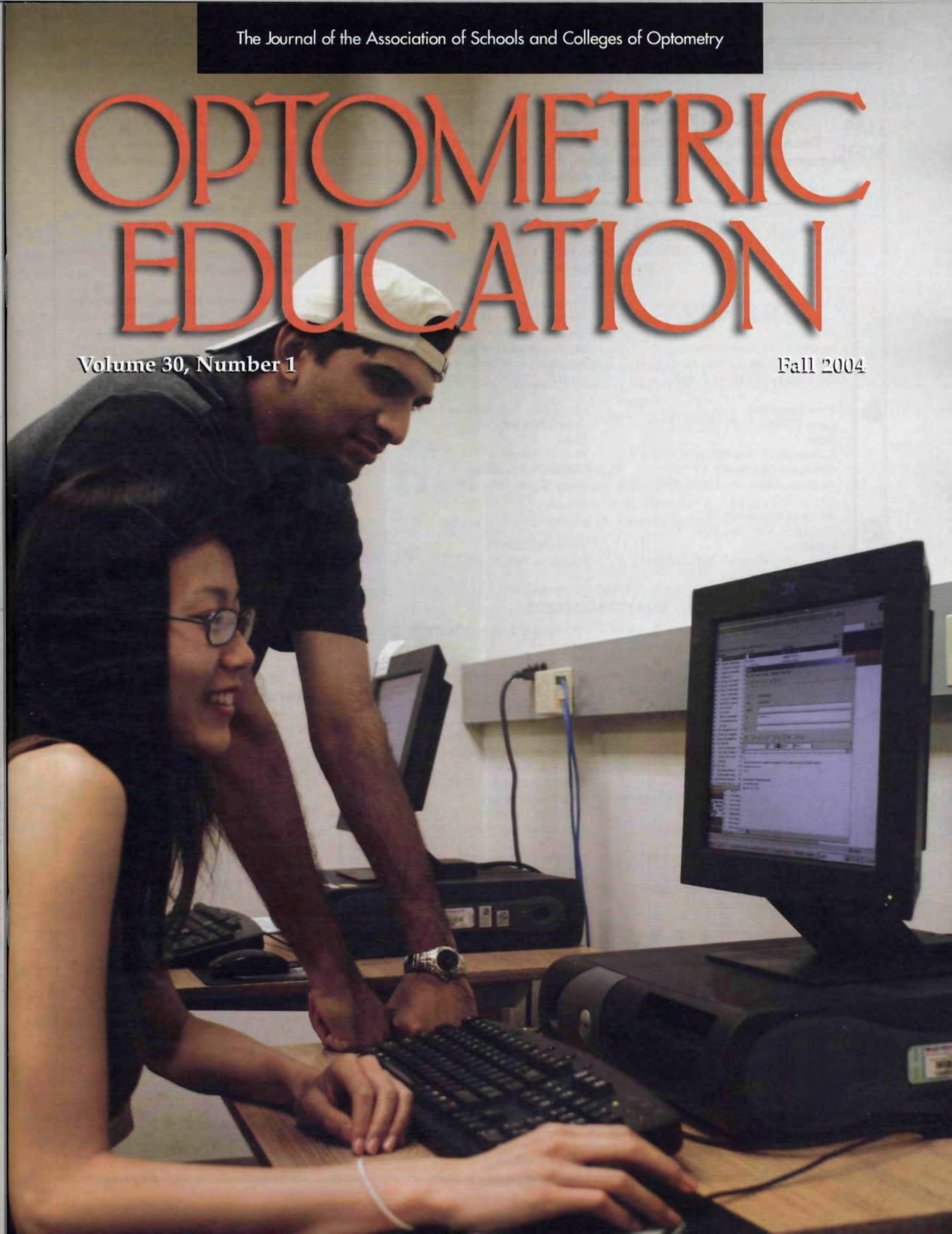
The Journal of the Association of Schools and Colleges of Optometry

OPTOMETRIC EDUCATION

Volume 30, Number 1 Fall 2004



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.

OFFICERS AND MEMBERS

BOARD OF DIRECTORS

Executive Committee

President
George E. Foster, O.D.
Dean
Northeastern State University
College of Optometry
Tahlequah, Oklahoma 74464

Secretary-Treasurer
Hector Santiago, O.D., Ph.D.
Dean
Inter American University of Puerto Rico
School of Optometry
Hato Rey, Puerto Rico 00919

President-Elect
Larry J. Davis, O.D.
Dean
University of Missouri at St. Louis
College of Optometry
St. Louis, Missouri 63121-4499

Immediate Past-President (Ex Officio)
Leland W. Carr, O.D.
Dean
Pacific University
College of Optometry
Forest Grove, Oregon 97116

At-Large Member
William E. Cochran, O.D.
President
Southern College of Optometry
Memphis, Tennessee 38104

Executive Director
Martin A. Wall, C.A.E.

BOARD MEMBERS

Kevin L. Alexander, O.D., Ph.D., Dean
Michigan College of Optometry
At Ferris State University
Big Rapids, Michigan 49307-2738

***Thomas L. Lewis, O.D., Ph.D., President**
Pennsylvania College of Optometry
Elkins Park, Pennsylvania 19027-1598

***Arol Augsburger, O.D., M.S., President**
Illinois College of Optometry
Chicago, Illinois 60616

***David Loshin, O.D., Ph.D., Dean**
Nova Southeastern University
Health Professions Division
Ft. Lauderdale, Florida

John Amos, O.D., Dean
University of Alabama at Birmingham
School of Optometry
Birmingham, Alabama 35294-0010

Gerald E. Lowther, O.D., Ph.D., Dean
Indiana University
School of Optometry
Bloomington, Indiana 47401

***A. Norman Haffner, O.D., Ph.D., President**
SUNY, State College of Optometry
New York, New York 10010

Melvin D. Shipp, O.D., MPH, Dr.PH, Dean
The Ohio State University
College of Optometry
Columbus, Ohio 43210-1240

Dennis M. Levi, O.D., Ph.D., Dean
University of California at Berkeley
School of Optometry
Berkeley, California 94720-2020

Earl L. Smith, III, O.D., Ph.D., Dean
University of Houston
College of Optometry
Houston, Texas 77204-2020

***Alan L. Lewis, O.D., Ph.D., President**
The New England College of Optometry
Boston, Massachusetts 02115

***Lesley L. Walls, O.D., M.D., President**
Southern California College of Optometry
Fullerton, California 92831

**Past Presidents*

ASCO Affiliate Members

Dr. Jacques Gresset, Director
University of Montreal — Optometry
Montreal, Quebec H3C 3J7

Dr. William Bobier, Director
University of Waterloo — Optometry
Waterloo, Ontario, Canada N2L 3G1

Dr. Stephen Miller, Exec. Dir.
College of Optometrists in
Vision Development
St. Louis, Missouri 63141

Mr. Robert Williams, Exec. Dir.
Optometric Extension Program
Foundation
Santa Ana, California 92705-5510

Dr. John Townsend, Director
VA Optometry Service
Department of Veterans Affairs
Baltimore, MD 21202

Dr. Jairo H. Garcia, Dean
Universidad de la Salle
Facultad de Optometria
Bogota, Colombia

Editorial Review Board

Editor: Lester E. Janoff, O.D., M.S.Ed.

ASCOTECH Coeditors:
Dominick M. Maino, O.D., M.Ed.
Geoffrey W. Goodfellow, O.D.
Communications Editor:
Ellen Richter Ettinger, O.D., M.S.

Diane T. Adamczyk, O.D.
John Baker, O.D., M.S.Ed.
Etty Bitton, O.D., M.Sc.
Nancy B. Carlson, O.D.
N. Scott Gorman, O.D., M.S., Ed.D.
Charles Haine, O.D., M.S.
Nada J. Lingel, O.D., M.S.
Richard E. Meetz, O.D., M.S.
Jeffrey Nyman, O.D.
Doug Penisten, O.D., Ph.D.
David Perrigin, O.D.
Hector Santiago, Ph.D., O.D.
Paulette P. Schmidt, O.D., M.S.
Julie A. Schornack, O.D., M.Ed.
Leo P. Semes, O.D.
Marlee M. Spafford, O.D., M.Sc., Ph.D.
Mark Swan, O.D., M.Ed.
Wayne Verdon, O.D., Ph.D.
Tim Wingert, O.D.

OPTOMETRIC EDUCATION

ISSN 0098-6917

VOL. 30
NO. 1

CONTENTS

FALL
2004

The Journal of the Association of Schools and Colleges of Optometry

DEPARTMENTS

Cover photo courtesy of SUNY College of Optometry

OPTOMETRIC EDUCATION is published by the Association of Schools and Colleges of Optometry (ASCO). **Managing Editor:** Patricia Coe O'Rourke. **Art Director:** Carol Nansel, Nighthawk Communications. Business and editorial offices are located at 6110 Executive Boulevard, Suite 510, Rockville, MD 20852 (301) 231-5944. The ASCO website is www.opted.org **Subscriptions:** JOE is published three times a year distributed at no charge to dues-paying members of ASCO. Individual subscriptions are available at $30.00 per year, $40.00 per year to foreign subscribers. Postage paid for a non-profit, tax-exempt organization at Rockville, MD.

Indexed in Current Index to Journals in Education (ERIC).

EDITORAL

Web-based Course Management Systems — Opening the Door to the Future

Lester E. Janoff, O.D., M.S.Ed., F.A.A.O.

Two articles published in this issue of the journal involve computer-assisted instruction (CAI), particularly web-based formats; both articles describe some benefits and challenges of using a course management system (specifically WebCT™). Nowakowski and Swanson present numerous figures that clearly indicate what the student sees when involved in this online activity, and they also list some interesting student comments about using WebCT™. Mozlin and Perry discuss the faculty experience that follows from a substantial investment in faculty training on WebCT™. Clearly both of these facets of Web-based courses need to be considered. Having been involved with WebCT™ at Nova Southeastern University College of Optometry, I can appreciate the seductiveness of this technology. But, I'm also familiar with the intense immersion required to learn to use the system and the frustration when computers and/or the Web seem to throw hurdles in your path, usually at the worst possible time.

But Mozlin and Perry ask the real question: Is a Web-based course management system an effective tool? First I believe we must consider the type of student admitted to Optometry College. What is the student's experience with computer-assisted instruction? Obviously students will prefer and be more comfortable with learning styles and formats that they are more familiar with. If undergraduate training consists entirely of traditional lecture with little or no computer interaction, then it is likely that students will find Web-based instruction unpleasant.

Many health professional students enjoy the interaction with specialist teachers whom they may see as role models. In these face-to-face encounters, learners can ask their questions and have them answered immediately. In fact, formative feedback has been well established as a valuable tool for learning. Technical glitches, dead hypertext links and poor course design can easily turn a student off to Web-based instruction. Good instructional design and facility with the computer program will require an extensive investment of faculty development time. It may well be that Web-based course management is not for everyone or for every course. Certainly, for students located away from the campus, it is ideal.

Which style of computer-assisted instruction is best? Most articles in the medical literature are descriptive rather than evaluative (using CAI as the Medline search term resulted in the retrieval of 215 articles as far back as 1975). And there is some concern about the internal validity of media comparisons. CAI may offer novel features not presented in a more traditional format. Do interactive computer formats produce learning superior to non-interactive formats? Not according to some studies. Yet we know that an active learning environment, in which students can build and test their mental model from information actively acquired rather than merely storing knowledge, fosters competence. The truth is we are in the infancy of CAI, and good evaluative studies are difficult to come by.

But, when we do develop good Web-based courses, the exciting part is that we can easily do precisely what Nowakowski and Swanson suggest. We can share selected online course work among the schools and colleges of optometry. This opens the door to fascinating future developments in optometric education.

E-Learning: Friend or Foe?

Geoffrey W. Goodfellow, O.D., F.A.A.O.
Dominick M. Maino, O.D., M.Ed., F.A.A.O

Technology surrounds our students in and outside the classroom. A recent study reported in the *Chronicle of Higher Education* found that 60% of college students were regular video game players. The time spent on gaming appears to be cutting into classwork. About half of the students surveyed said that gaming distracted them from studying. A third of the students even said they played games during class!

As the use of E-learning becomes standard practice in most schools and colleges of optometry, we tend to tie our students even closer to technology. Luckily, most research shows that such online resources are beneficial to the learning process. Even so, the jury is still out on how best to use this newest teaching medium.

David McArthur and colleagues have provided an excellent summary of the different blends of e-learning:[1]

Web-Displayed: Online syllabus, readings, assignments; no Web-based communication with instructor or online assessment or feedback. Classroom or correspondence is used mainly for instructional delivery.

Web-Enhanced: In addition to Web-Displayed components, also may include online lecture and/or interaction, including chat or threaded discussion; some assessment also may be online. Classroom is still main delivery method.

Hybrid: Uses all Web-Displayed and Web-Enhanced components and adds increasing online content, interaction, assessment, and feedback to replace some class sessions.

Online: No face-to-face component. Interaction, feedback, assignments, and other characteristics of Web-Displayed and Web-Enhanced courses are used to engage the student. This shift does not necessarily imply less instructor involvement.

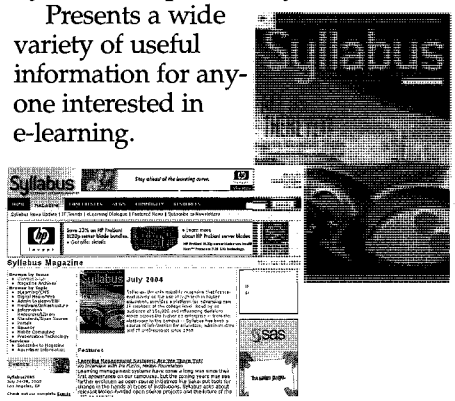
For educators, it is often difficult to determine which blend will provide the best experience for students. Likewise, it is sometimes challenging to transform a more conventional teaching style into a 21st century delivery scheme.

One great resource is Syllabus Magazine, which targets technology in higher education. This free publication is distributed ten times per year to about 50,000 administrators, IT personnel, and tech-savvy faculty. The e-newsletters at www.syllabus.com are full of helpful information. Their annual June conference also provides great continuing education for educators working with e-learning. Courses such as *Instructional Design that Fits Online* and *Developing Effective Online Pedagogy* provide valuable techniques for developing online resources. Optometric faculty should visit this resource and the other noted online resources frequently.

Online Educational Resources

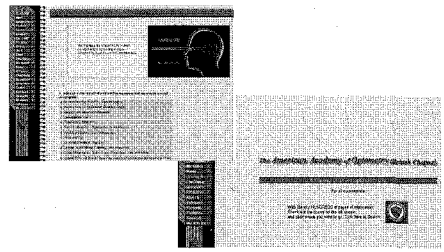
Syllabus (http://www.syllabus.com)

Presents a wide variety of useful information for anyone interested in e-learning.



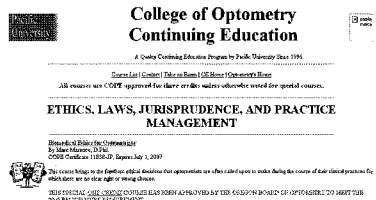
American Academy of Optometry (British Chapter) (http://www.academy.org.uk/)

The British Chapter of the AAO presents numerous interactive tutorials discussing everything from accommodation to gonioscopy, from lesions in the optic pathway to retinoscopy, and from indirect ophthalmoloscopy to conjunctival concretion removal.



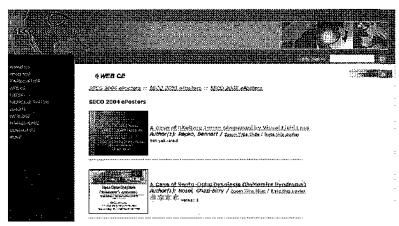
Pacific University (http://www.opt.pacificu.edu/ce/catalog/)

Pacific University has been a leader in online education for some time now. Here you will find several educational programs including courses on biomedical ethics, glaucoma, steroid use and pain management.



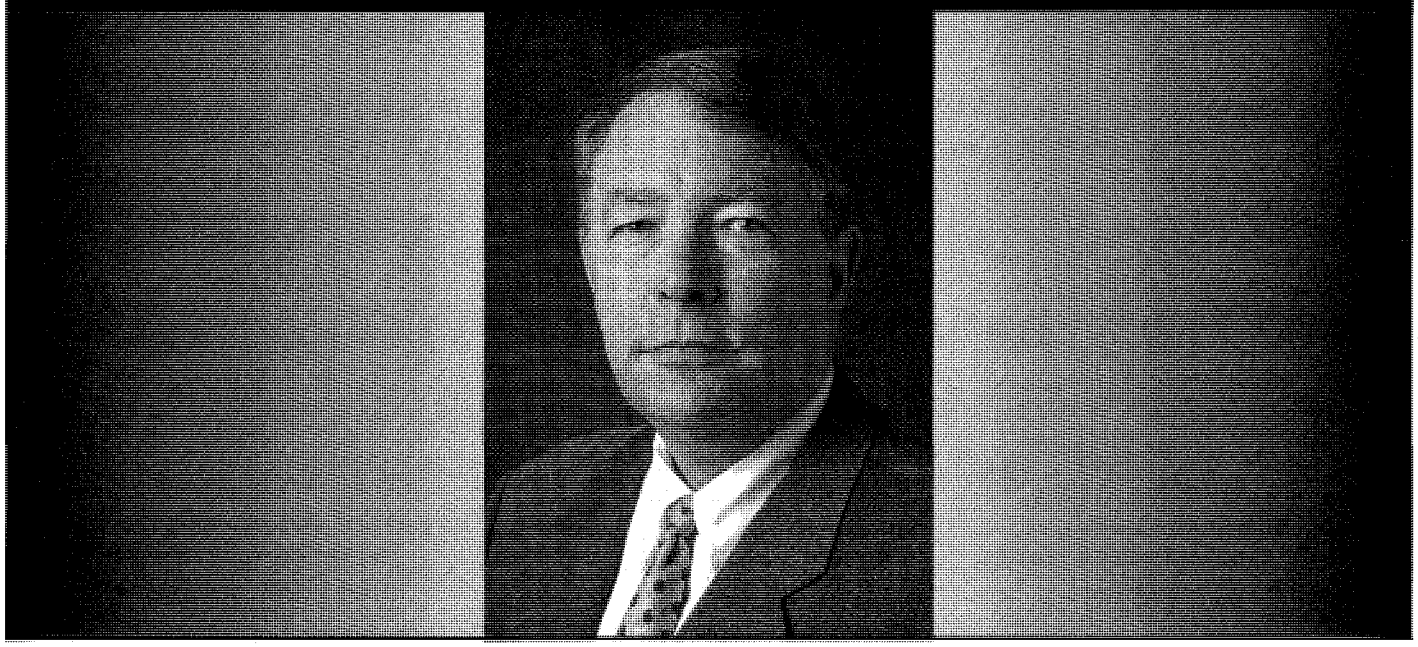
SECO (http://www.secointernational1.com/webce/index.cfm)

SECO International presents online courses in 3 different types of multimedia-formats that include online continuing education, electronic posters and Digital Grand Rounds. If you haven't taken advantage of what SECO has to offer, please do so immediately!



1 McArthur D, Parker A, Giersch S. Why plan for e-learning? Plann Higher Educ 2003;31(4):20-8.

FOCUS ON THE PRESIDENT



George E. Foster, O.D., began a one-year term as ASCO's president in June 2004. Dr. foster is dean of the Northeastern State University Oklahoma College of Optometry.

Dr. Foster graduated from Northeastern State University in Tahlequah, Oklahoma, in 1965, and received his Doctor of Optometry degree from the University of Houston in 1968.

Dr. Foster practiced optometry from 1971 to 1997 with Drs. Foster & Hiskett in Bristow, Oklahoma. Previously he had served as a captain in the United States Air Force, stationed at Loring Air Force Base in Maine and with the practice of Drs. Yourman & Foster. He has served as dean of the optometry school at NSU since 1997.

Dr. Foster served as president of the Southwest Council of Optometry and also as president of the Oklahoma association of Optometric Physicians. He is past chair of AOA's Ethics and Values Committee and was a member of the Council on Optometric Education from 1994-1996.

OPTOMETRIC EDUCATION: Dr. Foster, you have indicated that diversity will be your top priority as ASCO president this year. How do you explain your special concern for this area?

Foster: As I look around me, the people I see are as diverse as the sands on the beach. My appreciation of this was instilled into me by the community where I grew up. Before the turn of the last century (in the 1890's), my part of Oklahoma was Indian territory. A vast migration not only from east of the Mississippi but also east of the Atlantic ocean came to Oklahoma territory. They came seeking opportunities to improve their station in life but also to have a sense of starting something new — something that would make a difference for the future. The largest groups in my hometown of Bristow were Lebanese, Syrian and Persian. When I grew up in 1940-50's, Bristow had its second and third generation of Mediterraneans, Afro-Americans, Native Americans and East Europeans. In addition, exercise of religious freedom was also evident in our microcosm of the world. My next-door neighbors were Polish Jews who had escaped Hitler's Poland in 1939. Across the street was a second generation Italian family whose father was an attorney educated at Notre Dame. Across the alley lived an Afro-American family and up the alley were families of Native American descent, plus Baptists, Church of Christ, Seventh Day Adventist and Catholics.

It was a time in history when all these diverse households had children my age. It was a time when children grew up running in the streets at night until our parents made us come home and go to bed. It was a time when it seemed we lived and were molded in the homes of our friends as much, if not more than by our parents. If we misbehaved in someone else's house, those parents reprimanded and corrected us. My group of friends attended each other's church services. We celebrated Hanukkah, Midnight Mass and every Vacation Bible School in town. And whether we were or not, we called each other "cousins." The Lebanese patriarchs, who gambled everything to come to Oklahoma and sent enough money to bring their families and friends to America to start a new life, are the basis of my concept of extended family. We didn't know an ethnic joke until we went to college. But we knew we were unique and special because of our extended community family's affirmation.

As a private practitioner for twenty-nine years in this small town in Oklahoma, I was also able to experience this concept of extended family in the Profession of Optometry. So many of us were doing good to help our fellow man. The cornerstone of our profession was "Next to life itself, God's most precious gift is vision." We as individuals have but one life to give, but the principles of this profession continue to enrich the world. Many schools' entering classes are two-thirds female.

Asian-American students are in the majority of some of our schools. BUT do our new graduating classes reflect the diversity of the citizens in America? The evolution of Optometric education throughout the world is producing better eye and vision care worldwide. But do our entering classes in the United States reflect our African American cousins? Hispanic cousins? Other underrepresented cousins? I think not.

OPTOMETRIC EDUCATION: What do you see as ASCO's role in the area of diversity?

Foster: ASCO, in partnership with the AOA and private ophthalmic industry, has a moral obligation to address the needs of society. Patients need to be provided eye care by practitioners who can make them feel comfortable and meet their needs. All we have to do is get the census data and compare the percentage of Hispanics to the percentage of Hispanic Optometric Physicians to demonstrate the lack of diversity in our profession. The same can be said about the Afro American population.

ASCO's "Each One Reach One" Campaign has had a positive impact upon the number of applicants to the schools. But ASCO's recruitment and private ophthalmic industries and private practitioners efforts to bring in the under-represented to the profession needs to do more in order to truly allow this family to serve all aspects of our society. Our schools and profession must meet the needs of the public's health, not just refractive care, but also the patients' whole health care. Of course, our schools must be able to provide the tools for our students to make a living, but it is also important for the graduates to be able to practice to the highest level of their education, remove the economic barriers between patient and doctor, and educate the population to the need (especially the pre-school and post retirement) for preventive eye care. If these conditions are met, there will be an overall shortage of Optometric Physicians. With the help of the profession and industry, our schools can reflect our community and have an impact upon the quality of life for our patients.

OPTOMETRIC EDUCATION: What other key issues will you emphasize during your term as ASCO president?

Foster: As our schools get more maturity in dealing with their missions, it is critical to diminish the "We"s and "They"s in the eye care industry. It is almost human nature to divide into the "we"s and "they"s but our profession must unify as "UsN"s.* I hope to re-emphasize the importance of family within the eye care industry. ASCO has a mandate to be collaborative with the American Optometric Association, American Academy of Optometry, State Optometric Associations, National Eye Institute, American Public Health Association, American Diabetes Association, the Association of Regulatory Boards in Optometry, American Student Optometric Association, World Council of Optometry, World Health Organization, etc. We are all threads woven together to be of benefit and strength to our society.

OPTOMETRIC EDUCATION: Who were the people who influenced the development of your educational and administrative ideas?

Foster: There are so many people who provided opportunities for me. My most significant mentors were Dr. M.A. Yourman and J. LeRoy Oxford, Ph.D. Dr. Yourman was my hometown optometrist and then my partner. Ethics and services to your patients, community and profession were paramount with his life. He started our practice in Bristow, Oklahoma in 1931. We had eye health records for seven generations of patients when I left in 1977. He always said optometry was the most over educated and under licensed profession in America. Dr. Oxford was the executive director of the Oklahoma Association of Optometric Physicians. He took great pride in having the state association organization with the highest percentage of members, most finances in reserve and one of the lowest dues in the country. He lived and taught by example the importance of the Optometric family and being a member of the "Optometric Political Party."

There are so many who come to mind that influenced my educational and administration ideas. I think of Dr. Chester Pheiffer, my dean at the University of Houston and the inaugural dean at Northeastern State University College of Optometry in Oklahoma.. This school would not have happened if it weren't for his passion for patient care and Optometric education.

Drs. Les Walls, Lee Carr, Jerry Strickland, Billy Cochran, Alan Lewis and Linda Casser have all been my mentors these past seven years as Dean. Dr. Doug Penisten and Mary Stratton have led the school with professionalism and made me look good. Dr. Penisten continues to be a great leader in Optometric Education and is destined for greater responsibilities. My heroes in optometric education will always be Dr. Norman Haffner, Dr. Dick Hopping and Dr. Jack Bennett. There are so many "cousins" and I am so blessed to have been part of their family in the profession.

OPTOMETRIC EDUCATION: Could you share with Optometric Education's readers what makes your school so special?

Foster: NSU Oklahoma College of Optometry is located in a rural setting in Northeastern Oklahoma. It is in the foothills of the Ozarks with beautiful hills and rivers and lakes. The reason it is here in Tahlequah is that there was an uninsured and underserved population. The students, faculty and staff have over 40,000 patient encounters per year. Over one half of the Native American Optometric Physicians in the USA are NSU Oklahoma College of Optometry graduates. Although the class size is small — 26 per year — the qualified application pool has never dropped below four for each position. Our self-imposed catchment area for admission is Oklahoma, Arkansas, Kansas, Missouri, Colorado, Nebraska, New Mexico, Texas and Louisiana.

NSU Oklahoma College of Optometry is the smallest ASCO school. Our location is in a small population state. But the State Association, State Board of Examiners and the College of Optometry are united and stand up for the values of the past and the promise of the future. I pray that the students, faculty, staff and administration will always remember that the privileges and respect that optometry have now is because we are standing on the shoulders of the giant cousins who went before us.

*"UsN" spelled backwards is NSU.

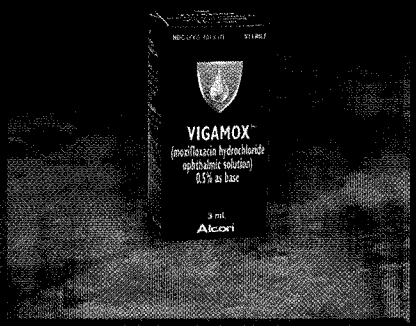
Vision and Commitment

- A worldwide company committed to the discovery, development and manufacture of ophthalmic products and instrumentation.
- Over the next 5 years, Alcon will invest more than $2 billion in eye-related research and development. That's an investment in your future.
- Alcon is uniquely positioned to continue its aggressive course of developing and producing the most innovative products and technologies.

20 years with optometry

www.alconlabs.com

Alcon®



0409VWAD02

INDUSTRY NEWS

ASCO Corporate Contributors*

Visionaries ($100,000+)
Vistakon®, Division of Johnson & Johnson Vision Care, Inc.

Patrons ($50,000-$99,999)
CIBA Vision Corporation/ Novartis Ophthalmics

Benefactors ($30,000 - $49,999)

Supporters ($15,000 - $29,999)
Essilor of America
Alcon Laboratories
Bausch & Lomb, Inc.
Hoya Vision Care, North America
Transitions Optical, Inc.

Friends ($5,001 - $14,999)
Advanced Medical Optics (AMO)
AO.Sola
Coopervision
Volk Optical, Inc.

Contributors ($5,000)
Marchon Eyewear
Safilo Group
Santen, Inc.
The Spectacle Lens Group

*Companies are listed within each category in order of their total contributions. When companies contribute the same amounts, they are listed alphabetically. ASCO Corporate Contributors support national programs and activities benefiting the schools and colleges of optometry. For more information on the program, contact porourke@opted.org

Transitions Hosts European Academy Meeting in Ireland

Representatives from 11 countries gathered for the first annual European Transitions Academy held June 1-4 in Galway, Ireland. "Transitions Vision Academy: Vision for a Healthy Future," which was modeled after the highly successful American Transitions Academy, provided an educational forum for independent optical laboratories to share cross-cultural experiences and learn business-building strategies.

"The European Academy was an ideal platform to discuss our successful partnership with Transitions and provide tips on how to grow business by maximizing the training and marketing tools available through the company," said Jeff Szymanski, sales manager, Toledo Optical.

"The first European Academy proved to be a tremendous success, with a diverse group of independent optical lab attendees," said Isabelle Prestat, channel marketing coordinator, lenscaster and independent labs, Transitions. "We hope that the European Academy will continue to grow similar to the eight-year-old American Academy, to become one of the optical industry's most educational and enjoyable events each year."

For more information about the company and Transitions Lenses, the first to earn the American Optometric Association's Seal of Acceptance for Ultraviolet Absorbers/Blockers, visit transitions.com or contact Transitions Optical Customer Service at (800) 848-1506.

Marchon Adds New Hinged and Hingeless Designs to Collection

Marchon Airlock has enhanced its patented collection of hinged and hingeless ophthalmics with the addition of four new styles that feature an assortment of exclusive colors and modern shapes. These high-fashion three-piece mounts are constructed of durable, yet flexible, beta-titanium, offering a lightweight, hypoallergenic approach to comfort.

Point-of-purchase materials include 6-piece and 8-piece displays that exhibit the full product range and a chassis prescription program. A 20 x 60 pop-up, fully collapsible "lama" highlights Marchon Airlock's "it's like wearing nothing" ad campaign, featuring male and female models hidden behind respective fitting room doors. Lab support is available to dispensers, including: mounting kit with step-by-step instructions, parts kit with step-by step instructions, instructional training video/CD and training manual. Marchon Eyewear, headquartered in Melville, NY, is one of the world's largest, privately owned designers, manufacturers and distributors of fashion and technologically advanced eyewear and sunwear. (Contact: 631-755-2020; www.marchon.com)

Cooper Buys Ocular Sciences

The Cooper Companies, Inc. and Ocular Sciences, Inc., announced that they have signed an agreement for Cooper to acquire Ocular Sciences, Inc. The Cooper Companies' CooperVision unit, the world's fourth largest contact lens manufacturer, is a leading global supplier of specialty contact lenses with estimated fiscal 2004 revenue of about $385 million. When combined with Ocular Sciences, the world's fifth largest contact lens manufacturer, Coopervision will become the world's third largest contact lens company.

"This acquisition represents an ideal strategic fit for Cooper. Ocular Sciences will add geographic and product line balance and manufacturing technology know-how," said A. Thomas Bender, Cooper's chief executive officer.

DEFINITY Lenses Web Site Debuts

With a simple click of the mouse, presbyopes and eye care professionals can now explore the world of possibilities available with DEFINITY Lenses through a new Web site by The Spectacle Lens Group of Johnson & Johnson Vision Care, Inc. The Web site, www.definity.com, is part of a national roll out of DEFINITY Lenses and is designed to enable both consumers and eye care professionals to "experience" this breakthrough progressive lens without ever leaving their desks.

"The new Web site allows us to reach out to eye care professionals and consumers and provide them with an opportunity to learn more

(Continued on page 18)

ASCO Meeting Calendar 2004

ASCO MEETINGS AT AMERICAN ACADEMY OF OPTOMETRY

December 9 – 12, 2004
Tampa Marriott Waterside
Tampa, Florida
Contact: Mary Eastman (301-231-5944; meastman@opted.org)

Wednesday, December 8, 2:00 - 5:00 p.m.
ASCO Educators' Workshop on Genomics & Optometry
2:00 – 5:00 p.m.

Friday, December 10
Residency Educators
(7:30 a.m. – 11:00 a.m.)
Development Directors
(8:00 a.m. – 12:30 p.m.)
Binocular Vision & Perception Educators (7:30 a.m. – 9:00 a.m.)
Residency Affairs Committee
(11 a.m. – 12:00 p.m.)
Ethics Educators
(12:00 p.m. – 2:00 p.m.)
Vision Science Librarians
(9:00 p.m. – 5:00 p.m.)

Saturday, December 11
Chief Academic Officers
(1:00 – 3:00 p.m.)
Continuing Education Directors
(1:00 –3:00 p.m.)
Optometric Informatics
(10:15 a.m. – 12:00 p.m.)
Vision Science Librarians
(1:00 p.m. – 5:00 p.m.)

Sunday, December 12
Vision Science Librarians
(9:00 a.m. – 12:00 p.m.)

ASCO EXECUTIVE CMTE. & BOARD OF DIRECTORS MEETINGS

March 18 – 20, 2005
Oklahoma
Contact: Mary Eastman (301-231-5944; meastman@opted.org)

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

Online Learning — Initial Lessons From Course Supplementation With WebCT™

R. W. Nowakowski, O.D., Ph.D., F.A.A.O.
M. N. Swanson, O.D.

Abstract

Purpose: *An online component was introduced into the Physical Diagnosis course at The UAB School of Optometry with the goals of having 24-hour availability of lecture materials and PowerPoint® presentations, online testing and grading, online assignment submission and online tracking of student participation.*

Methods: *The authors used the WebCT™ course management system to attain the stated goals. The effectiveness of the online component was evaluated with a student survey and instructor impressions.*

Results: *The stated goals were attained and overall, the students and authors found the online component to be beneficial in spite of some technical difficulties.*

Conclusions: *Online supplementation offers distinct course management benefits.*

Key Words: *Online, hybrid course, WebCT™, physical diagnosis, FAQ, HTML*

Dr. Nowakowski is a professor and Dr. Swanson is an assistant professor at the University of Alabama at Birmingham School of Optometry.

Introduction

WebCT™ (WebCT™, Inc., Lynnfield, MA) is a course management system for supporting online learning. WebCT™ can be used to give a course completely online or for a hybrid course that uses online learning as one component of a traditional classroom course. The authors used WebCT™ to create an online enhancement for a traditional course in physical diagnosis. The sections that follow will detail how this was accomplished as well as which aspects were successful and which were not.

Other medical disciplines have used WebCT™ as an online course management system.[1,2] The University of Alabama at Birmingham (UAB) has an Enterprise license for WebCT™, Version[3,7], Campus Edition, and it is therefore a resource available for any faculty member. The authors took a seminar series on campus to learn the functionality of the various WebCT™ components and attended a series of pedagogy lectures presented by other faculty members at UAB who had taught online or hybrid courses.

Physical Diagnosis (OPT 325) is a one-quarter course offered during the winter quarter of the third year of the professional curriculum at the UAB School of Optometry (UABSO). The goal of the course is to teach techniques of physical examination pertinent to primary eye care and to emphasize the connection between systemic disease and eye disease, including the associated physical findings. Techniques are taught for examination of the following regions or systems: head and neck, neurological, cardiovascular, pulmonary and musculoskeletal. Three additional sessions are devoted to imaging, laboratory testing and certification in cardiopulmonary resuscitation. The final lecture ("Clinical Correlations") covers many case examples and the final laboratory is a practical examination in which the students demonstrate all of the skills they have learned on a practice patient.

There were several goals to be accomplished by adding an online component. The first goal was to have printed materials, images and PowerPoint® presentations available online for 24-hour access by the students which would obviate the need to provide hard copy handouts. The second goal was to have online testing and grading for weekly quizzes with immediate grading and feedback. The quizzes were to be available for a fixed period of time and the student could take the quiz any time within that timeframe that he or she felt prepared. The third goal was to have online assignment submission, again within a fixed timeframe, whenever the student felt prepared to submit it. The final goal was to be able to track student participation in the online component of the course, which would serve as one indication of overall class participation.

WebCT™ makes attainment of these goals possible and there are several other inherent advantages. Students can view and/or download files and PowerPoint® presentations from any place they have a computer with an Internet connection. This reduces expenses for labor and materials, by reducing the need to photocopy and provide handouts. PowerPoint® presentations and images online are available in color which is important for identifying many pathological conditions and can have embedded video and audio. This is not the case when the presentations are printed as handouts and photocopied for distribution in class. Grades are maintained in the system, which allows students to access individual grades and class averages. Student access to the online

component is tracked in a variety of ways; for example, access time and date are stored for all content pages and can be displayed for each student in several formats.

Methods and Materials

1. Online Structure

Student access to the online component is by password and is only available to those registered for the course. The instructor assigns an initial password that can be changed later by the student. Instructions for logging on were provided before the start of the course and were reviewed at the start of the first class session. During that same session, the instructors demonstrated how to navigate through the site, how to take the quizzes and how to submit assignments.

Development of the website begins with a course shell provided by the webmaster. The course shell begins with a homepage and is completed by the designer (the authors) by adding pages or "tools" offered within WebCT™. The menu of available pages and tools is given in Table 1. Content is added as text files, image files or other compatible files. All files are stored within a module available to the instructor called "Manage Files." Text files are stored as HTML files and image files are typically JPEG (Joint Photographic Experts Group) or GIF (Graphics Interchange Format) format. Standard Microsoft® Word documents were converted to HTML format in Microsoft FrontPage™. Documents created this way have greater compatibility with WebCT™ than those created by simply saving in HTML (HyperText Markup Language) format within Microsoft® Word. Once files have been imported to WebCT™, they can be linked to the various pages as required.

Two versions of the website are generated — one for the students, which cannot be modified and one for the designer (the instructors in this case), which allows full access to the various pages and tools through a control panel. It is possible to allow teaching assistants to have limited access for specific teaching functions. Designer privileges can also be granted to others by the designer.

Figure 1 shows the entry portal or home page for the student. There is a navigation bar on the left ("Course Menu") and the main menu of eight links displayed in the center below the course name (Orientation, Instructors, Syllabus, etc.). The links are activated by left-clicking the mouse when the cursor is over the link. The format of this page was customized within WebCT™ by the authors. The link icons were created in Adobe® Photoshop® Elements and imported to WebCT™ as JPEG files. They link to pages or tools added by the instructor. Standard icons are available within WebCT™ so it is not necessary to create custom ones, but doing so adds a sense of individuality and makes for a more professional appearance.

The WebCT™ tools and pages that were utilized for the Physical Diagnosis Course were: Content Module, Syllabus, Mail, Organizer Page, URL (Uniform Resource Locator), Single Page, Quiz/Survey and Assignments. These will be discussed below within the context of the eight links on the home page.

Orientation

The "Orientation" link connects to an HTML file (Figure 2) called "Orientation Handout," which describes how WebCT™ will be used as a course supplement including how to use the mail component, how to take the timed quizzes, how to access PDF (Portable Document Format) files and other information related to the online component.

Instructors

The icon titled "Instructors" links to a group picture of all the instructors participating in the course. The image is stored as a JPEG file within WebCT™.

Syllabus

"Syllabus" (Figure 3) is a Course Content Tool that is customizable within WebCT™ via a menu driven selection process. It spells out the basic course information including course goals, course description, required textbooks, policies and grading.

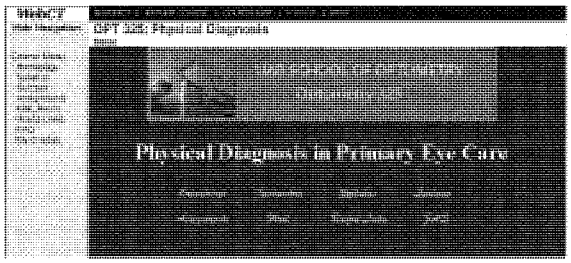
Lectures

The lecture sequence is created on

Table 1 Tools and Pages Available Within WebCT™

Page or Tool Name	Options
Course Content Tools	Content Module, Calendar, Syllabus, Index, Glossary, CD-ROM, Search Compile, Image Database, Resume Course
Communication Tools	Discussion, Chat, Mail, Whiteboard
Pages/URLs	Organizer Page, URL, Single Page
Evaluation Tools	Quiz/Survey, My Grades, Self Test, Assignments
Study Tools	My progress, Student Homepages, Language, Student presentations, Student Tips

Figure 1



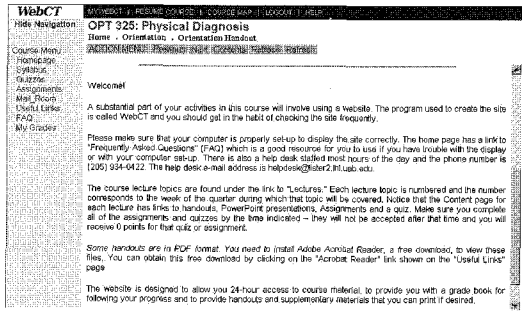
This is the homepage that becomes visible when the student logs on to the website. There are eight links under the course title and eight links in the Course Menu seen at the extreme left. Two of the links on the Course Menu are different ("Homepage" and "My Grades"). All links are created by the designer and the two listings could be identical or completely different at the designer's discretion. The Course Menu remains visible throughout the site unless "Hide Navigation" (top left) is selected.

an "Organizer Page" (Figure 4) and each topic links to a "Content Module." The content module loads with a Table of Contents heading and the contents are entered as links to text files ("handouts"), PowerPoint® presentations, assignments and a weekly quiz (Figure 5).

Assignments

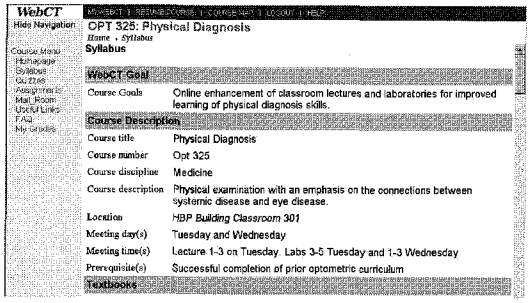
The "Assignments" tool is a WebCT™ Evaluation Tool (Table 1) and all assignments for the course appear here (Figure 6). Assignments are given a due date and must be submitted as a file that the student uploads from his or her computer into WebCT™. The due date and time serve as a cut-off point after which an assignment cannot be submitted. Alternatively, it is possible to allow late submissions. The due date sets the time that distinguishes on-time from late submissions.

Figure 2



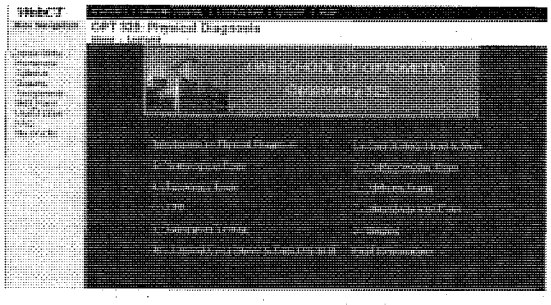
This HTML file "Orientation Handout" provides basic information about the online supplement. The students also received a demonstration in class that showed them how to navigate throughout the site, how to take the quizzes and how to submit assignments.

Figure 3



The "Syllabus" gives details about the Physical Diagnosis Course and is comparable to any other class syllabus except that it is online. Sections not shown include required textbooks, grading policies and instructor office hours.

Figure 4



The "Lectures" page is called an "Organizer Page" in WebCT™ and displays the course topics in the order they will be presented. Each subject title is an active link to a "Content Page" for that subject. These links can be hidden to prevent access before or after any desired date and can be programmed to become active at any desired date and time.

Mail

An online course supplement has the potential to produce a voluminous number of e-mails and it is important to separate these from one's daily influx of other e-mails. The "Mail" tool is an e-mail system within WebCT™ (Figure 7). All students were required to use this module for communicating about the course. For a course that is totally online, e-mail is the main way students communicate with the instructor and for large classes, the number of e-mails can be frightening. Witness the following quote, " E-mails are like Hitchcock's birds. They pursue you relentlessly, hover in flocks, and leave you running for cover. "[3]

Useful Links

This page (Figure 8) is generated by the "Single Page" tool and contains links (URLs), chosen by the authors, to PubMed, Internet Explorer free upgrades, Adobe® Acrobat Reader free download, CLIA (Clinical Laboratory Improvement Amendments) homepage, The UAB Lister Hill Library Virtual Desktop and a site where students could hear normal and abnormal heart and breath sounds. Each of these links was set to open in a separate window to preserve the student's place within WebCT™. The URLs for these links are given in Table 2.

FAQ (Frequently Asked Questions)

This is a link to the "Learning Technologies and AskIT" Helpdesk at the UAB Lister Hill Library (Figure 9). Information is available at this site to assist students with WebCT™ and with technical problems related to online learning. It is particularly important to have a resource for students to visit with questions about accessing the course materials and other problems related to computer set-up and WebCT™ itself.

2. Testing and Grading

The WebCT™ Quiz Tool allows the

user to create a database of questions of any type including short answer, multiple choice and true/false. Questions can also be loaded into the database from existing sources via a specially formatted text file or from Respondus® (Respondus, Inc., Redmond, WA), a software application for testing and assessment. Quizzes are then created from that database. All tests are constructed with the Quiz Tool and are referred to as quizzes. Quizzes can have associated text or image files. Quizzes can be limited in availability and duration and can be set to give instant feedback of the student's score.

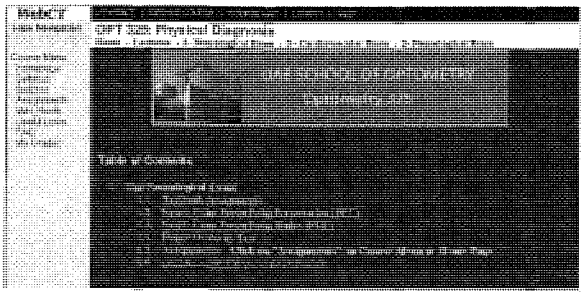
Common quiz statistics are readily available as a feature of WebCT™ and an example of the statistical format for one of the quizzes is shown in Table 3. This table also shows two potential problems. Questions are given a category and a title when they are created by the instructor. The title appears in the left-hand column even though the column heading given by WebCT™ says it is the question category. Secondly, the title should be used to distinguish one question from another and this is not the case for the two questions entitled Lymph node examination and the two entitled Oculoglandular syndrome.

The midterm and final written examinations were not given online. This decision was made simply to ensure that each student's work was his or her own since online activities cannot be verified with respect to who actually logged on. Additionally, there was no computer laboratory available with a sufficient number of terminals for simultaneously testing the entire class.

Assignments were structured to require a written response from the student that was submitted as a file within WebCT™. The instructor graded the assignment within WebCT™ and the grade was available online to the student as soon as it was entered.

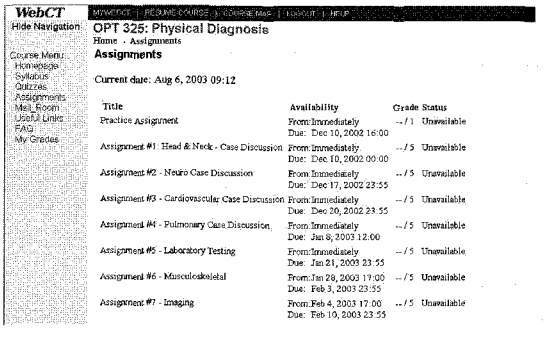
WebCT™ serves as a grade book for both the instructor and the student. Grades and grade statistics are available to the instructor for individuals and groups. Students can view their individual grades online by clicking on "My Grades" in the course menu (Figure 1) and, again, grades were available online as soon as they were posted by the instructor or computed by the system. Instant feedback and online access to grades are beneficial features for student and instructor alike as recognized by other educators[2,4,5]. Online grade posting circumvents the problems associated with protecting privacy when grades are posted publicly, even if it is done anonymously with unique personal identifiers.

Figure 5



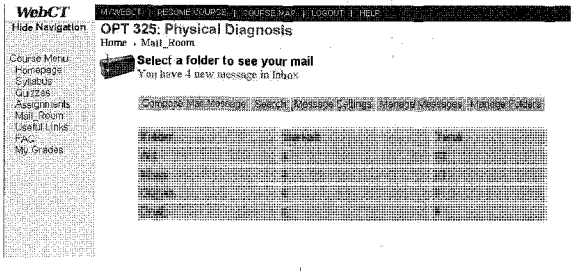
This is a "Content Page" which loads with a blank Table of Contents and the designer adds the content in the form of links to PowerPoint® files, PDF files, HTML text files, images, quizzes or assignments.

Figure 6



The "Assignments" page shows the assignments, their associated points, their current availability status and provides the timeframe during which they will be available.

Figure 7



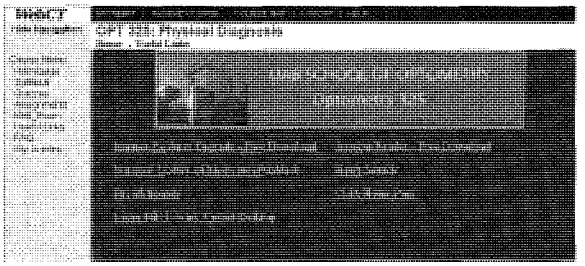
The "Mail Room" icon links to this page which shows standard e-mail functions. Each student has his or her own e-mail address within WebCT™.

Results

The degree of success in achieving the four stated goals was evaluated by a student survey at the conclusion of the course, other student feedback provided during the course and by the instructors' personal experiences during the course. Students were asked to answer a number of questions related to the course and the use of WebCT™ using the following scale: 1 = Not at all helpful, 2 = Somewhat helpful, 3 = Neutral, 4 = Helpful and 5 = Very helpful. The questions specifically related to the online component were as follows:

1. How helpful was having 24-hour access to handouts/lecture material?
2. How helpful was having 24-hour access to quizzes?
3. How helpful was it to have course materials available online?

Figure 8

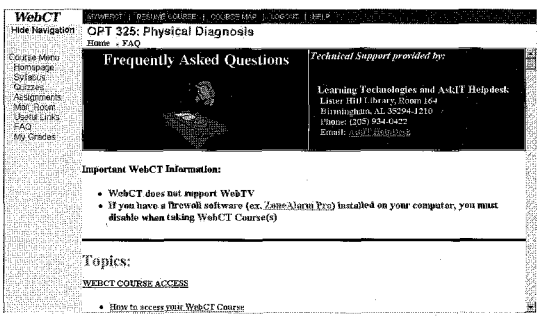


Seven "Useful Links" were provided on this "Organizer Page" and the URL for each is shown in Table 2. The page is fully customizable by the designer.

Table 2
URLs for the Links Provided on the Page "Useful Links"

Website	URL
PubMed	http://www.ncbi.nlm.nih.gov/PubMed
CLIA	www.cms.hhs.gov/clia/
Internet Explorer download	www.microsoft.com/windows/ie/default.asp
Adobe® Acrobat Reader	www.adobe.com/prodindex/acrobat/readstep.html
Heart sounds	www.wilkes.med.ucla.edu/inex.htm
Lung sounds	www.wilkes.med.ucla.edu/lungintro.htm
Lister Hill Library Virtual Desktop	www.uab.edu/lister/

Figure 9



"FAQ" (Frequently Asked Questions) links to a site where students can obtain assistance with accessing and using WebCT™. This site is maintained by the UAB Lister Hill Library of the Health Sciences.

4. How would you rate the efficiency in grading of the quizzes and assignments?
5. Was having instant feedback of quiz performance helpful in preparing for the midterm and final examination?
6. How helpful was the mail component of WebCT™?
7. How helpful was the "My Grades" component of WebCT™?
8. How helpful was the WebCT™ component of Physical Diagnosis course in regards to its benefit in learning the material/objectives of the course?
9. Please add any comments you like. This will be most helpful if it is constructive.

The results of questions 1 - 8 are summarized in Table 4 and are discussed below. Nineteen written comments germane to the online component appear on Table 5. The comments give insight into the perceived strengths and weaknesses of the online component from the students' perspective. The comments are self-explanatory and relate to issues discussed elsewhere so no further discussion is provided

Goal #1 — Twenty-Four Hour Access to Online Materials

The 24-hour availability of quizzes received the highest rating, being judged better than helpful (mean = 4.26). The 24-hour access to course materials was rated more helpful than neutral (mean = 3.71) and the availability of online handouts in general (Question #3) was judged to be slightly more helpful than neutral (mean = 3.58).

Five student comments (Table 5, Comments 1, 2, 6, 10 and 11) revealed difficulty printing handouts and two students stated that they preferred receiving printed copies (Comments 10 and 11). These comments suggest that handouts were printed rather than used online for study purposes. Comments outside of the survey revealed that students preferred having a hard copy of the handout in class to embellish with their own notes.

From the instructors' perspective, it was desirable not to have to make copies of handouts. This saves time and expense. Part of the problem students experienced stemmed from long download times for PowerPoint® presentations. This improved when they were provided online as PDF files.

Goal #2 — Online Testing and Grading

The instant feedback of test performance was considered helpful (mean = 4.0). Grading efficiency was rated more helpful than neutral (mean = 3.49). This may reflect the slower turn around time for grading assignments, which was done manually. Grades were available to the students for private viewing online as opposed to being posted publicly. Even when grades are posted anonymously (by individual code) in public, privacy is eventually lost as multiple grade results are posted over the four-year professional curriculum. While grade privacy was not part of the survey, the online grade book ("My Grades") was rated helpful (mean = 3.95).

Student comments pointed out some inconsistency in assigning Quiz and Assignment availability time-

Table 3
A Sample of Quiz Statistics Available Within WebCT™

Question Category	N	% Correct Of:			Discrimination	Score	
		Whole Group	Upper 25%	Lower 25%		Mean	SD
Chief complaint	39	100	100	100	0.00	100.0%	0.0
Techniques	39	100	100	100	0.00	100.0%	0.0
Myxedema	39	74	100	42	0.60	74.4%	44.2
Oculoglandular syndrome	39	97	100	92	0.20	97.4%	16.0
Oculoglandular syndrome	39	82	100	50	0.69	82.1%	38.9
Ear drum	39	87	100	71	0.42	87.2%	33.9
Thyroid	39	46	100	28	0.42	46.2%	50.5
Lymph node examination	39	79	100	50	0.59	79.5%	40.9
Lymph node examination	39	92	100	78	0.36	92.3%	27.0
Lymph nodes	39	100	100	100	0.00	100.0%	0.0
					Overall Mean:	**85.9%**	

Table 4
Student Survey Statistics

Question	N	Frequency						Mean	SD	Median	Mode
		-	1	2	3	4	5				
1	38	1	0	12	1	11	14	3.71	1.27	4.0	5
2	38	1	1	3	2	11	21	4.26	1.06	5.0	5
3	38	1	3	8	2	14	11	3.58	1.33	4.0	4
4	39	0	1	8	5	21	4	3.49	1.02	4.0	4
5	38	1	1	5	2	15	15	4.00	1.12	4.0	4,5
6	38	1	1	6	2	22	7	3.74	1.03	4.0	4
7	38	1	0	5	3	19	11	3.95	0.96	4.0	4
8	39	0	4	14	7	9	5	2.92	1.24	3.0	2
9	Written comments (see Table 5)										

frames (Table 5, Comments 4, 5 and 18). This was a legitimate complaint that will be corrected.

From the instructors' perspective, the online testing and grading was a great time saver. The major disadvantage is that it is not possible to know who actually took the test since a password could be shared. The fact that quizzes were available for a one-week period may also be a disadvantage if students who have completed the quiz elect to share questions with those who have not. These disadvantages were minimized by assigning a relatively low percentage of the course points to this activity. Student comments, expressed apart from the survey, were very favorable toward being able to take the quizzes whenever they felt ready during the available time frame which was usually one week.

Goal #3 — Online Assignment Submission

Online submission of assignments was problematic from day one and therefore was not included in the survey but it is reflected in the survey comments. The assignment files submitted by students were frequently not viewable in WebCT™. File compatibility depends to a large extent on the user's computer set-up including the browser version used, service pack installation, enabling JAVA and setting Cache to "Always Reload a Page." Nevertheless, some students complained that they followed the correct set-up protocol and still could not submit compatible files. This problem was eventually resolved by ensuring correct set-up and providing an HTML file template created on one of the author's (RWN) terminals, which the students used by pasting their assignments into the template for submission. Resolving this issue for every student took much of the quarter and was a source of frustration for students and instructors alike. This frustration is very clearly reflected in Table 5, Comments 3, 8, 9, 10, 14, 15 and 18.

Goal #4 — Tracking Student Participation

The students were not aware of the tracking capability and therefore were not asked about this in the survey. The course began on November 25, 2002, and students' first access to the site ranged from November 23, 2002 to December 7, 2002. (It was possible to log on prior to the start of the course since the URL was provided in advance.) The class ended on February 21, 2003, and students' last access to the site ranged from February 10, 2003 to March 18, 2003. There was a wide variation in access to the website for individual students ranging from 48 to 286 "hits." It is tempting to ask if a higher number of hits is associated with a better final grade even though this was not one of the stated goals for using WebCT™ and was not expected. When total points earned were plotted against the number of hits, the linear regression line is essentially flat ($y = 0.1048x + 678.43$ and $R^2 = 0.0313$). This reflects the fact that the course emphasized practical skills as well as material learned from texts that was not part of the website.

The instructors found the tracking information particularly interesting. WebCT™ provides a graph of the distribution of pages visited and a tabulated history of the content pages visited with date and time of access viewable by the instructor for each student. It is useful to have this data available, as one indicator of class participation, when discussing performance with individual students.

Discussion

WebCT™ requires a significant time investment by the instructor to become

even reasonably proficient in its use. There is a definite learning curve and it does get better with experience. Anyone anticipating its use should allow sufficient advance set-up time to learn to utilize its features and to structure the course. WebCT™ is not the only course management system for supporting online learning. Others include Blackboard[a], Course Insite[b], Angel[c], Learning Space[d] and Prometheus[e].

This was the instructors' first experience with giving a hybrid course and it was not possible to include all of the online features that will be used in the future; for example, an important educational aid for physical diagnosis would be video clips of examination techniques. Digital audio and video files of lectures could also be provided within WebCT™. There was a substantial time

Table 5
Verbatim Comments From the Student Survey

1	Regarding the online handouts/lectures, it was not always easy to print or access these, but when they were easily accessed, they were very helpful.
2	Sometimes it was not possible to print the handouts from lecture. I don't know if it was due to the way they were programmed or what.
3	I'm not convinced the submission problems have been fixed. I was asked last week to help someone and I saw the submission fail.
4	The major constructive criticism is to be more consistent with the quizzes and assignments, as far as the time restraints, the time they are due, etc. I know personally I missed a quiz because they are typically due at 23:55 and so I signed on ready to take it at 23:05 and it was randomly due at 23:00. Hopefully this will be helpful in the future.
5	With the difficulties some folks were having turning in assignments it might be useful to make the template available at the beginning of the class. Having the materials available online is nice, but I think we are either too cheap or too lazy to print them out ahead of time so that we will have something to take notes on. Making all the online quizzes due at the same point in the day would make matters less confusing than they were here toward the end of the course. Overall a well conducted course and as we students and you [as] teachers become more familiar with WebCT™ I think there will be a vast improvement in the efficiency of course administration and learning.
6	Like having material on-line; however, I would rather have taken in-class quizzes
7	The quizzes and assignments did help to prepare somewhat for the midterm...
8	Once the kinks are worked out with the WebCT™ it will be more convenient. It would be helpful if assignments could be submitted from our home computers vs. having to submit them from the school.
9	I thought that WebCT™, though a good idea, was very frustrating, especially when trying to send in assignments. After I received the template, though, I didn't have any trouble. Maybe making the template available during the beginning of the course would ease some frustration.
10	WebCT™ was OK, but the sending of assignments presented some problems. I would also prefer to have handouts in my box at school; printing them off the internet is just extra "secretarial" work for us to do, taking up time that we could be studying.
11	I was unable to pull up many of the lecture handouts. It is a lot easier to have the instructors pass out the handouts during class.
12	This class has made me become more dependent and knowledgeable on computers.
13	The Web CT was very aggravating at first but became a very good learning experience in using the computer for class purposes. Overall, the program has more positives than negatives and should be used again.
14	Web CT was frustrating when it came to submitting assignments. The exact same method of submitting would be used and it seemed to only go through when it felt like it.
15	I think the WebCT™ is good idea. The only problem I had with it was in submitting the assignments. Only certain computers in the computer lab will allow you to send the items which is a big pain. I always found myself scrambling to locate a computer to submit the assignments on time.
16	Some of the components of WebCT™ were a little troublesome, but overall I think that it was helpful. The quizzes and assignments were helpful in solidifying the information we learned in class and lab.
17	I think WebCT™ would be a great resource if not for all the bugs. I know you were probably promised one thing but delivered another. I am sure the computer guys said this would work perfectly.
18	I do not think it is fair to not accept assignments simply because the computer wouldn't submit it correctly. Even the school computers would randomly just not work. Countless people complained of not getting credit for assignments even though they worked very hard on them. There should be some leeway or a better system for this. I also did not think it was fair to change the times when things were due week by week. Most quizzes were due at midnight, this is fine, but please be consistent. Don't abruptly change to 11:00 pm with no prior notice IN CLASS, not just posted on the website.
19	I really liked the increased interaction & feedback that doing the course partially on WebCT™ provided. (I like learning in a case based manner, which the assignments provided.)

commitment to structuring the online component for the first time and there simply was not enough time to prepare the video files. This will be included when the course is offered next. It is anticipated that the video component will be a major focus of study for physical examination techniques and for revisiting lectures. The addition of video will make 24-hour access particularly useful since students will be able to view the videos at their convenience literally at any time and from any place that they have Internet access.

The frustration with file submission was solved late in the course and will not be a complication in future offerings. Students entering optometry training are increasingly computer savvy and technical problems should continue to decrease.

Once the course shell is completed, future enhancements are easy to make and it is anticipated that the online component will play an increasingly important role as a course supplement. The advantages outweighed the disadvantages and online supplementation offers distinct course management benefits. This view is shared by others as evidenced in the following quotes, "Hybrid courses...promise the best of both worlds, offering some of the convenience of all online-courses without the loss of fact-to-face contact"[6] and that online teaching "....prompts faculty to rethink their approach to teaching."[7]

Finally, an exciting future opportunity exists to share selected online course work among the schools and colleges of optometry. Given the relatively small number of programs, it would possible to offer a more unified curriculum and perhaps reduce the individual program demand on faculty lecture time if core courses could be presented online for all to share.

Footnotes

a.Blackboard, Inc., Homepage: http://www.blackboard.com. Accessed 5 August 2003

b.Course InsiteTM, Home page: http://www.avatartechnology.com/flash/elearning.html. Accessed 5 August 2003

c.Angel Homepage: http://www.angel.ac.uk. Accessed 5 August 2003

d.The Learning Space, Homepage: http://www.learningspace.org. Accessed 5 August 2003

e.Prometheus Homepage: http://company.blackboard.com/prometheus. Accessed 5 August 2003

References

1. Broudo M, Walsh C. Medicol: online learning in medicine and dentistry. Academic Medicine 2002;77(9): 926-927.
2. Hong C-h, McLean D, Shapiro J, Lui H. Using the internet to assess and teach medical students in dermatology. J Cutan Med Surg 2002 July;6(4): 315-319.
3. Young JR. The 24-hour professor. The Chronicle of Higher Education 2002 May; XLVIII (38): A31-A33
4. Daniel, J. Lessons from the open university: low-tech learning often works best. The Chronicle of Higher Education 2001 Sept; XLVIII(2):B24
5. Cobb KL, Billings DM, Mays RM, Canty-Mitchell J. Peer review of teaching in web-based courses in nursing. Nurse Educator 2001 Nov/Dec; 26(6): 274-279.
6. Young JR. 'Hybrid' teaching seeks to end the divide between traditional and online instruction. The Chronicle of Higher Education 2002 Mar; XLVIII(28): A33-A34
7. Carnevale D. Study of Wisconsin professors finds drawbacks to course-management systems. The Chronicle of Higher Education 2003 July; VXLIX (43): A26.

Industry News
(Continued from page 9)

about DEFINITY Lenses and how they help presbyopes to see wider and sharper," said Sandra Lawrence, vice president, sales and marketing. The Spectacle Lens Group of Johnson & Johnson Vision Care, Inc., and the DEFINITY Lenses laboratory, are located in Roanoke, VA., where they develop, manufacture and distribute technologically advanced spectacle lenses. For more information on DEFINITY Lenses and The Spectacle Lens Group, call (800) 920-2021, Ext 3700.

Women Leaders In Optometry Recognized

A number of representatives from companies affiliated with ASCO's Corporate Contributors Program were included in *Vision Monday's* recent list of "The 50 Most Influential Women in Optical." Included on the list were Debora DeLong, regional manager for N. California - Safilo USA; Connie Falvo, director of sales, North America - Transitions Optical; Nancy Roellke, senior marketing manager - Sola Optical; Mary Angrisani, director, national accounts - Coopervision; Dr. Cristina Schnider, director of academic affairs — Vistakon and Debi Zuccheri, director of managed care and ecommerce — Ciba Vision.

Volk Introduces New Versions of Surgical Lenses

Volk Optical, the leader in aspheric optics, introduced AutoClaveSterilizable (ACS) versions of their popular wide-field MiniQuad® and Central Retinal vitrectomy lenses. These new lenses offer Volk's superior double aspheric optics with decreased sterilization processing time, and the option of Volk's patented self-stabilizing vitrectomy (SSV®) design. The new Volk one piece lenses go from surgery to autoclave to surgery, with no intervening steps. In addition to ease of handling, the lenses have a lower cost per use when compared to disposable lenses, with the added benefit of wide-field views.

A free 30-day risk free trial is available from Volk direct for customers in the United States. To order or obtain more information, visit www.volk.com or phone Volk direct at 1-800-345-8655.

Essilor, Transitions Sponsor Healthy Eyes, Healthy People Conference

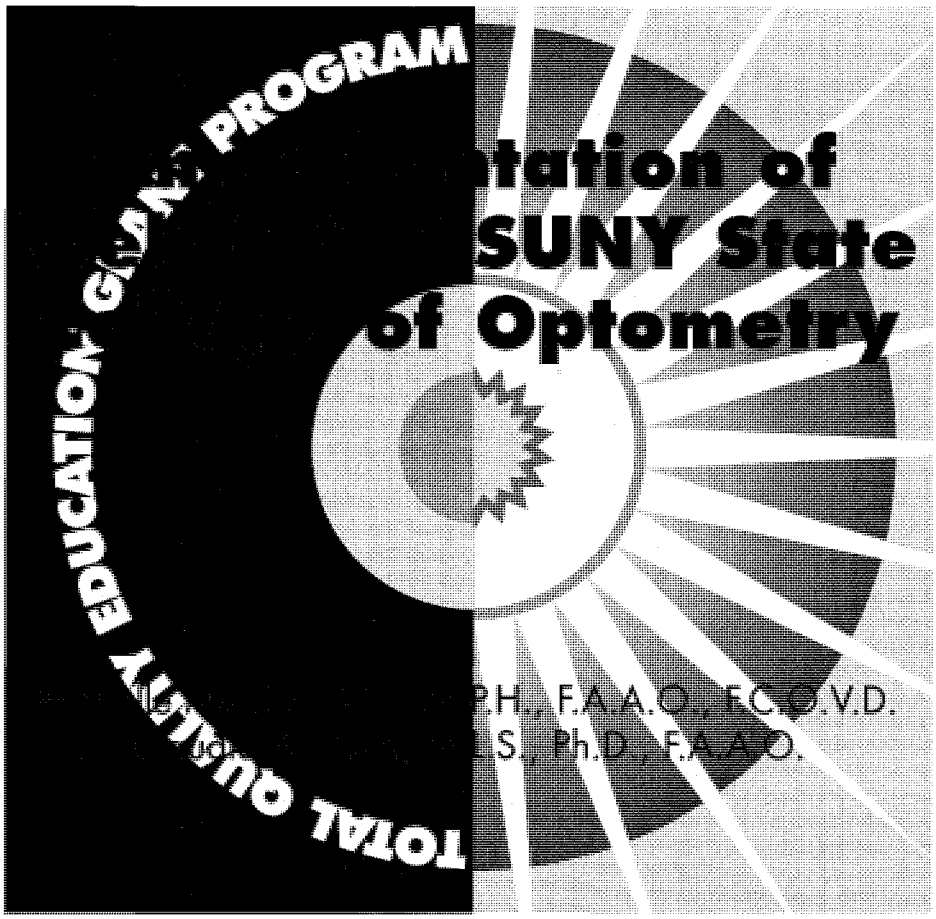
Improving the community's health and visual welfare, improving access and utilization of optometric services and supporting advocacy through private/public partnerships at the state and local level will be the goals for AOA's Third Annual Healthy Eyes Healthy People Conference: Meeting Needs, Reaching Communities, Building Practices, October 21-24, 2004, in Chicago, according to conference chair Barry Barresi, O.D., Ph.D.

The program is sponsored by Essilor Laboratories Safety Eyewear Division and Transitions Optical.

Varilux Hosts Superbowl XIII

Southern College of Optometry (SCO) in Memphis won the coveted Varilux Optometry Superbowl cup for the second consecutive year. The event was held at the 107th Annual AOA Congress and 34th Annual AOSA Conference in Orlando.

"The crowd support for these students grows in numbers and energy each year," said Rod Tahran, O.D., vice president of professional relations and clinical affairs for Essilor of America.



Abstract

Introduction. *In order to integrate WebCT™ in its clinical and didactic educational programs, SUNY State College of Optometry initiated a multi-stage faculty development initiative. At the end of the first year, a faculty survey was undertaken to determine the extent to which WebCT™ was being utilized, the impact on the curriculum, the faculty workload, and future directions.*

Methods. *A survey was developed within a WebCT™ course entitled "Faculty Cyber Café," in which all faculty involved in WebCT™ development were enrolled.*

Results. *The majority of faculty members were utilizing WebCT™ minimally, primarily to post their syllabi and PowerPoint lectures. All respondents agreed that designing and administering a course within WebCT™ were work intensive, but 100% planned on using it again in the next academic year. Sixty-four percent responded that WebCT™ not only helped to achieve curricular goals, but forced them to reconsider course content and presentation. The vast majority of faculty felt that they received the appropriate amount of faculty support.*

Discussion. *The utilization of an assortment of resources has given the implementation and integration of WebCT™ into the curriculum a successful beginning. Despite the workload, all faculty planned to continue using WebCT™ and most planned to expand utilization. One can only speculate that these responses would have been less robust if less faculty development and support had been available. The question remains: is WebCT™ an effective educational tool?*

Key Words: *Educational technology, curriculum, faculty development, course management system, web-based learning, educational outcomes*

Introduction

In January 2001, the SUNY State College of Optometry began to explore implementation of a web-based course management system (CMS). A course management system is a software program that provides a set of educational tools to both students and teachers, such as discussion boards, online quizzes, and calendars to facilitate learning, communications, and collaboration. While considering several different products, an effort was made to involve large numbers of individuals in the decision-making process in order to build support for the initiative. Vendor demonstrations were well attended and discussions were held within various college committees and councils.

In May 2001, the decision was made to purchase a WebCT™[a] license. WebCT™ (an acronym for Web Course Tools) is a comprehensive course management system that seemed to offer the most flexibility for offering faculty the tools required to develop a web-enhanced curriculum for both didactic and clinical educational programs. Several other schools and colleges of optometry were using WebCT™, including Pacific University College of Optometry and Michigan College of Optometry at Ferris State University. At that time, a joint grant project was being established between SUNY State College of Optometry and these two institutions to develop an online course for students at external sites. Obviously having the same CMS at all three institutions was a major advantage, but the collaborative nature of this project offered several SUNY faculty an opportunity to gain some experience and mentoring in course development using WebCT™, as well. Other perceived advantages of WebCT™ over other products included the capabilities for implementing a digital image database (which was of great interest to many members of the clinical faculty) and the responsiveness of vendor contacts to questions and requests for information. However, it was also apparent that many faculty would characterize WebCT™ as having a "steep learning curve." The schools and colleges of optometry, as well as higher education in general, have identified "assisting faculty integrate technology into instruction" as one of the information technology issues of greatest concern.[1] In addition, courses that are not well designed may demand more time from students without adding any value leading to student resentment and disengagement from course activities.[2] For both these reasons, it was assumed that the implementation and integration of WebCT™ would require multiple strategies as well as the investment of multiple resources. The ultimate goal was to slowly adopt WebCT™ to design courses that supported different learning environments (classroom v. clinic) while focusing on core learning principles such as problem based learning and customized knowledge.[3]

A faculty development plan specific to the implementation of WebCT™ was developed and enacted through the office of the dean of academic affairs from June 2001 to June 2002. At the end of one year, a survey of all faculty involved with WebCT™ was undertaken to determine the extent to which WebCT™ was being implemented within the curriculum, the impact on the curriculum, the workload associated with its implementation and future directions.

Dr. Mozlin is an associate clinical professor at the SUNY State College of Optometry. Dr. Perry is associate professor, Graduate School of Library and Information Studies, Queens College, City University of New York

WebCT™ Implementation Initiatives

The WebCT™ implementation plan consisted of four separate initiatives:

- The development of a course template by a WebCT™ consultant.
- A three-day training program for selected faculty conducted by WebCT™ personnel.
- A series of individualized training workshops conducted by a faculty member.
- A WebCT™ course for all faculty involved with course design and implementation.

The WebCT™ consultant spent the day at the college in June 2001 meeting with various faculty members who had expressed interest in using WebCT™ in both traditional and innovative ways. A course format was then developed that satisfied most of the identified needs, but could easily be modified to suit individual instructors. This course template became a separate course within WebCT™ and is easily uploaded to any new course that is subsequently created on the server. The course template offers the additional advantage of presenting a consistent interface to students when accessing any of the courses in which they are enrolled.

The three-day training program was conducted in July 2001 and was attended by 12 faculty members who had expressed interest in using WebCT™, as well as three support personnel (two from the Office of Information Technology and one from the Office of the Dean for Academic Affairs). Participants were given designer privileges for their own course, to which the course template had been uploaded. Therefore, faculty received basic instruction in using the WebCT™ as well as the opportunity to begin to modify their courses for their individual needs.

Due to the lock-step nature of the optometric curriculum, it was apparent that many faculty members would not invest additional time in course design until the quarter in which their course was being taught, or as much as 9-10 months after they had received their WebCT™ training. Therefore, a series of workshops was conducted by a faculty member to provide individualized instruction to faculty members as well as to encourage them to invest time in course design over the year instead of compressing the workload into one quarter. The workshops were held during intersessions in order to maximize participation of clinical faculty. Of the 12 faculty members who participated in the original training program conducted by WebCT™, eight received from 3-18 hours of additional training, with an average of 5.7 hours. An additional nine faculty members received from 6-18 hours of "beginners" training, with an average of 10 hours, bringing the total number of faculty who received WebCT™ training to 21. Seventeen of the 21 were instructors for various courses in the professional program. This represents approximately half of the faculty with didactic responsibilities. The remaining four faculty members had significant involvement in clinical education programs, including externships and residencies.

All faculty members and support personnel were enrolled in a WebCT™ course entitled "Faculty Cyber Café, " which was designed and facilitated by a faculty member. Faculty were encour-

Table 1. Statistical Summary for Faculty Survey

Item	N	Frequency											Mean	SD	Median
		1	2	3	4	5	6	7	8	9	10	11			
1. Department	11	2	3	6											
2. No. courses	11	6	2	3	0	0									
3. WebCT™ training	11	11	0												
4. Computer literacy	11	1	2	3	4	1							3.18	1.17	3
5. Curricular goals	11	0	0	4	4	3							3.91	0.83	4
6. Resulted in rethinking course	11	0	1	3	4	3							3.82	0.98	4
7. Work load - implementation	11	0	1	2	4	3							3.55	1.51	4
8. Work load - design	11	0	0	0	6	5							4.45	0.52	4
9. Easier for students	11	0	0	5	5	1							3.64	0.67	4
10. Worth the effort	11	0	0	3	4	4							4.09	0.83	4
11. Use it again	11	0	0	0	6	5							4.45	0.52	4
12. Degree of implementation	11	5	2	2	1	1							2.18	1.4	2
13. Support	11	0	1	9	1	0							3.00	0.45	3
14. Expand course	11	0	0	2	7	2							4.00	0.63	4
16. Most effective tool	11	2	0	1	6	1	0	0	0	0	0	1			
17. Tool with most potential	11	0	0	5	0	0	0	3	0	0	0	3			

aged to use Discussions to post questions and describe their successes. A series of reference sheets was posted with instructions for completing common tasks and utility functions.

Methods

In order to assess the success of these faculty development initiatives, a survey was prepared for all faculty involved in WebCT™ course design. The 17 question survey was developed and administered within WebCT™ by using the Faculty Cyber Café, in which all faculty designers were enrolled as students. The survey was designed to probe faculty demographics, the applicability of WebCT™ to curricular goals, and issues of workload and faculty support (see Appendix 1). Of the 21 faculty who received WebCT™ training, three never undertook course design after their training, five had very limited exposure, and one was on maternity leave. Responses were obtained from 11 of the 12 remaining faculty members.

The effectiveness of the "Faculty Cyber Café" was assessed by analyzing the number of "hits" per page.

Results

At the time of this analysis, 28 of 66 courses listed in the college catalog (42%) had an associated WebCT™ course. Twenty-three were in active use. Nineteen of these courses were being used to enhance traditional didactic courses, but the remaining four were more innovative. For example, a virtual classroom for fourth year students at external sites used an evidence-based medicine model to discuss challenging cases.[4] A similar model was used for a course in clinical decision making as an extension of third year clinical activities. The survey was sent to all faculty involved in WebCT™ development and a statistical summary for all questions in the survey is provided in Table 1.

Of the 11 faculty respondents, six (55%) were teaching courses in the Department of Clinical Science, three in the Department of Vision Science and two in the Department of Basic Science. The majority (6/11) was implementing WebCT™ for one course, but several faculty were involved in two or three courses. All 11 had participated in the three-day training program conducted by WebCT™, and 73% of respondents rated their computer literacy as good or better.

When describing their degree of utilization of WebCT™, only two respondents could be called "power users." These faculty members were using multiple tools, such as discussions, quizzes and surveys, and the image database, in a more interactive format. Because the survey was submitted anonymously, it was not possible to determine if the nature of the courses being taught demanded the use of multiple tools, or if these "power users" had greater experience and comfort with web-based technologies. The majority of respondents (7/11) were utilizing WebCT™ minimally, primarily to post their syllabi and lecture notes as PowerPoint® files. In fact, everyone used WebCT™ to post lecture notes, 82% used the calendar and the syllabus tools, and 64% used content modules and the image database. Fifty-five percent of the respondents pointed to posting PowerPoint lectures as the most effective tool for achieving curricular goals. The image database, the ability to link to other websites, and the quiz/survey tool were identified as those with the most potential and worthy of consideration for expanding utilization of WebCT™ (see Table 2).

When asked if WebCT™ helped to achieve curricular goals, seven of the 11 respondents (64%) agreed that it had. Seven of the 11 respondents also agreed that implementation of WebCT™ had caused them to reconsider course content and presentation. However, only six of the 11 respondents (55%) felt that using WebCT™ provided additional benefits to the students.

When rating the workload, respondents were asked to consider designing the course and implementing/administering the course separately. Both components were viewed as work intensive, especially course design. However, 73% of respondents felt it was worth the effort, and 100% reported that they planned to use it again in the next academic year.

The vast majority (82%) of the respondents felt they received the appropriate amount of faculty support. One respondent reported not receiving enough support, and one reported receiving too much support.

The Faculty Cyber Café was minimally utilized. The number of hits per page ranged from 2-18 (see Table 3). The most popular pages were instructions for using PowerPoint® in WebCT™ and placing assorted files in an appendix, e.g., a folder for files in various formats, such as full-text articles in pdf format, data presented in spreadsheets, and text-based templates for writing reports.

Discussion

The utilization of an assortment of resources and diverse initiatives has given the implementation and integration of WebCT™ into the curriculum a successful beginning. Within one year, 23 WebCT™ courses were up and running with 18 faculty members as active designers. Ten of these designers had participated in the initial training provided by WebCT™, but the remaining eight received training in workshops conducted by a faculty member. Of the 21 faculty members who received

Table 2. Tools in WebCT™

Tools	Number of Responses		
	Used	Most Effective	Most Potential
Discussions	3	2	
Quiz/Survey	1		5
Content Module	7	1	
Posting lecture notes, PowerPoint files	11	6	
Calendar	9	1	
E-mail	2		
Image Database	7		3
Glossary	5		
Chat	0		
Syllabus	9		
Linking to web sites	4	1	3

Table 3. Number of Hits Per Reference Page

Page Name	Hits
Backing Up Your Entire WebCT™ Course	2
Copying My Files to Your Local Computer	12
Use This HTML Template	3
Placing Assorted Files in an Appendix	14
PowerPoint in WebCT™	18

WebCT™ training, three faculty members were "lost" along this journey, but only one felt that WebCT™ was not an appropriate tool to extend the boundaries of the traditional classroom. The two remaining faculty members had good intentions but never were able to find the time to create even a basic course within WebCT™. In the year since the survey was completed, an additional 6 faculty members requested and received WebCT™ training and five WebCT™ courses were added to the server. Currently, 68% of didactic faculty are active designers, and 42% of all courses have a WebCT™ component.

The success of this implementation and integration of WebCT™ seems to be directly correlated with the investment of resources. One faculty member has been allotted one day per week for administration of WebCT™, faculty support, and WebCT™ course development. In the first year, over 150 hours of individualized training and workshops were provided to faculty on an "as needed" basis. Many faculty began with relatively simple course designs, but asked for more support as they began to utilize more features of WebCT™, such as use of the image database and the quizzing/survey tool. Despite the work intensity required to both design and administer a WebCT™ course, 100% of the faculty who responded to this survey planned to use it again in the next academic year, and 83% planned to expand utilization. One can only speculate that these responses might not have been as robust if less support had been available.

In contrast to the individualized workshops, the Faculty Cyber Café was poorly utilized. With easy access to individualized support, perhaps these pages were considered unnecessary or more time consuming to utilize. However, they did provide a redundancy that proved useful. Often, several months after receiving WebCT™ instruction and support, faculty would forget how to perform a particular task. The Cyber Café was often all that was needed to refresh their memory.

Most encouraging is the fact that 64% of the faculty felt that WebCT™ helped in achieving curricular goals and caused them to reconsider course content and presentation. As faculty begin to expand their utilization of WebCT™ and as the students become more sophisticated users of WebCT™ over the course of their professional education, the purpose of using this technology must be identified and linked to course goals and objectives.[5] In other words, why bother to invest significant amounts of money, time, and effort in academic applications of informational technology unless it improves the quality and effectiveness of learning? Gilbert [6] delineates several reasons for increasing commitments to improving teaching and learning with technology:

- Increased access to instructional materials that would not otherwise be available due to scheduling restrictions or distance.
- Instructors can demand higher quality results by providing more interaction with and feedback to students.
- Students need more experience in using information technology resources and tools that they will continue to use in their daily work.
- Technology can support "collaborative learning" and teamwork that is essential in almost all work environments.
- An institution's ability to compete for students, faculty, and grants is at least somewhat dependent upon the degree of use of information technology.

Course management systems, specifically, "when implemented within a cohesive programmatic and management framework,"[7] can help achieve many of these goals, but their adaptation and integration with more traditional pedagogies are likely to be incremental and not without new challenges.

In an effort to maintain the commitment to educational technology in general and WebCT™ specifically, the results of this survey were used to identify faculty needs and redirect resources accordingly. The time commitment to faculty support and course development remains intact. After identifying the tools within WebCT™ that the faculty felt had the most potential, the decision was made to purchase a slide scanner and several licenses for a software add-on program called Respondus.[b] The slide scanner is being used by several faculty members on a rotating basis to build image databases. Respondus allows the user to build quizzes and surveys and upload them to WebCT™ with much greater ease. For example, it was used extensively in the development of a coding and billing course designed to enhance 3rd and 4th year student education in this aspect of patient and practice management. It includes several quizzes that provide extensive feedback to the students as they practice coding patient encounters.

Conclusions

The SUNY State College of Optometry has begun to look beyond the initial implementation and integration of WebCT™ into educational programs. There are efforts underway to use WebCT™ to move certain "educational modules" out of the classroom and into WebCT™. In addition to the course on coding and billing, a course on infection control is also being considered for development. WebCT™ is being considered to support collaborative research projects as well as educational activities being provided in partnership with the Universidad Autonoma de Aguascalientes in Mexico.

Simultaneously, many colleges of optometry are beginning to incorporate courses into their curricula that emphasize problem-based learning and principles of the adult learner.[4] However, there is also a need for curriculum reform that moves beyond the classroom into clinical education.[8] The ability of the web to integrate data, images and links to the vast array of information sources make it an ideal platform for the delivery of a more unified curriculum. The structure imposed by a course management system such as WebCT™ allows a small educational institution to harness the power of the web without the need of a large IT staff to write and maintain applications.

But even as licenses for WebCT™ or similar products are being purchased by the schools and colleges of optometry, the question remains: is WebCT™ an effective educational tool? Will students exposed to WebCT™ in both clinical and classroom environments become better doctors of optometry? Even more basic, one can ask how educational outcomes should be measured. Research into web-based learning is certainly in its infancy, but at present there is no compelling evidence that confirms the educational benefits of significant investments in this educational technology.[9] As Yolton[10] noted over three years ago, "educational technology is moving too fast for us to turn back now." If there is no turning back, then we should move forward with a clear understanding of the resources that are required to build "webs in the classroom"[10] and a plan to measure the outcomes associated with the investment.

Acknowledgements

This project was supported by an ASCO/Ciba Total Quality Education Grant and by a New York State/ United University Professionals Technology Grant.

Footnotes

a. WebCT™, Inc., 6 Kimball Lane, Suite 310, Lynnfield, MA 01940. http://www.webct.com
b. Respondus, Inc. 17127 NE 83rd Ct., Redmond, WA 98052. http://www.respondus.com

References

1 Perry C. The state of information technology in higher education-how does optometry compare? Optom Educ 2002; 28:16-24.
2 Carmean C, Haefner J. Next-generation course management systems. Educause Quarterly 2003; 26:10-13. Available at http://www.educause.edu/ir/library/pdf/eqm0311.pdf. Accessed July 24, 2003.
3 Boettcher J. Course management systems and learning principles: getting to know each other. Syllabus July1, 2003. Available at http://www.syllabus.com/article.asp?id=7888. Accessed July 24, 2003.
4 Mozlin R. Evidence-based medicine. Optom 2000; 71:490-500.
5 Frayer D. Using email and online discussion to enhance learning. Available at www.tltgroup.org/resources/frayeremail.htm. Accessed May 16, 2003.
6 Gilbert S. Why Bother? Available at www.tltgroup.org/gilbert/WhyBother.htm. Accessed May 16, 2003.
7 Katz R. Balancing technology and tradition-the example of course management systems. Educause Rev 2003; 38:48-59. Available online at http://www.educause. edu/ir/library/pdf/erm0343.pdf. Accessed September 2, 2003.
8 DiStefano AF, Dayhaw-Barker P, Oleszewski S, Dell WM. The Pennsylvania College of Optometry transforms its curriculum for the preparation of 21st century optometrists. Optom Educ 2001; 27: 11-9.
9 Chumley-Jones HS, Dobbie A, Alford CL. Web-based learning: sound educational method or hype? A review of the evaluation literature. Acad Med 2002;77: S86-93.
10 Yolton R, deCalesta D. Pacific's experience with web-based instruction: bats in the belfry or webs in the classroom? Optometry 2000; 71:20-8.

Appendix: Faculty Survey Administered in Faculty Cyber Café

Q1. Under which academic division does your WebCT™ course fall?
1. Basic Science 2. Vision Science
3. Clinical Science

Q2. For how many courses have you implemented WebCT™ (If your course runs over several quarters, please consider each quarter a separate course)?
1. 1 2. 2 3. 3 4. 4 5. 5

Q3. Did you participate in the 3-day WebCT™ sponsored training program?
1. Yes 2. No

Q4. Please rate your computer literacy on a scale from 1 to 5, with 1 representing limited computer skills and 5 representing excellent computer skills.
1. 1 2. 2 3. 3 4. 4 5. 5

Q5. Using WebCT™ for my course has helped me achieve curricular goals.
1. Strongly disagree 2. Disagree
3. Neutral 4. Agree 5. Strongly agree

Q6. Implementation of WebCT™ in my course caused me to reconsider course content and presentation.
1. Strongly disagree 2. Disagree
3. Neutral 4. Agree 5. Strongly agree

Q7. On a scale of 1 to 5, please rate the workload involved in implementing and administering your WebCT™ course while teaching the course (this does not include the initial design phase). One represents a minimal workload and 5 represents very work intensive.
1. 1 2. 2 3. 3 4. 4 5. 5

Q8. On a scale of 1 to 5, please rate the workload involved in designing your WebCT™ course and getting it up and running (this does not include implementation of the course during active teaching). One represents a minimal workload and 5 represents very work intensive.
1. 1 2. 2 3. 3 4. 4 5. 5

Q9. Implementing WebCT™ in my course was beneficial to students enrolled in my course.
1. Strongly disagree 2. Disagree
3. Neutral 4. Agree 5. Strongly agree

Q10. Implementing WebCT™ for my course was worth the effort
1. Strongly disagree 2. Disagree
3. Neutral 4. Agree 5. Strongly agree

Q11. I plan to use WebCT™ again when I teach my course in the next academic year.
1. Strongly disagree 2. Disagree
3. Neutral 4. Agree 5. Strongly agree

Q12. Please describe the degree to which you utilized WebCT™ for your course. One represents minimal utilization (e.g., posting a syllabus and lecture notes) and 5 represents maximum utilization (e.g. use of multiple tools such as case discussions, quiz/surveys, image database, student participation).
1. 1 2. 2 3. 3 4. 4 5. 5

Q13. Using a scale of 1 to 5, please describe whether you received the degree of support that was right for you. One represents too much support, and 5 represents not enough support.
1. 1 2. 2 3. 3 4. 4 5. 5

Q14. I plan to expand and/or enhance implementation of WebCT™ when I teach my course in the next academic year.
1. Strongly disagree 2. Disagree
3. Neutral 4. Agree 5. Strongly agree

Q15. Please indicate the WebCT™ tools that you utilized in your course(s).
1. Discussions 2. Quiz/Survey
3. Content Module
4. Posting existing lectures, PowerPoint files
5. Calendar 6. Email
7. Image database 8. Glossary
9. Chat 10. Syllabus
11. Linking to other websites

Q16. Of the tools that you did utilize, which one was the most effective in helping you achieve learning objectives? Please pick one tool (see items 1-11 in Q15).

Q17. If you are planning to expand/enhance implementation of WebCT™ next year, which tool do you feel has the most potential for helping achieve learning objectives? In other words, which tool are you mostly likely to add to your course or increasingly utilize? Please pick one tool (see items 1-11 in Q15).

Accuracy of Self-Assessment by Optometry Students And Its Role in Optometric Education

Aurora Denial, O.D., F.A.A.O.
Dorothy Tolls, O.D., F.A.A.O.

Abstract

Background: *Students' ability to accurately self-assess knowledge base and clinical skills is an integral part of the educational process. The* ***purpose*** *of this study is to test the hypothesis that optometric students are accurate at self-assessment when compared to a clinical instructor and to test the hypothesis that self-assessment can be a useful learning tool.* ***Methods:*** *Twenty-eight third year students at The New England College of Optometry were asked to self-evaluate their clinical skills and knowledge base using comprehensive clinical performance criteria. The instructor supervising each student also evaluated the student using the same criteria. At the end of the quarter the students' and instructors' evaluations were compared and both groups were surveyed.* ***Results:*** *The results showed that for most categories, the grades were well correlated (P<.05) and the students were accurately able to self-assess. The survey showed that instructors and students agreed that the process of self-evaluation motivated students to review the grading criteria and take a more active role in the evaluation process.* ***Conclusion:*** *The students in this study were able to accurately self-assess when compared to a clinical instructor. The role of self-assessment in optometric education is to facilitate the learning process and establish a pattern of behavior that will support independent life long learning.*

Key Words: *self-assessment, self evaluate, independent learning, clinical student assessment, active learning*

Introduction

Students' ability to accurately self-assess knowledge base and clinical skills is an integral part of the educational process. Accurate self-assessment facilitates active and independent learning by providing a mechanism to identify strengths and weaknesses, both to build self-confidence and direct learning.[1] The ability to critique oneself is also vital to the development of professional life-long learning skills.[2] Not only have many studies questioned the validity and accuracy of student self-assessment, but there is varied opinion over whether the ability to accurately self-assess can be acquired.[2,3,4,5]

Concerning the accuracy of student self-assessment, most studies report no or low correlation between student and instructor self-assessment.[6,7,8,9] Henhest & Fehrsen[10] found a positive correlation between the marks students gave themselves and those given by faculty members. Wooliscroft found that lower performing students rated themselves higher than instructors while the reverse was true for higher achievers.[5]

Historically, limitations of accurate student self-assessment include lack of specificity in the evaluation criteria, inherent psychological concepts of students' self-perceptions, and persistent variability in instructors' ratings of students.[3,5,11] In the optometric literature, there is little information about the application of self-assessment in optometric clinical education.

In 1995, The New England College of Optometry developed and implemented a clinical evaluation system based on objective, progressive criteria.[12] One of the goals of this system was to allow students to use the same evaluation tool instructors employed in their summative assessments to provide them with a mechanism for self-assessment and self-directed learning. This evaluation system provides the criteria that were used by students' and instructors' evaluations in this study.

The purpose of this study is twofold: first, to test the hypothesis that optometric students are accurate at self-assessment when compared to a clinical instructor; and second, to test the hypothesis that self-evaluation can be a useful learning tool.

Methods

Twenty-eight third year students at The New England College of Optometry were asked to self-assess their clinical skills and knowledge base using comprehensive clinical performance criteria. Twenty- seven students participated at the mid-point and seventeen participated at the end of the spring quarter. The instructor supervising each student also evaluated the student using the same criteria. The comprehensive clinical performance grid and criteria is the grading tool used throughout students' clinical rotations at The New England College of Optometry. (Appendix A&B) The use of the evaluation criteria is an effective method of student evaluation that meets many of the intended goals of clinical education.[13] The criteria identify a level of skill at different developmental stages. From prior use of the grid and criteria, both students and clinical instructors had access to and knowledge of expected levels of performance.

Students were asked to complete the self-assessment grid without collaborating with each other or with the

Dr. Denial is an assistant professor of optometry at The New England College of Optometry. Dr. Tolls was associate professor and course director for final year clinical programs at The New England College of Optometry when this article was written.

instructor. Each of the students picked a level reflecting his/her perceived performance in each category. The instructors independently did the same. The instructors were not allowed to review the students' self-assessments until after the instructor had completed the evaluation of the students. At the end of the spring quarter, both the instructors and students were surveyed to gain insight into their thoughts about the usefulness of self-evaluation as a learning tool.

The third year students in this study were assigned to patient care at two Neighborhood Health Centers in the Boston area — the Fenway Practice of the New England Eye Institute and the New England Shelter for Homeless Veterans. The total number of patient encounters per student during the spring quarter ranged from 7 to 35. The time each instructor spent with a student varied; however, each encounter was supervised.

Results

The results that demonstrate correlation were calculated using the seven categories from the performance grid that were consistently measured at each of the four clinical sites. A Pearson correlation coefficient was generated for each category. The categories are case history, refraction, functional tests, anterior segment, posterior segment, communication, and professionalism. Other categories such as glaucoma and low vision were either not applicable to the students' clinical experience or not consistently evaluated by all the instructors.

The results showed that, for most categories, the grades were well correlated (P<. 05). At the midterm, 57% (4 of 7) of the categories were correlated between student and instructor. At the end of the quarter, 71% (5 of 7) of the categories were well correlated. The categories of case history, refraction, and communication were well correlated at both the midterm and final evaluation. (See Tables 1&2)

In the evaluation of accuracy, the instructors are assumed to provide the gold standard assessment. At the midterm, the students and instructors showed no difference in grading 51% (115 of 227) of the time. (Table 3) By the end of the quarter, the students and instructors were in agreement 68% (105 of 154) of the time. (Table 4)

Five out of seven clinical instructors and twenty-two out of twenty-eight

Table 1 Midterm Self-Evaluation

	Correlation coefficient	*P Value*
Case History	r =.638	*P=.0003*
Refraction	r =.418	*P=.029*
Posterior Segment	r = .532	*P=.0036*
Communication	r =.688	*P<.0001*

Table 2 Final Self-Evaluation

	Correlation coefficient	*P Value*
Case History	r =.567	*P=.026*
Refraction	r =.569	*P=.025*
Anterior Segment	r =.792	*P=.0002*
Professionalism	r= .681	*P=.004*
Communication	*r =.694*	*P=.003*

Table 3
Agreement/Discrepancy between Instructors and Students Midterm

	-2	-1	0	+1	+2
CHX	2	8	12	4	-
Rf	-	10	13	4	-
Func	1	3	7	4	-
Neurol	1	2	3	-	-
Glauc	1	3	3	-	1
Ant Seg	-	9	15	3	-
Post Seg	-	7	17	3	-
Syst Dis	-	4	5	1	-
CL	-	-	2	-	1
Psych	-	1	8	4	-
VT	-	-	-	-	-
L Vision	-	-	-	-	-
Ophth Mat	-	3	2	6	-
Comm Skills	-	5	13	9	-
Prof	-	9	15	3	-
Total	**5**	**64**	**115**	**41**	**2**

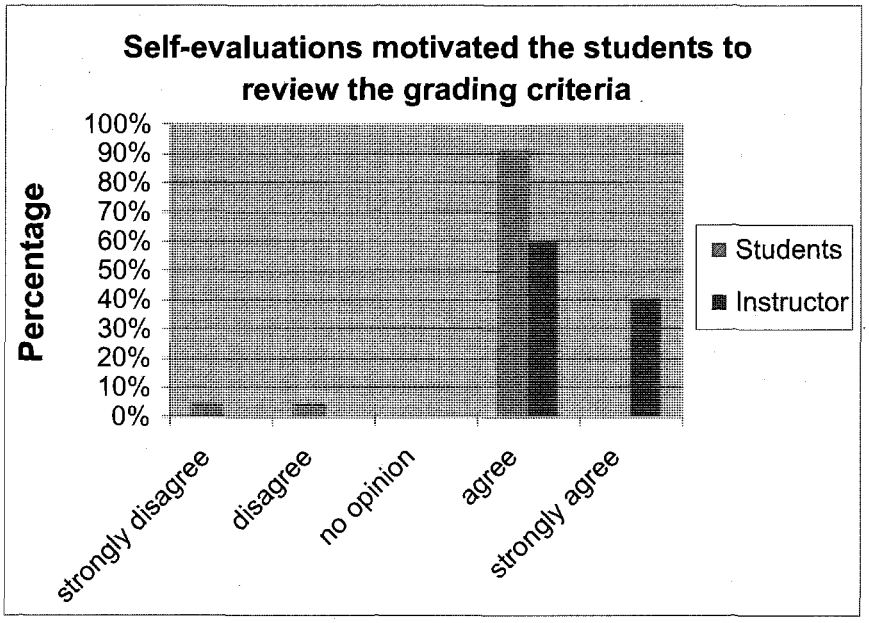
(-) indicates preceptor graded the student lower than the student's self-assessment (+) indicates preceptor graded the student higher than the student's self-assessment

Table 4
Agreement/Discrepancy between Instructors and Students Final

	-2	-1	0	+1	+2
CHX	-	2	10	5	-
Rf	-	2	10	5	-
Func	-	1	5	1	-
Neurol	-	0	7	0	-
Glauc	-	3	7	1	-
Ant Seg	-	2	13	2	-
Post Seg	-	3	12	2	-
Syst Dis	-	2	4		-
CL	-	-	-	-	-
Psych	-	1	5	5	-
VT	-	-	-	-	-
L Vision	-	-	-	-	-
Ophth Mat	-	1	8	1	-
Comm Skills	-	3	11	2	1
Prof	-	2	13	2	-
Total	-	**22**	**105**	**26**	**1**

(-) indicates preceptor graded the student lower than the student's self-assessment (+) indicates preceptor graded the student higher than the student's self-assessment

Figure 1



students returned the survey. The survey revealed that 100% (5of 5) of the instructors and 91% (20 of 22) of the students who responded agreed that the process of self-evaluation motivated the students to review the grading criteria. (Figure 1) Both groups also agreed that the use of self-evaluation allowed the students to take a more active role in the evaluation process and was a useful learning tool. (Figure 2&3) Eighty percent (4 of 5) of the faculty and 46% (10 of 22) of the students agreed that the use of self-evaluation facilitated discussion. (Figure 4)

Seventy-three percent (16 of 22) of the students agreed that by reviewing the grading criteria, they were better able to judge their clinical skills. Sixty-eight percent (15 of 22) felt that they were familiar with the evaluation criteria prior to being asked to self-evaluate. Ninety-one percent (20 of 22) of the students would participate in self-evaluation again.

Students and faculty were also asked to comment on the best and worst features of self-evaluation. (Examples of comments are shown in Table 5 and 6)

Discussion

As educators, our goal is to produce competent eye care professionals. The educational process to achieve this goal should include encouraging students to develop skills that allow them to be active participants in their learning. Educators must teach, encourage, and reinforce early in the educational process the skills needed to self- reflect and accurately self- assess. Through self-assessment and reflection the students will participate in their training. Additionally the students will develop an internal mechanism, which will aid in their training and development of future life long learning skills.

Success at self-directed learning requires, in addition to accurate self-assessment, motivation, intellect and appropriate experience.[5] Westberg and Jason identify components for creating a program that fosters self-assessment. Some of those components are clear goals, feedback, and a self- assessment tool.[14] The accuracy of the student's self-assessment in this study may be attributed to an appropriate evaluation tool, which clearly states goals and expected levels. A learning curve may have contributed to the improved accuracy from the

Table 5 Faculty Comments

Best Features

"Students became self-critical and were generally correct. It did also force them to look at the grading criteria and understand the progression."

"Students were less inhibited by writing on a form first...Discussion was more focused."

"The dialogue was around performance criteria and the areas of strengths and weakness."

"...made students look up expected values"

Worst Features

"Took time in clinic."

"Some students were as lax about assessing themselves as some preceptors were."

Table 6 Students' Comments

Best Features

"...enabled me to know my areas of strengths and weaknesses and improve upon them."

"It made me more aware of the grading criteria."

"Immediate feedback."

"It mirrored the evaluations already in use, so it was familiar and easy to compare to preceptor evaluations."

"It forced me to take a look at the clinical levels."

"Iit helped start a discussion with the preceptor regarding specific aspects of clinical skills and where improvement can be made,"

"I was able to accurately assess myself according to both my preceptor and my own standards."

"It made me think about my progress at the clinic myself instead of passively being told of my progress"

"It made me address my goals for the quarter, and if they were being met."

"weaknesses can be readily identified."

"It made me analyze my skills and helped me focus on area or improvement before the end of the quarter."

Worst Features

"It is hard to evaluate yourself."

" It took time out of my schedule"

"some of the categories were irrelevant"

"student may think they are bad at something but the preceptor may not realize it and later that may end up counting against you"

"took me awhile to really think about it"

"It was awkward comparing it with the preceptor's evaluation during the meeting...I know I would not always be honest with every preceptor. I can see myself marking what I thought they felt instead of what I truly believed. I was nervous about creating a confrontational situation if I felt I was better at something than the preceptor thought."

Figure 2

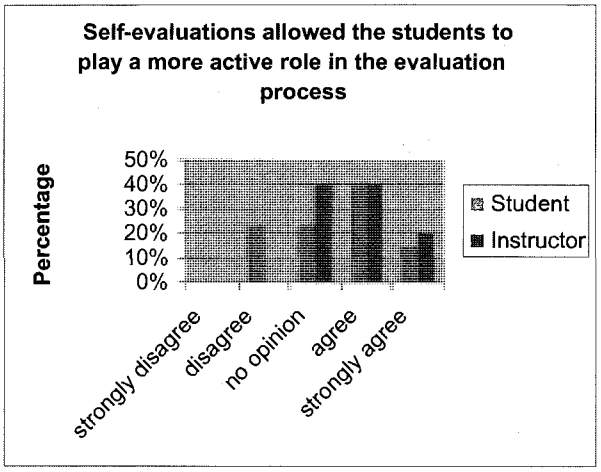


Figure 3

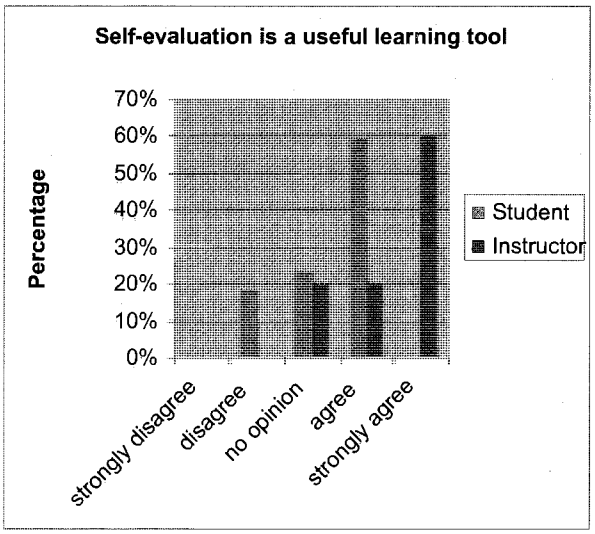
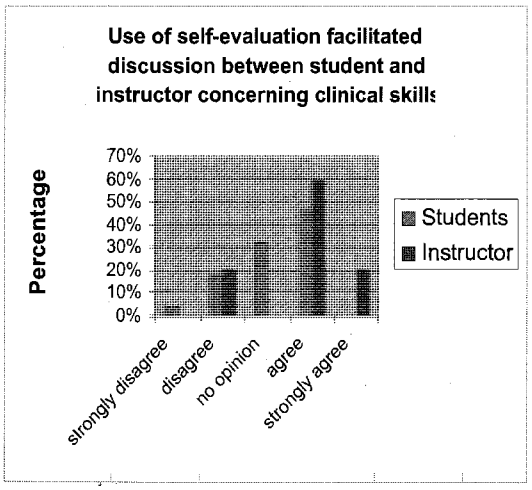


Figure 4



midpoint to the end of the quarter. At the end of each clinical encounter the students receive feedback from the clinical instructors. Feedback from clinical instructors may also have contributed to the accuracy of the student's self-assessment.

Feedback from instructors will shape the students' perception of their skills, allowing easy identification of weaknesses and strengths. Each student was assigned to the clinic and was examining patients approximately six weeks prior to the midterm. The range of patient encounters varied among students from 7-35 patients per student. Increased patient encounters may have allowed more opportunities for feedback. Verbal or written feedback from instructors after each patient encounter allowed the student to develop the internal mechanism to evaluate his/her own performance.

Consistency in feedback may have increased correlation among categories. The categories of case history, refraction, and communication were consistently correlated at both the mid-term and final. Since patient populations varied and exposure to pathology varied, the students may not have received uniformed feedback from instructors in the other categories (functional, anterior segment, and posterior segment).

The comprehensive clinical performance grid was the tool used for student self-evaluation. The accuracy and correlation of student's self-assessments and clinical instructors may be related to the specificity of the comprehensive clinical performance grid. The criteria allowed the students and instructors to specifically evaluate the technique level, knowledge base, and integration of material in each category within strict guidelines. The grid clearly outlines goals and expected levels of performance. The criteria do not dictate a level of adequacy such as outstanding, average or inadequate. Rather they identify a level of skills at each stage of development. The skill levels are identified as technical skill, knowledge base, analysis, diagnosis, and management. The students were able to identify a level of development without the psychological impact of admitting they did poorly in a specific category.

Accurate self-assessment allows the student the opportunity to be an active participant in his/her education. The results of the survey as well as student and faculty comments support using self-evaluation as a learning tool to create an active learning environment. An active learning environment is one in which students feel involved in their education and are thinking about what they are doing, seeing, or hearing rather than just performing rote tasks. The process of self-assessment allowed the students the opportunity to be more involved and take responsibility for their progress and learning.

■

In the evaluation of accuracy, the instructors are assumed to provide the gold standard assessment. At the midterm, the students and instructors showed no difference in grading 51% (115 of 227) of the time. (Table 3) By the end of the quarter, the students and instructors were in agreement 68% (105 of 154) of the time. (Table 4)

The two main benefits of using self-assessment to facilitate learning were to provide motivation to review the grading criteria and to create an active learning environment. All students at The New England College of Optometry received a copy of the grading criteria at the beginning of their clinical rotations. Although most students felt they were familiar with the criteria, the majority reviewed the criteria before self-assessment. Knowing that they were going to grade themselves and be compared to an instructor motivated students to take a closer look at the criteria. Knowledge of the grading criteria and expected clinical skill levels contributed to learning by allowing the students to take a formative role in the evaluation process. A formative role is defined as an internal evaluation which serves to improve the product being developed.[15] Developing this internal mechanism will help with setting goals and objectives, and it supports development of life-long learning.

The majority of students did not feel the process of self-assessment facilitated discussion about clinical skills. In contrast, the majority of instructors felt self-assessment did stimulate discussion. This dichotomy is interesting and brings up several questions. Did the students feel the dialogue was one sided? Did the students feel the discussions were not in-depth? Did the students not listen to the instructors because the feedback was not what they wanted to hear? The perception of adequate feedback was clearly not the same for students and instructors.

Informal surveys have revealed that students often find evaluations anxiety producing due to confrontation.[14] Students in this study were also concerned about creating a confrontational situation with self-assessment.

"It was awkward comparing it with the preceptor's evaluation during the meeting. I know I would not always be honest with every preceptor. I can see myself marking what I thought they felt instead of what I truly believed. I was nervous about creating a confrontational situation if I felt I was better at something than the preceptor thought."

Gordon[4] reports that benefits of self-assessment include reduced anxiety over grading and improved communication between student and teacher. To maximize learning, students and clinical instructors should be able to discuss the student's performance in a relaxed non-critical environment. Discussions between students and instructors should be perceived by both parties as a learning experience. Communication skills can be acquired. In the clinical programs at The New England College of Optometry, students are expected to learn professional communications skills, including dialogue between themselves and the

instructor. The students are expected to accept criticism and modify behavior. Students' accurate identification of their weakness relieves the instructor of the sole responsibility for providing negative feedback.[14] Clinical instructors should praise students for being self-reflective.

The most consistent negative comment by both students and faculty was that the process of self-evaluation took time. The evaluation process is a requirement of clinical teaching, and the process of self-assessment is a student-directed activity. Interim outcomes assessment of the evaluation grid found that above all, students want most to receive verbal feedback in evaluation.[13] Time should be taken to discuss clinical grades and to give feedback in any clinical learning environment.

The limitations of this study include few patient encounters for some students and few instructors. Instructor variability in grading may influence the accuracy of the results. If the instructors are assumed to provide the gold standard in assessment, then variability of grading may influence discrepancy but not necessarily reflect a lack of accuracy of student self-assessment.

Conclusion

The students in this study were able to accurately self-assess when compared to clinical instructors. An appropriate tool, which set specific goals and objectives and feedback from clinical instructors, was likely the key component for creating a program that fostered accurate self-assessment.

The goal of self-assessment in optometric education is to facilitate the learning process and establish a pattern of behavior that will support independent life-long learning. The learning process is facilitated by allowing the student to take a formative role and be an active participant in his/her education. Implementing a program of self-assessment should be considered in all clinical optometric educational settings. To establish a pattern of reflective thinking, self-assessment needs to be started early in the clinical curriculum and be used consistently in all clinical activates. Faculty members need to be well versed in the skills needed for teaching self-assessment. Time needs to be designated by the student and instructor for self-reflection, assessment and follow-up plans. However, implementing this tool need not be a time consuming process for instructors nor should it impinge on clinic operations.

There are many possible approaches to the implementation of student self-assessment. Self-assessment is a student directed activity. It can be a formal or informal process, used to facilitate discussion, or recommended for independent study. Self-assessment does not need to be a formal written assignment; perhaps reflection alone is enough in the later stages of education.

Creating professionals with life-long learning skills is a goal of optometric education. To this end, the implementation of student self-assessment will create an active learning mindset that will enhance students' formal education and translate into effective professional self-development in the future.

Acknowledgements

We would like to thank Dr. Frank Thorn for his help in the statistical analysis and Dr. Nancy Carlson for her help in editing the article.

Note

Copies of the Comprehensive Performance Grid are available by contacting the author at deniala@neco.edu

References

1. Neame RKB, Powis DA. Toward independent learning: curricular design for assisting students to learn how to learn. J Med Educ 1981; 56:886-893.
2. Maudsley RF. Effective in-training evaluations. Med Teacher 1989; 11:285-290.
3. Gordon M. A review of the validity and accuracy of self-assessments in health professions training. Acad Med 1991; 66:762-769.
4. Gordon M. Self-assessment programs and their implications for health professions training. Acad Med 1992; 67:672-679.
5. Wooliscroft8 JO, TenHaken J, Smith, Calhoun JG. Medical students' clinical self-assessments: comparisons with external measures of performance and the students' self-assessments of overall performance and effort. Acad Med 1993; 68:285-294.
6. Stuart MR, Goldstein HS, Snope FC. Self evaluation by residents in family medicine. J Fam Prac 1980; 10:639-642.
7. Cochran SB, Spears MC. Student self assessment and instructors ratings a comparison. J Amer Diet Assoc 1980; 76:253-257.
8. Morton JB, Waag, Macbeth. Correlations between staff, peer and self assessment of fourth year students in surgery. Med Educ 1977; 11:167-170.
9. Sclabassi SE, Woelfel SK. Development of self assessment skills in medical education. Med Educ 1984; 18:226-231.
10. Henbest R, Fehrsen S .Preliminary Study at the Medical University of Southern Africa On Student Self-Assessment as a Means of Evaluation. J Med Educ 1985; 60(1):66-8
11. Gross SM, Zoltoski RK, Cornick ML, Wong KKW. Student self-assessment of professional communications skills at the Illinois College of Optometry. Optom Educ 2000; 25:107-115.
12. Bazzinotti Tolls D, Carlson N, Wilson R. Comprehensive clinical performance grid for student evaluation. Optom Educ 1998; 23(3):75-81.
13. Tolls D, Carlson N, Wilson R, Richman J. Interim outcomes assessment of the comprehensive clinical performance grid for student evaluation. Optometric Educ 2001; 26:77-82.
14. Westberg J, Jason H. Fostering learners' reflection and self-assessment. Fam Med 1994; 26:278-82.
15. Best M, Carswell R, Abbott D. Self-evaluation for nursing students. Nurs Outlook 1990; 38(4): 172-7.

Reflections on an Assessment Scheme

Catherine M. Suttle, PhD., MCOptom.

Abstract

Assessment methods provide students with an indication of the type of learning that is required (active or passive, deep or surface). Students who take an active part in their learning are more likely to understand concepts and to retain the knowledge and understanding they have gained than those taking a passive role. Teaching and assessment methods may be chosen to encourage active learning. In my own teaching, I have modified my assessment methods in an attempt to encourage active, deep learning, to help generate a sense of the students' responsibility for their education, and to discourage surface, passive learning and excessive dependence on the "teacher." I hope that the modified scheme, described here, will help students to retain indefinitely the knowledge and understanding they gain during my course.

Key words: *assessment, active learning, presentation, discussion*

Dr. Suttle is a lecturer at the University of New South Wales School of Optometry and Vision Science in Sydney, Australia. Previously, she was a postdoctoral researcher at the University of California, Berkeley, School of Optometry.

Introduction

Teaching and assessment methods play a vital role in determining the type of student learning (active or passive, deep or surface) and therefore the level of student understanding.[1] Students who take an active role in their learning are more likely to understand and remember concepts they have learned than those taking a passive role. If teaching consists of passive learning and assessment is by methods that allow rote memorization, students are likely to remember key aspects for an assessment task, but to forget them soon afterwards, and may not need to fully understand them at all.[2,3] Thus, it is important that teaching and assessment use methods that discourage surface learning, such as rote memorization.

I teach a group of approximately 60 second year undergraduate Optometry and Vision Science students and have been teaching the same course for three years. Each year I have amended the course structure (including assessment) in an attempt to encourage discussion among students and to shift students' focus from "The Exam" to the course itself, and course topics. I have encouraged discussion among students, in tutorials and lectures, but the students have been reluctant to participate until the discussion became a part of assessment. Students' contributions to discussion counts for a total of only 5% towards the final mark, so the incentive is quite small, but apparently sufficient to persuade students to become involved in discussions. I have also found that most of the students I teach are reluctant to undertake active learning activities unless their involvement is assessed and contributes towards their final mark.

Assessment tasks need to be valid (relevant to course objectives) and reliable. Initially, my course objectives comprised a list of course topics that students should understand by the end of the course. The word "understand" was used, without further or more specific explanation. This word may be interpreted in a variety of different ways by different readers, so some students may think that memorization is sufficient to satisfy course objectives, while others may assume that a demonstrated ability to hypothesize and reflect on course topics and related concepts will be required.[4] My course objectives now provide a more specific explanation of the level of understanding of course topics that students are required to demonstrate when completing course assessment tasks.

Each course coordinator has a different outlook on teaching methods and assessment criteria, and consequently the students may be confused about what is required in order to "do well" in each course in the program. This has been pointed out to me, in fact, by some of the students. Students may perhaps feel cheated — they have become accustomed to a certain style of learning and assessment, then some of their teachers and assessors move the goalposts, so that they have to take a different approach in order to succeed. I hope that the "alignment" of my own teaching has improved with more specific objectives, and written assessment criteria relating to each assessment task, so that students are aware of what is expected of them.[5,6]

I assess students using student presentations, an essay and two written tests during the course. These tasks provide formative assessment, allowing opportunities for feedback to students as well as a contribution toward their grade for the course. The final exam, on completion of the course, is the only purely summative form of

assessment, since this provides no opportunity for feedback and is used only for grading.

Student Presentations

Student presentations are worth 15% of the total mark for the course. The presentations are each of one-hour duration and are made by groups of two to four students. The groups are randomly assigned, and each group chooses from a range of topics (compiled by me) relevant to the course. If a group finds none of the listed topics sufficiently interesting, they are allowed to devise their own topic, subject to my approval. This choice places some control and responsibility for learning in the students' hands.[4] Following each presentation, students in the audience (all students not involved in that presentation) discuss the topic of the presentation within small groups for about 15 minutes, then each group asks the presenters at least one question. I, as moderator, attempt to ensure that each of the presenters are asked questions, and that all students in the small groups contribute to the discussions. Presenters are awarded marks based on their apparent understanding of the topic they present, as judged by me. I look for evidence of understanding in the presentation itself (for example, explaining concepts, rather than reading notes to the audience), and particularly in responses to questions from the audience. Those in the audience are also assessed on their contribution to these sessions. A maximum total of 5% towards the final mark for the course is awarded for contribution to discussion at these sessions and for asking questions of the presenters.

I have been pleased to see most of the students respond to this assessment format by making excellent presentations, discussing the topics actively, and asking insightful questions. However, the reliability of this subjective form of assessment may not be high. For example, when judging each student's contribution to the presentation, my impression may be affected by my prior experience of that person.[7] In addition, students prepare the presentations within small groups, so it is likely that my assessment of an individual student's performance may be affected by the contribution of others within the group, in at least two ways. Firstly, if the first speaker in the presentation is excellent, the next may make a good contribution, but appear poor in contrast. Secondly, individuals may be affected by the level of enthusiasm and effort of others within their group, and may either be "carried along" or "dragged under" by the others. While I am aware of these potential problems in assessment, the presentations have greatly increased discussion and collaboration among students, thus encouraging deep learning.[2,3] In addition, the choice of topics and the research required during preparation of the presentation have encouraged students to take responsibility for their own learning and reduced dependence on a teacher.[4,8]

■

My course objectives now provide a more specific explanation of the level of understanding of course topics that students are required to demonstrate when completing course assessment tasks.

At present, I check each student's involvement in discussion by circulating during the discussions, and chatting with each small group briefly. Perhaps reliability of assessment could be improved by making video recordings of the sessions for review by myself and another assessor. Alternatively, a second assessor could perhaps attend the sessions with me and assess the students independently. Ideally, the assessor should not have prior experience of these students and so would have no preconceived opinion that might affect their judgment. Rowntree[7] discusses the issue of judging student presentations, and notes that video recordings may be useful in some ways, but may in fact reduce the reliability of assessment, since the recorded presentation will be different from the "live" performance. For example, the video operator will determine which aspects of the presentation to focus on, with some remaining off-camera. In addition, there may be subtle factors such as audience appreciation and general atmosphere that may be lost in the recorded version. Thus, perhaps video recording is not an ideal tool in the assessment of student presentations. Further possible improvements to this form of assessment are discussed later.

Essay Assignment

One essay assignment is included as part of assessment. Last year, students were offered a choice of three essay titles to encourage each student to take responsibility for this task and to reduce the sense of having this assessment task imposed upon them. Of the three titles, one was on a topic that is explicitly taught in lectures. The other two titles were closely associated with course topics, but required students to search the literature to find the relevant material independently. The first essay, therefore, required less independent work and thought than the other two. Just under half of the students chose the first title. Those who chose one of the other two generally wrote more original essays (unsurprisingly, since little could be "lifted" straight from lecture handouts) with more of their own opinion and thought on the topic. A number of students who chose these titles were awarded a mark of 10 out of 10, but none of the students who chose the first title were awarded this mark. This difference reflects the criteria for assessment, which included "originality." Thus, the choice of titles, coupled with my assessment criteria, may have generated a bias away from the first title, a factor which may have reduced the reliability of this assessment task.

Reliability may have been further reduced by a non-optimal marking method. While reading the essays, I make notes on the work itself, for feedback to students, and for my own reference in allotting a mark. I look in particular for evidence of original and independent thought and clear explanation of the issues. I rarely find evidence of extensive plagiarism, but some instances of occasional obvious use of another person's words. One concern here is that it is relatively easy for those students with a good com-

mand of English language to plagiarize without being "caught." Students from non-English-speaking backgrounds are likely to find it far harder to use their own words, and the assessor is more likely to notice when they rely on other people's wording. This factor may further reduce the reliability of this form of assessment. In addition, when marking the essays I read approximately 10 essays per day. It seems likely that various factors that might change my attitude towards each essay would change during the day. For example, I might become tired or bored, or perhaps irritated by one of the essays. My criteria for awarding a global mark is, therefore, likely to change as I work through the essays. I intend to retain essays as a means of assessment in the course, partly because the students rise to the challenge of writing an original piece of work, including their own thoughts and opinions. However, the factors described above may reduce the reliability of this form of assessment. For this reason, I have now adopted a more rigorous marking scheme, in which specific aspects of each essay, such as introductory outline, relevance, originality, and use of references, are allotted a pre-determined proportion of marks.[9,10] The marking scheme is consistent with the task objectives and criteria provided to students.

Students were allowed three weeks to write the essay, but some found this period too short, since they had assignments to prepare at the same time for other courses, and some were preparing for their presentation. The essay is not intended to test students' ability to work under pressure, or to complete the work within a limited time, so it seems reasonable that essay titles should be provided well in advance of the submission date.

Written Tests

Two written tests are used as part of assessment, each counting for 10% towards the total mark for the course. This year, the test questions were designed to discourage students from "regurgitating" lecture material. The students were made aware that the questions would require some thought, and that they should not simply write down or draw something that they remember from a lecture, in a reflex type of reaction to the question. However, it seems that they did not listen to, or believe, this instruction until they saw the evidence (their marks for the tests). Marks were lower than previous years, when the test questions have perhaps permitted "regurgitation." Some concepts had not been fully grasped from the lectures, with the result that students were generally unable to take the knowledge acquired from the lecture, and apply this in a different context.

I returned the papers to the students with my comments written on them for feedback and told them the range of marks. I advised them to discuss with their colleagues any concepts they did not understand and, if necessary, to see me for further explanation and discussion of any course topics they have not understood well. Less than 5% of the students came to see me. I hope that the others have managed to resolve any outstanding issues by discussion with their colleagues, but sadly I suspect that most have simply accepted that they will not understand the topics. In view of the poor performance in the test, I set aside one two-hour lecture period to re-visit topics that students did not understand. I did not want this time to turn into just another lecture; the students had not understood previous lectures, so another lecture of similar format was unlikely to help. I wanted to use this opportunity to generate further discussion among the students, with help from me as required. I therefore asked students to each write down at least one specific concept that they felt they did not understand (as revealed by the test, or otherwise) and at least one that they felt they understood well.

I have been pleased to see most of the students respond to this assessment format by making excellent presentations, discussing the topics actively, and asking insightful questions.

These responses were to be delivered to me. I would then group students so that those who felt that they did understand certain concepts were placed with those who felt they did not. There might be six concepts, for example, so six groups would be formed, each with a maximum of 10 students with a range of understanding on that topic. My intention was to check the understanding of those who felt they understood well, and to clarify the concept for those who felt they did not. I hoped that the exercise would also increase students' confidence in their ability to learn independently and by discussion with colleagues, as they may realize that the "teacher" is not necessarily their key to understanding, and that they may learn equally well from each other. I was disappointed to see that none of the students suggested a topic for discussion. For this reason, the discussion session was cancelled, but I intend to introduce group discussion of this kind in a modified format in future, in an attempt to increase opportunities for active and deep learning in my course.

Final Exam

The final examination in my course has always consisted of a choice of essay questions, to be completed within three hours. This traditional exam format has been criticized on a number of grounds. Firstly, as mentioned earlier, the final exam offers no opportunity for feedback to students, and is only used as a summative assessment,[7] to grade students. Secondly, the exam is completed within a time limit, so students must race against the clock when writing their answers, a situation that may increase the likelihood that they will regurgitate "facts," and decrease the likelihood that they will offer original thoughts and opinions. Thirdly, a choice of questions is usually offered, so not all students write the same exam paper. This factor introduces a degree of inequality among students.[6] I have considered the possibility of abolishing the final exam from my course, and introducing a number of shorter tests during the course, which would provide both formative and summative assessment. Why have I not made this change yet? Rowntree[7] notes that assessors may be aware of a "respectability" factor in their course assessment as well as validity and reliability factors. In other words, perhaps I feel that a traditional three-

Table 1

Assignment	% of responses (n=57)
Final exam	12
Tests	26
Presentation	26
Essay	35

hour examination provides an element of respectability to my course, because it is such a well-accepted and widely used form of assessment. It seems that a certain degree of bravery is required to abolish the final exam!

Course Evaluation: Students' Impressions of Assessment

As discussed earlier, students may be encouraged towards deeper learning by careful choice of assessment task.[1] In an informal questionnaire designed to elicit student feedback on the course and on teaching and assessment methods, I asked students which type of assessment used in the course encouraged them to think most deeply. The tasks included the Essay, Presentation, Tests and Final exam. As Table 1 shows, about one third of the students who responded found that the essay encouraged them to think most deeply. As explained above, most of the essay assignments were very well written and showed a high degree of originality, probably reflecting deep thought. I hope that the students who took time to consider their essay topic carefully have an understanding of the relevant issues that will stay with them for some time.

In the same questionnaire, students were asked whether the Presentation assignment had helped to generate their interest in the topic in question. Sixty-five percent of the students answered "yes." Of the 35% who answered "no," their reasons for lack of interest included lack of time to devote to preparation and research, a lack of interest in the subject matter, and a lack of interest from colleagues in the same presentation group. Students were offered the option of suggesting their own topic for the presentation, so they were all given the opportunity to reject the suggested topics if they seemed uninteresting, and design their own topic. However, students were required to decide on their topic in the first week of the course, which means that they had to decide at a stage when they had had no exposure to any of the course topics. Thus, it would have been difficult for them to know what they might find interesting at that stage. In addition, it is likely that the general level of interest of each group will be affected by the interest and involvement of each member of the group. Students could not choose their colleagues, and were randomly assigned to groups of two to four. This action was taken in order to allow students with different backgrounds and learning styles to work together, so that students with a high level of enthusiasm for the subject would be distributed among the groups, rather than grouped together.

I hoped that this might generate enthusiasm and a wish to learn more in those students who usually appear less interested. However, it seems equally possible that the opposite could happen — the less interested students could, and perhaps did, dampen enthusiasm of the more interested students in the group. I would prefer to allow students to prepare and present their own presentation, but decided against this for two reasons. Firstly, individual preparation and delivery of presentations would eliminate the stimulus for student collaboration and discussion, so there would be no opportunity for peer teaching.[11] Secondly, some students may be particularly nervous about individual presentations and may perform less well in that situation than in a group.

As mentioned earlier, students were not in a position to know which topics they might be interested in at the beginning of the course. Students need to choose their topics at an early stage, in order to allow them sufficient time to prepare the presentation. I have addressed this problem by providing students with a more extensive written description of each of the topics, using terminology they will be able to understand before taking my course. The description provides an overview of the issues relevant to each topic and allows students to decide which topic is likely to be of most interest to them.

Some students did have much less time to prepare and research their presentation than others, because the presentations took place throughout the term, with some students presenting in the 3rd week, and others in the 14th week. For this reason, I now provide the list of course topics before the course begins, allowing a few weeks for additional preparation and research, if required.

Summary

When I first began teaching three years ago, I had very little knowledge of the issues involved in teaching and assessment of students. As my awareness of these issues has increased, I have modified my course in an attempt to encourage deep learning, to improve feedback to students, and to increase fairness of assessment. As discussed above, modifications include more specific objectives for the course as a whole and for each assessment task, encouragement of discussion and collaboration, and more time for preparation of work. The level of success of these modifications is evaluated from the assessments themselves and by feedback from students, and future course structure will be amended further as required, in a continuing attempt to optimize teaching and assessment methods.

References

1. Toohey S. Designing courses for higher education. Buckingham UK: Society for Research in Higher Education and Open University Press, 1999.
2. Gibbs G. The nature of quality in learning *In* Improving the quality of student learning. Bristol UK: Technical and Education Services, 1992.
3. Gibbs G. Strategies for fostering a deep approach *In* Improving the quality of student learning. Bristol: Technical and Education Services, 1992.
4. Candy PC. How people learn to learn *In* Smith, R.M., Learning to learn across the life span. San Francisco: Jossey Bass, 1990.
5. Biggs J. What the student does: teaching for enhanced learning. higher education research and development, 1999, 18(1): 57-75.
6. Jacobs L, Chase C. Developing and using tests effectively: a guide for faculty. San Francisco: Jossey Bass, 1992.
7. Rowntree D. Assessing students: how shall we know them? London: Kogan Page, 1987.
8. Ramsden P. (1992) Learning from the student's perspective *In* Learning to teach in higher education. London: Routledge.
9. Gough M. (2001) http://www.prs-ltsn.leeds.ac.uk/philosophy/articles/gough/
10. Roberts A, Burford C, Mew S. (retrieved 2002) http://www.mdx.ac.uk/www/study/ markguid.htm
11. Biggs J. Teaching for quality learning at university. Buckingham UK: Society for Research in Higher Education and Open University Press, 1999

IN REVIEW

Ophthalmic Photography: Retinal Photography, Angiography, and Electronic Imaging, second edition. PJ Saine, ME Tyler: Butterworth-Heinemann, 2002, 368 pp, $150.00.

This well-thought-out and organized text was written with a large audience in mind including professional ophthalmic photographers as well as optometrists, ophthalmologists, and students. The intent of the second edition of this text is to meld the basics of ophthalmic photography with the new technology of digital imaging with the hope of making one a better ophthalmic photographer. The scope of this text spans from the very basic to very advanced. Principles and techniques of stereo fundus photography, fluorescein angiography, indocyanine green angiography, electronic imaging, analog and digital videography, and scanning laser ophthalmoscopes are meticulously detailed in the 9 chapters of this text. Accompanying this are high quality color and black/white images, descriptive interpretation of sample cases, emergency intervention, step-by-step guide in trouble shooting, and film processing and printing.

This is an exceptional text and resource tool for the student and doctor learning how to capture stereo retinal photos with either traditional film or digital/computer imaging. It is also an excellent instructional text on performing, reading, and interpreting the various angiographies. The only fault of this text is that it indiscriminately covers too many topics, some of which might be better relegated to more basic sources.

Guest Reviewer: Dr. Judy Tong
Assistant Professor
Consultant, Ocular Disease and Special Testing
Southern California College of Optometry

Color Atlas and Synopsis of Clinical Ophthalmology 5-Volume Library (Wills Eye Hospital Series) Christopher Rapuano Ed., New York: McGraw-Hill Professional - paperback. 1,613 pp., $275.00/Library, $65.00/Volume.

I found this series to be an easy to use text and an excellent clinical resource. As a faculty member who teaches both optometry students and private practitioners, I am repeatedly asked to recommend a reference text that provides both pictures of an ocular disease condition, as well as a synopsis of how to manage the condition. This series provides both of these requirements.

The library is divided into the following topic areas: cornea, glaucoma, neuro-ophthalmology, oculoplastics and retina. The first thing that will strike the reader is the exquisite photography that is displayed in the series. In each of the volumes, the clarity and detail of the pictures is superb. The text or synopsis for each ocular disease condition is clinically relevant, giving the reader a quick overview of the disease and how to evaluate, treat and manage the disease entity. If the reader requires a more in-depth explanation of a particular ocular disease, he would have to utilize other reference materials.

The volume on cornea covers the areas of conjunctiva and sclera as well as cornea. The majority of the volume is dedicated to cornea and covers developmental anomalies, dystrophies, degenerations, infectious diseases, inflammatory disorders, ocular surface disease and systemic conditions affecting the cornea. Corneal surgery and complications are included at the end of the volume. I believe the reader who is in a refractive co-management setting will find this to be an excellent review and helpful reference resource.

The glaucoma volume was one of the best clinical texts on the disease that I have had the pleasure of reading. The text is broken into four sections: glaucoma diagnosis, glaucoma management, disease syndromes and imaging technologies. I found this volume to provide an excellent clinical review for the individual comfortable with managing glaucoma patients, as well as a very good foundational text for those who are less experienced in managing the disease. The final section on imaging technologies reviews recent and emerging technology for glaucoma diagnosis and management. This section also reviews how to interpret the test results from each instrument.

I believe the volume on retina would be very beneficial to the primary care provider. The format is similar to the other volumes in providing a brief background of the disorder, pathophysiology, clinical signs, diagnostic evaluation, prognosis and management It is divided into ten chapters which include categories such as macular diseases, diabetic retinopathy, retinal degeneration and dystrophies, chorioretinal inflammatory diseases and peripheral retinal disease to name a few. For practitioners or students looking for a good reference in posterior segment disorders, this volume will serve them well. The pictures and clinical synopses will provide the user with an excellent foundation of the posterior segment disease processes. There are several tables at the end of the text which provide a differential diagnosis of common retinal entities which the clinician will find helpful as well.

The volume on Neuro-ophthalmology is broken into thirteen chapters. I found the section on Magnetic Resonance Imaging for the ophthalmologist to be a very good review with excellent pictures of orbital disease and intracranial lesions. Practitioners in a hospital and/or multi-disciplinary setting will find this to be a great reference source.

Finally, one would imagine that the volume series on oculoplastics would not be utilized much by Optometry. One would be wrong. There are three sections in this volume divided into eyelids, lacrimal apparatus and orbit. I believe that the practitioner might utilize this volume more frequently due to the day to day lid and lacrimal disease entities that one might encounter in practice. The pictures and clinical description of the various anterior segment disorders are very good and provide the user with an excellent reference source.

In summary, I found the Color Atlas & Synopsis of Clinical Ophthalmology (Wills Eye Hospital Series) to be one that would fit nicely into any practice setting. I would advise purchasing the entire set as I believe that all five volumes will be utilized by the practitioner. This small paperback series can be easily stored on a desk top for quick and easy reference.

Guest Reviewer: Dr. David Sendrowski
Chief, Ophthalmology Consultation/ Special Testing Service
Associate Professor
Southern California College of Optometry

Field of Vision: A Manual and Atlas of Perimetry. JJS Barton and M Benatar: Totowa, New Jersey: Humana Press 2003, 334 pp., $150.

This textbook is the seventh in a series entitled Current Clinical Neurology. Its purpose is to address measurement of the visual field and interpretation of test results, along with assessment of the history and other findings, in the context of neuro-ophthalmic disease. The book is for those who are already familiar with visual field testing and visual pathway disorders.

The first chapter, *An Introduction to Perimetry and the Normal Visual Field*, provides a general review of perimetry. *Functional Visual Anatomy* describes the visual pathway and includes many illustrations, brain sections, and magnetic resonance images. *Perimetry at the Bedside and Clinic* emphasizes the importance of the central field and discusses confrontation, Amsler grid, and tangent screen testing. *Goldmann Perimetry* and *Automated Perimetry (Humphrey Field Analyzer)* describe each technique and interpretation of results, with case examples demonstrating various artifacts.

Following the chapters is the atlas, where 100 cases are presented in anatomical order. The reader is challenged to develop his diagnostic skills by first reviewing *History and Exam*, then turning the page to see the *Discussion*, which includes a description of the visual field, localization, diagnosis, brain scan and/or fundus photos. The *Discussion* for each case covers the differential diagnoses, which had been considered, and management. The next 20 cases are presented in random order so that one can test his skills. More than half of the cases have Goldmann fields.

One of the best aspects of the book is that it demonstrates and explains the variabilities and irregularities in visual field testing which are encountered in clinical practice. The numerous MRIs are quite helpful in learning to interpret brain scans, particularly to recognize small normal structures and subtle abnormalities. The *Discussions* provide many clinical pearls. I would have liked to see more photographs and Humphrey fields in the case presentations.

I don't think the textbook is appropriate as an introduction to visual field testing for optometric students, and private practitioners might feel it is not sufficiently relevant to their work, given the emphasis on Goldmann fields and radiology. I think it would make a useful library resource for fourth-year interns. I heartily endorse it as a learning tool for trainees in ocular disease, geriatric, or hospital-based optometric residency programs, where they may frequently encounter neurological conditions, and have access to Goldmann perimetry and radiology. Optometric educators and those who work in hospital settings would likely enjoy testing and fine-tuning their diagnostic skills.

Guest Reviewer: Dr. Pauline F. Ilsen
West Los Angeles VA Healthcare Center
Southern California College of Optometry
Los Angeles, CA

Genomic Medicine: Articles from the New England Journal of Medicine; edited by Alan E. Guttmacher, Francis S. Collins, and Jeffrey M. Drazen. The Johns Hopkins University Press, 2004, 179 pp., $39.95.

This book is a compilation of a series of articles that appeared in the New England Journal of Medicine from November, 2002 through September, 2003, dealing with the application of genomic principles, concepts and knowledge in medicine. Two of its editors, Drs. Collins and Guttmacher, are director and deputy director, respectively, of the National Human Genome Research Institute at the National Institutes of Health, and were very involved in the project that unraveled the human genome. The articles, first of all, provide a short but informative primer for health care practitioners who are not well-versed in the basics of modern genetics and molecular biology. Many of the other topics covered are timely and up-to-date, and include genetic testing; pharmacogenomics; hereditary implications in colorectal, breast, ovarian and hematologic cancers, Alzheimer's disease, and Parkinson's disease; and a discussion of the ethical, legal, and social implications of genomic medicine.

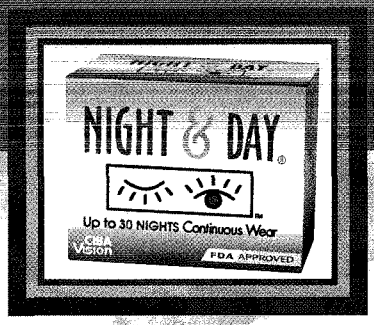
This book is a wonderful addition to the library of anyone interested in gaining a knowledge base and learning about some of the other important issues involved in genomic medicine. It is beautifully prepared with glossy, easy-to-read pages and illustrative diagrams and tables.

Medicine is presently in the very early stages of applying genomics to clinical care. It is encouraging to see that organized optometry is apparently awakening, albeit belatedly and slowly, to the notion that genomics will become a major factor in health care delivery in the not-too-distant future. Reading this book would be one way of gaining some significant appreciation of what will probably become the most important achievement in health care in the first half of the 21st century.

Guest Reviewer: Dr. Jerry Rapp
SUNY State College of Optometry

NIGHT & DAY®

THERE'S ONLY ONE BEST™



The Highest Level of Oxygen Transmissibility Available in a Silicone Hydrogel Lens[1]

Focus® NIGHT & DAY® is the one and only silicone hydrogel lens to exceed the 125 Dk/t critical minimum for no stromal anoxia.[2] And with a biocompatible surface treatment that prevents protein and increased bacteria build-up[3] while enhancing wettability, NIGHT & DAY ensures the optimal patient wearing experience.

DRYNESS	Patients refitted into NIGHT & DAY have fewer and less severe complaints of contact lens related dryness, particularly upon awakening and late in the day.[4]
COMFORT	Patients refitted from existing lenses to NIGHT & DAY found their lens comfort improved. 99% were satisfied or very satisfied.[5]
SATISFACTION	A recent clinical study found that at one week 97% – and at 12 months 99% – of patients were satisfied or very satisfied with NIGHT & DAY lenses.[5]

REFERENCED NOTES: 1 Data on file. CIBA Vision. 2 Harvitt D, Bonanno J. Re-evaluation of the oxygen diffusion model for predicting minimum contact lens Dk/t values needed to avoid corneal anoxia. *Optometry and Vision Science*. 1999; 76(10):712-719. 3 Keay L, et al. Bacterial Populations on 30-night Extended Wear Silicone Hydrogel Lenses. *CLAO Journal*. 2001; 27(1): 30-34. 4 Schafer J, Barr J, Mack C. A characterization of dryness symptoms with silicone hydrogel contact lenses. *Optometry and Vision Science*. 2003; 80(12S):187. 5 Dillehay S, Long B, et al. Patient experience and management in HDk silicone hydrogel soft contact lenses. *Optometry and Vision Science*. 2003; 80(12S):186.

Brief statement of intended use: NIGHT & DAY lenses (lotrafilcon A) are indicated for daily wear or extended wear for up to 30 continuous nights. Warning: The risk of serious ocular complications is greater for extended wear as compared to daily wear of contact lenses and smoking increases the risks. The long-term risk of microbial keratitis has not been determined for this lens. Post-marketing studies are in progress. Precautions: Not all patients can achieve the maximum wear time of up to 30 nights of continuous wear. Patients should be monitored closely during the first month of 30-night continuous wear. The maximum suggested wearing time should be determined by the eye care professional based upon the patient's physiological eye condition because individual responses to contact lenses vary. Side effects: Infiltrative keratitis was reported at a rate of approximately 5% during the one-year US study of 1300 eyes. Other side effects included conjunctivitis, GPC, and lens discomfort, including dryness, mild burning, or stinging. Contraindications: The lens should not be used when an inflammation or infection of the eye is present, or when there is any disease or injury in or around the eye or eyelids. The lenses should not be used by individuals who have medical conditions that might interfere with contact lens wear. Consult the package insert for complete information about Focus NIGHT & DAY lenses, available without charge from CIBA Vision Corporation at 1-800-241-5999 or www.cibavision.com. Rx only

CAN-DO Authorized Distributor

NIGHT & DAY. THERE'S ONLY ONE BEST.™ mycibavision.com

CIBA Vision® A Novartis Company