9.1 Minimum Technology Standards for Classrooms and Laboratories

GAVILAN COLLEGE

Minimum Technology Standards for Classrooms and Laboratories

Sponsored by:
Gavilan College Academic Senate

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for
Classrooms and Laboratories

1.0 Introduction

This standards document is the product of a planning effort sponsored by the Gavilan College Academic Senate and was conducted from April 2005 through December 2005. Part I of this effort was led by Alpha Tech Company which conducted detailed workshops and published the first draft of this document. This version of the planning document constitutes Part II of the process and has been prepared by Angus-Hamer Incorporated. The purpose of the planning process is two fold:

1. To establish minimum functional standards as they relate to the use of technology for instructional delivery in classrooms and laboratories.
2. To establish minimum technology standards for classrooms and laboratories which will provide a basis for architectural design requirements for the campus infrastructure upgrades planned for 2005 through 2011.

These minimum standards are intended to assist architects, engineers, planners, faculty and staff in developing programming requirements for the planning phases of the Architectural Design Process for the remodel of classrooms and laboratories. Ultimately these standards spin-off operational procedural documents that support excellent instructional delivery to students.

1.1 Risk Statements:

1. Technology infrastructure is often omitted or inadequately provisioned in new buildings and remodeled buildings.

2. Technology infrastructure deficiencies in classrooms and laboratories immediately impact the quality of instructional delivery to students.

3. The time-value-of-technology information is often only twelve to eighteen months making it difficult to plan very far into the future.

The standards established herein are intended to mitigate these risks by indicating minimum standards and insuring flexibility in classroom and laboratory design. One of the major reasons for omitting technology infrastructure are costs. Gavilan's minimum standards will emphasize flexibility and agility in design which will allow for the capability for a particular function to be added in the future, without the necessity of provisioning all technology features upon construction.

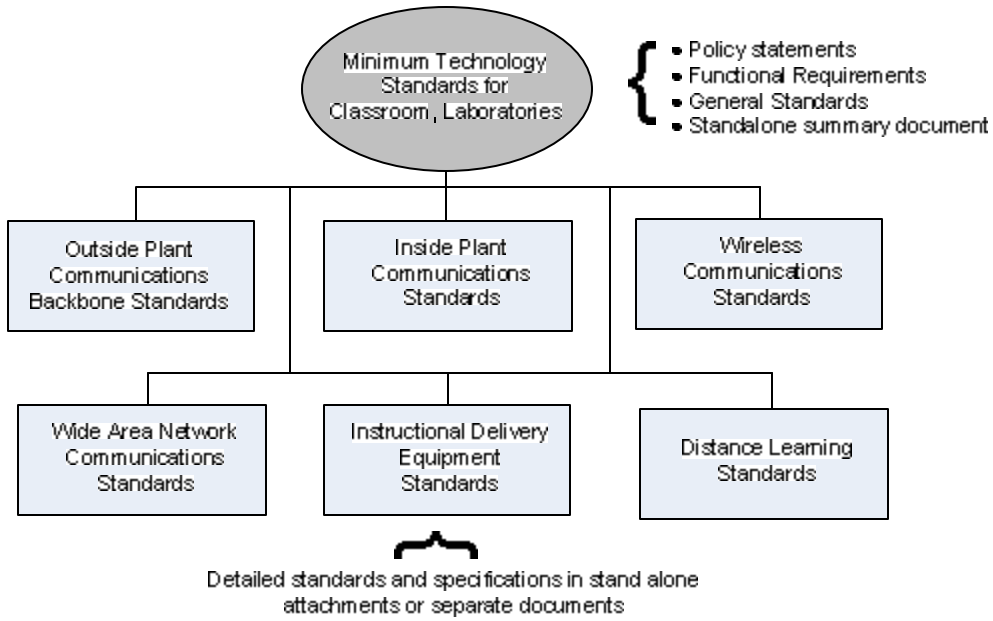
1.2 Planning Hierarchy

This document is a child document to the following planning documents:

1. Educational Master Plan
2. Gavilan College Strategic Plan
3. Technology Master Plan
4. Facilities Master Plan

Likewise this document will evolve and spin-off several more detailed child documents that will be required in the construction documents, construction administration, and maintenance phases of the building process and also as operational documents for instructional delivery. This document makes policy statements, identifies functional requirement, and provides general standards while the child documents yet to be developed will provide detailed standards and specifications. Figure 1 depicts the document hierarchy and suggests some of the child documents that need to be created for the architectural design process or by faculty and staff.

Figure 1 – Minimum Technology Standards Document Tree



1.3 Staffing and Training

Staffing and training as it relates to technology are currently addressed in the Technology Master Plan which is due for an update. Proper staffing and technology training are critical success factors for the operational aspects of the policies and standards described herein; however, the detailed planning for staffing and training should be addressed in the Technology Master Plan.

2.0 Mission Statements

The data obtained from the workshops and planning meetings strongly indicate that faculty, where appropriate, want the ability to utilize technology as a tool to enable excellent instructional delivery. This planning process is intended to directly support the various mission statements currently in place at Gavilan Community College District.

The use of mission statements is designed to ensure alignment and cohesion with key overarching goals and objectives when developing subordinate plans and support activities. The two mission statements cited herein are: 1) the overall District Mission Statement and 2) a draft of the Technology Mission Statement.

2.1 District Mission Statement

In an environment that nurtures creativity and intellectual curiosity, Gavilan College serves the community by providing a high quality learning experience and preparing students for higher education, technical and public service careers, life-long learning and participation in a diverse global society.

Source: Gavilan College Educational Master Plan February 23, 2001

2.2 Technology Mission Statement

Mission: As stated in Gavilan College's Strategic Plan, the Institution values "maintaining excellence in the arts, sciences, and technical/public service programs and promoting student success." In the specific area of technology, Gavilan has committed "To lead in the application of appropriate educational technology" by developing "the community, instructional, and institutional potential of Gavilan College television and distance education," by leading "the region in public access educational television," by promoting "electronic literacy and access," by establishing and maintaining "efficient campus telecommunications and data processing services to support research and development," and by using "innovative technological facilities, resources, and ideas to enhance student learning."

Draft August 27, 2001

3.0 Core Campus Communications Infrastructure Minimum Standards

3.1 Low Voltage Communications Systems

To enable and support technology functions for classroom and laboratories a minimum core campus infrastructure is required. In 1991 the Electronic Industry Association and Telecommunications Industry Association (EIA/TIA) released their joint 568 Commercial Building Wiring Standard, also-known-as structured cabling for uniform, enterprise-wide, multi-vendor, cabling systems. The standard suggests how cabling may best be installed to maximize performance and minimize maintenance. It is based on a hierarchical design that divides cabling into the following subsystems:

1. Data Center(s)
2. Equipment Rooms
3. Campus Backbone Pathways and Cabling Infrastructure
4. Building Entrance Facilities
5. Telecommunications Closets
6. Horizontal Cabling/Inside Wire
7. Work Areas (Classrooms and Laboratories)

All of these subsystems make up the campus' core infrastructure and like plumbing, electrical, heating and air conditioning, low voltage communications systems require appropriate planning and design to insure that the functional requirements for a classroom or laboratories are able to be met. Some low voltage communications systems such as Fire/Life Safety are required by law whereas others are optional. Angus-Hamer has identified the following twelve low voltage communications systems that are usually included in the architectural design process:

1. Data and Digital Media Communications
2. Telephony or Voice Communications
3. Community Access Television (CATV) or Cable TV
4. Closed Circuit Television (CCTV)
5. Building Access Systems
6. Clocks and Bells
7. Intercoms
8. Energy Management Communication Systems
9. Audio Visual Systems
10. Fire/Life Safety Systems
11. Intrusion and Alarm Systems
12. Distance Education and new digital media delivery

3.2 Key Minimum Standards:

1. The remodeled Gavilan College Campus core communications infrastructure must be professionally designed in accordance with EIA/TIA and National Electric Code Standards.

2. As stated earlier structured cabling systems are based on a hierarchal design with work space (classrooms and laboratories) located at the bottom of the hierarchy. This means for a structured communications system to provide proper function in a classroom or laboratory all higher level subsystems must be properly designed, in place or at a minimum provide the capability for technology features in the future.

3. A key functional requirement here is that particular attention must be paid to the availability of pathways for all low voltage communications systems regardless of whether a particular system will be provisioned in a classroom or laboratory. The availability of ample pathways provides the flexibility of being able to easily add a low voltage system to a classroom or laboratory with out significant structural modification those work spaces.

4. Classroom and Laboratory low voltage communications design must be able to support multiple seating configurations for a particular classroom. The technology features must function in the same manner regardless of room configuration. For example classrooms will have to be designed to allow for AV capture and projection equipment on multiple walls within a classroom.

5. The resulting Gavilan College Campus Core Communications Infrastructure must have flexible capability of supporting the following minimum communication types:

    - Communications between staff resource center and classrooms, labs, and offices
    - Communication within classrooms and laboratories
    - Communications to external sources via the Internet
    - Communications between classrooms and laboratories
    - Provide the ability for wireless access networks from classroom and laboratories

4.0 Common Computing Environment

A common computing environment is characterized by a set of standards for central data servers, desktop computing, and software suites. Where possible Gavilan should strive to develop and utilize a standard computing environment based on widely accepted and utilized hardware and software. These standards should be jointly developed by the MIS department and instructional departments. The functions of a common computing environment are:

1. To increase productivity for faculty and students by providing a user interface that is familiar and easy to use
2. To simplify operational training curriculum for equipment and software.
3. To minimize equipment and software acquisition and maintenance costs by leveraging a large economy of scale
4. To utilize equipment and software that students will likely be exposed to at universities, at work, or at home.

Using a desktop or laptop PC as an example, a minimum standard configuration could be developed for the make, model, hardware and base software. These technology decisions will allow for use of volume purchase agreements for both software and hardware and allow for various software images to be developed that will allow for fast rebuild of classroom and lab computers when needed. These standard desktop or laptop builds insure that the students and instructors using these devices always know what to expect from classroom to classroom and laboratory to laboratory.

5.0 Mobile Computing

Mobility has emerged as a key trend to leverage technology to enable the more efficient and effective use of faculty, staff, and student's time by providing secure connectivity to computing resources and information

5.1 Key Minimum Standards:

The following mobile computing technologies all have the common instructional function of providing easy, pervasive access to instructional computing resources thereby making it easier for students to meet instructional requirements and easier for faculty to deliver instruction.

5.1.1 Virtual Private Networking

Virtual Private Networking (VPN) enables faculty, staff, and potentially students to access the campus computing environment from networks external to Gavilan College. Technology is readily available today to allow for secure VPN connectivity from typically high speed connections such as home DSL services. The functionality of being able to connect from foreign network as if internally connected to Gavilan's networks is a basic requirement.

5.1.2 Laptop Use

Provide for the utilization of personally owned (students, faculty, staff, etc.) laptop computers connected to the District network. Security, virus, intrusion, and other issues must be considered so as to protect the District environments from potential harm. Allow those who own their own laptop computers to connect to a protected and segregated District networks that utilize scan-block technology to interface with District services.

5.1.3 Wireless Network Access

Attract and retain students by providing them with increased flexibility to access campus technologies and the public Internet through wireless access and the use of personal-owned laptops. Design and deploy a wireless solution for students and staff that allows unrestricted access to public resources and securely limits and restricts access to District technology-related services to those with the proper access rights.

5.1.4 Web-based Technologies

Increase use and access to web-based capabilities by web-enabling existing applications to the fullest extent possible and ensuring future applications contain web-enabling capabilities. Web-based capabilities depend less on desktop or Operating System dependent applications, thereby increasing the potential audience size of the application, information, or other communication intent. Establish standards surrounding portal-based methodologies for access to applications and information. Utilize role-based authentication strategies such that access can be granted based on categories of users rather than specifically user-by-user. Include access for Education-related as well as student and administrative-related requirements. Establish self-maintained departmental web pages and portals

6.0 Minimum Standards for Classrooms and Laboratories

For the purposes of this document, a classroom provides the capability for instructor led learning. It does not provide for hands-on or interactive participation between the students and technology. The term "Smart Classroom" has been used to describe a classroom which includes technology that allows the instructor to incorporate multi-media content into the learning environment; specifically audio, video, and presentation projection. The multi-media content could be available from a number of sources; the public Internet, campus servers, live TV, DVD/VCR, a computer or a flash drive. All classrooms must have the capability to be "Smart Classrooms" in that they must be designed to have the ability to be "connected" to the infrastructure and services and have a baseline of audio visual presentation capability. All classrooms should be wired to allow for two-way video and audio connectivity should this function be desired between rooms. Laboratories also require connectivity to campus services such as shared application software, printing, publishing, and storing of documents. In an instructional lab environment, there is also the need for controls by the instructor to manage the student environment. They might need to demonstrate something that can be viewed by the students at their workstations or on a centralized monitor. Instructors may also need to monitor what the students are doing at their individual workstations. These actions require the same connectivity required in a classroom, but with more access points. Simply stated, connectivity is the minimum standard for all classrooms and labs. Services, capabilities and specific curriculum needs will change over time and will utilize the common thread of connectivity.

6.1 Key Minimum Standards for Classrooms and Labs

6.1.1 Cabling Infrastructure Standards

The cabling infrastructure connects the work area location to the communications equipment. It is recommended that the District establish standards that adopt the highest quality/capability cabling infrastructure available so that both current and future capabilities can be maximized. Provide a cabling infrastructure that provides 15 to 20 year warrantees so as to delay reinvestment as long as possible. Design should be as specified in section 3.0 Core Campus Communications Infrastructure Minimum Standards

6.1.2 Physical Security

Lectern, equipment mounts, and media cabinets require a level of security that protects equipment and software from damage and theft. This is especially important in classrooms and labs where students may not always be directly supervised. Labs with large concentrations of equipment should be alarmed for physical intrusion. The District must develop procedures for alarm codes and cabinet keys that allow for faculty and staff access 24 X 7.

6.1.3 Classroom Layout Considerations

The layout of the classroom is critical in making it functional for the teacher and the students. Since classrooms will continue to be used for traditional instruction, the front center of the room needs to accommodate whiteboards, chalk boards, screens, open space for displays and experiments, and physical space for the instructor. There needs to be adequate space to use the whiteboard while images are shown on the screen. A 25 foot deep room with 25 seats needs 9 feet in front; a 35 foot deep room with 70 seats needs 11 feet in front, and a 45 foot room with 180 seats needs 15 feet in front.

As technology components are expected to be added to the classroom, the addition of a lectern/media cabinet should be added to house and consolidate the components. The location of the lectern should be planned as the termination point for power and network access and should be placed a the right or left of the room so that it is not in the way of the instructor as s/he moves around or in the way of the images on the screen or the board. The arrangement is similar to slide presentation, where the speaker is at the podium on one side of the room and faces the audience while the visuals are shown on a screen in the center of the room. The instructor can control the images from the lectern or through the use of a wireless mouse and keyboard. The lectern should be of a simple design that allows the instructor to plug in his/her laptop to power, network and projection. Lighting should be designed so that it is parallel to the front of the room to allow for some control for four lighting zones: (1) Back row; (2) Center seating area; (3) Front presentation area; and (4) Lectern lights. Controlled light is necessary for readability on the board when used with computer materials projected on the screen. Prevent ambient room light and glare from washing out images on screens through the use of parabolic louvers. During projection, room light should be bright (30-40 candles) for student interaction, not just dim for note taking. When lights in the student zone of the classroom are turned on, no more than 3-5 foot candles of ambient room light should fall on the screen. This requirement tends to preclude indirect lighting. Reduce ambient sound rather than trying to overcome the noise with microphones. Acoustical treatment should address concerns of reverberation time and ambient noise. Ideally, classrooms should have reverberation times in the range of 0.4 – 0.6 seconds and noise levels should not exceed NC 25 to 30. Quiet ventilation, electronic fluorescent light ballasts. Add generous sound absorbing material to minimize the need for voice amplification in standard size classrooms. When an instructor does need sound reinforcement in a classroom, a microphone and amplifier can be added to the lectern. Mount speakers for computer, CD and television sound in the ceiling near the front of the room. Ceiling mounting helps contain the sound in the room. In large lecture halls ceiling speakers around the room and an amplifier are necessary for voice, CD, TV and computer sound. A wall mounted panel or a control panel on the podium should contain all the controls that the instructor needs to switch between technology components such as the VCR, DVD, or projector and to adjust the room lighting.

Screen sizes for each of the classrooms should be based on room depth and seating capacity. In larger rooms, consider multiple smaller screens or add one or two screens on either side of the one center screen. Sometimes a classroom will lend itself to an additional corner screen at a 40 degree angle. Be sure to plan for screen size changes in the future as newer technologies are

becoming more standard. Screens today are slightly rectangular in a 3 units high x 4 units wide ratio. A new 30% wider proportion of 3 x 5.3 for DVD and HDTV will need to be accommodated in the future.

The college must develop a standard for video display monitors for use when projecting computer, DVD, VCR and other video sources. Some choices are TV Monitors, Flat screens, or data projectors.

A minimum standard for communication outlets must be developed. The following is an example of the of mixture and variety of communications outlets the college should consider: Classrooms should have a minimum of 10 communications outlets per room. Various multifunction communications outlets configurations must be designed and conveniently placed as follows:

1. Minimum of two data jacks per usable wall
2. Minimum of one data jack on any counter space
3. Minimum of one voice jack placed in the front of the classroom
4. Minimum of one data jack placed in the ceiling for a wireless access point
5. Minimum of one AV outlet in the ceiling for projection equipment
6. Minimum of one Coax outlet in the front of the classroom for TV monitors
7. Minimum on one AV outlet in the back of the classroom for future use
8. A 110 Power Outlet must be located within 12 inches of each communications outlet

Note: Not all outlets need be provisioned, but pathways and blank outlets must be available for future use if needed.

6.1.4 Optional and Add-On Classroom Technology

Classroom technology must be as simple, friendly and non-intimidating as possible. Installations must serve the faculty well, yet remain affordable. Develop a "plug-in" approach to the design so that technology components may be added as necessary without having to rework the infrastructure already in place. Enable faculty, outside of class, to prepare text, charts, graphs, and complete desktop presentations and to practice the presentation as often as necessary. Faculty need to be confident that instructional presentations will work in the classroom without assistance and with minimum set up. Rather than outfitting each classroom and each full-time faculty member with a desktop computer, purchase laptops for full-time faculty members and a loaner pool of laptops for those part-time or adjunct faculty members who need one. Most instructors would feel more secure if they could plug in their own laptop and know that everything has been prepared in advance and will work. This would also reduce the number of desktops that would be needed for each physical classroom and each faculty member. The faculty member's laptop can also be used during a lecture to see what is being displayed to the class without the teacher turning around to look at the large screen. A lectern that can double as a media cabinet should be situated to the side of the screen and would contain a port to plug in the laptop and cabling for power, network access and projection.

6.1.5 Minimum AV Standards

AV component needs should be based on classroom use and size. Not every classroom will require all items listed but as a minimum mobile multimedia AV carts should be constructed and available for use in any classroom. The mobile carts must be of high quality with ball bearing wheels with pneumatic tires so as to protect the equipment as carts are moved from location-to-location. Depending on classroom use the following types of AV equipment may be required:

1. Drop-down Screen
2. Video Projector
3. Video Projector Ceiling Mounts
4. Speakers
5. Television Monitor
6. VCR/DVD
7. Lectern/Media Cabinet
8. Wall Control Panel
9. Wireless Control Remote
10. Document Camera
11. All equipment must be capable of assistive technologies such as closed captioning for students with disabilities.

The District must standardize on a suite of AV equipment and develop training programs for faculty and staff. Faculty and staff must be trained and thereby certified to use the District's standard AV suite.

6.2 Laboratories – Additional Considerations

6.2.1 Cabling Infrastructure Standards

Like classrooms it is imperative that lab communications systems are professionally designed as specified in section 3.0 Core Campus Communications Infrastructure Minimum Standards. Because of the large concentration of computing devices in laboratories it is very important to develop modular cabling raceways and modular power systems. The requirement is to provide for adequate connectivity while hiding unsightly cables and power cords. Additionally, all of the connecting cables and power cords need to be secured from students as much is possible.

6.2.2 Lab Design and Layout

Some instructional laboratories have specialized requirements. For example, computer labs have different functional requirement than science or nursing labs. It is important that content experts for each discipline become part of the design team for all labs. The content experts will assist in laboratory design and detailed technical specifications.

6.2.3 Minimum AV Standards

Labs should have the same minimum AV capabilities as classrooms with the consideration that labs tend to have a more permanent workstation layout which allows for a more permanent AV installation.

6.2.4 Lab Consolidation

Where possible and practical the college should create efficiencies and consistencies in laboratories by consolidating physical locations of laboratories so that resources in the laboratories could be better managed, resources for student supervision could be reduced, and student's experience could be made consistent. Lab consolidations are currently being considered by an ad hoc committee chaired by the Vice President of Instruction and Student Services. This committee will be reporting its findings to the Academic Senate in the Spring of 2006. The committee is considering the following:

1. Various lab usage, purpose, and definition
2. Identification of the physical spaces for the laboratories on campus
3. Development of the layout of the physical spaces and development of detailed Lab Standards for each type of Instructional Lab and Open Lab
4. Development of the use and staffing models for each lab.
5. Inventory of general and specialized software used in the laboratories to determine costs and potential economies of scale.

7.0 Distance Education

Distance Education or Distance Learning can be delivered via a variety of technologies. For example departmental web pages and portals are simple forms of providing access to information and the ability to transmit information from a distance. The more complicated and more expensive form of distance learning is characterized by two-way video and audio communication between a central location and a remote location. These sessions are instructor led from a studio/classroom that has specialized equipment to allow for remote student interaction as though the student were present in the classroom with the instructor. Often these sessions are recorded and can be streamed via web casts. Other forms of instructor led video distance learning are one-way communications such a feeds to local cable television. Some cable television sessions allow for phone calls into the classroom. There are many possibilities and combinations of distance education.

Specialize studio/classrooms and video teleconferencing rooms require customized design on a case-by-case basis depending on their size and intended function.

Glossary of Terms

Architectural Design Process is a structured process that parallels a building or remodel project from inception to construction. The phases are as follows:

1. **SCHEMATIC DESIGN PHASE**: Preparation of conceptual design options, which depict the Client's site, building (space) program and budget, consisting of: site plan, conceptual floor plans and exterior elevation(s) to convey materials and three-dimensional solution(s).
2. **DESIGN DEVELOPMENT PHASE**: Preparation, from an approved Schematic Design concept (described above), of the various components of a single design solution for a Client's project, consisting of: site plan, dimensioned floor plan(s), building sections(s), exterior elevations, roof plan.....together with engineering disciplines, showing structural, mechanical, plumbing and electrical systems, which fix and define the chosen solution as to finishes, systems, scope & budget.
3. **CONSTRUCTION DOCUMENTS PHASE**: Preparation, from the Client-approved Design Development Phase submittal, of the detailed working drawings and specifications necessary to bid and construct the approved project. Documents consist of: detailed site and building plans, exterior & interior elevations, roof & reflected ceiling plans, building & wall sections and details, structural foundation & framing plans/schedules/details, HVAC plans, plumbing systems plans and schedules, lighting/signal & communications plans, schedules & details and related information to obtain competitive bids and construct the project. An updated budget and schedule for construction are included at this Phase, as well as approval-agency permitting (i.e. State or local Building Department plan-check/approval).
4. **BIDDING PHASE**: Advertisement and/or solicitation of contractor & subcontractor bid-quotes for the construction of the project that was approved by the Client, including receiving & tabulation of bids, recommendation of lowest responsible bidder-award and approval (by Client) to award a construction contract.
5. **CONSTRUCTION PHASE:** Administration of the construction contract from start to completion including periodic field-inspections to ascertain the scope, quality and requirements of the construction documents are met by the contractor/subcontractors. This Phase normally includes field observation, monthly reporting (progress and any deviations), review & certification of contractor's monthly payment requests, as well as interpretation of the requirements of the contract documents and any dispute resolution issues during construction. Upon substantial completion of the construction, a thorough inspection is made to ascertain compliance with construction documents and design-intent and the development of a Final 'Punch List' (incomplete or non-complying work) for contractor's remediation/completion. Final project closeout is performed, once construction completed, so Client-occupancy may be achieved and all record documents are furnished to Client; no liens are recorded against the project and final contractor payment is made.

Distance Learning or Distance Education is the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies, new digital media and other forms of learning at a distance.

Guidelines – Unlike polices guidelines are recommendations. A policy can be transformed into a guideline by simply replacing the word "must" with the word "should".

Instructional Laboratories are used to teach the use of specialized equipment and/or applications in the room. Regular class times are scheduled in these labs. Some require the students and the instructor to interact with specialized hardware and software as in the Nursing Lab, the Digital-Media Lab, and the Network Lab. Other laboratories such as the Career Transfer Center utilize specialized software and allow the students to either drop in or schedule appointments for career counseling.

Minimum Functional Standards are the minimum technology features required in every classroom and laboratory that faculty must have to deliver excellent instruction to their students.

Open Laboratories, sometimes referred to as "drop in" labs, are generalized laboratories for students that allow the use of basic software programs and research. The Library is an example of an Open Lab that is available to every student.

Policies are management instructions indicating a predetermined course of action, or a way to handle a problem or a situation. Policies are high level statements that provide guidance to faculty, staff, students and contractors who must make present and future decisions. Policies are written generalized requirements that must be communicated. Policies are mandatory and should be considered organizational law.

Scan and Block Access Systems are combinations of hardware and software solutions that allow for un-trusted laptops and other mobile computing devices to be scanned for security compliance prior to being allowed on internal organizational segments. Non-compliant devices such as those that do not have up-to-date virus protection and operating system patch levels are quarantined on a "safe" network segment. This technology is in its infancy, but due to necessity the industry is reacting quickly with many solutions emerging.

Technology Standards – While policies provide general instructions, standards provide specific technical requirements. Like policies standards require compliance. Standards cover details such as implementation steps; systems design concepts, interface specifications, algorithms, calculations, drawing details and other specifics.

Wet Labs are special purpose labs such as science labs that are plumbed for water, natural gas, and emergency showers or eye washes. These labs increasingly integrate computer simulation to augment or replace certain instructional experiments.

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