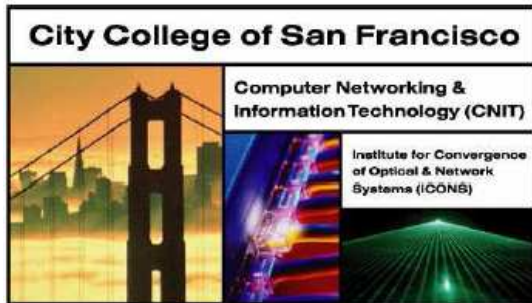


DUE 0501703

**Job Skills Mapping and Curriculum
Alignment Process Report**



**Institute for Convergence of Optical
& Network Systems (ICONS)
at
City College of San Francisco**

March, 2007

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On behalf of ICONS, Ann Beheler, Primary Investigator for the Convergence Technology Regional Center based at Collin County Community College, was contracted by CCSF in May, 2006, to facilitate a modified DACUM (Developing a Curriculum) job skills analysis and curriculum alignment process with representatives from the ICONS Business Advisory Council to identify the job skills regional businesses desire graduates of the CNIT program to possess and to modify the CNIT curriculum to teach students those skills.

The initial job skills and knowledge domains that seeded this analysis were the skills and knowledge domains previously validated by the Business and Industry Advisory councils for the Convergence Technology Regional Center based in Frisco, Texas; however business representatives were free to add and subtract skills from the list to make the list align with their needs. Following the job skills analysis, the facilitator worked with CCSF faculty to identify those courses covering the skills and knowledge domains deemed important by the Business Advisory Council. At a later meeting, the facilitator began working with faculty to identify curriculum gaps and to develop a list of new courses as well as degrees and certificates based on validated skills and knowledge domains.

The degrees and certificates developed thus far are explained in this document. Additional meetings will occur with the faculty to finish addressing the gaps between current curriculum and the skills that the business advisory council need graduates to possess. Note that the results of this alignment process will ensure that skills taught in the curriculum will match the needs of local businesses, and differs from the curriculum originally anticipated to be supported by the ICONS grant.

The project description as originally submitted in the grant proposal in 2004 was:

Over a three-year period, ICONS will develop an Associate of Science (A.S.) Degree in Information and Communication Technology (ICT) and two certificate programs, one in Metropolitan Optical Networking and the other in Advanced Optical Networks, focusing on the growing fields of Internet Protocol (IP) convergence and fiber optic communications. Note also that the grant objectives were amended in March 2005 to include developing only one new certificate in Metropolitan Optical Networking, eliminating the certificate in Advanced Optical Networks

As background against which the job skills analysis and curriculum alignment were done, the Goals, Objectives, Deliverables, and Activities specified in the original grant proposal and modified in the subsequent amendment are shown in Table 1.

Table 1 Goals, Objectives, Deliverables, and Activities

.1. Develop an A.S. degree program in ICT that articulates with high school and four year university programs.
2. Develop one certificate program in Metropolitan Optical Networking.
3. Offer faculty training in ICT.
4. Recruit a diverse group of students into the ICT program.
5. Advise other community colleges nationwide with respect to implementing ICT and optical networking education and training
6. Seek to become a formal NCTT Collaborating Partner

Additionally, at the time the proposal was submitted, the Metropolitan Optical Networking certificate was envisioned to include the following (the courses preceded by "F" would be developed under the grant):

- CNIT 106 Introduction to Networks
- CNIT F01 Fiber Optic Networking Technology
- CNIT F02 Metro Optical Networking
- CNIT F03 Convergence Network Technologies

Because the grant application clearly stated that ICONS would utilize a DACUM (Developing a Curriculum) process that has been used for over 40 years to align curriculum using the expertise of a panel of subject matter experts. Typically the

subject matter experts (SMEs) are drawn from businesses in the region who are likely employers of graduates from the curriculum programs thus aligned with the DACUM process, and in this case, they were drawn from the Business Advisory Council itself.

Further, this process is typically time-consuming; frequently starting with a blank slate that is populated with the skills the business representatives suggest and agree should be included. DACUM is unique in that expert workers in the selected field (i.e., the technicians themselves) are used to determine curriculum, rather than having curriculum selected by instructors, college professors, or training managers. By using those actually doing the work as the experts, DACUM narrows the gap between what is typically taught in classes and what workers actually need to know to achieve excellence in the workplace.

Recognizing that starting from a blank slate often requires 2 days or more to complete a job skills list and recognizing the difficulty of convincing the business experts needed to complete a meaningful DACUM to invest 2 days of their time, Brent Kesterson, an instructional designer with over 30 years of experience in the military and community college, developed a streamlined DACUM process called PCAL 7 to accomplish the same results with significantly less time invested by the business experts. (Note that the facilitator has used this modified process successfully for three previous curricula projects.)

The PCAL 7 process uses educators to research and create a pro forma list of job skills to use as a starting point with the business experts and allows the business experts to add and remove skills. This process can usually be accomplished in 4-8 hours. The reduced time makes the process more attractive to the business experts needed to complete a meaningful process, and it makes it more likely that they will complete the process. After the job skills have been identified, the PCAL process is almost identical to the DACUM process.

After the skills have been identified and validated and ranked (see details in the Job Skills analysis Section), the facilitator works with faculty and administrators to identify gaps between existing courses and the job skills desired by the experts. After the gap have been identified, courses may be identified to be used "as is", "with minor modifications", or as new courses the need to be created. Once this rationalization is complete, the scope (number of hours and content) and sequence (order of classes for a degree or training program) are decided by the group. The product is a rough draft curriculum.

Finally, after the rough draft of the curriculum has been created, curriculum is converted by instructors, department chairs, deans, trainers, and training managers into a format that is acceptable to a college curriculum committee or the human resources department for business or industry. The end result may be an entire curriculum, degree, certificate, or curriculum modules that can successfully upgrade incumbent workers' skills or prepare students for new

careers. Additionally, specific instructional materials such as tests, texts, overheads, Power Point presentations, videos, etc., may need to be created. The DACUM or modified PCAL 7 process yields all the necessary to develop curriculum aligned with regional business need.

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As explained in the previous section, the process used for the job skills analysis was based on the PCAL 7 process developed by Brent Kesterson of Richland College. The process is a streamlined DACUM (Design a Curriculum) process that uses a minimum amount of the business representatives' time. The process is best accomplished face to face with business representatives, and this process was started on May 3, 2006.

For each skill and knowledge domain, business representatives were asked for the following ratings (1 to 4 with 1 being lowest):

Importance (How important is it for entry level employees to know or to do the performance criteria statement – i.e., job skill)

Level (How good is good enough for entry level employees to know or to do the performance criteria statement)

Time Spent (How frequently are entry level employees expected to know or do the performance criteria statement)

Difficulty (How difficult is it for entry level employees to know or to do the performance criteria statement)

Additionally, representatives were allowed to remove skills and knowledge domains from the list and to add skills and knowledge domains to the list after discussion.

If business representatives disagreed on any of these ratings, they were asked to discuss their positions and come to consensus. Unfortunately, some of the representatives had to leave before all the rankings were complete and others were not able to attend. However, some of these representatives were able to complete their rankings and supply them via email to the facilitator.

Once the ratings were captured on a spreadsheet, an algorithm was applied to each set of data to help determine the level of importance of each validation. This method is called the Training Emphasis Rating (TER). Depending upon the number of responders, the number in the algorithm represents the total number of subject matter experts. If the number of responders were 8, for example, then the algorithm would be:

$((\text{Count}/8*4)*2+(\text{Importance rating}*3)+\text{Proficiency}+\text{Frequency}+\text{Difficulty})/8.$

The numbers used are the rating averages for each skill and knowledge domain. This resulted in a weighted overall rating used to identify the most important skills to use in the curriculum. A TER rating of 3.0 or greater is considered significant, based upon the 1 to 4 ratings.

Skills Gap Identification and Degree and Certificate Development Process

March, 2007

On May 23, 2006, the facilitator met with the faculty of the CNIT department at City College of San Francisco to begin the process of cross-referencing the existing courses at City College with the skills and knowledge domains indicated as needed by the job skills analysis. This process was complicated by the fact that curriculum had not been reviewed recently and outcomes per course existed largely in the minds of the faculty members; therefore the process was a difficult one. The process did, however, point out that there were too many wireless courses in the curriculum and the faculty undertook to rationalize these courses down to two courses prior to the next skills gap analysis meeting that occurred on January 16, 2007.

At the skills gap meeting on January 16, the faculty members completed the skills gap mapping and were able to create a list of certificates and degree options for the Associate of Science degree. Due to the deadline for submitting curriculum to the CCSF Curriculum Committee, CNIT faculty and ICONS leaders submitted the initial set of AS degree options and submitted them in February, 2007. Additional work is needed to address gaps between current curriculum and the skills business and advisory council members determined graduates need to possess, based on the job skills process. It is envisioned that new certificates and possibly new degree options will be created to address these gaps over the next several months. At this point it is anticipated that there is need for a Convergence certificate and a Digital Home Technology Integration certificate, but the details of such curricula are yet to be finalized.

It is important to note that business representatives identified a skill and knowledge domain set that differed somewhat from the initial Metropolitan Area Network certificate, and CNIT faculty will continue to work with the facilitator to develop new courses and certificates to address these skills and knowledge domains.

**New AS degree proposed with major in
Computer Networking and Information Technology
4 Core Courses Units (included in all options)**

CNIT 103 Computer Hardware	3
CNIT 106 Introduction to Networks or CNIT 201 Internetwork Design	3
CNIT 131 Internet Basics and Beginning HTML	3
CNIT 120 Network Security	3
 Subtotal Units	 12

**New AS degree proposed with major in
Computer Networking and Information Technology
Option in Computer Technical Support**

Electives Units

CNIT 104 Operating Systems Technologies	3
CNIT 105 Computer Technical Support	2
CNIT 150 Home Technology Integration (New)	3
CNIT 103L Computer Hardware Lab or CNIT 104L OS Tech Lab or CNIT 105L Comp Tech Support Lab	1
 Total Units (including 12 core units)	 21

Option in Web Site Development Techniques

Electives Units

CNIT 132 Intermediate HTML and XHTML	3
CNIT 133 Interactive Web Pages: JavaScript and AJAX (revised)	3
CNIT 134 Server-side Technologies: ASP.Net	3
 Total Units (including 12 core units)	 21

Option in Network Security

Electives Units

CNIT 121 Computer Forensics	3
CNIT 122 Firewalls	3
CNIT 123 Ethical Hacking & Network Defense	3
Total Units (including 12 core units)	21

Option in Wireless Networks

Electives Units

CNIT 107 Wireless LANs	3
CNIT 108 Wireless Networks, Advanced	3
CNIT 212 Cisco Wireless	3
Total Units (including 12 core units)	21

Option in Cisco Networking

Electives Units

CNIT 202 Router Technologies`	3
CNIT 203 Switching and Routing	3
CNIT 204 WAN and Project-based Learning	3
Total Units (including 12 core units)	21

Option in Microsoft Windows

Electives Units

CNIT 335 Windows Vista Desktop Support (new)	3
CNIT 340 Managing & Maintaining Windows Server	4
CNIT 341 Windows Server Infrastructure (new)	4
Total Units (including 12 core units)	23

Certificate Programs
(As shown in the catalog in March, 2007)

Advanced Routing and Switching (Cisco)

The program of study for the Certificate in Advanced Routing and Switching (Cisco) includes instruction and practice in the theory, design, configuration, and operation of Enterprise Local and Wide Area Networks.

Courses Required

CNIT 205 Advanced Routing	3
CNIT 206 Remote Access	3
CNIT 207 Multilayer Switched Networks	3
CNIT 208 Internetwork Troubleshooting	3
Total Units	12

Computer Technical Support

This program provides instruction in the support of a typical workplace computer environment including hardware, operating systems, and application programs. Students in this program practice diagnostic troubleshooting, technical and logical problem solving, end-user training and customer relations skills.

Courses Required

CNIT 100 Intro to Computers Using PCs	3
CNIT 101 Operating Systems I – Windows	3
CNIT 102 Operating Systems II - Command Line	3
CNIT 103 Computer Hardware	3
CNIT 104 Operating Systems Technologies	3
CNIT 105 Computer Technical Support	2-3
or	
CNIT 235 Windows Desktop Support Tech	
CNIT 106 Intro to Networks	3
CNIT 197 Work Experience or CS 198A or CNIT 103L Computer Hardware Lab or CNIT 104L Operating System Tech Lab or CNIT 105L Computer Tech Support Lab 1	
Total Units	21-22

Computer Technician

The program of study for the Computer Technician Certificate includes instruction and practice in the identification, installation, and configuration of hardware devices to build, maintain, upgrade, and improve performance of a computer system. This course prepares students for CompTIA's A+ exam, a certification equivalent to six months' work experience as a computer technician.

Courses Required

CNIT 101 Operating Systems I – Windows	3
CNIT 102 Operating Systems II - Command Line	3
CNIT 103 Computer Hardware	3
CNIT 103L Microcomputer Hardware Lab	1
CNIT 104 Operating Systems Technologies	3
CNIT 104L Operating Systems Tech Lab or CNIT 197 Internship or Work Experience	1
Total Units	14

E-Commerce Systems Development

The program of study for the Certificate of Completion in E-Commerce Systems Development provides instruction in the fundamental concepts and technical skills needed to design, develop, and support a commercial Internet website and database. Teams of students in this program plan, design, develop and test a working practical project in the workplace or on campus.

Courses Required

CNIT 120 Network Security	3
CNIT 135A Internet3	
CNIT 190 Internet Systems Analysis & Design	3
CNIT 240 Windows Network Essentials	3
CNIT 245 Internet Information Server or CNIT 251 SQL Server Administration	3
Total Units	15

Fundamentals of Networking

The program of study for the Fundamentals of Networking Certificate provides a solid core of the concepts and terminology, an introduction and overview of all aspects of computer networking, including components and principles of local and wide area networking and the Internet. Students who complete this certificate will be ready to undertake further study and advance to more specific industry training.

Courses Required

CNIT 103 Computer Hardware	3
CNIT 104 Operating Systems Technologies	3
CNIT 106 Introduction to Networks	3
CNIT 131 Internet Basics and Beginning HTML	3
CNIT 340 Managing & Maintaining Window Server	4
Total Units	16

Network Security

This program provides instruction in the measures that must be taken to detect and prevent network security mistakes and vulnerabilities, and includes descriptions of common attacks and methods to configure the operating system, servers, routers, firewalls, and email. Preparation for the CompTIA Security+ exam.

Courses Required

CNIT 106 Introduction to Networks	3
CNIT 108 Wireless Networks, Advanced	3
CNIT 120 Network Security	3
CNIT 122 Firewalls	3
CNIT 123 Ethical Hacking or CNIT 221 Cisco PIX firewall & Router Sec	3
Total Units	15

Routing and Switching (Cisco)

The program of study for the Certificate in Routing & Switching (Cisco) includes instruction and practice in the theory, design, configuration, and operation of simple Local and Wide Area Networks. This course of study prepares students for entry-level positions in network administration and for the Cisco Certified Network Associate (CCNA) and Network+ exams.

Courses Required

CNIT 103 Computer Hardware	3
CNIT 201 Internetwork Design	3
CNIT 202 Router Technologies	3
CNIT 203 Switching and Routing	3
CNIT 204 WAN and Project Based Learning	3
CNIT 120 Network Security	3
CNIT 340 Maintaining & Managing Windows Server	4
Total Units	22

Web Site Development Techniques

The program of study for the Certificate of Completion in Web Site Development Techniques includes instruction and practice in the configuration and operation of web sites. This course of study prepares students for entry-level positions in web site administration, and covers the objectives of the CompTIA I-net+ examination.

Courses Required

CNIT 131 Internet Basics and Beginning HTML	3
CNIT 132 Intermediate HTML and XHTML	3
CNIT 133 Interactive Web Pages: Javascript & DHTML	3
CNIT 134 Server-side Technologies: SML & ASP.NET	3
Total Units	12

Windows Networking

The program of study for the Certificate of Completion in Windows Networking includes instruction and practice in the theory, design, configuration, and operation of local and wide area networks using Microsoft Windows servers. This course of study prepares students for entry-level positions in network management and technical support of Windows networks.

Courses Required

CNIT 106 Local Area Networks or CNIT 201 Internetwork Design	3
CNIT 235 Windows Desktop Support Technician	3
CNIT 240 Windows Network Essentials	2
CNIT 241 Supporting Windows Networks I	3
CNIT 242 Managing Windows Networks	3
CNIT 246 Active Directory for Windows	3
Electives: Select one course from this list	
CNIT 243 Exchange Server Administration	3
CNIT 244 Windows Network Infrastructure	3
CNIT 245 Internet Info Server Admin	3
CNIT 250 Security for Windows Networks	3
CNIT 251 SQL Server Administration	3
Total Units	20

Wireless Networking

The program of study for the Certificate of Completion in Wireless Networking includes description, installation, and configuration of network devices for wireless communication, and focuses on issues of performance and security. Completion of the certificate prepares students to take the Certified Wireless Network Administrator (CWNA) and the Certified Wireless Security Professional (CWSP) exams.

Courses Required

CNIT 106 Introduction to Networks or CNIT 201 Internetwork Design	3
CNIT 107 Wireless LANs	3
CNIT 107L Wireless LANs Lab	1
CNIT 108 Wireless Networks, Advanced	3
CNIT 109 Wireless Security	3
Total Units	13

Summary

March, 2007

The table below shows the accomplishments and plans with respect to the curriculum alignment and curriculum development that were part of the ICONS grant proposal.

Activity	Status
Job Skills and Knowledge Domain analysis by the Business Advisory Council representatives	Complete
Identification of existing courses covering these skills and knowledge domains	Complete
Development of initial set of options for AS degree for CNIT	Complete
Completion of development of certificate and degree options to address remaining skills not covered in the initial AS degree options and CNIT certificates	In process and will be completed within the next grant year
Yearly updating of Job Skills and Knowledge Domains to reflect business changes	Yearly