematics 5] • Controls computer functions by using programs, setting up functions, writing software, or otherwise communicating with computer systems [Language Arts 3B7-8; Mathematics 5] • Demonstrates awareness and knowledge of programming languages: C++, Visual Basic, Java, Perl, SQL
Standard 4: Information Systems Management Students will understand computerized information systems. They will evaluate and use hardware and software solutions to re-engineer business processes and improve productivity. They will make data-driven decisions based on feedback mechanisms (e.g., collected data that are pertinent and accurate).	• Previews, selects, and installs software for business applications • Tests, corrects errors, and modifies programs or databases [Mathematics 5] • Identifies, evaluates, selects, and configures compatible systems across various platforms [Mathematics 5] • Evaluates effectiveness of controls, accuracy of reports, and efficiency and security of operations and devises controls for error detection [Mathematics 5] • Tests and evaluates hardware, software, and peripheral equipment to determine efficiency, reliability, and compatibility with existing system [Mathematics 5]

Information Technology Technical Content Standards	
Technical Content Standards	**Sample Performance Indicators**
Standard 5: Telecommunications Students will understand the telecommunications concepts and systems necessary to transmit information and to function in a technological, global society.	• Demonstrates knowledge of transmission, broadcasting, switching, control, and operation of telecommunications systems [Language Arts 5A; Mathematics 5] • Identifies areas of operation which need upgraded equipment, such as modems, fiber optic cables, and telephone wires [Mathematics 5] • Analyzes implications of protocols and international standards and their impact on data transmission [Mathematics 5; History/Social Sciences 3E] • Uses communications services and applications, such as on-line information services, electronic mail systems, listservs, newsgroups, on-line conferencing, voice mail, and fax [Language Arts 1B, 5A] • Performs a variety of tasks, using electronic media, to transmit information effectively [Language Arts 5A-B]

Information Technology Technical Content Standards	
Technical Content Standards	**Sample Performance Indicators**
Standard 6: Technical Communication and Documentation Students will design, develop, and edit technical documentation. They will define the targeted audience and intended purpose of the communication. They will become familiar with both editorial and visual elements of a document, and improve the clarity and organization of the final product. Students will also understand documentation standards and the development of overall end-user documentation.	• Translates complex technical information into understandable and usable documents [Language Arts 1A-B, 1D, 3B2, 3B7-8, 3C] • Understands how to distinguish and how to correct common problems such as inconsistency, ambiguity, and incorrect punctuation in technical writing and editing [Language Arts 1A-B, 1D, 3B2, 3B7-8, 3C] • Uses editing tools such as proofreader's marks, style sheets, style guides, and standard editorial reference material [Language Arts 1A-B, 1D, 3B2, 3B7-8, 3C] • Coordinates documentation development with deliverables (e.g., HTML report overviews, on-line help for customizing homepages, on-line help for performance management frameworks, users' guides, product update notes, installation guides, logical data model diagrams, and technical reference manuals) [Language Arts 3B2, 3B7-8] • Demonstrates awareness of strategies for new and existing technical products and services based on organizational objectives, customer research, and documentation and software usability testing [Mathematics 5]

Information Technology Technical Content Standards	
Technical Content Standards	**Sample Performance Indicators**
Standard 7: Testing and Quality Assurance Students will understand data test analysis, preparation of test reports, and document findings. They will understand the responsibilities for establishing test methodologies, writing test plans, and leading test execution.	• Assists in development of quality assurance plans • Monitors success of quality assurance plans • Provides feedback to quality assurance managers for modifications to quality assurance plans and implements on-going changes to quality assurance plans [Language Arts 4A-C] • Assures product development is on time, on budget and meets customer standards • Develops and executes product test plans, reports product defects, and interfaces with software engineers to ensure timely resolution of product issues [Language Arts 3B2, 3B7-8, Mathematics 5] • Determines the impact of new software on the production environment

Academic Standards for Information Technology	
Academic Standards	**Sample Performance Indicators**
Standard 1: Language Arts Students will demonstrate reading, writing, speaking and listening skills, media literacy, and an appreciation for cultural diversity in literature and language.	• Uses a wide range of strategies to read, comprehend, interpret, evaluate, and respond to a variety of information technology demands (e.g., reports, documentation, quality assurance, transcriptions, data transmissions) [Language Arts 1A-C] • Reads and comprehends a range and breadth of written material including public and functional documents [Language Arts 1A-B, 1D] • Expresses ideas and information in written form clearly and accurately and tailors to the intended purpose and audience (e.g., customers, end users) [Language Arts 3A-C] • Actively listens and communicates in a clear, courteous, and complete manner on personal and professional levels [Language Arts 4B-C] • Presents oral reports, verbalizes and delivers ideas, enunciates well [Language Arts 4A, 4C] • Organizes and presents oral and written information using appropriate technological resources and support materials [Language Arts 5A] • Analyzes, interprets, and evaluates information (e.g., documentation, technical manuals, reports) for explicit and implicit messages [Language Arts 5B]

Academic Standards for Information Technology	
Academic Standards	**Sample Performance Indicators**
Standard 2: Mathematics Students are able to reason, communicate, solve problems and develop understanding of numbers, measurement, geometry, functions, statistics and probability, logic, and algebra.	• Analyzes and solves business and technology problems (e.g., calculate budget items, program formulas) by selecting and applying appropriate quantitative methods [Mathematics 1, 2, 5] • Analyzes and interprets numeric information (e.g., demographic and marketing statistics and data) [Mathematics 1-8] • Applies mathematical equations and formulas in the management of resources (e.g., budgeting) and solving technology problems in information technology [Mathematics 2, 5] • Applies mathematical concepts (e.g., numbers, accounting, statistics and probability) to understand sound business management techniques and procedures used by the information technology industry [Mathematics 1-2, 4-5]

Academic Standards for Information Technology	
Academic Standards	**Sample Performance Indicators**
Standard 3: History/Social Science Students will demonstrate historical thinking (e.g., examining evidence, diversity/multiple perspectives, interpretation, significance, participation) and understanding of government (e.g., courts and contemporary issues) and economics (e.g., fundamental economic concepts) in information technology.	• Analyzes major economic trends (e.g., globalization, rapid growth of the Internet) and how they impact information technology [History/Social Science 1A, 1C-D, 3A, 3E] • Describes major developments in information technology as they relate to the role of government and policymaking (e.g., development of the Internet and e-commerce) [History/Social Science 2C, 2F] • Identifies how contemporary issues and fundamental economic concepts impact the information technology industry [History Social/Science 1A, 1C, 2F, 3A] • Explains information technology law concepts (e.g., government relations, regulations, laws, and policies) as they relate to the role of information technology in the national and international marketplaces [History/Social Science 1A, 3D-E]

Academic Standards for Information Technology	
Academic Standards	**Sample Performance Indicators**
Standard 4: Science Students will demonstrate understanding of physics (e.g., motion and forces, conservation of energy and momentum, heat and thermodynamics, waves, and electronic and magnetic phenomena), chemistry (e.g., atomic and molecular structure, chemical bonds, acids and bases, solutions, and chemical thermodynamics), and biology/life sciences (e.g., ecology) and the connections and applications as these concepts relate to information technology	• Explains basic scientific concepts as they relate to health and safety in information technology environments [Science 1A, 1E, 1H, 2E, 3E, 3G, 4A, 4E] • Demonstrates understanding of the impact of technology and science as they have contributed to the growth and expansion of the information technology industry [Science 1E-F, 2E, 3A, 4E] • Explains the impact of science (e.g., historical and contemporary contributions) and interactions between science and society in relation to information technology [Science 1E-F, 2E, 3A, 4E]

Resources

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