

DEPARTMENT REPORT OF PROGRAM LEARNING OUTCOMES ASSESSMENT

Department: Computer Information Systems

Program (Degree): Computer Information Systems (CIS)

Type of Degree: X AAS AA AS ATS AIS

Chairperson: Charlotte Wharton Date: May, 2002

Person(s) Interviewed: Charlotte Wharton, Tony Mann, Randy Brown

- I. **Program Curriculum:** A description of the basis for the program curriculum (i.e., how it is derived and validated). Include accreditation organizations, advisory committees or external groups that influence curriculum. Describe curriculum review activities including the review of course master syllabi.*

The CIS program curriculum has undergone a dramatic change that was begun in 1999-2000 and was completed by spring 2001. The new curriculum which better reflects current trends in the IT industry resulted from input from a variety of sources including curriculum models from the Association of Computing Machinery (ACM), the Association of Information Technology Professionals (AITP) and the Northwest Center for Emerging Technology for national input. A significant consideration in the development was alignment with the state of Ohio IT-Works curriculum model. This competency-based model was derived through a DACUM process using a panel of business, industry and labor in Ohio. Ongoing input about IT in the Miami Valley is provided by the Information Technology (IT) Alliance, an offshoot of Miami Valley Coalition of Economic Development. The department continues to work closely with Tech Prep to ensure a smooth transition between K-14 and the Sinclair CIS curriculum.

The Ohio Board of Regents approved the new CIS degree in spring 2001. The degree consists of a core of courses that align with competency OBOR specifications, Sinclair general education requirements, student feedback from the CIS capstone course, and industry trends. Students may choose electives from five areas of concentration that include: Network Manager, Network Engineer, User Support, Software Development/Programming, and Web Development.

Tech Prep initiatives have expanded and now include Greene and Miami Valley Career Technology Centers, Centerville, Greenville, Kettering Fairmont, Dayton, Miamisburg, Northridge, Warren County Career Center, D. Russell Lee Career Center. The high schools provide introductory level courses in computer literacy, word processing database, spreadsheet, web

development and networking or introductory programming. Sinclair builds on that foundation on an individual basis and moves students into more advanced course work. The CIS core curriculum is aligned with high school curriculums.

The department was awarded a National Science Foundation (NSF) Grant in partnership with three other community colleges to improve and expand IT learning opportunities. The emphasis on curriculum development is being supported by this grant. Faculty began work on incorporating the NSF model for modular architecture into new courses during summer of 2000 with special emphasis placed on development of instructional materials to support part-time faculty. The faculty completed work on eight courses during the 2001-2002 academic year.

The department has developed five short term certificates including "Fast Track," an industry retraining effort for experienced programmers, Web Authoring, Web Programming, and Java Enterprise Development. An IT Alliance focus group was instrumental in guiding the development of the Fast Track certificate and Lexis/Nexis was the driving force in development of the Java Enterprise Development certificate. All certificates were approved through the Sinclair curriculum approval process spring 2001.

The Advisory Committee has been redefined to align with the new curriculum and degree options. The Committee consists of over 60 members who provide representation for each degree option. Membership is drawn from the Dayton IT industry, Sinclair IT staff, area Tech Prep schools, and the Dayton New Horizons training center.

II. Program Learning Outcomes: A description of what you intend for students to know (cognitive), think/feel (affective), or do (psychomotor), when they have completed your degree program. A suggested manageable number of outcomes should be in the range of five to ten. Describe Program Learning Outcomes review activities.*

Even though there has been significant change in the curriculum structure, the program outcomes have changed only in minor ways since the last program review.

An entry-level graduate with an Associate of Applied Science Degree in Computer Information Systems from Sinclair Community College will be able to:

| Learning Outcomes | Related Courses |
|---|---------------------|
| 1. Apply mathematical skills to formulate and solve problems manually (later to be solved by programming a computer). | MAT 116 or 121, 122 |

| Learning Outcomes | Related Courses |
|--|---|
| 2. Identify and apply the principles of financial accounting. | ACC 111 |
| 3. Describe/apply general business knowledge and skills. | ECO 201; LAW 101; MAN 205; MAR 201 |
| 4. Exhibit professional/occupational behavior and work habits. | all CIS courses |
| 5. Correctly design and program a computer solution using procedural and non-procedural methods, given detailed specifications of a problem. | CIS 110, 111; CIS language options |
| 6. Apply program development techniques that demonstrate a formal process for decision making and problem solving. | CIS 110, 111, 210, 265 |
| 7. Identify, analyze, and document program/system specifications and information requirements for a typical business problem. | CIS 110, 111, 210, 265, and all CIS concentration electives |
| 8. Demonstrate the ability to use an operating system and software packages on a personal computer to prepare and manipulate word processing documents, design and use spreadsheets, create graphs, use databases and communicate with other PCs using telecommunication facilities available. | CIS 107 or CIS 108, BIS 160 or BIS 161 (Advanced MS Office) |
| 9. Demonstrate the ability to design and implement personal and corporate databases using a commercial database package. | CIS 265 or CIS 266 |
| 10. Identify the basic, underlying procedures and relationships which are the components of a business computer system, including hardware, software, data, and people. | CIS 210, 225, 230, 265 |
| 11. Work as part of a team to complete a system development project assignment. | CIS 265, 278 |

III. **Assessment Method(s)**: A measurable indicator of success in attaining the stated learning outcome(s). The methodology should be both reliable and valid. Please describe in detail.

- a. **Formative Assessment Method(s) and Description**: a measurable indicator of student in-progress success in attaining the stated learning outcome(s).

Formative assessment is achieved through course-by-course completion. CIS courses provide interactive learning experiences where students complete small projects. Tests and quizzes are also used to assess learning. As a result of work using the “adopt and adapt” strategy from the NSF model modular architecture, all CIS classes complete a beginning of class competency self assessment using an interactive Web site connected to a database of course competencies. This process was pilot tested using 15 courses winter term 2002 and implemented throughout the entire curriculum spring 2002.

- b. **Summative Assessment Method(s) and Description**: a measurable indicator of end-of-program success in attaining the stated program learning outcome(s).

Summative assessment is conducted in CIS 278, the capstone course for this degree. All students are required to participate in the capstone course. In the past students from all areas of concentration were in one class. Spring 2002, the schedule included a separate capstone class section for each area of concentration, thus allowing a more focused course and project. CIS 299, a four-hour course which focuses on a systems development project that the students design and complete, was offered as a final experience in past years. During 2001-2002, the capstone has supplanted this course. Projects come from both inside and outside the college. Examples of past projects have included web pages, grants development projects, inventory and budget projects, database creation, and business plans. Since the capstone courses have transitioned to multiple sections based on area of concentration, they were taught by six instructors with the network manager section being team taught. One faculty person was designated the capstone experience coordinator and handled the arrangements for setting guidelines, coordinating the final presentations, and conducting a follow-up meeting. The instructor acts as the development manager, and user interviews are part of the early structure of the project. Collaboration and team dynamics play an important role in the success of the projects. The instructor also completes a transcript review for each student so that teams can pull from appropriate strengths and weaknesses of the students.

Another major part of CIS 278 is a career planning and placement component, including resume preparation, marketing, researching job opportunities, and interviewing. Students complete course and peer evaluation forms which are used to review the degree curriculum and the students' perceptions of their abilities. This data is shared with CIS faculty.

Final presentations were held in the CIL before a large group of students, faculty, and customers. Students were assessed by faculty and staff from various departments during the formal presentation of their projects.

Summative assessment for the Computer Support Services track is conducted in CIS 278 (Computer Support Services Capstone). This course has embedded within it preparation for A+ Certification (computer hardware repair certification). Students must work as part of a team to complete a system development project assignment. This includes installing, configuring, verifying, and troubleshooting a network system. Content for a portion of the course was guided by a local networking group. Project evaluation is based on technical competency, professional work habits, and behavioral work habits. A+ certification is the benchmark for hiring students in the workplace. More than 50% of the companies in the area require A+ certification. A+ Certification comes after the completion of CIS 278. Students are not required to either take or pass the examination as part of the course requirements.

IV. Results: A description of the actual results of overall student performance gathered from the summative assessment(s). (see III.b.)

The spring 2002 projects included two web page development projects (*The Dayton Daily News*, The Network Engineering Option for the Computer Information Systems Department), four networking projects (two simulations using the Windows Networking environment and two using Cisco), two programming projects (Developmental Writing tool, Class Roster), two database projects (Charitable Giving and Volunteers database for the city of Clayton, and a grades database for Sinclair faculty), and one user support project (Unity/Case Management). Students are completing all projects and demonstrate competence in computer skills. Feedback from CIS 278 indicates that students' technical skills are very good. Areas needing emphasis include oral and written communication, time management, teamwork, and critical thinking. Students found great value in working with a team on a "real" project with customers who sometimes changed the requirements.

We have begun to collect data on students who pass industry certifications related to the coursework completed in their programs. Specifically we will track Microsoft networking certifications, Cisco certifications, A+, Network+, or any programming or Web development certification. This work was begun at the end of spring 2002.

During winter 2002, 14 classes were selected to pilot the web-based competency self-assessment developed as part of our NSF grant. Six classes completed both the starting and exit assessments. They included CIS 129, 131, 162, 241, 265, and 281. The average start assessment score for all courses was 2.58 (on a 1 to 5 point scale with 5 being high and one low). The average exit score was 4.12 and the average gain from start to exit was 1.53. All competencies showed a gain except this competency for CIS 241: "Identify and describe the functions of each of the seven layers of the OSI reference model;" And for CIS 162: "Demonstrate problem-solving

techniques in troubleshooting application software.” Students rated themselves 4 out of 5 at the beginning of the course on both these items. This is a very high rating. Most students were exposed to the OSI model in CIS 230 which may account for their high start assessment on the CIS 241 competency. A full report of the assessment is attached to this report.

- V. **Analysis/Actions:** From analysis of your summative assessment results, do you plan to or have you made any adjustments to your program learning outcomes, methodologies, curriculum, etc.? If yes, describe. If no, explain.

We have begun preliminary analysis of our starting and exit competency self-assessment to determine student perceived skill gains. As a result of the analysis, we are reviewing the list of competencies for each class and their relevance in the scope and sequence of all courses in the curriculum. We are changing a few prerequisites to ensure that students have the required skills for each class. Preliminary changes include:

CIS 136 and 137 will be prerequisite to CIS 131
CIS 108 and CIS 241 will be alternative prerequisites to CIS 271
CIS 108 and CIS 241 will be alternative prerequisites to CIS 272
CIS 136, 137, and CIS 130 or 131 will be prerequisite to CIS 229
CIS 112 will be a prerequisite to CIS 233 and for CIS 280

Since we are in the early phases of evaluating this data, we anticipate further changes particularly in the sequencing of prerequisites and in competencies. The goal is to make them more accurate and current with the changing technology.

- VI. **General Education:** Are you using any tool(s) to assess any of the three primary general education outcomes* (communication, thinking, values/citizenship)? If so, describe.

General education components are built into the program on a course-by-course basis. The master syllabus for CIS 110, Program Design and Logic, has been used as a model by other departments for incorporating general education learning outcomes for communication, thinking and values/citizenship/community into a course.

- a. Where within the major do you assess written communication? Describe the assessment method(s) used. Describe assessment results if available.

Written communication is incorporated in many courses. We do not have a standard plan to evaluate consistently across these courses. We rely on the grades from ENG 111 or 131, ENG 112 or 132 at this time.

- b. Where within the major do you assess oral communication? Describe the assessment method(s) used. Describe assessment results if available.

The oral communication checklist is used in the capstone course for assessment of the team project presentations. Use of the oral communication checklist is at the discretion of the individual faculty member.

We are discussing implementing a modest revision of this checklist to evaluate oral presentations more consistently in CIS classes where presentations are a part of the course activities.

Teamwork activities incorporating interpersonal communication are used by some CIS instructors.

- c. Where within the major do you assess thinking? Thinking might include inventing new problems, seeing relationships and/or implications, respecting other approaches, demonstrating clarity and/or integrity, or recognizing assumptions. Describe the assessment method(s) used. Describe assessment results if available.

All CIS courses contribute significantly to the students' abilities to think logically within the computer information content areas. Courses such as programming, networking, Web development, hardware and software troubleshooting, as well as the capstone course require problem solving, creativity, and revision to develop working solutions. Grades of C or better in these classes indicate a moderate to high level use of these skills.

- d. Where within the major do you assess values/citizenship/community? These activities might include behaviors, perspective, awareness, responsibility, teamwork, ethical/professional standards, service learning or community participation. Describe the assessment method(s) used. Describe assessment results if available.

Ethics is an important component of CIS 278 and is included as part of the competency, "Exhibit professional/occupational behavior and work habits." The classes discuss ethical behavior in the workplace as well as ethical behavior in the job search process. The capstone classes in some cases complete a project that fits into the service learning arena. All projects involve group work. Evaluation is done through instructor feedback, client feedback, and student self-assessment.

The CIS department sponsors a student chapter of AITP, Association of Information Technology Professionals, where students learn about professional ethics.

Discussion of ethical aspects of computing should happen sooner than the capstone. CIS 107, 110, or 111 would be good classes to begin this discussion since all CIS students take these classes. Many instructors incorporate ethics in all the courses they teach, but a more structured requirement earlier in the program would be a good addition. Randy Brown suggested that ethics in computing might become part of the Sinclair "Honor Code" initiative.

- * Note: The oral communication checklist and the written communication checklist developed by the General Education Committee were adopted for college-wide use during the 1997-98 academic year by Academic Council. Thinking

Guidelines developed by the General Education Committee are being piloted by faculty during the 1998-99 academic year.

Winter 2002

Pilot Competency Self Assessment

Based on a five point scale with 5 representing high skill and 1 representing low or no skill.

Classes asked to do the assessment were: CIS 107, 111, 113, 129, 130, 131, 141, 162, 238, 241, 264, 265, 281, 283, and 284

Classes that did the preassessment were: CIS 129, 131, 162, 241, 265, and 281

| Class | Num students do START | Num students do Exit |
|--------------|-----------------------|----------------------|
| CIS 107 | 5 | 0 |
| CIS 111 | 2 | 0 |
| CIS 113 | 1 | 0 |
| CIS 129 | 15 | 11 |
| CIS 130 | 6 | 0 |
| CIS 131 | 9 | 9 |
| CIS 141 | 1 | 0 |
| CIS 162 | 1 | 1 |
| CIS 238 | 8 | 0 |
| CIS 241 | 9 | 2 |
| CIS 264 | 1 | 0 |
| CIS 265 | 18 | 12 |
| CIS 281 | 6 | 4 |
| CIS 283 | 15 | 0 |
| CIS 284 | 7 | 0 |
| Total | 104 | 39 |

Competency scores for start and exit surveys

| Start Ave | Exit Ave | Gain | Course # | Competency |
|-------------|-------------|-------------|----------|--|
| 2.91 | 4.55 | 1.64 | CIS129 | Use the Hypertext Markup Language to code web 1 pages. |
| 1.91 | 3.82 | 1.91 | CIS129 | Use JavaScript to code dynamic interactive effects 2 on web pages. |
| 2.91 | 4.27 | 1.36 | CIS129 | 3 Test the web pages for errors. |
| 2.73 | 4.09 | 1.36 | CIS129 | 4 Recode the web pages for the correct results. |
| 2.62 | 4.18 | 1.57 | | Average for CIS 129 |
| 2.11 | 4.67 | 2.56 | CIS131 | Use Systems analysis skills to decide what the 1 user wants in a Web Site. |
| 2.33 | 4.78 | 2.44 | CIS131 | 2 Use design to outline and model the Web Site. |

| Start Ave | Exit Ave | Gain | Course | # | Competency |
|------------------|-----------------|-------------|---------------|----------|--|
| 2.33 | 4.67 | 2.33 | CIS131 | 3 | Use production skills to create the Web Site. |
| 3.33 | 4.89 | 1.56 | CIS131 | 4 | Work with other Team members to follow assigned tasks. |
| 2.67 | 4.89 | 2.22 | CIS131 | 5 | Author the Web Site with a professional tool such as Composer or FrontPage. |
| 2.59 | 4.48 | 1.90 | | | Average for CIS 131 |
| 4 | 5 | 1 | CIS162 | 1 | Install, configure, verify and troubleshoot an application software package. |
| 4 | 4 | 0 | CIS162 | 2 | Demonstrate problem-solving techniques in troubleshooting application software. |
| 3 | 4 | 1 | CIS162 | 3 | Understand the components of application software suites. |
| 3 | 5 | 2 | CIS162 | 4 | Design techniques to correct or prevent problems in using application software. |
| 3 | 4 | 1 | CIS162 | 5 | Design ways to prevent common problems in application software for evaluating support needs. |
| 4 | 5 | 1 | CIS162 | 6 | Work with other students to thoroughly and logically explain how to correct given problems or situations. |
| 3.5 | 4.5 | 1 | | | Average for CIS 162 |
| 4.00 | 4.00 | 0.00 | CIS241 | 1 | Identify and describe the functions of each of the seven layers of the OSI reference model. |
| 2.50 | 4.00 | 1.50 | CIS241 | 2 | Describe data link and network addresses and identify key differences between them. |
| 2.50 | 4.00 | 1.50 | CIS241 | 3 | Define and describe the function of a MAC address. |
| 3.00 | 3.50 | 0.50 | CIS241 | 4 | List the key internetworking functions of the OSI Network layer. |
| 2.00 | 3.50 | 1.50 | CIS241 | 5 | Identify at least three reasons why the industry uses a layered model. |
| 2.50 | 4.50 | 2.00 | CIS241 | 6 | Describe the two parts of network addressing, then identify the parts in specific protocol address examples. |
| 2.50 | 3.50 | 1.00 | CIS241 | 7 | Identify the functions in each layer of the ISO/OSI reference model. |
| 2.00 | 4.00 | 2.00 | CIS241 | 8 | Define and explain the five conversion steps of data encapsulation. |
| 2.00 | 4.50 | 2.50 | CIS241 | 9 | Describe the different classes of IP addresses [and subnetting]. |
| 2.50 | 3.00 | 0.50 | CIS241 | 10 | Identify the functions of the TCP/IP network-layer protocols. |
| | | | CIS241 | 11 | Demonstrate an understanding of the basic networking operations in a business environment. |
| | | | CIS241 | 12 | Setup and install an intermediate to large business network. |

| Start Ave | Exit Ave | Gain | Course | # | Competency |
|------------------|-----------------|-------------|---------------|----------|---|
| 2.55 | 3.85 | 1.30 | CIS241 | 13 | Demonstrate an understanding of networking software and networking equipment. Average for CIS 241 |
| 2.17 | 4.25 | 2.08 | CIS265 | 1 | Define a database and describe the differences between traditional file management systems and database management systems (DBMS). |
| 1.67 | 3.92 | 2.25 | CIS265 | 2 | Describe the relationships established in the DBMS and their relevance to the user community, including schemas and subschemas. |
| 1.58 | 3.83 | 2.25 | CIS265 | 3 | Complete the steps involved in database development, draw dataflow diagrams, establish a data dictionary, and provide process descriptions. |
| 1.50 | 4.00 | 2.50 | CIS265 | 4 | Identify the concepts of the relational model, normalization, dependencies, restrictions, and constraints. |
| 1.50 | 4.17 | 2.67 | CIS265 | 5 | Construct and use a rudimentary relational database by implementing the relational operators involved in SQL or query. |
| 1.50 | 4.08 | 2.58 | CIS265 | 6 | Describe the functions of database recovery, security, and administration. |
| 1.50 | 3.83 | 2.33 | CIS265 | 7 | Describe the various job positions and their related duties relative to the database team. |
| 1.63 | 4.01 | 2.38 | | | Average for CIS 265 |
| 3.50 | 4.50 | 1.00 | CIS281 | 1 | Use classes to effectively organize larger programs. |
| 2.25 | 3.75 | 1.50 | CIS281 | 2 | Create attractive and dynamic Java applets and applications using the AWT and the Swing set. |
| 2.25 | 3.25 | 1.00 | CIS281 | 3 | Create powerful graphical user interfaces for Java programs. |
| 3.00 | 3.75 | 0.75 | CIS281 | 4 | Have the skills necessary to extend the standard Java classes to include essentially any needed capability. |
| 3.00 | 3.75 | 0.75 | CIS281 | 5 | Store data from Java programs on the computers hard drive or diskette. |
| 1.75 | 3.00 | 1.25 | CIS281 | 6 | Become fluent in using collections to store program data. |
| 2.63 | 3.67 | 1.04 | | | Average for CIS 281 |
| Start | Exit | Gain | | | |
| 2.58 | 4.12 | 1.53 | | | Overall Average |