Educational Technology Guidelines for Schools and Colleges of Optometry

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I. INTRODUCTION

The beginnings of what was then called the Informatics SIG dates back to 2000. At the annual Academy meeting in Seattle that year, Jerald Strickland (University of Houston College of Optometry) asserted that a need existed to establish educational technology guidelines for optometric educational institutions. He argued convincingly that the ASCO Educational Technologies SIG--more so than any other body--is comprised of people with the relevant expertise and is, therefore, the appropriate authority to establish and disseminate those guidelines.

Accordingly, the SIG took up the challenge in subsequent meetings. Volunteers were solicited to write draft guidelines in areas of their own expertise, and over the next several years, a draft collection of guidelines began to

emerge. This document is the first published collection of those guidelines. It is expected to be revised and updated periodically in tune with the evolution of electronic technologies and instructional practices. In order to ensure that it remains current, review of the document and a call for updates will be part of the annual ASCO Educational Technologies SIG meeting, most recently in 2010 at the American Academy of Optometry meeting in San Francisco.

Several advantages for optometric educational institutions are envisioned from the application of these educational technology guidelines. Perhaps foremost is the value of guidelines in any environment—guidelines are *guidelines*, less than absolutes but more than mere recommendations. Adherence to guidelines promotes a general consistency in goals and practices and encourages peers to move in the same general direction. In our context—optometric education—guidelines will encourage such practices as the sharing of instructional materials among institutions and ultimately could result in such developments as the interchange of electronic patient-based data for research purposes.

The level of institutional efficiency will be raised by attempts to meet these guidelines. Local administrators seeking to allocate scarce resources can use these guidelines as an aid in the decision-making process; accrediting bodies can use them as benchmarks in assessing individual institutions; and faculty in all of the schools and colleges adhering to them will be more likely to speak the same educational technology language as their peers.

This document is organized by topic/subtopic in an attempt to facilitate interpretation and application at the local level. The authors recognize the fact that not every institution will be able to meet every standard immediately, and in fact, there may be powerful local arguments against meeting some guidelines. Furthermore, schools are not expected to meet every standard precisely—they may exceed the standard in some areas and lag behind in others. With the exponential growth in computing capabilities, it is difficult indeed for any organization to be in complete accordance with these guidelines at any given time. Accrediting bodies should consider all local circumstances when attempting to apply these guidelines to particular institutions. We also recognize that this is not the complete list of every desirable educational technology standard; it is only the list thus far. The ASCO Educational Technologies SIG will revise existing guidelines and produce new ones as the need arises.

The ASCO Educational Technologies SIG offers the following educational technology guidelines with the hope that each institution will use them to help guide in the development of its own electronic infrastructure.

The very useful website Educause (http://www.educause.edu) tracks the top issues in Information Technology (IT). Here is the latest list (accessed September 19, 2011), which is pertinent to the remainder of this document:

Top-Ten IT Issues, 2010
1. Funding IT
2. Administrative/ERP/Information Systems
3. Security
4. Teaching and Learning with Technology
5. Identity/Access Management
6. Disaster Recovery / Business Continuity
        Governance, Organization, and Leadership
7. Agility, Adaptability, and Responsiveness
8. Learning Management Systems
9. Strategic Planning
10. Infrastructure/Cyberinfrastructure

II. BUDGET, ADMINISTRATION AND PLANNING

The issues of adequate funding, effective management, and strategic planning are consistently among the biggest challenges facing those concerned with the role of Information Technology (IT) within higher education. As IT becomes an ever more essential part of the educational enterprise, it must be viewed as an important strategic asset and not just a cost-center. Increasingly, students and faculty use IT resources and support as among the factors influencing their choices of schools. At the same time, it is difficult to support a complex and rapidly changing infrastructure in the face of often flat or declining budgets. Consequently, it is essential that 1) planning for IT be closely aligned with institutional goals, 2) IT leaders work carefully with multiple constituencies to achieve appropriate value for the investment in IT, and 3) the budget process provide flexibility, stability and adequacy of funding to ensure reliability of operations and the ability to innovate.

The following are among the important guidelines to consider in assessing the adequacy of funding, planning, and effective administration of IT infrastructure and operations within the optometric education community.

A.   Members of higher administration and other key campus constituents should understand the value of IT in supporting the strategic goals of the organization and can point to examples of effective or potential uses of IT in teaching, learning, research, and clinical services.

B.   Key members of the campus community are familiar with IT services available on or off-campus and should have designated expectations for availability, currency, and performance.

C.   Key members of the campus community should rank essential resources and services in terms of value to the institution and risk if expectations are not met.

D.   Key members of the campus community should be aware of current expenditures in IT, the amount required to meet service-level expectations, and possible gaps between the two funding levels.

E.   Campus and IT administrators should explore possible cost-savings initiatives, reallocations of funds, and/or reorganization of services in order to achieve greater efficiencies in operations.

F.   Planning, administration, and budgeting processes should be sufficiently flexible to adjust to changing campus needs and priorities as well as new initiatives.

G.   The IT planning process should include substantive input from all relevant constituencies (including students, administration, librarians, research and clinical faculty, and IT and other support staff).

H.   The planning and budget process should incorporate measures of evaluation and assessment to ensure effective progress towards goals, objectives, and service expectations.

I.   The Chief Information Officer (CIO), or comparable top IT administrator, should interact regularly with top administrators and other key constituents and should be effective in spanning boundaries and staying abreast of diverse campus initiatives in which information technology might play a role.

J.   There should be a broadly representative advisory group and/or steering committee that ensures effective oversight of technology planning, decision-making, implementation, and overall direction.

K.   Regular and effective communication should be maintained between the IT organization and members of the campus community relating to routine operations and unexpected technical problems as well as short- and long-term projects and initiatives.

[Note: Specific data relating to the range of expenditures, practices and models for IT Financing and Management at a representative sample of colleges and universities are available through the annual EDUCAUSE Core Data Service *Summary Report*.

III. HARDWARE

In general, each institution should make available to faculty, staff, and students the electronic and information resources necessary to support its teaching, research, administrative, and service missions. Adequate personal computers and peripherals are essential for all faculty, students, and staff; reliable network servers for the web, databases, shared resources, storage, and backups are critical infrastructure requirements.

The object of this section is to ensure that faculty, staff, and students have access to modern hardware in order to maximize productivity, creativity, and learning. It is recognized that additional equipment to that listed below may be required depending on size, speed, and memory requirements for specific applications. Despite the need for flexibility in choosing equipment, there is still value in encouraging schools of optometry to provide support for their faculty, staff, and students with hardware that meets the following guidelines.

A. Workstation Guidelines: The Educational Technologies SIG <u>recommends</u> that hardware meets these guidelines (for desktops, laptops, or tablet computers):

1. Faculty

a.   CPU: The latest generation at the time of purchase Intel, AMD, or similar processors

b.   Ample hard drive storage or access to cloud (server) storage

c.   Ample RAM and video RAM

d.   Optical or cloud backup capability

e.   High resolution display

f.   Wi-Fi connectivity (Ethernet and/or encryption may be required for certain secure operations, such as electronic health records)

g.   Webcam and audio port for speakers or headsets for conference calling using Skype or similar service

h.   Networked or dedicated b&w laser printer or equivalent, minimum, 15 PPM.
Access to a networked color printer.

l.   Latest USB connectivity

m.   Pointing device such as optical mouse with scroll, or touch screen

n.   At least a three-year warranty on workstation CPU, with a five year minimum replacement schedule to minimize IT support costs

2. Staff

Because of processor speed demands in cloud computing, staff workstations and printers should be adequate to perform their functions. Administrative professionals do not necessarily need less sophisticated workstations than faculty or IT staff. Access to a networked or dedicated black and white or color laser printer is still recommended, though increasingly digital scans and e-signatures are replacing hard copy and faxes, even for prescriptions.

3. Students

Students need ready access to networked workstations in order to use email, instructional modules, do web research, and use productivity tools. Computers available for student use should be sufficiently powerful to access and use electronic information resources and electronic health records (EHRs). They also should have the capability to allow for file backup and portability, including cloud computing. Students are increasingly required to provide their own laptops and tablets, but should be cognizant that tech support and their own time will be consumed if their laptop is not modern with software updates maintained. Computers and printers should be of significant numbers and quality to enable students to have ready access to equipment without waiting. Currently, a ratio of at least one printer to each classroom of students is recommended -- more if classrooms are larger than 100 students.

As most optometric instruction is now delivered digitally, schools and colleges of optometry may recommend the purchase and use of handheld or portable devices by faculty and students. Such computers are used in the classroom to access information over the Internet and present grand rounds, in laboratories to run simulation software, or to conduct scholarly research for assignments. In addition, it has become standard practice for clinicians to take advantage of handheld devices (smartphones) to access information such as contact lens and drug availability, interactions, and pricing, differential diagnoses, and laboratory test interpretation. Tablet or smartphones could also be used to evaluate students in the clinic. Often, the responsibility for purchase of these handheld devices is that of the faculty member or student.

For times when these laptops are being serviced, the institution should therefore make available to faculty and students loaner laptop and/or tablet computers to support its teaching, research, and service missions. State-of-the-art mobile devices are critical to all faculty and students engaged in didactic and clinical instruction and research, but will usually be their responsibility to purchase and maintain.

Student-owned laptops and smartphones are high-maintenance equipment. A strategy should be in place to minimize the maintenance impact on hardware and software support personnel and to enhance equipment reliability. The organization should clearly state what it will and will not do in this regard. Some institutions have implementing standard "builds" for all student equipment in order to minimize variations in configuration and to facilitate reinstallation of software and operating systems. Automatic operating system updates and reliable virus protection should be installed, and use of anti-spam software, anti-spyware software, and firewalls should be required.

Among other issues to be considered concerning student laptops, tablets and smartphones are:

·   Do the colleges purchase the computers and add the cost to tuition?

·   Can students choose from the major platforms (Windows PC vs. Mac OS, for example)?

·   Can a previously purchased laptop, tablet, and/or smartphone be approved for use?

·   Should the specification be limited to specific brands of computers to reduce reliance upon IT staff?

·   Is there a secure (encrypted) wireless network, or will Ethernet connectivity be required for security of test-taking, etc? Note that security for electronic test administration can only be assured with locked down computer labs that require an administrator password to install software. Inexpensive net books can be used for this purpose.

1. Laptops

The standard for laptop computers is essentially the same as for desktop computers, with the exception of features that are laptop-specific, such as a wireless network card, secure carrying case, sufficient battery capacity, etc.

2. Tablets and Smartphones

State-of-the-art mobile devices are increasingly critical to all faculty and students. Such devices should be of sufficient power to support basic calendar and contact management functions plus clinical software applications. Wireless connectivity is essential for efficient information exchange.

C. Electronic Classrooms

The school or college should have available classrooms wired and equipped for use of electronic instructional materials. Classroom equipment should include at least one networked faculty-caliber workstation, Blu Ray/DVD player, document camera, data projector, screens, and sound system. Increasingly, classroom capture of a video podcast is a reasonable expectation for student absences, continuing education, and test review purposes.

D. Instructional Development Lab

The faculty and students should have ready, communal access to tools which are either too expensive or too sophisticated to be assigned to individuals. Such tools can be essential for faculty instructional and research activities. Suggestions for inclusion in this category are: networked dye-sublimation (publication quality) printer, poster printer, networked color laser printer, video capture equipment, slide scanner, high-end desktop publishing software, and an adequate number of high-end workstations for use with this equipment.

E. Hardware Replacement

The school or college of optometry should have in place a sound purchasing program for the replacement of the institution's hardware. All equipment should be on a life-cycle replacement schedule, and purchasing staff should demonstrate knowledge of faculty and institutional requirements in making purchasing decisions. Recommended hardware replacement cycles are at least every five years for desktops, laptops, printers, servers, and backup storage devices.

F. Other Issues

1.   Faculty, staff, and students should be kept aware of growth, changes, and improvements to the school's hardware infrastructure.

2.   Secure mass storage accounts should be available for faculty developing complex and data-intensive applications or instructional modules, and should be available remotely (as part of the cloud)

3.   Adequate portable equipment should be available to the faculty for the purpose of using for lectures or presentations at remote locations.

4.   A comprehensive, up-to-date hardware inventory should be maintained.

5.   Videoconferencing equipment should be available at near real-time speed and high-definition video.

6.   The entire enterprise should be wireless-enabled.

IV. SOFTWARE

Adequate productivity and instructional software is essential for the institution to achieve its instructional goals and to perform business functions effectively. Appropriate development tools for faculty teaching, research, and service as well as for development of instructional modules are essential and include, for example, such specialized applications as video capture, data modeling, statistical calculation, web and desktop publishing, and bibliographic software.

In addition to the software guidelines listed in the categories below there are a number of other issues which should be considered. These issues include:

·   The organization should have an adequate budget for the purchase, upgrade, and replacement of software. The recommended replacement schedule to minimize tech support for aging equipment is at least every five years.

·   The organization should have a policy in place to discourage software piracy by faculty, staff, and students.

·   The organizational climate should encourage personnel to apply software in innovative ways, including the use of "open source" software and educational technology (such as Moodle or Sakai).

·   The organization should have educational site licenses for software used by faculty, staff, and students in order to keep individual purchase prices as low as possible. Ideally, the institution will provide essential software free of charge, with, at most, a minimal charge to recover the cost of the media.

A. Operating Systems for Workstations and Laptops

The most current version and service pack of Microsoft Windows or Mac OSX should be used. While some users may prefer it, Linux is not generally recommended due to the lack of plug and play, limited hardware support, and the need to use command line language at times.

B. Productivity Software for Workstations and Laptops

1. Every workstation should have a productivity package containing current releases of software with the following functionality: word processing, spreadsheet, presentation, email, database, and web editing or web development, and access to electronic health records.

2. Workstations should contain or have easy access to image editing software, such as Adobe Photoshop.

3. Workstations should contain or have access to Adobe Acrobat or similar document creation software.

4. Every workstation should have a stable Internet browser.

C. Educational Software for Workstations and Laptops

While well-defined guidelines may be stated for educational technology hardware and for administrative, clinical and library software, the definition and specification of educational software for the optometric profession is more difficult to accomplish.

The institution should make available to faculty a wide range of software to support its teaching mission. Should the institution require that students purchase laptop or tablet computers, educational discounts and software should be made available to students as well.

1. Definition of educational software

a.   Learning Management System software

Portal systems such as Blackboard, Moodle, or Sakai allow the instructor to build a course-specific web site with course syllabus, announcements, assignments, lecture notes or multimedia presentations, links to related sites, chat rooms for students to work cooperatively, email to respond to student questions, and grade posting.

b.   Multimedia slide presentations and Podcasting

1.   Images should be in a universal cross-platform format (such as JPEG and videos in QuickTime MOV or Windows Media Player MPEG format). Classroom-capture of synched audio with video should be simple and straightforward to use with standard lectures formats like PowerPoint, Keynote, or Prezi.

2.   For self-paced multimedia tutorials, commercially-available software or Internet-based software should be used when appropriate.

3.   Animated or virtual-reality demonstrations, especially for clinical procedures, are increasingly becoming the norm, including in Part III of the NBEO board exams

In addition to presenting multimedia slide presentations, faculty should be encouraged to create animated demonstrations with cross-platform animation and/or authoring tools. These tools provide an extra degree of sophistication and interaction over static images or pre-canned videos.

4.   Demonstrations of visual-perceptual phenomena

In vision science courses, visual phenomena should not only be discussed but demonstrated when possible. Ideally, this should be accomplished by the simplest approach – either multimedia slide images, transitions between such slides, video clips, or animated presentations. However, when these options do not provide the degree of control needed to produce the perceptual effect in question, custom software may need to be developed. Software should be developed or accessed from the web using cross-platform programming languages such as Java if possible.

5. Laboratory experiment software

Laboratory software should encourage students to participate as subjects in short experiments. If software cannot be purchased to do so, custom software should be accessed from the cloud.

6. Simulation software

Simulation software comprises three categories of software: theoretical simulation, instrument/examination simulation, and patient case simulation. Theoretical simulations could include optics ray tracing, neurophysiology and optometric procedures simulations. Commercial software already exists for many of these applications and for optometric/ophthalmic applications.

2. Software development cost-sharing and open-source educational software

The production of small multimedia and software projects is possible at each school or college of optometry without undue cost, resources or manpower. However, larger projects require more resources than can be provided by any single college. To facilitate the generation of more sophisticated software projects, institutions should form cooperative partnerships to share costs and share expertise. External funding should be sought if possible.

Many institutions own software developed by their faculty and used solely within their institutions. Colleges of optometry should be encouraged to share such applications with other institutions, with the program source code openly available if it does not violate copyright laws. Creative Commons attribution, share-alike licensing is ideal.

ASCO has initiated a software sharing web site for optometry education. Members of the ASCO Educational Technologies SIG are a central resource for shared educational software. Their website can be accessed from http://www.pacificu.edu/optometry/ce/asco/.

Faculty members are encouraged to contribute their own locally-developed instructional software to the SIG's archive and to borrow freely from the archive for use in their own teaching.

D. Software for Tablets or Smartphones

Students and faculty should have access to current coding information, drug information, diagnostic information, and database searching. The development of applications (apps) should be afforded the same support and recognition as is provided for the development of software for workstations and laptops, as discussed in section XII.

V. NETWORKING

Optometry programs should have adequate communication and data transfer capabilities to meet their objectives efficiently. Although each school has its own specific mission statement and list of goals and objectives, it is reasonable to assume that each program should address both educational (classroom) and clinical technology infrastructure. Each of these general objectives has its own networking requirements, and each will have different levels of emphasis which will affect the level of networking resources needed. The following section will describe, in general, several of the network requirements for each objective.

A. Educational Technology Infrastructure

The educational responsibilities and challenges of optometry institutions are driving the need for greater efficiency in order to cover greater amounts of material and deliver it to broader audiences. In many ways we are looking to technology to attain these efficiencies.

Education of graduate students and residents has all of the standard educational requirements above and frequently is more likely to need multi-center communications. Their parochial areas of study often benefit from increased communication with peers and content specialists at other institutions. Also, multi-center research often requires secure data input and manipulation of a common database from different geographical locations.

As the profession expands, optometric institutions are looked to as a resource for continuing education of optometrists, para-professionals, interdisciplinary collaborations, political organizations (AOA and state associations), and public health information for the community. This may require a public web presence, as well as a secure network system for controlled access to instructional materials. In addition, if an institution wishes to develop an on-line continuing education program or other entrepreneurial ventures, a system capable of securely processing financial transactions would require an additional level of security.

B. Clinical Technology Infrastructure

All clinical programs use some sort of office management software for appointments, billing, and perhaps medical records. Such systems have already faced the challenges of complying with HIPAA and other medico-legal requirements for protection of personal patient data. These networks must be kept separate from other institution networks either through independent servers or with sophisticated software firewalls.

Telemedicine patient care is an area of potential growth. Therefore, videoconferencing and iInternet patient logs and iInternet compatible diagnostic devices should be considered.

Furthermore, as eye care programs add Internet financial services such as on-line ordering, sales, and payments, especially when coordinating multiple clinical facilities, an additional level of security will again be required.

Clinical care resources pose a new requirement for internal networks as evidence-based eye care is incorporated into our delivery of patient care. If this technology is to be adopted a multi-user network will need to be developed to provide real-time access to clinical care databases. Arguably each exam room should have access to clinic care guidelines and databases such as drug references and clinical / laboratory diagnostic norms. Many institutions are installing dedicated terminals for electronic health records in the exam rooms in their clinics.

C. Remote Access

Having remote Citrix/VPN access to the network should be available. Security precautions are highly critical in the remote environment.

11. Infrastructure—General Requirements

Networks simply will not run unless they are mounted on appropriate equipment. Those schools that are part of larger institutions generally will find that the institution's networking resources are more than adequate to meet their needs. Schools of optometry should have category 6 wiring installed and a sufficient number of wireless transmitters appropriately spaced for seamless and reliable wireless transmission. File servers should have fast processors and should be equipped with an ample amount of RAM. A sufficient number of fast drives should be installed to handle the enterprise's data with an appropriate RAID level for data security and reliability. Redundant power supplies should be employed to prevent loss of data and functionality during power outages. Incremental data backup should occur daily, with full backups scheduled weekly and monthly. Monthly backup media should be archived for a minimum of six months before reuse. Database servers should be appropriate to meet their purpose, with all necessary hardware, software, and security installed to meet industry guidelines.

While there are no recognized guidelines for reliability or uptime, institutions should strive for a goal of 99.97% uptime, and any downtime for maintenance and upgrades should be scheduled for periods when it is least likely to be disruptive—weekends, evening, or during breaks in the academic year. This goal is easier to reach with cloud computing relying on already redundant external servers.

VI. SECURITY

A. Information Security
The "security" of any information system is comprised of three essential components: confidentiality, integrity, and accessibility. Information must be readily available to those authorized to access it (accessibility), inaccessible to all not authorized to access it (confidentiality), and protected from destruction and/or unauthorized alteration of any kind (integrity). Electronic information and communication systems have evolved more rapidly than mechanisms to effectively protect the confidentiality and integrity of the information they convey. Rapid changes in the number, variety, and nature of hardware, software, and network/communication protocols requires that any guidelines for security be flexible, extensible, and accommodate a variety of different network, server, and client platforms. Security is inescapably inconvenient. Compromises unique to each school or college must be made to balance the security of sensitive and mission-critical electronic information with operational efficiency and attainment of its academic and clinical missions.

B. Technological Neutrality and Differences of Administrative Structure

Our schools and colleges of optometry differ widely in organizational structure and technological infrastructure. While some may be responsible for acquisition, maintenance, and management of their computer networks and information systems, others may rely upon a larger university to provide such equipment and services. Accordingly, there is a wide range in the degree of influence administrators of our schools and colleges of optometry have in specifying equipment and/or policies regarding use of information technology on their respective campuses. ASCO guidelines for information security must allow for such differences.

C. Flexibility and Extensibility

The rapid evolution of information technology, its vulnerabilities, and exploitations of those vulnerabilities makes it impossible to assure that any approach to electronic data security that is effective today will maintain its effectiveness for any extended period of time. For example, guidelines developed even a year or two ago would have been unlikely to account for the unique security vulnerabilities presented by the variety of wireless local area networks now ubiquitous within many hospitals, optometric clinics, private practices and university campuses. General guidelines for information security must provide for frequent, periodic expansion and revision as new technologies evolve and are implemented within our schools and colleges.

D. FERPA and HIPAA Compliance

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) and the Family Educational Rights and Privacy Act of 1974 (FERPA) are two examples of federal legislation that explicitly define ongoing responsibilities of every school and college of optometry to protect the personal information of all individuals to whom they provide clinical or academic services. Other federal and state legislation extends similar protection to sensitive information of employees. This protection extends beyond that related to the invasion of privacy and malicious attacks against organizations and individuals. It also includes protection from the inadvertent destruction or corruption of information due to failures of hardware or software, losses of information due to carelessness, ignorance, or accident on the part of authorized users, and those resulting from natural disasters such as fire, flood, earthquake and unexpected surges or loss of electrical power.

All schools and colleges of optometry, insofar as they provide clinical optometric services, must comply with the Health Insurance Portability and Assurance Act of 1996, including its "Privacy Rule" (see Section X.A below) and its "Security Rule," which had a compliance date of April 21, 2005 for most covered entities.

1. Security Essentials

The goals of information confidentiality, integrity, and accessibility may be achieved through a combination of administrative, physical and technical safeguards. This is the general approach taken by the HIPAA Security Rule.

1. **Administrative safeguards** include appropriate policies and the enforcement of those policies regarding the identification of sensitive and/or mission-critical electronic information, information security education for employees and students, identification of individuals requiring access to specific classes of information (e.g., "need to know") and/or network facilities, storage and disposal of electronic data and storage media, emergency procedures, disaster response and recovery plans, reasonable and equitable sanctions and appeals processes for violations of security processes, etc.

2. **Physical safeguards** include the physical location, protection of, and limitations of access to server and client computers, gas-based (vs. water-based) fire protection systems, simple solutions to restrict view of PC screens to users (occluding view to bystanders), uninterruptible power supplies for servers and client computers containing mission-critical data, different geographical locations for backup data, etc.

3.   **Technical safeguards** include antivirus and anti-spam software, intrusion detection software, software to remotely control and push operating system and other software updates to network clients, network monitoring software, etc. Any acceptable information security solution will involve a different blend of administrative, physical, and technical safeguards appropriate to the specific needs and characteristics of the individual institution.

F. Specific guidelines:

Every school or college of optometry should:

1.   Demonstrate full compliance with the HIPAA Security Rule with regard to all electronic protected health information (EPHI).

2.   Produce and maintain an up-to-date, comprehensive inventory of confidential and/or mission-critical electronic information stored within or accessed by its electronic information systems. This would include systems with access to confidential employee data, all clinical data covered by HIPAA, student grades and other confidential student information,

3.   Conduct and document an annual inventory of known vulnerabilities of all identified confidential and mission-critical.

4.   Establish and maintain, with annual revisions, a comprehensive summary of the administrative, physical, and technical safeguards maintained to protect all confidential and mission-critical electronic information.

5.   Establish and administer a program of information security education for all employees and students having access to confidential and/or mission-critical electronic information.

6.   Demonstrate a record of equitable enforcement of all information security policies.

7.   Establish and maintain a reasonable disaster response and recovery plan for all identified confidential and mission-critical electronic information.

8.   Maintain accurate and comprehensive records of any and all breaches of the security of identified confidential and/or mission-critical electronic information; records should include the exact date and time of the breach, the method by which the data was compromised, and the school or college's response to the event.

VII. WEBSITES

Website guidelines are necessary and important for assuring compliance with the U.S. Government section 508 (requires all federal web sites be fully accessible to the disabled) concerning accessibility for those with disabilities. In addition these guidelines are also to help promote a professional image of the optometric profession and the schools and colleges of optometry, through the web presence of our institutions.

A. Guidelines

1.   Comply with W3C 2.0 guidelines (http://www.w3.org/TR/WCAG20/)
2.   Contain link to national optometric organizations (AOA, AAO, ASCO)
3.   Include logo of the institution and logo of ASCO.
4.   If additional plug-ins or players are required for a site, provide a link.
5.   Give each page a unique title.
6.   Provide information about when page/site was last updated. Avoid broken links.
7.   Have a site map/index.

8.   Link to contact webmaster.
9.   Keep information up to date.
10. Support multiple browsers including recent older versions.
11. Cross-platform compatible.
12. Do not require a high-speed connection.
13. Maintain a professional appearance.
14. Provide text equivalents for all non-text content.
15. Include properly referenced source information and data if relevant.

B. Additional Suggestions
1.   Omit non-essential words.
2.   Avoid scrolling pages, or at least put the most important information at the top.
3.   Use only one to three words in links.
4.   Indicate what site is being accessed and how to return to the home page or navigate further within the site.
5.   Do not use frames.
6.   Avoid server-side image maps.
7.   Use descriptive links, rather than "click here"
8.   Provide text only versions when necessary (e.g., JavaScript, Flash, etc.)
9.   Use high contrast for text and backgrounds.
10.   Use relative font sizes rather than absolute.
11. Avoid "bold" text attribute, use headings instead.
12. Use meta tags to describe the page content and provide indexing keywords.
13. Use graphics sparingly and sizes small enough to load quickly (~25K).
14. Check links periodically for integrity.

C. The World Wide Web Consortium Guidelines

"The primary goal of these guidelines is to promote accessibility. However, following them will also make web content more available to *all* users, whatever they are using (e.g., desktop browser, voice browser, mobile phone, automobile-based personal computer, etc.) or constraints they may be operating under (e.g., noisy surroundings, under- or over-illuminated rooms, in a hands-free environment, etc.). Following these guidelines will also help people find information on the web more quickly. These guidelines do not discourage content developers from using images, video, etc., but rather explain how to make multimedia content more accessible to a wide audience."

VIII. ONLINE DISTANCE LEARNING

It is not required that institutions choose between in-person and online courses. Some of the most effective ways to teach are with hybrid courses that mix the two educational modalities. Because of this, schools and colleges of optometry should strive to:

A. Develop and implement hybrid or fully on-line courses in the optometric curriculum for its students. These required courses for credit in the curriculum will allow seminars, clinical grand rounds and optional type courses to be offered to students in clinical rotations, particularly off campus. The goal is to combine clinical training while continuing didactic education in the clinical years.

B. Develop and implement a policy that all academic and clinical courses in the curriculum contain a Web-assisted component to allow registered students access to all course information at the time and place of their choosing in addition their scheduled lectures.

C Develop and implement on-lines courses for its graduates and other professionals in the United States and outside the country, to foster the goal of life-long learning. These on-line courses should include continuing education courses and programs, advanced degrees such as residency, certificates, and other graduate type programs.

IX. ACCESS TO INFORMATION

The following guidelines draw heavily from both the Association of American Medical Colleges Medical (AAMC) Informatics Objectives and the Information Literacy Competency Guidelines for Higher Education drafted by a multi-association task force comprised of the American Association for Higher Education (AAHE), Middle States Commission on Higher Education (MSCHE), Association for Library and Information Science Education (ALISE) and the Association of College and Research Libraries (ACRL). These guidelines for optometric education also refer to a 1999 report from the National Research Council, cited in the ACRL Guidelines.   All three sources are similar in important respects. Because information technology is changing so rapidly, they make a point of distinguishing between knowledge of computer technology and information literacy or fluency to denote a higher level of competency. Additionally, they emphasize the need to develop life-long learning skills, or the ability of individuals to apply new information skills and knowledge to a continually growing base.

Schools and colleges of optometry should also conform to the Association of Vision Science Librarians' *Guidelines* and *Guidelines* for vision science libraries. The *Guidelines* present minimum levels of staffing, services, budget, electronic resources and technology that should be provided by a library; *Guidelines* provide information of a quantitative nature and are intended to be used in conjunction with the *Guidelines* in order to obtain a full range of qualitative and quantitative information.

Guidelines

To provide a foundation for life-long learning, the successful optometry school graduate should be able to do the following:

A. Define and articulate the need for information and the nature and extent of the information needed.

B. Access needed information effectively and efficiently.

1.   Identify a variety of types of formats and potential sources of information. Select the most appropriate information resources and tools available, and demonstrate awareness of these resources, their content, and the information needs they can address.

2.   Retrieve information online or in person using the most appropriate method and retrieval systems for accessing the needed information.   Relevant bibliographic resources include MEDLINE (http://PubMed.gov/), VisionCite (VisionCite.com) and other databases, textbooks and reference sources. Other relevant resources include health sciences internet resources, optometry-based technology such as patient simulation software, diagnostic tools, electronic patient records, and digital imaging technology.

3. Construct and implement effectively designed search strategies. Perform database searches using logical (Boolean) operators in a manner that reflects understanding of methods of scientific inquiry, biomedical language, terminology, and the relationships among biomedical terms and concepts.

4. Reevaluate the nature and extent of the information need. Refine search strategies to improve relevance and completeness of retrieved items if necessary.

5. Extract, record, and manage the information and its sources. Use a standard bibliographic application to download citations from a search and organize them into a personal database.

6. Retrieve patient-specific information from a clinical information system. Demonstrate knowledge of available sources of decision support, ranging from textbooks to diagnostic systems to advisories issued by a computer-based patient record.

7. Select and utilize information resources for professional and patient education. Be aware of the "invisible optometric community", e.g., discipline-specific online discussion groups, listservs, bulletin boards, or other electronic resources for exchange of ideas in support of continuing optometric education and clinical care.

8. Consider the costs and benefits of acquiring the needed information.

9. Be aware of the many ways information becomes lost or corrupted and the need to take appropriate preventative action (for example, routinely employing backup procedures for personal and institutional data).

C. Evaluate information and its sources critically and incorporate selected information into his or her knowledge base and value system.

1. Filter, evaluate, and reconcile information, demonstrating the following:

a. Knowledge of the factors that influence the accuracy and validity of information in general.

b. The need to use multiple information sources for problem solving; the ability to discriminate and evaluate types of information sources in terms of their currency, format (e.g., review v. original article), authority, relevance, and availability.

c. The ability to weigh conflicting information from several sources and reconcile the differences.

d. The ability to critically review a published research report.

e. The ability to synthesize main ideas to construct new concepts, determine the value added, contradictions, or other unique characteristics of the information.

f. The ability to make decisions based on evidence, when such is available, rather than opinion.

g. The ability to validate understanding & interpretation of the information through discourse with other individuals, subject area experts, and/or practitioners.

D. Use information effectively to accomplish a specific purpose.

1. Effectively employ written, electronic and oral communication, demonstrating the following:

a. The ability to use software to create visual materials that effectively support oral presentations.

b. The ability to create a handout that includes simple graphics and tables for use in teaching or patient information.

E. Understand many of the economic, legal, and social issues surrounding the use of information and information technology; access and use information ethically and legally.

1. Demonstrate knowledge of copyright and intellectual property issues, especially with regard to materials that are retrieved electronically. Acknowledge the use of information sources in communicating the product or performance.

2. Follow laws, regulations, institutional policies, and etiquette related to the access and use of information resources and electronic communications.

3. Maintain a healthy skepticism about the quality and validity of all information. (This includes recognition that technology which provides new capabilities also has the potential to introduce new sources of error.)

4. Effectively use security procedures (e.g., choosing "good" passwords, not sharing them, and changing them often).

5. Protect confidentiality of private information obtained from patients, colleagues, and others.

   1. Be able to access information remotely.

1. Effectively use VPN, proxy server, password or other means of access provided by institutions.

2.   Have the ability to make use of written or online guides and/or staff support for configuration of personal computers.

3. Understand issues of privacy, security, and copyright with regard to remote access.

X. CLINICAL INFORMATION

The development of educational technology guidelines for ASCO is driven by perceived need and is influenced by the user community, vendors, consultants, and government. If a standard is developed as an academic exercise and is before its time, the standard is often unused. If a standard is too late in development, it is difficult to change the patterns of what people do. The pace of guidelines development is controlled by the rate at which users and vendors

are willing to change. New technology often makes the acceptance of guidelines easier. Below are recommendations regarding clinical information systems.

Clinical information systems in the context of this document encompass electronic health records, image archival systems, diagnostic instruments, lab orders, and other clinical care systems (e.g. remote consultation systems, or decision support systems). The use of this document is as a guide that lists operational issues that should be considered before allocating resources to a clinical information system. This document is not meant to recommend implementation-specific or vendor-specific hardware or software.

A. Be HIPAA-Compliant (for a more comprehensive report and sample compliance forms see footnote) Also refer to section VI. D. for additional discussion. Clinical information systems should be HIPAA-compliant.

B. Health care information guidelines:

Below are listed several guidelines to follow when adopting clinical systems at schools and colleges of optometry.
1. Electronic Health Records

Electronic Health Records should be in compliance with the federal standards listed under the Electronic Records Management Initiative or similar standards.

2. Diagnostic instruments should be DICOM-compliant.

DICOM (Digital Imaging Communication in Medicine) has chartered an ophthalmic guidelines committee (Work Group 9) in order to develop a common format for data output from diagnostic equipment. Representatives of the major vendors of ophthalmic instruments have supported this effort in order to allow data from applications such as visual field analyzers, digital imaging devices, and electronic medical records to share a common user interface.

XI. STAFF TRAINING, INSTRUCTION AND SUPPORT

As noted in numerous studies since the 1990s, recruiting and retaining Information Technology (IT) staff has become an increasingly challenging problem in the United States workplace. In addition to shortages in particular geographic areas and in specific occupations, higher wages in the corporate sector have made it increasingly difficult for colleges and universities to meet their IT staffing needs. The rapid pace of change, high staff turnover, expanding reliance on technology in the teaching-learning process, and the need for ongoing staff development further complicate the situation.

The following general principles are essential to bear in mind to ensure an adequate staffing environment to support the hardware, software, networking and other IT needs of the schools and colleges:

A. Staffing levels should be sufficient to allow for adequate coverage during anticipated absences (sick leave, annual leave, and staff development) and cross-training for coverage of key responsibilities

B. The number and nature of IT positions should reflect the full range of technology infrastructure to be supported (e.g. user instruction, PC support, network administration, web site coordination and administration, support of instructional technology, computer lab management).

C. Staff should be professionally qualified by training and experience.

D. Position descriptions and responsibilities should be regularly reviewed and revised to reflect changing institutional priorities and technical needs.

E. Individual performance should be regularly reviewed and training goals established.

F. Ongoing staff development should be encouraged and facilitated, with a specific budget allocation for training and retraining in technical and interpersonal competencies.

G. Financial and non-financial rewards should be balanced to create an attractive working environment.

H. Access to higher levels of specialized support should be available as needed (e.g., programmers, database development specialists, course management software consultants).

I. A strong service orientation should be encouraged and rewarded.

J. Where appropriate, technical staff should be involved in planning efforts related to campus IT initiatives.

A perennially challenging question is the determination of what constitutes adequate numbers of staff to support the IT infrastructure in a particular setting. Staff-user ratios are one possible approach, but it can be difficult to determine the most appropriate unit(s) for comparison: faculty, students, numbers of computers. Further, this does not include support of more specialized functions such as network administration.

Widely influential documents, such as those developed annually by EDUCAUSE (http://www.educause.edu/) have identified in detail expectations of the skills and knowledge needed by students, faculty and staff in terms of information technology and information literacy at the start of the 21st century. Although students' self-perceptions of their computer skills are generally high, there is often a gap between students' comfort levels with technology, and their effective, ethical and legal use of technology. Further, faculty incorporation of technology into the teaching/learning process is far lower than one would expect, given the generally strong state of the technology infrastructure on college campuses (see Green, 2003). Among perceived barriers to greater use of technology by faculty are lack of time and lack of skills. "Keeping up with technology" was one of the top four reported sources of faculty stress in 2002 (Linholm et al.), and "assisting faculty in integrating technology into instruction" was considered to be the single most important IT challenge (out of ten options) over the next several years according to Green respondents (21.4%, p. 2) in a 2003 Campus Computing Survey. (See Section IX for some additional details on information literacy expectations.)

Consequently, it is essential that schools and colleges of optometry provide not just the technology infrastructure to support the teaching/learning and clinical care processes, but also instruction, training and support in its effective, ethical and legal use. The following are among the key guidelines to consider in assessing the adequacy of training and instruction to ensure IT fluency in the optometric education community. Our recommendations are:

A. The institution should provide appropriate orientation and training for use of technology resources to students, staff, and faculty.

B.   Core competencies (what every faculty/staff member should know) should be clearly identified and supported.

C. Ethics and Responsible Computing**:** A policy on responsible computing should be in place, and all people should be aware of it. Each school or college of optometry should draft a statement dealing with academic honesty for students using laptops, tablets, and smartphones. Extra security measures must be taken when using such devices to hold assigned projects to be graded or to conduct examinations.

D.   Specialized competencies should be regularly reviewed, revised, and supported to reflect changing institutional priorities and technical needs.

E.   Specialized training and instruction should be an essential component in the planning and implementation of new IT-based initiatives and evolving innovations.

F.   When possible, sabbatical release time should be offered to facilitate faculty participation in educational technology developments.

G.   Instructional/training efforts should incorporate a variety of delivery modes (workshops, one-on-one instruction, faculty showcases, tutorials and online resources) in order to address the differing learning styles and time constraints of faculty, staff and students.

H. There should be a professionally staffed and adequately supported Faculty Development Center that encourages faculty/staff experimentation with new and evolving technology innovations in support of the teaching/learning process.

a.   There should be a coherent program in educational technology instruction to ensure that student skills in the effective use of IT are reinforced throughout the academic and clinical components of the curriculum.

i. Faculty evaluation processes should seek to assess effectiveness in the integration of new technologies and encourage/reward ongoing improvement.

ii. Technology should be used to facilitate the assessment and evaluation of faculty, students, coursework and the curriculum.

iii. Appropriate campus leadership should plan and administer the IT Training/Instructional program supported by specific annual budget allocations and adequate staff.

iv. There should be a campus advisory group representing key constituencies (faculty, administrators, students, IT staff, librarians) and participating actively in the planning and evaluation of instructional/training initiatives.

v. Environmental scanning should be used to actively monitor new developments and innovations in "Best Practices:" to ensure currency with national and international trends in IT training, instruction and support.

XII. ACADEMIC RECOGNITION FOR SOFTWARE DEVELOPMENT

While much of the basic sciences curriculum of an optometry program can take advantage of educational software developed for the medical profession, there are significant gaps in the availability of commercial educational software for optometry due to the profession-specific nature of some topics. If such software is to be developed, it therefore must be developed by optometric faculty themselves.

The development of educational software ultimately benefits the faculty, students, institutions, and profession of optometry. However, development of educational software is a time-consuming task that requires expertise. This is especially true for the development of custom applications, which requires an intimate knowledge of computer programming. Acquisition of computer programming expertise may require the pursuit of graduate training in computer science.

It is imperative that institutions provide faculty with support and rewards for developing educational software. Colleges of optometry should recognize the contributions of those individuals who develop educational software by allotting faculty development time for the creation of such tools. In addition, the development of educational software should be credited towards scholarship and/or research with regards to tenure or promotion consideration.

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