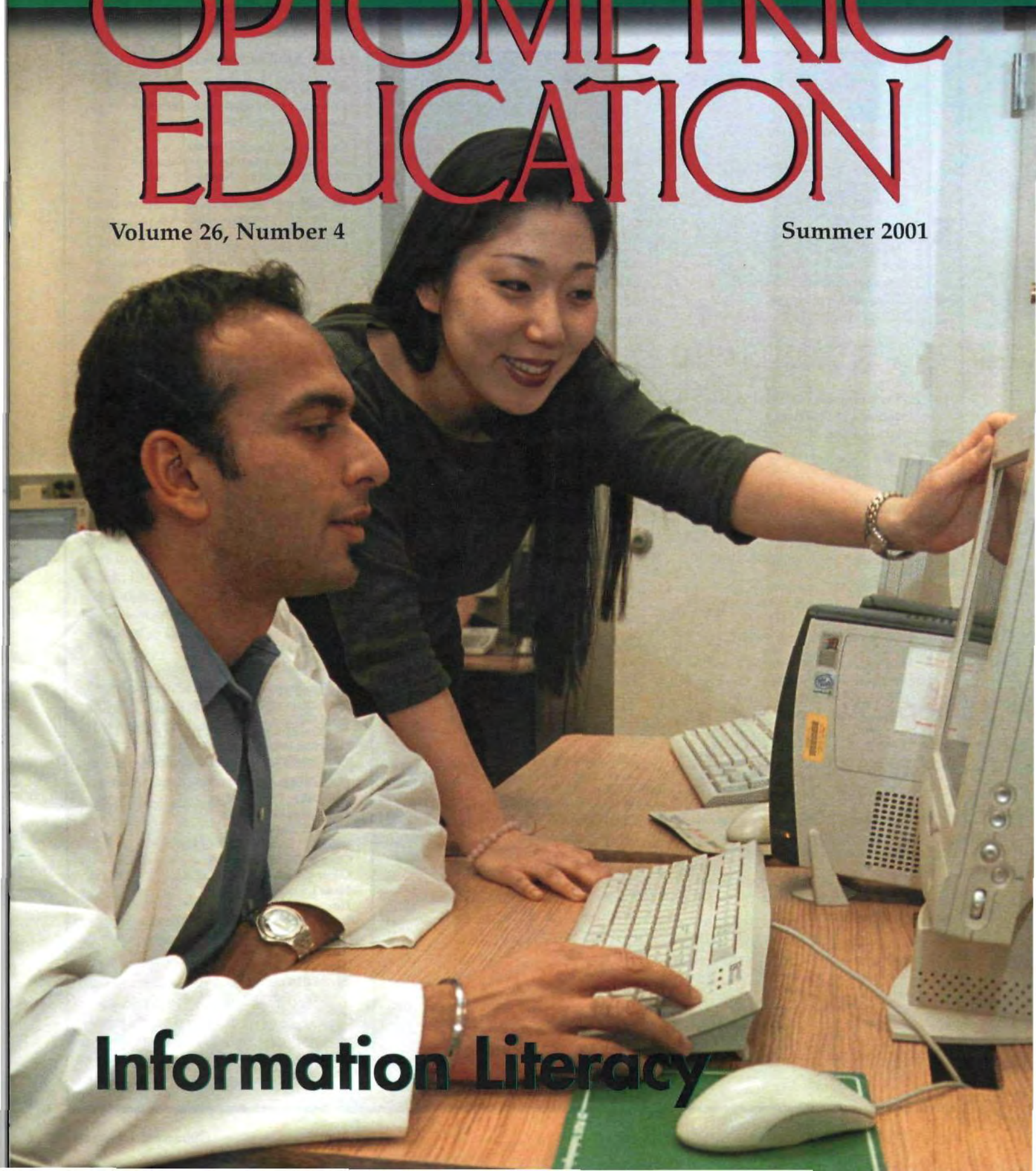
The Journal of the Association of Schools and Colleges of Optometry

OPTOMETRIC EDUCATION

Volume 26, Number 4 Summer 2001



Information Literacy

Association of Schools and Colleges of Optometry

The Association of Schools and Colleges of Optometry (ASCO) represents the professional programs of optometric education in the United States. ASCO is a non-profit, tax-exempt professional educational association with national headquarters in Rockville, MD.

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Cover photo of SUNY College of Optometry courtesy of Jennifer Parker

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EDITORIAL

Tomorrow's Leaders

Roger Wilson, O.D.

Where are tomorrow's leaders in academic optometry? They are among us. You know the type. They are respected teachers and clinicians who live the dual existence of rank and file faculty, and they often carry additional administrative responsibilities. They hold many posts. To name only a few, they are our clinician educators, our course and laboratory coordinators, the chairs of standing and ad hoc committees, clinical directors and coordinators, and our department chairs. They are usually active in faculty governance. They tend to be the instigators of change within our institutions.

Faculty leaders rarely receive formalized training and mentoring. They tend to naturally surface and are given assignments and opportunities based upon their interests and the needs of the institution. Unfortunately, a leadership void exists - we have much work to do to advance optometry and too few people to accomplish the tasks. The current "leadership workload" is divided amongst too few individuals. The profession will greatly benefit if more individuals could assume key leadership and administrative posts. Our own optometric organizations have long recognized this void and the necessity of providing opportunities for faculty to attain a skill set that will foster leadership qualities. Witness what has occurred over the past few years. The Association of Schools and Colleges of Optometry (ASCO), the American Academy of Optometry (AAO), and the American Optometric Association (AOA) have all offered seminars and conferences geared toward defining and cultivating the attributes of tomorrow's optometric leaders.

Sounds good so far. But there is a problem associated with the grooming of tomorrow's leaders, and it is in the form of irony. Leadership positions in an academic career often lead to a bifurcation in a faculty member's career goals. A fine line is typically straddled between accomplishment in one's area of expertise and efforts directed toward achievements in the administrative arena. Oddly, faculty who have consistently provided years of valuable professional service can experience losses in their own professional advancement. When they become eligible for promotion and/or tenure and begin to build their applications, some portions may appear anemic, notably in the areas of teaching and scholarship. Unfortunately, nearly all leadership efforts fall into the classification of "professional service," a catchall category of important but not promotion-worthy achievements. This realization usually surfaces when the candidate(s) compare his/her accomplishments to the set of institutional promotion standards. To add to their difficulties, if these leaders seek advancement in a year when their peers (who have elected to maintain more traditional work assignments) are eligible, the contrast between portfolios can be striking.

Once these faculty leaders realize that they are at risk of not being promoted, they may assume a defensive posture, or one of denial. They expect that the institution's criteria for advancement and the political process underlying it will support them. After all, look at all the service they have provided. But guess what? Most promotion and tenure policies (and promotion committees) rarely have the flexibility to accommodate tomorrow's heroes. Leaders are expected to fulfill all of the promotion requirements, just like any other member of the faculty. The once mighty faculty leader now possesses a rather paltry set of academic credentials when matched against institutional standards. Thus the irony - some faculty leaders become casualties of their own efforts to make a difference. What a mess!

How have the schools and colleges of optometry dealt with the challenge of supporting future leaders? Our professional organizations have made a concerted effort to cultivate tomorrow's leaders. Have the schools and colleges created sufficient flexibility in promotion standards and guidelines to make room for people with these exceptional abilities? Have we figured out how to acknowledge individuals who may have sacrificed their effectiveness in other areas in order to make our programs better? You can decide for yourself how well your institution has addressed these challenges by taking an inventory of your school's faculty and administration leaders. Have those individuals, who clearly made outstanding contributions in service, advanced through the ranks or have they been given non-faculty or non-tenure posts because they could not be successful candidates for promotion?

Maybe that outcome is fair. Faculty teach and administrators lead, organize, direct, implement and evaluate. But does it have to be this way? Do agents of change have to choose one side of the tracks or the other? There ought to be room for faculty to create a unique professional identity. Furthermore, they should be assured that the institution would support them through a fair and reasonable interpretation of its standards. I hope that as academic professionals we have the vision to recognize the need for future leaders. I also hope that we are smart enough to understand that it takes a variety of skills to make a program successful and to attain a mission.

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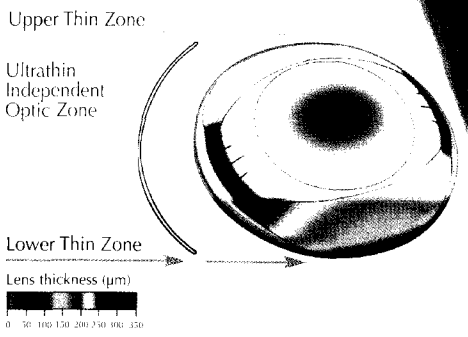

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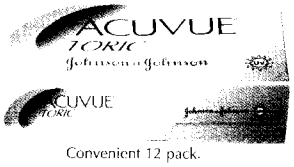

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Technology and Optometric Education

Dominick M. Maino, O.D., M.Ed., F.A.A.O.

If you are excited about health care education and the use of technology to improve your teaching, you will probably want to visit the following World Wide Web sites:

1. **Medical Education Online: An Electronic Journal**
   http://www.med-ed-online.org/

Medical Education Online (MEO) disseminates information regarding healthcare practitioner education. Manuscripts dealing with all aspects of training health professionals are considered for this peer-reviewed electronic journal format publication. MEO also provides resources such as curricula, data sets, syllabi, software, and any instructional material educators make available to the health education community.

Sample Articles and Abstracts from MEO

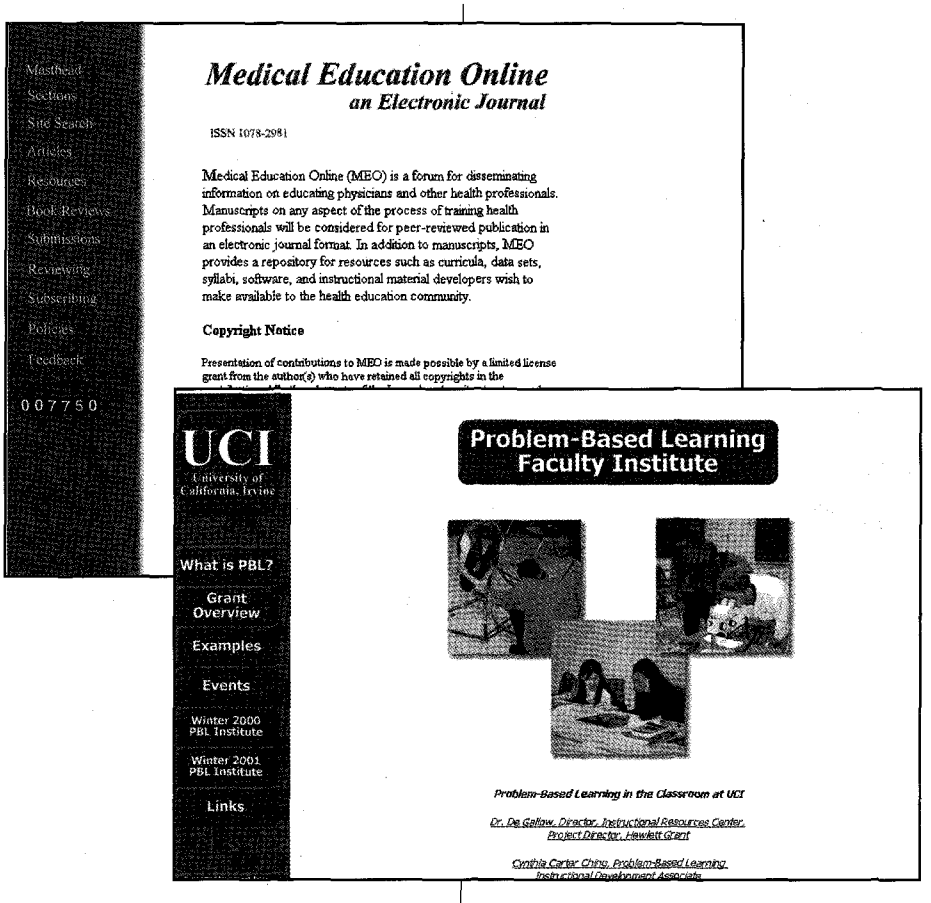
- Solomon D. **Because It's Time** (available from http://www.med-ed-online.org/f0000002.htm#f0000002 05/24/01)

Abstract: This paper reviews the rationale for starting Medical Education Online and on how electronic networks and other advances in communication are going to affect scientific journals and scholarly communication.

- Camp G. **Problem-Based Learning: A Paradigm Shift or a Passing Fad?** (available from http://www.med-ed-online.org/f0000003.htm#f0000003 05/24/01)

Abstract: The use of problem-based learning in medical education has increased significantly. PBL was once considered a fringe innovation. It has become more mainstream. Issues surrounding whether PBL will become such a successful innovation that it becomes the norm, or whether its popularity and widespread adoption will fade and be replaced by another, newer innovation are discussed.

Dr. Maino is a professor at the Illinois College of Optometry. (dmaino@eyecare.ico.edu)



- Ferrell BG. **A Critical Elements Approach to Developing Checklists for a Clinical Performance Examination** (available from http://www.med-ed-online. org/res00001.htm#res00001 05/24/01)

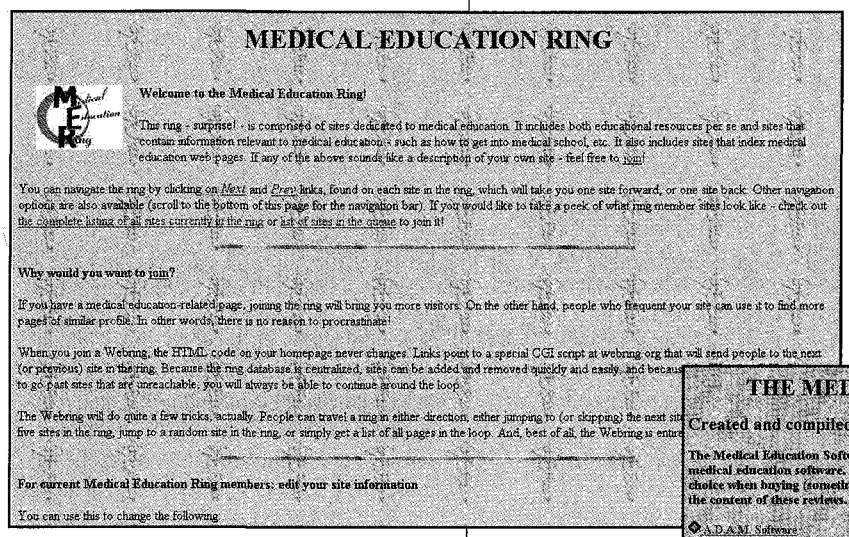
Abstract: A two-stage process was used to develop checklists for cases on a clinical performance examination. Checklist items were reviewed by faculty members to determine which might be critical to the case. Those determined to be critical would result in failure of the exam. For each case, a score was determined based on the completion of the items that judges rated as critical. This yielded a scoring protocol for each case. This protocol is outlined and applied to a hypothetical student. The perceived advantages of the approach are discussed in this article and suggestions made for further work. The protocol is being used to develop similar checklists for other cases as they are written for the clinical performance examination.

2. **The Medical Education Software Homepage**
   http://www.webcom.com/~woo ming/mededuc.html

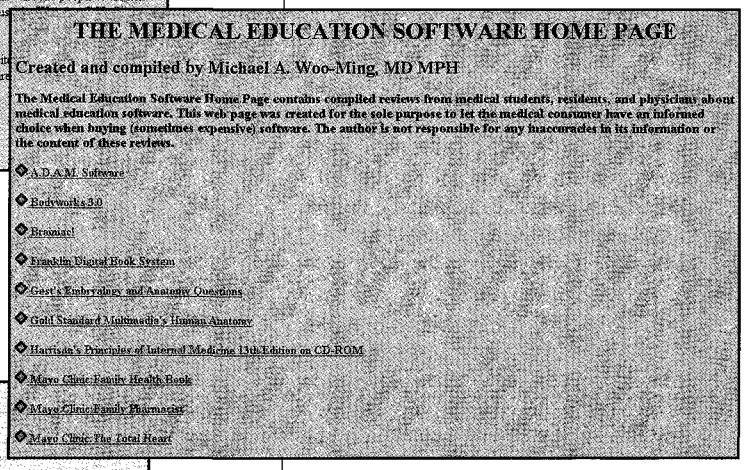
This Web site was created by Michael A. Woo-Ming, M.D., M.P.H. and contains compiled reviews from medical students, residents, and physicians about medical education software.

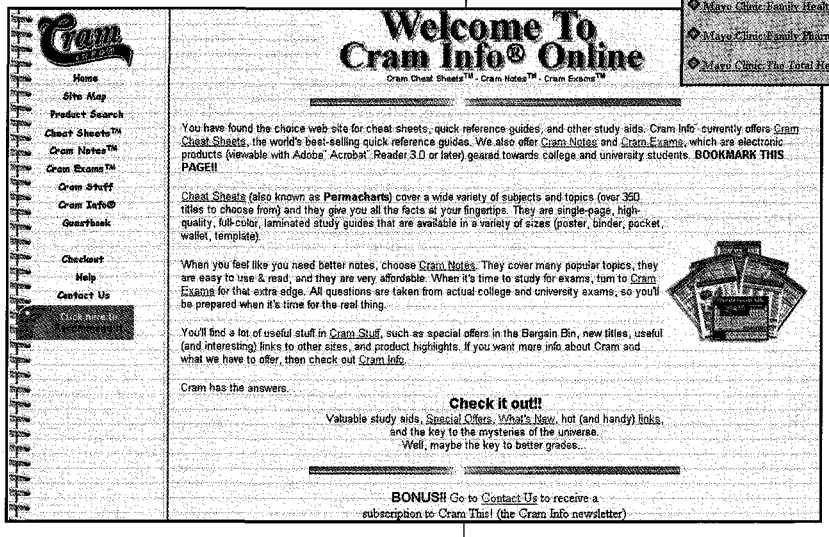
3. **Medical Education WebRing**
   http://www.med.jhu.edu/medcenter/mer/

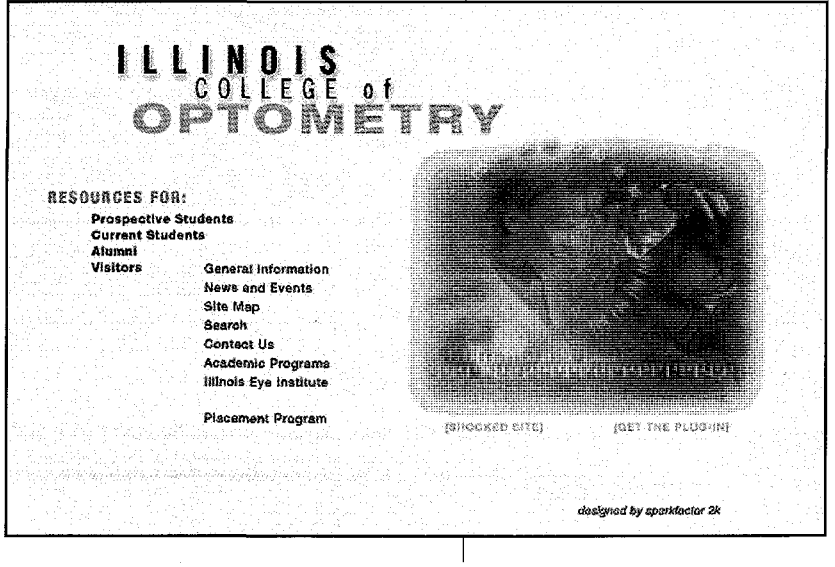
This Web site is comprised of sites dedicated to medical education. It includes both educational resources and sites that contain information relevant to medical education. You



can link your site to others. This will drive those interested to your website.







4. Cram Info Online

http://www.cram.com/cgi-bin/webcart/webcart-frames.cgi

This web site provides cheat sheets, quick reference guides, and other study aids for students.

5. Problem Based Learning

Several of our schools and colleges of optometry have investigated the incorporation of problem based learning into their curricula. Some have even completely altered their curricula to a PBL methodology. Want to learn more about PBL? Go to http://score.rims.k12.ca.us/problearn.html to learn all the basics. Resources about PBL can be found at http://www.udel.edu/pbl/articles.html as well. You may also wish to go to the Problem Based Learning Faculty Institute (http://www.pbl.uci.edu/) for more on the subject.

Ever wonder if there were any disadvantages to problem based learning? If you log on to http://edweb.sdsu.edu/clrit/learningtree/PBL/DisPBL.html you will see that PBL may not be the answer to your educational needs.

6. Technology in Contact Lens Education

Need some ideas for teaching contact lenses to your students? Visit http://www.ist.uwaterloo.ca/~chappell/Other/IST/EW/optometry.html for many ideas on how to use technology in your courses.

7. ICO's Award Winning Web Site

I am very proud to report that the Illinois College of Optometry's Website (www.ico.edu) won first place as the Best Graduate Education Web Site in the country. Please come and visit us.

INDUSTRY NEWS

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Transitions Introduces Materials For Eyecare Professionals

As part of the launch of its new brand-building print advertising campaign, "See Life in a Whole New Light," Transitions Optical is helping eyecare professionals leverage the campaign in their practices with a range of eye-catching point-of-purchase materials that utilize the ad campaign's imagery and key messages.

"The materials were designed to visually show the product features and benefits to help generate interest, educate patients and demonstrate the product," said Alyson Welch, public relations manager. By using these materials, eyecare professionals can provide their patients with comprehensive exposure to Transitions Lenses and increase the likelihood of patient interest and requests.

Transitions Optical has manufacturing operations in Pinellas Park, Florida; Tuam, Ireland; Manila, Philippines; Sumare, Brazil; and Adelaide, Australia. For more information, contact Transitions at (800) 848-1506.

Vistakon Resolves Antitrust Litigation

Vistakon, a division of Johnson & Johnson Vision Care, Inc., announced that a court has granted preliminary approval of a settlement agreement resolving antitrust claims, while recognizing Vistakon's right to sell its disposable contact lenses only to customers who obey federal and state laws.

"We agreed to settle, in large measure, because the state attorneys general affirmed, in the settlement agreement, our right not to sell to unethical suppliers who dispense contact lenses without prescription and contrary to state and federal law," said Mr. Philip Keefer, president, Vistakon, Americas. "The stipulations set forth are important because of the critical role that eye care professionals play in ensuring the long-term eye health of contact lens wearers. We have always valued our relationship with eye care professionals. This agreement upholds that strong relationship."

As part of the settlement, Vistakon will pay the plaintiffs $25 million, inclusive of fees and expenses. The settlement will also include a guaranteed Benefits Package Fund of $30 million, consisting of products and services related to contact lenses. Under the agreement, any consumer who purchased a Ciba Vision, Bausch & Lomb or Vistakon brand replacement contact lens from an eye care professional from 1988 to the present is eligible to receive: a $50 discount off a purchase of four or more multi-packs of ACUVUE(r) Brand Contact Lenses; a $25 discount on a visit to an eye care professional; and one additional coupon for $25 off a future purchase of four or more multi-packs. Vistakon will also set up a Compensation Fund of $5 million in cash and/or coupons, for consumers who once wore Vistakon contact lenses but no longer do so. Vistakon will provide $50 in Johnson & Johnson product coupons or $35 in cash to previous ACUVUE(r) patients who no longer wear contact lenses. Eye care professionals should direct eligible patients to call Vistakon's toll free line at 1-888-437-1294 or long onto the Web site, www.acuvue.com, where they can register for the benefits package.

Alcon Introduces TRAVATAN(tm)

Alcon Laboratories announced the availability of TRAVATAN(tm), a powerful new prostaglandin analog product. TRAVATAN(tm) Ophthalmic Solution, recently approved by the FDA, is indicated for the reduction of elevated IOP in patients with open-angle glaucoma or ocular hypertension who are intolerant of other IOP-lowering medications or insufficiently responsive (failed to achieve target IOP determined after multiple measurements over time) to another IOP-lowering medication.

TRAVATAN(tm) was safe and well tolerated in clinical studies according to Dr. Stella Robertson, vice president for ophthalmic products, research and development. Adverse events were non-serious, mild to moderate, usually resolved with or without treatment, and generally did not interrupt continuation of therapy. TRAVATAN(tm) has been reported to cause changes in

(Continued on page 126)

Information Literacy in The SUNY Optometric Curriculum

Claudia A. Perry, Ph.D., F.A.A.O.

Abstract

The December 1998 meeting of the ASCO SIG on Optometric Informatics emphasized the need to prepare our students to deal with a future in which informatics skills will be essential. Using experiences at the SUNY College of Optometry over a seven-year period as examples, this paper will examine selected issues and challenges for informatics and information literacy instruction in the optometric curriculum. Examples will highlight the rapid pace of change in information technology, the challenges posed by varying skill levels of students and faculty, the essential role of infrastructure and support, the helpful role student feedback can provide, and the importance (and challenge) of reinforcing and integrating the role of information literacy throughout the four-year curriculum. The development of informatics instuction in the curriculum can broaden awareness of the importance of pro-active information seeking by optometrists and of the existence of skills and tools to actively support health professionals' pursuit of lifelong learning.

Keywords: *Informatics, information literacy, optometric education*

Introduction and Background

Educational programs in professions ranging from dentistry to public health have noted the essential role that informatics and information management skills will play for health care practitioners in the coming decades.[1-5] As far back as 1984, the Association of American Medical Colleges (AAMC) report entitled *Physicians for the Twenty-First Century* recommended the incorporation of information sciences and computer technology into the general professional education of physicians.[6] Similarly, in optometry, the Georgetown Summit noted that "information retrieval will be at the heart of students' training and the subsequent continuing education needed for lifelong learning."[7(p44)] The importance of informatics and information literacy in optometric education was further stressed in the December 1998 meeting of the recently formed Association of Schools and Colleges of Optometry Special Interest Group (ASCO SIG) on Optometric Informatics.

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Yet the development of an effective program in these areas poses a number of challenges and can take various forms. Using experiences at the SUNY College of Optometry over a seven-year period as examples, this paper will examine selected issues and challenges for informatics and information literacy instruction in the optometric curriculum. Examples will highlight the rapid pace of change in information technology, the challenges posed by varying skill levels of students and faculty, the essential role of infrastructure and support, the helpful role student feedback can provide, and the importance (and challenge) of reinforcing and integrating the role of information literacy throughout the four-year curriculum.

The exploding volume of information in all sectors, and rapid advances in computing and telecommunications have led to a growing emphasis on information literacy throughout higher education.[8] Information literacy has been defined as "a subset of critical thinking skills which consists of individuals' abilities to know when they have an information need, and to access, evaluate..., and effectively use information for both content literacy in the curriculum and lifelong learning."[9(p35)] Information literacy often has been closely identified with traditional library instruction in using the online catalog and indexes to the journal literature. Increasingly, however, colleges and universities have made an effort to integrate the use of these and other information resources and technology into the curriculum. This can take the form of more active modes of hands-on learning, structured problem-based or evidence-based learning, small group assignments, or numerous other approaches that rely on finding and using information as part of the learning process. The model envisions students not as passive receptacles of information provided by others, but as active participants in their education. Changes in the United States (U.S.) health care system, the rapid growth and rate of change of biomedical information and technology, and the expanding scope of practice all contribute to a situation in which future clinicians must develop the essential skills, knowledge and attitudes to effectively recognize and manage their information-related needs. This is as true for optometric students and practitioners as it is for other health care professionals.

Information literacy is related to, but not synonymous with, the broader area of informatics. Informatics is an evolving interdisciplinary area open to various definitions and interpretations, about which even experts in the field do not agree. These views often but not necessarily include the role of technology and computers in dealing with information. For example, the adoption of structured vocabularies such as the *Medical Subject Headings* (MeSH) or *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) can make possible better access to complex information, whether or not the terminology is organized in an electronic database. Definitions also will vary slightly depending upon the profession (e.g., nursing, optometry) with which they are associated.[10] Informatics can be conceptualized as the tools and body of knowledge that encourage and enable the development of information literacy.

The Medical Informatics Advisory Panel to the AAMC's Medical School Objectives Project[11] used the following definition in its drafting of medical informatics objectives, which will serve quite well in the current context:

> Medical informatics is the rapidly developing scientific field that deals with resources, devices and formalized methods for optimizing the storage, retrieval and management of biomedical information for problem solving and decision making.[12]

The perceived importance of informatics is based on the premise that the volume and rate of growth of information are such that health professionals can no longer simply memorize all the facts they will need to know during a lifetime of practice. Instead, they must be able to find out what they need to know in support of their professional problem solving and decision-making responsibilities. Health informatics encompasses a range of application areas including clinical information management, electronic patient records, and expert systems, as well as information retrieval, and digital libraries.[10] The widespread availability of health information on the Web, coupled with the movement toward patients' increased participation in decisions regarding their own care, has given rise to the concept of "patient informatics," as well.[13] Regardless of possible differences in context, the central role of information is clear. For the purposes of this paper, the emphasis primarily will be on the latter set of applications (i.e., information retrieval and evaluation of publicly available information), including more clinically-oriented topics where appropriate.

The Development of the SUNY Optometry Information Skills Program

Initial Proposal and Early Implementation Efforts

In the early 1990s a concern arose about the need for SUNY Optometry students to develop greater competence in information management and evaluation skills. SUNY Optometry library faculty had a long history of providing group and individual instruction in an early CD-ROM version of the MEDLINE database, as well as traditional library orientations for students and residents. However, except for reserve materials, library use statistics in the late 1980s were declining.

About this time, academic faculty were being encouraged to include more research papers and projects in the first two years of the curriculum, while clinical faculty were more frequently asking students to investigate specific patient-related questions. In an effort to encourage more such patient-care activity, CD-ROM workstations were set up in the Primary Care and Ocular Disease Services. These were equipped with a five-year subset of the MEDLINE database, as well as CD-ROM versions of two ready reference sources, the *Physician's Desk Reference (PDR)* and the *Merck Manual.* Additional MEDLINE workstations were available in the library.

A review of the literature, and the author's previous experiences in a medical school setting, provided a possible model to address the issues of the skills needed to use these resources, as well as other components in the complicated skill set needed by clinicians to manage their information needs. Accounts in the literature emphasized the importance of integrating such instruction wherever possible into the curriculum, rather than attempting to teach information literacy skills in isolation. [e.g. 14] This led to the development of a proposal for an integrated information skills sequence-including a stand-alone course—which was presented to the SUNY Optometry Curriculum Committee in early 1993. Integration of information skills training with existing coursework required close cooperation with other faculty already interested in the use of information resources in their teaching, and an awareness of the types of questions third and fourth-year interns (and clinicians in general) were likely to encounter.

The sequence proposed instructional activities relating to the evaluation and use of information for selected existing courses throughout all four years (e.g., Optometry I, Optometric Procedures, Research Methods, Senior Seminar) in conjunction with relevant assignments. The centerpiece of the proposal was an additional required one-credit course in the Clinical Sciences Department (combination lecture and labs), entitled "Introduction to the Biomedical Literature" and taught by the author (then the Library Director) during the winter quarter of the second year. Although it might be necessary to reinforce the role of information throughout the curriculum, a stand-alone course was perceived to emphasize the importance of information literacy and informatics in a way that individual workshops or laboratory sessions in other courses could not.

Key topics in the new course included: 1) the organization and evaluation of scientific information, 2) an overview of the drug development process and its implications for finding drug information, 3) an introduction to statistics resources, as well as 4) hands-on instruction and practice in using MEDLINE and a variety of other print and electronic reference materials. It was hoped that concurrent coursework in pharmacology would emphasize the relevance of learning about drug information, while exposure to statistical sources would help students to prepare for a challenging research paper in health economics later in the quarter. Strong support from the Dean and the Clinical Sciences Chair helped to ensure approval of the course, first on a pass-fail basis, and after its successful introduction in the winter 1994, as a regular graded course.

Our experiences with the early implementation of the program were discussed in a 1995 presentation at the American Academy of Optometry

Annual meeting.[15] Major themes included the incremental and modular nature of the implementation, the balance between a stand-alone credit course and integrated information skills instruction in other courses, close communication and cooperation with other faculty, and a strong focus on clinical information needs. For example, clinical faculty members have helped to encourage an appreciation of the role that MEDLINE searching can play in support of clinical practice, and that it is important to stay current with the journal literature. Further, we attempted wherever possible to incorporate principles of active, hands-on learning. Theoretical background was reinforced with demonstrations, small group practice, individual and group projects, as well as individual consultation and feedback, typically including both library and clinical faculty. The lack of an appropriate text led to the development of detailed handouts, which many students rated among the most valuable aspects of the course. Perhaps most importantly, we adopted a strategy of ongoing evaluation, experimentation and revision. An informatics course cannot be static.

As a small stand-alone institution, the SUNY College of Optometry was relatively late in providing widespread access to e-mail and the Internet. Students provided a very powerful and positive lobby for these initiatives, as well as for the establishment of a campus web site in the summer of 1996. Since faculty and student familiarity with the Web and electronic mail varied greatly, we felt it was important for the Biomedical Literature course to model instructional uses of these technologies. Thus, once electronic mail was available to all students, course conference "folders" were used to regularly post electronic announcements. This practice has spread throughout the faculty; in any given quarter several instructors of record rely heavily on email for communicating announcements to their students. Electronic posting of grades (using numeric identifiers) has been particularly popular, although this practice might not be recommended or acceptable at other institutions.

Students in Biomedical Literature also were encouraged to submit assignments and questions electronically and were required to send the instructor at least one email message; for some, their first. (With changes in self-reported student use of email over time, this requirement has now been eliminated.) Over a period of a year, all course materials were converted to Web pages for easy access outside of class (as well as distribution in class). Web instruction emphasized resources available through the campus web site for ease of retrieval. Throughout, the aim was to integrate the use of information technology into the components of the course as seamlessly as possible, to assess how well it worked, and then to incorporate needed adjustments for the future.

Impact Measures

The collection of assessment data has enabled us to better track what worked and what didn't, to adopt an approach of continuing quality improvement, and initially, to address potential questions about the need for such a course. For example, although the Clinical Sciences Chair and Dean felt strongly that information skills instruction would be taken more seriously if grades were assigned, students were far less enthusiastic. A comparison of pre-test/post-test performance on a knowledge assessment instrument proved extremely persuasive in countering these early student criticisms. As shown in Table 1, although one measure of student opinion of the course became far less positive after grades were assigned, there was a significant difference ($p<.0001$) in the mean change between pre- and post-test scores when the course was taught on a graded basis as compared to pass-fail. [The course evaluation instrument included a number of questions on course format, structure, content, timing and value to students. The question used in Table 1 appeared to offer the best single overall evaluative measure of the course.] Students in the pass-fail version of the course may have been somewhat more satisfied, but anticipation of receiving a grade made a definite difference in their performance. Course evaluations in subsequent years have become noticeably more positive than those of this transition year.

Other indicators also suggest that the initial objectives for the course have been successfully addressed. Library use statistics over time have shown a steady increase. By Fall 1998, nearly 75 per cent of student respondents agreed or strongly agreed (4 or 5 on a 5 point Likert-type scale) that they "feel more skilled in finding and evaluating information using computers than they did at the start of the course." Faculty expectations of interns' abilities to identify patient-related information have provided

Table 1
Comparison of Student Course Evaluations and Pre-test/Post-test scores, 1994-1995

	Valuable learning experience	Average Pre-test Score	Average Post-test Score	n, Mean Difference* (SD)
Pass-Fail ('94)	n=49 85% (10% neutral)	54%	69%	n=42 14.95 (11.01)
Grades ('95)	n=45 42% (40% neutral)	62%	95%	n=51 33.52 (11.11)

*p<.0001

very positive reinforcement for these information-related skills, as—until a major change in winter 2000—have efforts to tie in with preparation for assignments in other courses. In a very short period of time Biomedical Literature became a well-established component of the curriculum.

Both informally and through end-of-the-quarter written evaluations, students consistently have provided exceptionally thoughtful and valuable feedback on ways that the course could be improved. These ranged from rearrangement of the timing of assignments to reduce the end-of-the-quarter crunch, to the development of alternative exercises and projects, to coordination with projects in other classes, thus ensuring better integration with existing courses. Thanks to this input, a 1997 class project required students to identify and evaluate Web sources that could be used in support of a challenging paper for Health Economics. The Web sources were subsequently compiled and posted on the College Web site (see Appendix). This compilation continues to be a very helpful resource for second year students in support of that assignment.

Similarly, class projects in 1998, 1999 and 2000 were conducted on the same topic as that assigned for a paper in Optometric Procedures the following quarter. Biomedical Literature assignments included the identification and evaluation of background material in printed sources, on the Internet, and in MEDLINE. For most students this greatly simplified their preparation when it came time to write the paper; they had in essence already done their research. Feedback from the graded Biomedical Literature assignments could be incorporated into the term paper, in much the same way that drafts of faculty manuscripts benefit from review by a trusted colleague. In particular, student awareness and grasp of the intricacies of correct citation practices improved noticeably, especially important given the perennial problems of incorrect citation format even in refereed journals. A guide featuring citation examples in American Psychological Association (APA) style is arguably the course handout most requested from students later in the curriculum.

Program Adjustments

Table 2 summarizes the changes to the course over time. In large part these adjustments reflect the expanding availability of technology to assist in information retrieval and management. Students still work with print materials and receive annotated bibliographies (see Appendix). In recent years, these bibliographies have become briefer and more selective, in order to more strongly emphasize a few key sources. Selected topics (e.g., statistical sources) are no longer specifically taught in response to changes in the scheduling of other courses, although students are referred to the Web versions of these tools as relevant projects are assigned later in the curriculum. Anecdotal reports suggest that many students continue to consult these lists of sources long after the course has ended: when studying for boards, for example, or selecting drug sources for purchase in their third year. However, each year the portion of the course devoted to working with print materials has decreased in order to accommodate a greater emphasis on the use of materials in electronic form.

This doesn't mean that print sources are perceived to be unimportant for lifelong learning by students and practitioners. A well-developed office collection should still be a cornerstone of future practice for all our graduates. Rather, instruction in the effective use of technology is viewed as an additional need. Students have had many years of exposure to using print materials and primarily must be made aware of appropriate sources. At the same time, it often is difficult to gain access to a print collection for reference purposes, especially at remote externship and residency sites. Increasingly, the availability of electronic information promises a way of addressing this vexing issue, if means can be found to equip these sites with computers and Internet access.

Electronic Information Sources

From the very beginning, a major focus of the information skills sequence was the development and reinforcement of skills in using MEDLINE, by incorporating expectations for its use in other existing courses. Although MEDLINE is extremely limited in its coverage of optometric journals (only four titles at this writing), it remains the dominant online database of the international biomedical journal literature. Further, its widespread availability (at no cost as of 1997) and informative abstracts ensure that even the most remote practitioner with access to a computer and a modem connection can use it to search for peer-reviewed published information. The availability of web-based access to Visionet (a database of the optometric literature maintained by the Southern College of Optometry) as of early 2000 provides a most welcome adjunct to our reliance on MEDLINE.

In order to keep the course fresh and ensure that it prepared students to deal with questions likely to be encountered in clinical practice, we experimented with creative efforts to identify real-life topics for investigation. These included: pairing volunteer clinical faculty with several second-year students during a specific clinical session to be assigned a patient- related search question; soliciting search topics of personal research interest from primary care faculty; and collecting clinically-oriented reference questions received in the library. The use of real questions was a strong motivator for students, and the printed search results presented to requesters were greatly appreciated by these faculty. An advantage of the latter two approaches was that topics could be reviewed in advance by the course instructor to determine their feasibility for MEDLINE searching. Although use of a changing group of questions kept things interesting, it also proved extremely labor-intensive to evaluate topics prior to student use. In subsequent years, we have relied chiefly on a bank of questions for practice MEDLINE searching assembled through these various approaches in order to challenge students without unduly frustrating them.

Care also has been taken to provide more detailed and more advanced instruction in MEDLINE search technique, such as how to limit retrieval to high-quality research articles (e.g., controlled clinical trials). Student feedback has consistently stressed the importance of additional, supervised, hands-on instruction and practice in this area, although a very few individuals have considered this to be an unnecessary waste of time. In particular, student comments have emphasized the value of individualized consultation sessions (2 students to 1 lab instructor).

Subsequent iterations of the course have expanded the amount of time devoted to using the Internet and

especially, evaluating its information. Recent studies show that many college students overestimate their information literacy skills[16] and are all too likely to rely on poor quality Web sites for information.[17] Further, Web sites are notorious for the varying quality of health information presented,[18] although efforts to ensure better quality sites are making headway.[19] As more and more health-related information is provided electronically, the ability to search the Web and evaluate Web-based retrieval will become an ever-more important skill set for optometrists to ensure the quality of their lifelong learning and to appropriately counsel patients in their own health-information seeking.

Program Considerations in Information Technology

Instructional Challenges Relating to Technology

Ongoing changes in the characteristics and availability of technology make informatics and information literacy instruction a particular and continuing challenge. Not only must the instructor constantly review and update course materials (as in any discipline), but when instructing with technology, there is always a chance of system malfunction. Flexibility and the ability to think fast on one's feet are thus essential. Lastly, any kind of hands-on instruction is incredibly labor-intensive and time-consuming.

A further complicating factor is the range of computer-related skill levels one is likely to encounter in any given class,[20] or even from class to class. Recent immigrants and foreign students especially may have more limited experience with computers than others who have been educated in the U.S. from an early age. This has an impact not just on the structure of the course syllabus, but also on the need for support outside the classroom. Students also may differ in their confidence in the adequacy of their skills, with some suffering unnecessarily low self-concept, and others falsely convinced of how much they know. Variation in technical skills and confidence characterize many faculty, as

Table 2
Course Evolution

Year	Topics/Format	Activities/Projects
1993	Library tour, MEDLINE instruction in lab sections of Optometric Procedures course	Small group instruction
1994 (Pass/Fail) 1.0 Credit Hours Req. course, Winter 2nd Year 1995 (Grades) Req. Course	Organization of the literature, print sources (medical, statistical, drug information), in-depth hands-on MEDLINE instruction. Basic format continues, augmented as below:	Lecture, hands-on exercises, one-on-two MEDLINE instruction, evaluation of print sources. Select "office collection"
1996	Brief introduction to the Internet added	Find 5 Web sites on a topic of your choice
1997 shifted to Fall 2nd Year	Expanded Internet instruction, selected course materials posted on College Web site, course announcements via email	Select/evaluate statistics Web sites in support of Health Economics paper
1998-2000	E-mail etiquette, Netscape browser, Web Search Engines, PubMed (Web) interface to MEDLINE, critical evaluation of print & Web sources, drug information. Course materials and most lectures posted on Web site (http://www.sunyopt.edu/suny/directory/coursecp99.html)	Select/evaluate Web sites and journal articles on ocular disease topics (paper for Optometric Procedures)
Winter 2000- First Year 1.5 credit hours (lecture/lab with two instructors)	Course merged with Research Methods, moved to Winter Quarter First Year, renamed Literature Evaluation. Discussion of experimental research methods & instruction in Visionet added; E-mail etiquette and Netscape browser instruction eliminated; annotated bibliographies shortened; statistical sources omitted (http://www.sunyopt.edu/suny/directory/liteval/coursecp00.html)	Select/evaluate Web sites and journal articles on vision-related topics (paper for Optometry III in Spring 2000 only)

well. This makes it challenging to identify role models who can reinforce and encourage the routine use of information technology in settings outside of the informatics course, or assist in lab instruction.

It is difficult even to reach consensus on a definition of "computer literacy" within higher education, let alone to determine whether or not individuals possess these skills. The AAMC Medical Informatics Advisory Panel has suggested a list of basic computer competencies for entering medical students that include use of a word processing program, electronic mail, and searching the World Wide Web.[11(p12)] The American Association of Dental Schools Foundation Knowledge Working Document includes database management and use of clinical information systems as psychomotor skills essential for the new dentist to possess in order to meet an information technology and management competency.[2(p2)]

As more undergraduate institutions encourage or require computer ownership and provide network access in dormitory rooms, it is likely that levels of computer literacy and self-confidence will become more consistent and comparable within a typical class of optometry students. Surveys (self-reports of experience with representative applications) can provide some sense of the level of competence (and confidence) of a class. Still, for some time to come, informatics instructors are likely to find it difficult to gauge the appropriate level of instruction to best match the needs of their students.

Technology Infrastructure and Support

It is patently clear that one cannot teach and reinforce the use of information technology if the infrastructure is completely lacking. Infrastructure can range from such basic concerns as adequate access to functioning computers and computer laboratory space, a dependable and sufficiently fast Internet connection, networked resources, and electronic mail capabilities, to the availability of computerized course management software, computer conferencing capabilities, and an electronic patient record system. Much depends on an institution's technological sophistication and program goals. However, the impact of instruction—and requirements for computer use throughout the curriculum—on the volume of demand for access is somewhat more difficult to plan for. The combined impact of technology-oriented initiatives among various individual courses may exacerbate demand at unexpected times during the academic calendar. Increased patterns of use also lead to increased demand for assistance, and frustration when help is not forthcoming. This is a particular challenge for institutions of higher education given the nation-wide shortage of technical personnel and the resulting competition with the corporate sector for talented staff. This shortage has only worsened in recent years, as Green reports in *The 2000 National Survey of Information Technology in Higher Education.*[21]

Reinforcing the Use of Technology Throughout the Curriculum

The initial proposal for an information skills sequence emphasized the importance of integrating information literacy instruction throughout the curriculum. Several authors continue to recommend an integrated approach in the 1990s.[22, 23] Unfortunately, despite the best of intentions, this objective is more challenging to meet than might first appear.

Efforts to integrate information technology projects throughout the curriculum can maximize the skills students gain from related assignments, while minimizing the negative impact on workload in a fairly demanding curriculum. However, topics identified for one class project may not translate effortlessly into a project for another, either between or within courses, and must be selected with care. For example, searching the World Wide Web for information on extremely rare medical conditions can be extremely frustrating, whereas a search of the same topic in MEDLINE may be fairly straightforward. Searching for information on such topics as Vision Therapy on either the Web or MEDLINE may yield little or no information, while a Web search on contact lens topics is likely to yield a plethora of potentially biased sites sponsored by manufacturers. One must be flexible in providing alternative topics for a given assignment, preferably before the student has expended untold fruitless hours searching for high-quality information that may not exist in that format.

The advantage of a stand-alone informatics course is that the instructor has primary control of the design and delivery of course content (subject to academic oversight). In contrast, efforts to integrate informatics instruction throughout the curriculum depend largely on voluntary cooperation. The distributed nature of the effort makes it much harder to coordinate, as do changes over time. Deans, chairs and course instructors change; planned initiatives don't necessarily work as intended; course placement in the curriculum may shift; instructors have differing levels of interest and experience with informatics and information literacy. And, as noted above, it is difficult for faculty to reinforce skills with which they do not themselves feel comfortable. Thus, while integration is a worthy goal to aspire to, it may at certain times be easier to implement than at others. Cultivating high-ranking administrators and like-minded colleagues to champion and participate in technology-related teaching/learning initiatives, sharing ideas and tracking similar activities at other schools, participating in relevant listservs and professional organizations, and staying alert to opportunities in other courses may prove helpful in advancing the goal of integration. Florance and colleagues point out that there is no one "right" way to meet the need for informatics instruction,[22] but recommend working within political realities, taking advantage of available talent, and collaborating wherever possible.

Changes in the curriculum may have a particularly strong impact on previously established integration efforts. In response to recommendations that exposure to informatics skills occur earlier in the curriculum, and as part of an effort to consolidate related courses, a recent curricular review at SUNY recommended moving the Biomedical Literature course to the first year. Subsequently, Biomedical Literature was merged with a 3rd year course in research methods and renamed Literature Evaluation, effective winter 2000. The 1.5 credit course is now taught in the winter of the first year by the two participating instructors who had previously taught each course separately. This shift unfortunately has made it impossible to sustain the very successful linkage between course projects in Biomedical Literature and the paper on ocular disease topics assigned in the second year spring

quarter course in Optometric Procedures, as described earlier. First year students have a much more limited knowledge base than students in upper classes, and lack familiarity with medical and pharmaceutical concepts and nomenclature, so they may have difficulty appreciating the future value of developing clinically-oriented information seeking skills. One student volunteered specifically in the winter quarter 2001 that "this course seems misplaced in our schooling. We are still learning basic sciences and are not involved in research at all. It would be better placed later....when we are more involved in developments in eye care and diseases."

As instructor-of-record, my own preference would be a return to a slot in the second year schedule. As a member of the Curriculum Committee I also realize that curricular scheduling inherently involves compromises; disagreement over optimal placement of informatics instruction has been the norm ever since the course was first initiated. Further, despite some similarities in content, it is always challenging to merge two formerly discrete courses. We are still exploring the optimal mix of activities and emphasis of the combined course. As has been the case previously, experimentation, student feedback and assessments of student performance will be used to fine-tune the course structure and content in order to best meet perceived needs.

"Lessons Learned"

This section attempts to distill the overall experiences described in the present article into a brief set of helpful hints or lessons learned, for quick reference. Some hints are inherently subjective and reflect my own biases. I welcome comments and suggestions from like-minded colleagues for ways of dealing with our mutual challenges in teaching informatics.

1. Technology-based instruction is very labor-intensive and most students welcome individualized attention; whenever possible, recruit technology-savvy colleagues to assist in lab instruction.
2. Don't assume all students feel equally comfortable with technology; using partners for hands-on lab practice can help address varying levels of class expertise without overwhelming the instructor(s).
3. Providing the option of groups or partners for conducting hands-on learning exercises and/or submitting projects jointly helps tailor work to personal learning styles, encourage cooperative learning, and address limited technology skills. **Requiring** partners may serve to punish those who prefer to work alone or who get paired with less competent partner(s).
4. Technical skills do not guarantee competence in assessing the quality of information retrieved; most students need explicit instruction, practice and feedback on critical evaluation of electronic materials.
5. Library sites can be especially useful sources for tutorials, checklists and guidelines on critical evaluation of materials on the Web, and for their subject listings of high quality sites (e.g., See Appendix).
6. Scheduling an informatics course to take advantage of prior or concurrent exposure to biomedical and pharmaceutical concepts and vocabulary will better reinforce instruction in support of clinical information seeking.
7. Using the same topic for more than one exercise can help students make the most of their growing subject knowledge and allow them to focus more on information seeking and evaluation skills.
8. At the same time, be sure to pretest search topics using the various sources the students will be using; be ready with alternatives if a topic does not work well in a new source (e.g., WWW vs. MEDLINE vs. Visionet).
9. While students relish the opportunity to interact with clinical faculty for assignment of patient-care-related search topics, questions are not always suitable for MEDLINE searches and the logistics of tracking down busy clinicians can be problematic.
10. Less is often more, especially for first year students; prefer fewer sources, shorter handouts, more hands-on practice, or students may be overwhelmed. (We are not trying to train future librarians or computer specialists in this program!)
11. Equipment and connections can and will fail; consider backup options (e.g., screen captures of Web pages).
12. Slow Internet connections can frustrate even the most dedicated student; consider self-paced exercises at off-peak times as an alternative to supervised practice if connections become a problem.
13. Be flexible with student deadlines; hands-on projects can be more time-consuming than you ever anticipated.
14. Student feedback is an especially useful tool for keeping an informatics course in tune with student skill levels, needs and competing priorities given an exceedingly rapid pace of change.
15. Be creative, try new approaches, and don't be afraid to adjust, adapt or totally discard previously successful segments of your course. As noted earlier, commit to a program of ongoing evaluation, experimentation, and revision.

Future Directions

The expanding availability of Web-based information suggests one way of dealing with the difficulties of limited library access at external sites, and indeed, in professional practice. Although many high-quality Web sites on ocular disease and general health care topics are of direct relevance to optometrists, coverage of optometric topics still lags behind that of medicine. At the same time, Web-based delivery of information increasingly is being used to complement (and sometimes substitute for) print publication; it is cost-effective, convenient and widely available. Federal and state governments, educational and professional organizations, and even traditional publishers often provide access to key information using the World Wide Web. One recent trend among journal publishers is to provide free electronic access to individuals (or institutions) receiving a print subscription. This expanded availability is complicated by the fact that the World Wide Web is still an evolving medium, with great variability in format and quality.

As noted earlier, health informatics potentially encompasses such applications as clinical information management, electronic patient records, expert systems and the retrieval of digital information, including patient-oriented materials. Digital image databases are likely to become increasingly important in both health sciences education and patient care in the near future. The tools will always be changing; storage formats will come and go. In our setting, MEDLINE instruction

using CD-ROM was replaced by network access, then subsequently by reliance on PubMed, the free, web-based interface to MEDLINE hosted by the National Library of Medicine (http://www.ncbi.nlm.nih.gov/PubMed/). Similarly, new search engines for the World Wide Web are introduced all the time; software is regularly upgraded; new systems are implemented. The quality and usability of these tools are likely to continue to improve. Hersh observes that we will probably see an increasing number of "portal" Web sites that provide focused and filtered access to content and editorial review.[18] Clinical information systems will become better integrated with other electronic sources. The rapid pace of change is likely to be exhilarating as well as a continuing challenge for informatics educators.

Conclusion

Early implementation of information literacy instruction at the SUNY College of Optometry emphasized an incremental approach, close collaboration and cooperation with like-minded faculty, a balance between a stand-alone course and integrated information skills instruction in other courses, and a strong focus on clinical information needs. Ongoing complications have included variability in student (and faculty) computer literacy and the impact of informatics instruction on increased demand for access. A particular and continuing challenge is how to sustain the integration and reinforcement of informatics skills throughout the curriculum given changes over time in deans, department chairs and course instructors; course placement and sequencing; competing educational priorities in a demanding program; and consequent curricular revisions.

Perhaps the most important overall goal for informatics instruction in the optometric curriculum is attitudinal. The development of informatics instruction can broaden awareness of the importance of pro-active information seeking by optometrists, and of the existence of skills and tools to actively support health professionals' pursuit of lifelong learning.

Improvements in institutional technology infrastructure are likely to expand the boundaries of what might be taught in informatics courses in the future, as will progress in levels of student computer literacy and self-confidence. Further, collaboration and cooperation among key stakeholders (administrators, faculty, librarians and technologists) will be essential to successfully carry out a program of effective informatics implementation, instruction, reinforcement and regular use. In all these cases, a key challenge will be to ensure that informatics instruction moves beyond simply developing the technical capacity to work with an array of information systems, to capitalize on the role of these tools to further extend and support health professionals' effectiveness, lifelong learning, and ongoing competence.

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Appendix:
Useful Web Sources

Primary Course Databases:
PubMed: http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi
Visionet: http://www.visionet.sco.edu/
Introduction to Visionet: http://www.sunyopt.edu/suny/directory/liteval/vsnet200.html

Course Resources (e.g. bibliographies, handouts, lectures, links):
http://www.sunyopt.edu/suny/directory/liteval/coursecp00.html

Student Course Projects (Classes of 2000, 2001 respectively):
Statistics Web Sources: http://www.sunyopt.edu/cperry/stats/stats2.html
Ocular Disease Web Sources: http://www.sunyopt.edu/suny/infotech/eyedis/eyedis98.html

Selected Health-related Links:
*Kohn Vision Science Library (numerous categories of links, especially "Eyesites", Healthlinks):
http://www.sunyopt.edu/library/libhome.html
Association of Vision Science Librarians, Eye Resources on the Internet:
http://webeye.ophth.uiowa.edu/dept/websites/eyeres.htm
The Metasite Project (compares health sites and search engines): http://henry.ugl.lib.umich.edu/megasite/toc.html

eMedicine World Medical Library: http://emedicine.com/
Handbook of Ocular Disease Management: http://www.revoptom.com/handbook/hbhome.htm
MEDLINEPlus: Eye Disease: http://www.nlm.nih.gov/medlineplus/eyediseasesgeneral.html
University of Iowa Virtual Hospital: http://www.vh.org/

Resources on Information Literacy, Medical Informatics, Information Literacy:
http://www.sunyopt.edu/assistant.html

ASCO Meetings Calendar

ASCO OPHTHALMIC OPTICS EDUCATORS SIG
August 3-5, 2001
Hyatt Regency Westshore
Tampa, Florida

Clinic Directors/Administrators Special Interest Group
October 4-7, 2001
Portland, Oregon

ASCO Executive Committee and Board of Directors
November 2-3, 2001
Dallas, Texas

ASCO Executive Committee and Board of Directors
March 22-23, 2002
Ft. Lauderdale, Florida

For the most up-to-date information on ASCO meetings, contact ASCO's website at http://www.opted.org

Optometry Students' Perceptions of Observing Clinical Care

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Abstract

Background: *Primary care clinic observations are required of first and second year optometry students at the Illinois College of Optometry (ICO) and other optometry schools. We surveyed students to determine the perceived value of clinic observations.* ***Methods:*** *Third year ICO students were asked to voluntarily complete a survey regarding their primary care clinic observations during the previous two years. The survey consisted of 10 statements that were rated on a 4-point Likert scale.* ***Results:*** *Of the 160 class members, 149 completed the survey. More than half of the students agreed that clinical observations were worthwhile, assisted in orientation to clinic and the faculty's role, helped them understand expectations of third year clinicians, familiarized them with the general eye examination, helped them understand the use of techniques or theories, and helped them improve their efficiency and communication skills. In contrast, slightly more than half of the students believed that observations did not help them improve their documentation and technical skills. Although the results cannot be applied directly to other schools and colleges of optometry, the general trends indicate that primary care observations are useful and aid in the development of basic clinical abilities.*

Key words: *Clinical education, observation, experiential learning, optometric procedures*

Introduction

Clinic observation, which can be used to help familiarize students with technical procedures in a clinical environment, was defined as a teaching method at the Workshop on Teaching Strategies as part of the July 1992 Curriculum Conference in Denver, Colorado.[1] A mixture of teaching methods was deemed "essential to arrive at an optimally efficient curriculum."[1] To determine how frequently observation was actually used in optometry schools, we first conducted an informal survey by telephone or E-mail. The first author contacted the AOSA trustee or a faculty member from each school or college of optometry in the United States and Canada. Although the schools did not follow the same protocol for observations or require the same number, 10 of the 12 respondents reported that their schools utilized primary care clinical observations. Thus, clinical observation appears to be a commonly used teaching method in optometry schools.

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Clinic observations can be termed experiential learning experiences. *Experiential learning* is a process by which concrete experiences and reflection upon those experiences cause modification or further definition of concepts.[2,3] Understanding of concepts and tests, which have been introduced in lecture and laboratory during the procedures courses, is refined through observation experiences. By writing a summary of the examination observed or answering questions regarding the examination, students are encouraged to reflect upon what they have observed.

Observations also expose students to how techniques are performed by student clinicians and faculty. Students observe standard testing being modified or specific testing being chosen for a patient. This may help students better understand what will be expected of them as clinicians.[4] The examinations observed are experiences that foster understanding and competency in the material, complementing that gained from the formal clinical procedure courses.

Experiential methods have been implemented into both ambulatory care and anesthesia educational programs at select medical institutions.[3,5] For example, at Northwestern University, when students are learning basic examination skills, they observe and model the faculty's demonstration of these skills.[6] As another example, in the osteopathic medicine program at Nova Southeastern University, students regularly observe a primary care mentor physician, starting in their first year of training.[7] It has been reported that Nova Southeastern students and faculty feel very positively about this program.[8] In general, early clinical exposures of a variety of types are beneficial to students.[9,10]

During the first two professional years at the Illinois College of Optometry (ICO), students are taught all procedures necessary to conduct a primary care eye examination. At the beginning of their third year, they begin performing primary care examinations on clinic patients under the supervision of faculty. Part of the process of training these students during the first two professional years involves observation of student clinicians.

Although observations were previously performed at ICO, this current

model for observation was introduced into the curriculum in 1994. At that time, ICO was implementing a curriculum revision of the optometric procedures courses. The purposes of clinic observation were to provide a prolonged orientation to the clinical program, establish the link between classroom and clinic, and help students develop enthusiasm for clinical care and empathy for patients.

Observations at ICO typically involve students being assigned randomly to observe third or fourth year clinicians performing examinations in the primary care clinic at specific times. Observers are to shadow the clinicians performing the examination, but are not actively involved in performing examination procedures. They shadow the clinician during all or part of the examination. They observe the testing and interaction of the clinician and attending faculty with the patient, discussion of the case with attending faculty, and patient education. Student clinicians who are performing the examinations are not given any specific criteria or objectives to discuss with the student observer. However, students are free to ask questions of the clinician or the attending faculty member.

A total of nine clinic observations are required of all students by the six optometric procedures courses taught during the first and second years. Depending upon the course, observation requirements and type of examination observed vary. For example, a course that overviews the general eye examination requires observation of the entire examination, whereas a course on ocular health procedures requires specific observation of procedures such as biomicroscopy, tonometry, and gonioscopy, which may occur during a general eye examination or follow-up visit.

During the course of observations, students are required either to answer written questions or write a reaction paper based on their experiences. These questions focus on topics covered in the course in which they are currently enrolled. For example, for the ocular health procedures course, students must comment on the quality and efficiency of the ocular health techniques performed. Additionally, certain courses require that student observers record history and examination data as they are obtained from the patient by the examining clinician. This documentation is in addition to that in the medical record and is turned in to the course instructor for critique. The observing students are required to follow all established policies regarding patient confidentiality and ethics as published in the ICO Student Guide.

ICO faculty desire that certain objectives be met through observations. These include the students' obtaining: an orientation to primary care clinic and the role faculty and students play; demonstration by student clinicians and faculty of communication skills and examination techniques that are being taught concurrently; demonstration of appropriate documentation of findings; and demonstration of how and when tests should be performed in a clinical setting. Observations ideally

Table 1

Summary of students' responses to the following statements regarding primary care clinic observations. Survey statements are listed in order from those most students agreed with ("agree" and "strongly agree" categories combined) to statements students agreed with least. (In some cases, percentages do not add up to 100 due to rounding.)

	N	STRONGLY AGREE (%)	AGREE (%)	DISAGREE (%)	STONGLY DISAGREE (%)
Helped me familiarize myself with a primary care module in the Illinois Eye Institute (based on your primary care clinic observation experiences during first and second year).	147	25.2	59.9	15.0	0
Acquainted me with the role faculty play when providing patient care in the primary care clinic (based on first and second year).	147	16.3	63.3	19.0	1.4
Helped familiarize me with the components of a general eye exam (based on first year only).	147	13.6	65.3	17.7	3.4
Provided me with practical examples (positive or negative) which helped me improve my patient communication skills (based on first and second year).	147	17.7	59.9	19.0	3.4
Were worthwhile uses of my time (based on first and second year).	147	10.2	64.6	20.4	4.8
Provided me with real life examples, which helped me better understand the use of a test, technique or theory that I was currently learning (based on second year only).	149	9.4	65.1	22.8	2.7
Provided me with practical examples (either positive or negative), which helped me to improve my efficiency performing examinations (based on second year only).	147	5.4	54.4	34.7	5.4
Helped me realize what is expected of me as 3rd yr. clinician in the primary care clinic (based on first and second year).	147	7.5	45.6	40.1	6.8
Provided me with practical examples (either positive or negative), which helped me to improve my technical skills (based on second year only).	149	5.4	42.3	48.3	4.0
Provided me with realistic opportunities to practice documentation, which helped to reinforce my understanding of proper documentation (based on second year only).	149	4.7	42.3	41.6	11.4

serve as a supplement to course instruction and hands-on practice in laboratories.

Because no formal outcome measures had been obtained for the observation program, we undertook a survey of fall quarter third year students to determine the perceived value of clinic observations completed during the previous two years. The survey instrument was designed by the authors based on the faculty's objectives as specified in the preceding paragraph, which were specific to clinic observation during the first and second professional years.

Methods

Third year ICO students were asked to voluntarily complete a brief written survey tailored to their primary care clinic observations that had been performed during the previous two years. The survey consisted of 10 statements that were rated on 4-point Likert scale (strongly agree, agree, disagree, strongly disagree). The statements are listed in Table 1. The survey was distributed during a required fall quarter laboratory that was not related to the optometric procedures courses. The faculty members who administered the survey were not instructors in the optometric procedures courses. Willing students were given time to complete the survey and hand it in during the laboratory session. Consent was implied if the survey was completed and returned. All responses remained anonymous. This study was approved by the Institution Review Board of the Illinois College of Optometry.

At the time the survey was distributed, the third year class consisted of 160 students, of whom 70 were men and 90 were women. The mean age of the class members was 25.6 years. To avoid any form of identification, age and gender were not recorded for those who actually completed the survey.

The results were tabulated, and statistical analysis was performed using SPSS® Base 10.0 (SPSS Inc., Chicago Illinois). Percentages of students selecting each response were calculated. A secondary analysis was performed to assess what factors may have influenced students to rate observations as a worthwhile use of time. To accomplish this, the responses to "were a worthwhile use of my time" were correlated with the remaining nine survey statements.

Results

Table 1 summarizes the percentages of students choosing each response for each item of the survey. There were 149 students who completed the survey. Eleven students did not answer all the questions so the number of responses per question varied between 147 and 149.

Overall, observations were rated positively by students. The majority of students (74.8% when the "agree" and "strongly agree" categories are combined) felt that clinical observations were a worthwhile use of their time. The majority of students felt that observations assisted in orienting them to a primary care module (85.1%) and to the role that faculty play when providing patient care in the primary care clinic (79.6%). Slightly more than half (53.1%) felt observations helped them to understand what would be expected of them as third year clinicians.

Although the majority of students (74.5%) felt that observations helped them to understand the use of a test, technique or theory, and 78.9% agreed that observations helped to familiarize them with the components of a general eye examination, more than half of them (52.3%) did not believe that observations helped them improve their technical skills. Many students (59.8%) did, however, feel that observations gave them examples that helped to improve their efficiency. The majority of students (77.6%) also felt that observations provided them with examples that helped to improve their patient communication skills. In contrast, 53.0% of students responded that observations did not help to improve their understanding of proper documentation.

When the survey statement "were a worthwhile use of my time" was correlated with the remaining nine survey statements, a positive correlation was found with all statements (p=0.01). Since the correlation coefficients ranged between 0.28 and 0.38 (Kendall's tau b), the correlation with all survey statements was considered mild. Table 2 summarizes this information.

Discussion

Overall, students rated primary care clinic observations positively. Because the survey statements were based on the faculty's objectives for observations, it appears that those objectives were met. Students apparently per-

Table 2

Correlation of the survey item "Were worthwhile uses of my time" with each other survey item. All correlations were statistically significant at the p=0.01 level.

	Correlation Coefficient (Kendall's tau b)
Helped me familiarize myself with a primary care module in the Illinois Eye Institute (based on your primary care clinic observation experiences during first and second year).	0.28
Helped me realize what is expected of me as 3rd yr. clinician in the primary care clinic (based on first and second year).	0.38
Acquainted me with the role faculty play when providing patient care in the primary care clinic (based on first and second year).	0.28
Provided me with practical examples (positive or negative), which helped me improve my patient communication skills (based on first and second year).	0.39
Helped familiarize me with the components of a general eye exam (based on first year only).	0.31
Provided me with real life examples, which helped me better understand the use of a test, technique or theory that I was currently learning (based on second year only).	0.32
Provided me with realistic opportunities to practice documentation, which helped to reinforce my understanding of proper documentation (based on second year only).	0.26
Provided me with practical examples (either positive or negative), which helped me to improve my efficiency performing examinations (based on second year only).	0.30
Provided me with practical examples (either positive or negative), which helped me to improve my technical skills (based on second year only).	0.32

ceive that observations provide a vehicle for orienting them to the primary care clinic and the role faculty and students play, developing communication skills, and demonstrating how and when techniques should be performed in a clinical setting. The majority of students perceived clinic observations as a worthwhile experience. These findings seem logical since observations provide very realistic and practical examples of duties in the clinic and application of material covered in the procedures courses. Observations may motivate students to learn by further demonstrating the clinical relevance of the procedures courses.[11] By observing an experienced examiner such as a student clinician or attending faculty performing a technique, students may better understand how efficient their testing needs to become and the knowledge base they need to develop.[12]

Since effective interpersonal and communication skills have been shown to affect the patient's perception of a doctor and in the clinical context, to be related to clinical competence,[13] it is especially important to address communication skills in the optometric curriculum. At ICO, students are exposed to communication issues from a variety of sources. Communication issues are introduced in the case history portion of the procedures courses. Students are also required to take a course dedicated to communication issues. A majority of students believed that clinic observations improved their patient communication skills. Observations may allow students to see practical illustrations of communication issues that arise in clinic in addition to having them presented in a lecture setting or via videotape.

We attempted to determine which variables correlated best with students' perceptions that observations were "a worthwhile use of my time." Interestingly, all statements showed similar correlations with "a worthwhile use of my time." Thus a proportion of students who felt that observations were worthwhile also felt that other intended objectives were being met as well. No single factor indicating why students might consider observations worthwhile was identified.

Students' positive perceptions of observations elicited in this study correlate with the findings of Gable.[14] Gable reported on the general comments solicited from first year ICO students who had completed a required observation in the primary care clinic. Although 9 out of 165 students commented that they did not get much out of the assignment, 65 commented that they found it exciting to be in clinic.[14] This excitement may motivate the students to achieve the objectives for observations that the faculty desire.

Students did not perceive that observations were very effective at providing examples to improve their documentation or technical skills. This may be due to the observers' lack of active involvement in the patient examination. Observers do not document information directly into the medical record. Observers also do not document the assessment and plan for instructor critique since they do not yet have enough knowledge or experience to properly determine and state an assessment and plan for most patient cases. Students also are not actively involved in performing the testing during the examination. Although the observations demonstrate practical application of techniques taught in the procedures courses, there is no opportunity for students to practice performing techniques during observations. Students may have rated the statements on documentation and technical skills (and possibly others) higher if they had been more actively involved in the examination. However, this involvement should not be accomplished at the expense of third or fourth year clinicians' experience or efficiency of patient care. Clinical experience during the second year could be enhanced by having second year students examine patients on a limited basis with significantly more faculty supervision than third or fourth year students need.

For 9 of the 10 statements, responses varied between strongly agree (rated as 4) and strongly disagree (rated as 1). This variability may be due to differences in students' perceptions, experiences and the methods by which they learn. Differences in the students' interactions with clinicians and faculty during the observation may play a role. Clinicians and faculty are given no objectives for students who observe. It was felt that providing observation objectives for faculty and clinicians might distract them from their primary duties of patient care. Patient diversity may also play a role in the variability of student observers' perceptions. While students are told what portion of the eye examination they need to observe, patients are randomly assigned to student observers without regard to age, responsiveness or health history. With the large number of student observations, attempting to control these variables would likely create logistical problems.

In conclusion, our survey has revealed that clinic observations by first and second year ICO students are perceived to be a beneficial aspect of their clinical training. Although our findings cannot be directly applied to other schools and colleges of optometry due to the differences in structure and number of observations, the general trends may be useful to aid in refining the use of observations in the optometric curriculum.

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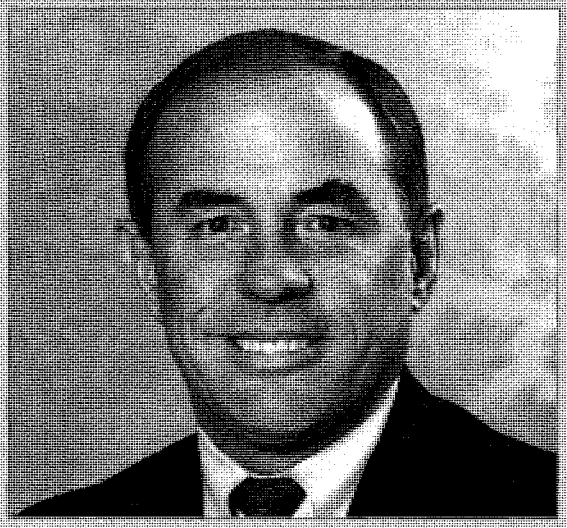

W. David Sullins, Jr., O.D., D.O.S., F.A.A.O.

Optometric Education recently interviewed Dr. W. David Sullins, Jr. as he left the Council on Optometric Education (COE) after a distinguished nine years of service, five of which he served as chair. At its annual Meeting in Boston, ASCO approved a resolution honoring Dr. Sullins for his "long and extraordinarily productive career" and for his "remarkable and sensitive leadership" of the COE.

Dr. Sullins, a graduate of the Southern College of Optometry, has exhibited leadership in a variety of venues spanning thirty-five years in optometry. He served as the president of the Tennessee Optometric Association and the American Optometric Association. He was the first optometrist to achieve flag rank in the U.S. Navy Reserves. He has served in numerous community service organizations and is a prodigious writer and lecturer.

How did your perceptions of accreditation and optometric education change from the time you began your service on COE to the present?

As an optometrist who has spent most of his life around the General Assembly of, not only Tennessee, but of many other states, I have always been aware of the responsiveness of optometric education. My experiences as a member, and particularly as chair of the Council on Optometric Education, have reinforced my feelings about the responsiveness of optometric education. History will reflect that few professions have had the educational structure to respond to the profession's request for increased responsibility with no loss and, in most cases, improved quality assurance in the educational product. I was impressed with the fact that in the United States accreditation is a totally non-governmental process that asks programs to enter into a process of self-improvement to assure quality improvement. I have been impressed with the commitment that most of the CEO's (deans and presidents) give to accreditation and how they use this process as it was intended, i.e. to improve the planning and execution of their program's educational objectives. The real value of accreditation is its role in stimulating continuous quality improvement, and it is counterproductive to look at the accreditation process as a seven-year cycle to be done just prior to the production of the self-study and site visit.

Early in my tenure as COE chair, I read an article written by Dr. Larry Braskamp, then president of CHEA, that espoused the philosophy of accreditors as "sitting alongside instead of standing over" educational programs. This philosophy embraces the concept of encouraging programs to achieve self-improvement. As COE chair, I adopted this approach as a personal philosophy. While still ensuring that the Council's standards are met, the COE has worked hard to encourage programs to engage in self-improvement activities.

Why do you think accreditation has improved?

I am firmly convinced that the Council on Optometric Education and other accrediting groups have made tremendous strides in self-improvement over the years. Historians of accreditation tell us that early accreditors placed a heavy focus on inputs, such as how many books are in the library, and what is the square footage of the classrooms.

Accreditation in 2001 is very different from its predecessor. Today's accrediting process calls for the program to define its mission (what it is), goals to help the program meet its mission, and objectives to help it assess when the program has reached its goals. With input from its constituency, the accrediting group develops a set of standards that define what elements are essential in an educational program in the discipline. These standards focus heavily on assessing whether a program meets its own mission, goals and objectives and prepares an individual to function in the discipline.

External review of accreditors has also led to improvements in the process over the years. Since 1952, the USDE has had provisions in place to recognize accrediting organizations. (The COE has been recognized by USDE since the government began recognizing accreditors.) Other non-governmental organizations throughout the years have attempted to bring together accreditors to discuss best practices and to look at areas of mutual concern. Currently, the Council on Higher Education Accreditation (CHEA) and the Association of Specialized and Professional Accreditors (ASPA) are two external non-governmental groups that focus on quality assessment and improvement of accreditation. ASPA has published a "Code of Good Practice," which the COE and other member accreditors must follow. CHEA has developed a recognition process, and the COE recently received its initial recognition from this new organization. The external entities that review accreditation require accreditors to do introspection on a regular basis that leads to self-improvement. This process is similar to the self-study performed by programs in the accreditation process and leads accreditors to identify strengths and weaknesses in relationship to external criteria.

The Council on Optometric Education has improved its process dramatically over the last decade with

the establishment of standards that are more specific than the earlier COE guidelines. The COE is committed to seeking input from all interested parties as we develop standards. The Standards Conference that COE convened in Chicago in 1998 when we began our most recent five year comprehensive review of the professional optometric degree standards is an example. It allowed us to meet with representatives of the schools and colleges of optometry and other organizations representing the profession to obtain a broad input concerning our then current standards before we began the revision process.

To improve the quality of the site visit process, the COE's Leadership and Professional Development Committee, chaired by Dr. Nada Lingel, has developed an excellent training process for Council members and consultants that combines distance learning with face-to-face discussion. We have developed an evaluation component of this training that allows the COE to make frequent "mid-course" improvements to the training when feedback from participants indicates that changes would be beneficial. COE also has developed a formal evaluation process for site visits that allows the programs to evaluate the performance of the teams that visit them. Team members evaluate team chairs, and team chairs evaluate the members. All of this information gathered from site visit evaluations is fed into the development process for the training program. I have been particularly grateful for the candor of all involved in completing the site visit evaluation forms. The evaluation information is confidential, and I strongly encourage accredited programs to continue to complete evaluation forms frankly.

The COE strives to increase the amount of input it receives from accredited programs and other stakeholders in the accreditation process. Annually, COE representatives have met with representatives of programs, ASCO, ARBO, AOA and NBEO to discuss areas of mutual interest. Through these interactions, the COE has done much to promote understanding and acceptance of our accreditation process.

Are there any consistent patterns to the recommendations offered to the schools and colleges that reflect problems that schools have in common in meeting certain standards?

One of the COE's Quality Improvement Committee's annual tasks is to review all of the outstanding recommendations of the accredited programs and to evaluate any patterns. When we see a standard that many programs seem to have difficulty with attaining, the Committee analyzes whether additional information about the standard is needed by the programs.

Many programs have experienced difficulty coming into full compliance with all portions of Standard 1 *Mission, Goals, and Objectives.* Providing evidence of a systematic use of outcomes assessment to improve the program has also been difficult for some. Since the Council assesses each program on the program's ability to meet its stated mission, goals and objectives, it is essential that programs address Standard 1. The Council has recently clarified its definitions of mission, goals, objectives and outcomes, and since the concepts are so key to accreditation, I will take the liberty of repeating those definitions here:

- **Mission** — The mission statement should express the overall purposes, intent and uniqueness of the program. It is a statement of the fundamental reasons for a program's existence.
- **Goals** — Goals specify the end results necessary to achieve the mission; they should elaborate each of the major components of the mission. They provide clarification and specificity for components of the mission statement.
- **Objectives** — As the goals were derived from components of the mission, specific objectives should flow from the goals. Objectives are the specifications on how the particular goal is to be reached. They are statements which define outcomes attributable to the mission and goals of a program.
- **Outcome** — An assessable quantity or quality relative to the overall success of a program in the achievement of its mission, goals and objectives.

In the area of residency accreditation, the Council has found that closer coordination must develop between many of the schools and colleges of optometry and their affiliated residency programs. It is essential that the academic affiliate and the clinical sponsor coordinate efforts to maximize their respective talents and to maximize the educational and clinical opportunities offered through the residency.

Do you feel that COE does an adequate job of assessing a school's clinical education during a school's accreditation visit?

The COE does more than an adequate job of assessing clinical education. However, as with all processes, there is always room for improvement, and the Council welcomes suggestions. With each revision of the Council's standards—and I have been a part of that revision on two occasions—there was a conscious effort to strive to make the standards more clear, valid and clinically relevant. The community of interest has responded to the request to assist us in the revision of those standards.

The COE requires the programs to design a curriculum that will allow the program to fulfill the intent of its mission statement to prepare graduates for entry-level as defined by the program. The COE requires the program to assess each student's achievement of curricular outcomes and to periodically evaluate the program, including the clinical component. The Council requires each program to establish and apply a set of clinical outcomes to prepare students for entry-level practice.

During the evaluation of the clinical program, the Council meets with students and faculty to gain an understanding of how the clinical educational program is conducted. The team examines the evaluation forms completed by students concerning their clinical education experience, and by instructors concerning the students' progress. The team also looks at the process used by the curriculum committee to design the clinical component of the curriculum and any changes that might be made based on feedback received from the evaluations. The team also reviews the process conducted by programs to select external clinical sites, to monitor students' progress at these sites and to monitor the preceptor's performance of the written agreement between the school or college and the external clinic.

Could you speak to the future of funding of the accreditation process?

The COE gives considerable attention to means of reducing or minimizing the time and dollar costs of accreditation, while maintaining a quality process. The COE Planning Committee is charged with continuing to explore this area. Funding of accreditation has

always been a challenge. I commend the American Optometric Association for creating the COE, assuring that it is an independent decision making entity and funding, by far, the lion's share of the Council's budget. The AOA funded 100% of the budget from the inception of COE until approximately 1983. At that time, negotiations allowed AOA to reduce some of their funding and ask the Association of Schools and Colleges of Optometry (ASCO) and the Veteran's Health Administration to assume some of the Council's funding. Today, the AOA funds approximately 70% of the accreditation budget, with the balance being funded by the Veteran's Health Administration and accredited programs.

The COE has been proactively seeking sources of funding from the community of interest that are not currently sharing the financial burden of accreditation. In the coming years, the COE will be working to implement its plans to reduce the portion of funding received from the American Optometric Association by reexamining the fee structure for accreditation and seeking funds from other constituents who have not previously been involved in funding the Council.

What are the best ways to facilitate the communication and unity of the profession for the common purpose of enhancing the profession among its different fiefdoms, i.e., AOA, NBEO, ARBO, ASCO, etc.?

First, during my tenure on COE, I have come to learn quite a bit about other health professions, and on this basis, I want to cite the unity and fundamental accord that exists within our profession. Unity is a luxury we have enjoyed while all parties maintain their respective roles and relationships. Regarding unity and communication as they relate to accreditation and the COE, the Council has met with its communities of interest, AOA, NBEO, ARBO and ASCO, at least once a year for the past five years. Ongoing dialogue has been helpful to allow all involved to understand the accreditation function. It is important for all entities involved to come together periodically to address issues of common concern.

What do you view as your most significant accomplishments as chair of the COE?

Working with input from the communities of interest, the Council on Optometric Education, with its dedicated volunteers and staff, has achieved much in the past half of a decade. Our, not my, most significant accomplishments are:

1) **Increasing effective communication and "buy-in" from the community of interest.**

I am pleased that the Council has had many opportunities to discuss its activities during the past five years with other organizations and programs. The COE also recently developed a web presence that allows the public as well as the profession to have access to information about the Council. The Council has also presented educational programs annually at the Academy at the ASCO Residency SIG breakfast meeting for those interested in residency education.

2) **Building a staff more commensurate with the workload activities of the Council.**

With the burgeoning growth of residency programs in the last five years, the development of COE committees and the increasing emphasis that the COE wanted to give to quality improvement activities, it was essential that COE have more staff to support its activities. Two years ago, the COE increased its total staff to two full-time professional and one administrative staff.

3) **Building an infrastructure to allow the Council to function more effectively while broadening the base of input.**

When I met with Dr. Jim Boucher in 1996 to discuss the transition to the COE chair, we realized that the Council needed to look at some means of reorganizing to allow the COE to most efficiently function with the growing workload it faced. We discussed the formation of a committee structure, and I am pleased at how this structure has flourished. The Council's Committees develop ideas, programs and policies, which are presented to the Council. The Committees serve in an advisory capacity and make recommendations to the Council. The result is that the issues pertinent to accreditation are more closely examined with more alternatives considered than is possible when operating as a "committee of the whole." The Committees are manned by members from COE and representatives of accredited programs or professional practice who are not COE members. This broadened membership also gives us more insight as we develop our policies and processes.

4) **Developing a distance learning program for COE consultants that will allow us to continue to maintain the quality and consistency of the site visit process.**

The COE's Leadership and Professional Development Committee must be commended for its efforts to develop a site visitor training process that is recognized as excellent by the accreditation community.

5) **Developing an ongoing plan to assess the validity, reliability and relevancy of COE functions.**

The COE's Quality Improvement Committee, through its regularly scheduled assessments and special projects, continues to significantly advance the Council's commitment to improvement.

What do you see as the major challenges to the accreditation of optometric schools and colleges in the next 5-10 years?

The Council must: 1) continue to increase the "buy-in" within the community of interest and the profession at large; 2) educate the community of interest about the real value of the accreditation process; 3) share the cost of accreditation among all parties within the community of interest; 4) explore ways to decrease the cost of accreditation, including new technologies; 5) Continue to encourage programs to develop assessment systems that allow them to better evaluate their programs using significant barometers and milestones; and 6) Increase the understanding of using accreditation as a quality improvement and quality assurance process.

In closing, I must say how thrilled I am to have served our profession in this most important capacity. I commend to you, the ladies and gentlemen who served on the COE over the years, and especially those I have had the pleasure to serve with over the past nine years. Few, if any, people make the contributions that they have made, and continue to make, on behalf of optometric education, the profession we love and the patient public that we all attempt to serve. I will cherish my years on the Council and especially those in which I served as COE chair. I hope you will continue to think well of this marvelous institution. I commend all those people within optometric education for the enormous contributions they have made and will continue to make and the dreams they have for the future.

Optometry Student Computer Skill Trends

Bill B. Rainey, O.D., M.S.

Abstract

Purpose: *The use of instructional technology in optometric education is increasing rapidly, and optometry students must possess a few basic computer skills in order to take full advantage of this technology. Information about student computer familiarity would be useful when developing and implementing technology in the classroom.* ***Methods:*** *Since 1995, third year optometry students at the Indiana University School of Optometry have been surveyed at the beginning of the fall semester about their computer experience and skills. This survey enabled the computer applications used in the course to be adapted to the appropriate technological level. The results of the surveys were compiled for each class.* ***Results:*** *Optometry student computer skills increased considerably over the five years of this survey. Students in the fifth year of the survey rated their overall level of computer experience much higher than the students did in the first year of the survey. In addition, Internet familiarity and the regular use of electronic mail ("e-mail") has grown considerably.* ***Discussion:*** *There are many factors to consider when deciding whether or not to incorporate instructional technology into optometric education, including faculty expertise and motivation; costs of hardware and software; and the need for technological support. However, it seems that optometry students are becoming more experienced with computer use and the Internet; thus they are prepared to take advantage of any instructional technology tools that are made available.*

Key Words: *instructional technology, computers, student computer skills, Internet*

Introduction

The use of computers and electronic information technology to assist in classroom instruction has increased significantly over the past several years.[1,2] A variety of computer-based resources exist for the optometric educator, both at the desktop and on the Internet.[3-7] These resources are usually intended to supplement, not to replace, existing educational methods such as lectures, slides, videos, textbooks, and written assignments.

In addition to offering an additional method of teaching and learning, there are several reasons to use computer technology to augment optometry classroom and clinical instruction. First of all, the volume of information that must be covered in each course is growing, but the number of hours available for traditional teaching is limited. In a particular course, for instance, it might be desirable to add more clinical case examples to illustrate basic concepts, but this would take away from teaching time spent on covering the basic information. So, adding case examples in a computer format would allow students to apply what they have learned in the classroom without using additional lecture time.

Secondly, using computer resources keeps students involved in coursework outside of scheduled lecture and lab times. The more time a student spends studying and reviewing course material, the better the material might be learned. If a student only thinks about the course when he or she is in class, less information is retained. Thirdly, information can be more easily accessed and shared, regardless of time or location. Students can view Internet-based course materials from a computer anywhere in the world, at any time of day or night. In other words, everything is accessible by everybody from anywhere at any time.

Despite these benefits, faculty and administrators considering the use of computer technology for teaching may encounter a few problems. For example, Internet information can only be accessed from a computer that has an Internet connection, which requires hardware, software, and support. This may not be a problem at institutions that have rich and elaborate technology infrastructures. But, some academic institutions may not have an adequate level of information technology equipment and support, and the development of such an infrastructure can be expensive. Also, the development and maintenance of such technology can be extremely time consuming.[5] Additional staff must be hired and trained to support faculty course development, and students may have to be trained to use these resources. Many faculty, staff, and students are unfamiliar with computer capabilities and operation, and may even avoid the use of computers.

Since 1989, technological availability at the Indiana University School of Optometry has grown dramatically. This is due, in large part, to comprehensive strategic planning by the School through its Technology Committee.[8] Currently, in addition to faculty workstations, approximately 35 computers are available in the Optometry Building for optometry student e-mail, Internet and World Wide Web (WWW) access, word processing, presentation development, and other tasks, and many courses in

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the School of Optometry curriculum include some amount of computer use. As a result, student computer skills and experience have changed over the past 10 to 15 years. In order to assess the level of student computer skills, IU optometry students have been surveyed annually since 1995. This information was used to assist in the development of computer tools used for teaching purposes. This report summarizes the results of those surveys.

Methods

Since 1995, the third year Basic Vision Therapy course (V755) at the IU School of Optometry has used the Internet as a teaching resource to exchange information among students, instructors, and other professionals and organizations with related interests. Currently in this course, the Internet is being used for e-mail and bulletin board communication, and the posting of lecture and lab notes and of various WWW links to related information. Basic interactive surveys and review questions are also being developed. The most recent V755 WWW 'Virtual Classroom' can be found at www.indiana.edu/~v755.

For the past five years, third year optometry students have been surveyed at the beginning of the fall semester about their computer familiarity, experience and skills. This survey enabled the computer applications used in the course to be adapted to the appropriate technological level. The results of the surveys were compiled for each class. Appendix I lists the survey questions, which can also be found as a WWW form on the V755 Virtual Classroom.

Results

Table 1 gives the response rates for each year of the student survey. For the first four years of the survey, the questions were completed on paper in class. In 1999, the fifth year of the survey, the questions were completed and submitted via the WWW during the first week of class. Because the response rate for all years was so high, the summary results accurately represent the reported skill level of the classes.

Overall, student experience and comfort with using computers increased significantly between 1995 and 1999 (Figure 1). In 1995, only 30% of students felt at least " fairly experienced/pretty comfortable," with using computers, and this percentage increased to 78% in 1999. As far as knowledge of the Internet, 97% of students in 1999 at least " know what the Internet is and what it can do," compared to only 53% in 1995 (Figure 2).

Optometry student use of computers for communicating has also increased dramatically since 1995. All Indiana University students are given e-mail user accounts through the University upon enrollment. Despite the existence of these e-mail accounts, less than 50% of students in 1995 used e-mail at least once a week, whereas virtually all students do so now (Figure 3). E-mail communication has become a regular daily routine for many students for academic, professional and social purposes.

In addition to the computers available in the School of Optometry Building, the Bloomington campus of IU maintains over 2,000 computers for student use in desktop and Internet applications. These workstations use either IBM/Windows or Macintosh operating systems. In addition, students have access to several large Unix mainframes with various educational and research applications.

Along with this rich and well-supported University-based computing environment, many students own their own computers for use at home. In 1999, 60% of third year optometry students owned a computer (Figure 4), with the vast majority of them

Figure 1
Student Self-Rating of Computer Experience

(3 = "fairly experienced/pretty comfortable"; 4 = "quite experienced/very comfortable";5 = "Lots of experience (could program for Bill Gates!)").

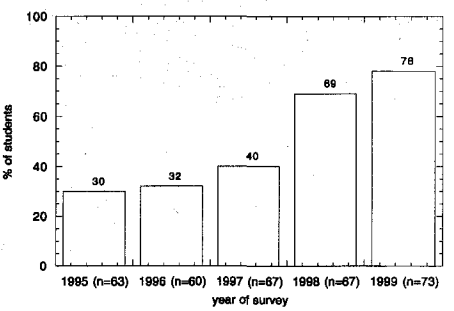


Figure 2
Student Self-Rating of Internet knowledge

(3 = " know what the Internet is and what it can do "; 4 = " have used the Internet on occasion "; 5 = " regular Internet surfer").

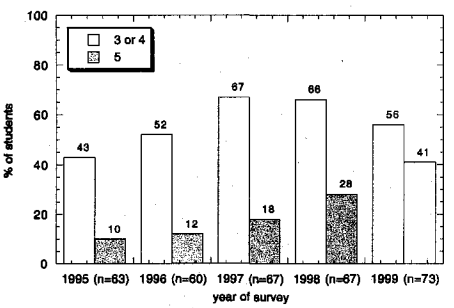


Table 1
Response Rates of Third Year Optometry Students.

Year	Number of students enrolled in V755 course	Number of responses	% of class responding
1995	65	63	97%
1996	69	60	87%
1997	76	67	88%
1998	68	67	99%
1999	73	73	100%
Overall	351	330	94%

* The survey was given each year at the beginning of the fall semester.

Figure 3
Student Use of e-mail.

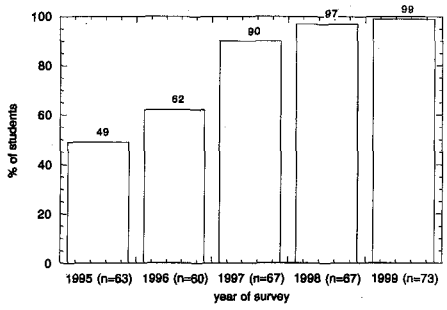


Figure 4
Percent of Third year Optometry Students Who Own a Computer.

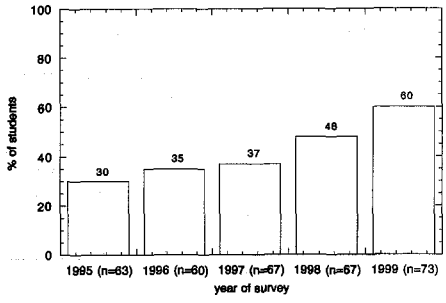


Figure 5
IBM/Windows vs. Macintosh Operating Systems Among Student Computer Owners.

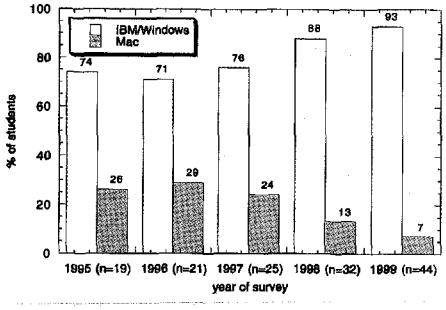
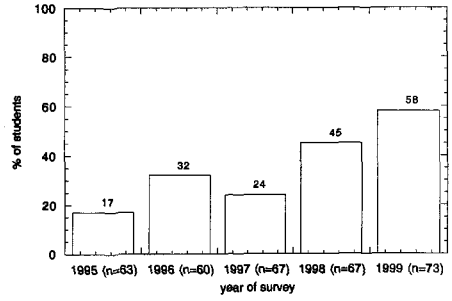


Figure 6
Percent of Third Year Optometry Students Who Own A Computer with a Modem.



being IBM/Windows systems (Figure 5). Virtually all of the student-owned computers have modems (Figure 6), and IU provides free Internet access software to students and faculty.

Discussion

Because of the availability of adequate computer hardware and software resources for student use, and because of increased faculty use of this information technology for teaching, student computing experience and skills have improved dramatically at Indiana University over the past five years. In 1995, students did not feel as comfortable with their computer skills, and made minimal use of desktop and Internet applications. In fact, the first scheduled laboratory in the V755 course was designed to teach students basic e-mail and WWW skills for use in the course. This laboratory has not been taught for the past two years, because students felt it was unnecessary.

Faculty use of computer technology has also increased over this time. Some of the available course applications can be found on the WWW at www.opt.indiana.edu/optlib/elecreserves.html. The combination of these applications, and the widespread availability of technology hardware, software, and support has contributed to the increase in student skills and experience.

Development and maintenance of a solid information technology infrastructure may be costly, in terms of both time and money.[5] Because of these additional costs, many optometry schools might see this as a barrier to such development. Educational computer applications should be considered in terms of each school's mission and existing resources. Despite the costs, it is clear that if access to information technology exists, and if applications of this technology are incorporated into existing methods of teaching, students will take advantage of it. Additional tools must then be developed and used to assess the effectiveness of this technology.

Summary

At the IU School of Optometry, students are becoming more experienced with computer use and the Internet. Optometry students are regular users of Internet communications such as e-mail and the WWW, and over one-half of third year students own a computer with a modem. Information technology in this form is an important educational resource, and each optometry school should carefully consider the role that such technology will play in optometric education.

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Appendix I
Computer Skills Survey Administered to Third Year Optometry Students

The following form is intended to survey the IU School of Optometry Class of 2001 regarding computer familiarity and experience. There are no "correct" answers, and you will NOT be graded on your responses. Participating in the survey DOES, however, count towards your lab grade. The class composite results will be posted to the Web for your review.

Please answer the following questions as accurately as possible, so that we can better understand the level of computer experience of your class.

Check the best response:

1. How would you rate your overall level of computer experience?
   __ no experience
   __ a little experienced/somewhat comfortable
   __ fairly experienced/pretty comfortable
   __ quite experienced/very comfortable
   __ LOTS O' experience (could program for Bill Gates!)
2. What do you know about the Internet?
   __ nothing
   __ know that it exists
   __ know what the Internet is and what it can do
   __ have used the Internet on occasion
   __ regular Internet surfer
3. If you have used the Internet, what have you used it for? (check all that apply)
   __ have never used the Internet
   __ e-mail
   __ mailing lists
   __ Usenet newsgroups
   __ ftp
   __ Gopher
   __ World Wide Web
4. How often do you use your IU UITS computer account?
   __ never
   __ less than once a month
   __ once a month
   __ once a week
   __ daily
5. Do you regularly (i.e., at least once a week) send and receive e-mail?
   __ yes __ no
6. Do you own a computer?
   __ yes __ no
7. If you own a computer, what kind is it?
   __ DOS/Windows
   __ Mac
   __ Don't own a computer
8. If you own a computer, do you have a modem?
   __ yes (speed->_____bps) __ no
9. If you own a computer, do you subscribe to any of the following on-line services? (check all that apply)
   __ America On-Line
   __ Prodigy
   __ CompuServe
   __ Delphi
   __ Other
   __ I said, "I DON'T own a computer!
10. Do you know what BTW, IMHO, and FWIW mean?
   __ yes __ no

(Continued from page 104)

pigmented tissues (iris and periorbital tissue), and increased pigmentation and growth of eyelashes. These changes may be permanent. TRAVATAN(tm) is contraindicated in patients with known hypersensitivity to travoprost, benzalkonium chloride, or any other ingredients in this product. TRAVATAN(tm) may interfere with the maintenance of pregnancy and should not be used by women during pregnancy or by women attempting to become pregnant. For more information, visit www.travatan.com or call 1-800-451-EYES (3937).

PRIO Introduces Computer Eyewear Collection

PRIO Corporation, market leader in the fast growing computer vision field, has introduced an affordable designer eyewear collection specifically for computer use as part of its *Complete Computer Vision Solution.* Mary Matthew, PRIO's vice president for sales and marketing, and an eyewear designer and executive for 15 years, designed the new eyewear collection.

PRIO's *Complete Computer Vision Solution* is a "one-stop shopping" computer vision specialty marketing approach that gives retailers and independent optometrists the opportunity to draw patients' attention to the problem of computer vision syndrome and its solution.

"PRIO developed the *Complete Computer Vision Solution* to support the doctor in the development of a computer vision specialty," said Jon Torrey, president and CEO, PRIO Corporation. "With the industry experiencing tremendous growth in this niche, we saw the availability of high quality, yet reasonably priced designer computer eyewear as a huge market and excellent opportunity for retailers and doctors." For more information, visit www.prio.com or call (800) 621-1098.

Marchon Catalog Features 240 Styles

Marchon Eyewear released its latest catalog to the Marchon team, featuring more than 240 styles, all shown in silhouette with their complete color range, totaling over 1000 photos. The catalog also includes beautiful imagery and the industry's biggest and best selection of merchandising materials.

The catalog's extensive merchandising section includes merchandise and point-of-purchase materials for the Marchon and Flexon collections, as well as the following Marchon licenses: DKNY, Nike, Nautica, Calvin Klein, cK Calvin Klein, Fendi, Disney and Officemate. There is also a price list in the back cover pocket for easy reference. Marchon Eyewear, Inc., headquartered in Melville, New York, is the world's largest, privately owned producer and distributor of fashion and technologically advanced eyewear and sunwear.

Corning Ophthalmic Names New Manager

Yvonne Gleek has joined Corning's Ophthalmic division as lens-manufacturing development manager. Gleek has more than 12 years in the ophthalmic industry, with experience in the management of sales, marketing, manufacturing and research and development. Before joining Corning, Gleek served as director of product development for Magnivision. She was previously with Neolens and Sola Optical.

Transitions Appoints New Marketing Manager

Transitions Optical named Vanessa Johns marketing manager of North America, responsible for development and implementation of advertising, sales promotion, publicity, direct marketing, professional relations and market-research activities. Johns had served as Transitions' marketing manager of South America, based at the company's plant in Brazil.

Paragon Names New Director, Global Sales

Mike Wildman has been named director, global sales development, for Paragon Vision Sciences, a leading producer of innovative materials used in the manufacture of oxygen permeable lenses, headquartered in Mesa, Arizona. Wildman will help drive Paragon's oxygen permeable materials business, a multi-million dollar operation that has a rapidly growing market share. Most recently, Paragon introduced SportSight(tm) GP Performance Contacts - the first RGP contact lens product developed specifically for sports usage and general outdoor wear. For more information, contact Paragon at (480) 892-7602 or visit its Web page at www.paragonvision.com.

PRIO Adds to Regional Sales Force

PRIO Corporation announced the addition of three new regional managers to its national sales force. The new managers are C. Patrick Higuera in the far west; Carole A. Maxwell in New England; and Karri Bolman in the Pacific Northwest. "The talents, energy and experience offered by Patrick, Carole and Karri will greatly bolster the support we will be able to offer our customers in these regions and around the country," said Jon Torrey, president and CEO of PRIO Corporation. "This is particularly critical in light of the dramatic growth the computer vision industry has experienced and will continue to face in the future."

Vistakon Sponsors Women's Soccer

Vistakon, Division of Johnson & Johnson Vision Care, Inc., announced its sponsorship program in support of the women's United Soccer Association (WUSA). Key elements of the four-year sponsorship include the creation of Team ACUVUE(r) Goalies (eight projected starting goalkeepers) for eye health education, retail visits and youth clinics; a traveling interactive booth where people can win premium prizes; and a Viewers' Guide with soccer terminology, player facts, league information and eye health tips.

"We are thrilled to be a charter sponsor of the WUSA," said Carlos Navarro, product director, Vistakon. "The goalkeepers are our focus because they need great vision, are the last line of defense, and always must 'keep their eye on the ball,' no matter where the action is on the field. These players truly share the ACUVUE(r) Brand vision of bringing the importance of good eyesight and eye health to the public."

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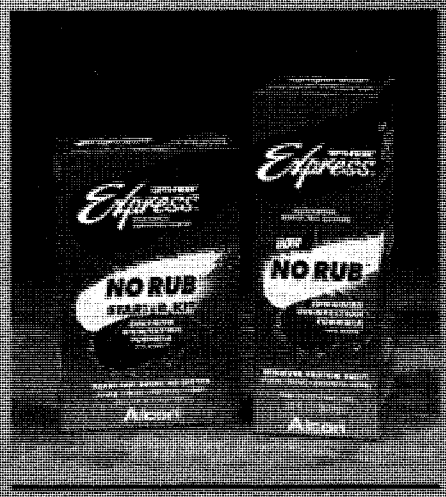

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