

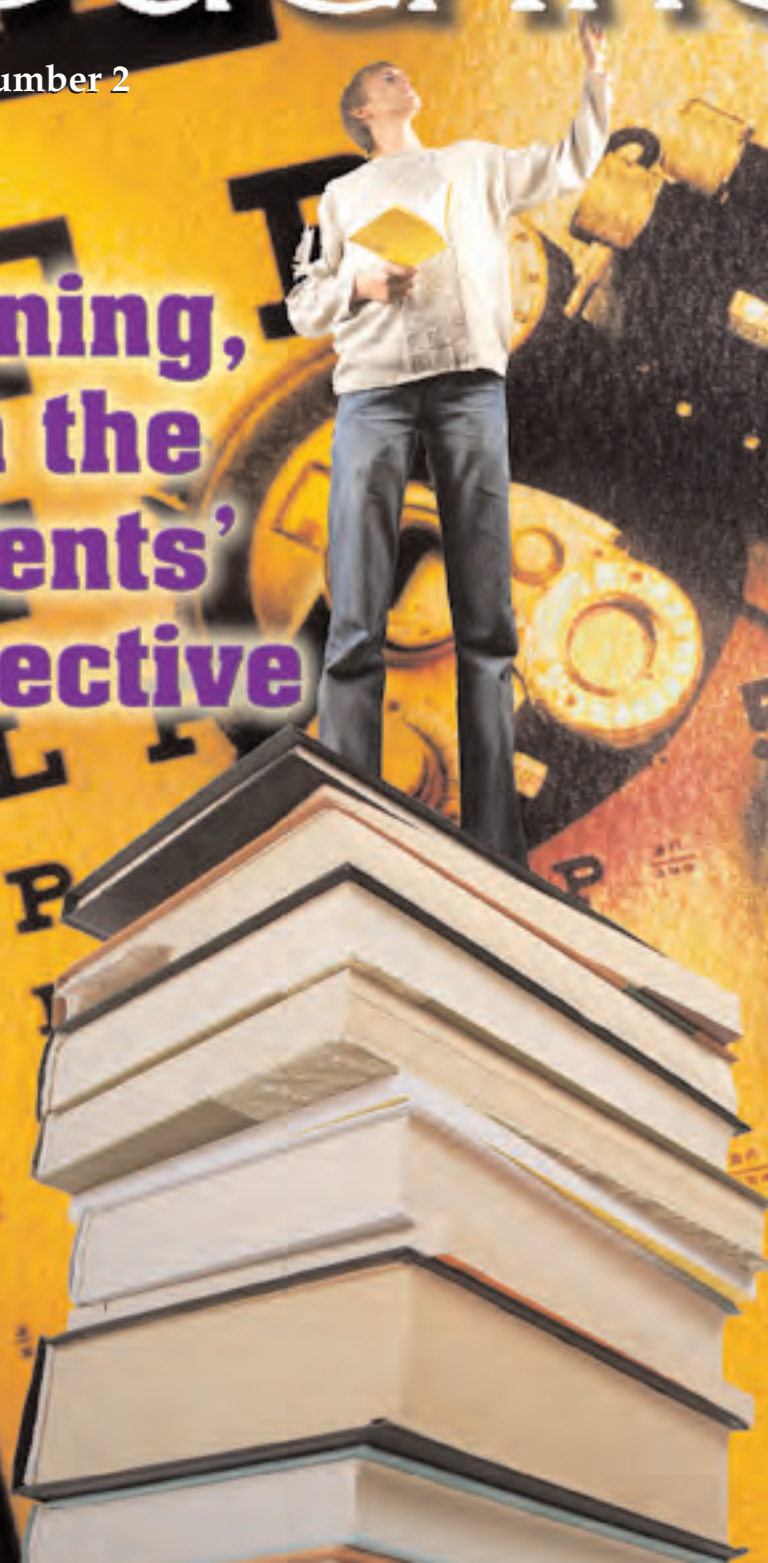
The Journal of the Association of Schools and Colleges of Optometry

OPTOMETRIC EDUCATION

Volume 33, Number 2

Spring 2008

**Learning,
from the
students'
perspective**



Association of Schools and Colleges of Optometry

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The Journal of the Association of Schools and Colleges of Optometry

Overseeing Student Clinical Education: The Role of the Educational Facilitator

Leon Nehmad, O.D., M.S.W., F.A.A.O.
Mitchell W. Dul, O.D., M.S., F.A.A.O.
Marie I. Bodack, O.D., F.A.A.O.
Patricia A. Modica, O.D., F.A.A.O., F.C.O.V.D.

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Alcon

Cover: courtesy of Rick Clapper, Director of Graphics and Branding, Western University of Health Sciences

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INDUSTRY NEWS

The following companies support ASCO's national programs and activities benefiting all 17 schools and colleges of optometry in the U.S. and Puerto Rico:

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The Vision Care Institute™, LCC,
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CIBA VISION: New Corporate Identity Reflects Company's Focus on Innovation, Quality, and Strong Partnerships with Eye Care Professionals



With the upcoming introduction of several exciting CIBA VISION product innovations, and in recognition of significant upgrades in its manufacturing operations, CIBA VISION is proud to introduce a new corporate identity to reflect the company's renewed commitment to being leaders in the eye care field. The new corporate identity includes a modern, new corporate logo and new purpose statement - "Shared Passion for Healthy Vision and Better Life" - which communicates the high level of dedication CIBA VISION shares with eye care professionals to improving vision and in turn, improving lives.

CIBA VISION is also upgrading its global supply chain processes and facilities to further ensure manufacturing quality and consistency as well as more reliable product supply. These efforts, such as the opening of a new silicone hydrogel lens manufacturing facility in Johor, Malaysia and the addition of new production lines at existing lens production sites, have resulted in a return to high customer service levels for CIBA VISION products. Investments in manufacturing innovation have also led to a new level of comfort and consistency for CIBA VISION's O2OPTIX® and NIGHT & DAY® silicone hydrogel lenses.

Another area of increased focus and investment for CIBA VISION has been in research and product development, resulting in an unprecedented number of new product innovations and product upgrades, particularly in the silicone hydrogel and daily disposable contact lens segments.

To better partner with and support eye care professionals in bringing the benefits that these new products offer to their patients, CIBA VISION is also increasing its investment in programs to educate professionals on enhancing the patient experience and improving the business performance of their practices.

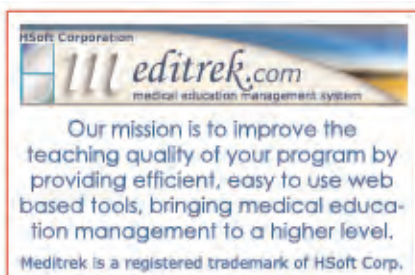
CIBA VISION will phase in the new logo on product packaging and other materials throughout 2008, with full transition to the new logo on its product line expected by the end of 2009. With the updated logo, the CIBA VISION name will appear even more prominently on product packaging, and on professional marketing materials, owing to its more contemporary design.

Easier Gonioscopy Exams With Volk's New High Magnification 4 Mirror Lens

Volk Optical has improved the capability to view the anterior segment of the eye with a new offering in its G-Series line of glass gonio lenses, the 4 Mirror High Magnification Gonio Lens. The new lens utilizes a level of magnification previously unavailable in a four mirror gonio lens to provide a complete 360° view of the anterior chamber.

With an image magnification of 1.5x, the 4 Mirror High Mag Gonio delivers crisp, clear views for observation of key detail in the anterior segment during glaucoma screening. Four mirrors equally angled at 64° provide visualization of the entire anterior chamber, with only a slight rotation. The "nf" (no flange) design of this lens facilitates use without viscous interface solutions. Artificial tears or a thick natural tear layer is all that is required for patient comfort, facilitating exams. Large or small ring options are available to suit personal handling preferences. For additional flexibility, the versatile 2-in-1 handle can easily be adjusted to create a straight or 45° angled grip.

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[Click to go to Meditrek](#)

Industry News

(Continued from page 37)

OPTI-FREE® RepleniSH® MPDS Package Encourages Annual Eye Exams

“See Your Eye Doctor Yearly” now appears as a banner on Alcon’s OPTI-FREE RepleniSH® starter kits to remind patients of the importance of regular eye exams. Beginning in February, this message will appear on all OPTI-FREE RepleniSH packaging.



Since optometrists can detect many eye diseases before patients experience symptoms—and often in time to prevent vision loss—routine eye exams play a key role in ensuring eye health. The American Optometric Association (AOA) recommends routine eye exams for everyone, and specifically recommends that contact lens wearers receive more frequent exams.

Not all patients appreciate the importance of annual eye exams, however, so educating the public, particularly contact lens wearers, remains an ongoing challenge. Important public health messages require repeated exposure in order to affect behavior, such as the need to maintain appropriate cholesterol levels. Expanding the prevalence of this public education message is one way Alcon helps eye care professionals address this challenge.

ACUVUE® OASYS™ BRAND CONTACT LENSES WITH HYDRACLEAR™ PLUS WITH 8.8 mm BASE CURVE AVAILABLE

VISTAKON®, a division of Johnson & Johnson Vision Care Inc., today announced that as of January 2008, ACUVUE® OASYS™ Brand Contact Lenses with HYDRACLEAR™ Plus will be available with a 8.8 mm Base Curve. The power ranges for the 8.8 mm Base Curve will be the same as with ACUVUE OASYS 8.4 mm: -12.00 to +8.00 for both diagnostic and prescription lenses.

ACUVUE OASYS is indicated for daily wear vision correction and may also be worn for up to 6 consecutive nights/7 days of extended wear as recommended by an eye care professional. It is also indicated for therapeutic use as a bandage lens for certain acute and chronic ocular conditions ACUVUE OASYS can be worn continuously for up to six nights and seven days when used as a therapeutic lens. Contact lenses should not be worn for longer periods than recommended by an eye care professional. As with all contact lenses, eye problems, including corneal ulcers, can develop. Some wearers may experience mild irritation, itching or discomfort. When intended for vision correction, lenses should not be prescribed if patients have any eye infection, or experience eye discomfort, excessive tearing, vision changes, redness or other eye problems.

The Partnership Foundation for Optometric Education Welcomes the Maine Optometric Association as a Contributing Partner

The Partnership Foundation for Optometric Education is pleased to welcome the Maine Optometric Association (MOA) as its newest Contributing Partner. The MOA joins 16 national, regional, and state contributing partners, the 17 schools and colleges of optometry, and corporate partners in supporting the Partnership Foundation.

The Partnership Foundation for Optometric Education was established in 1996 by the Association of

Schools and Colleges of Optometry (ASCO) and the American Optometric Association (AOA) to ensure the continued viability and promise of the profession of optometry. Future practitioners will be the primary beneficiaries of the Foundation’s success, through financial support of the professional optometry degree (O.D.) programs and related special projects. Contributing partners donate one dollar per hour to the Foundation for each optometrist registered to receive paid continuing education. The Foundation’s assets are approaching \$4 million.

The Partnership Foundation’s President, Dr. Richard Wallingford, Jr., stated, “The Maine optometrists have shown their commitment to the profession. They are willing to contribute today, knowing it will be the next generation that will receive the benefits. You have to admire their desire to support the growth of our outstanding optometric educational institutions.”

The MOA is affiliated with the American Optometric Association and represents more than 160 eye doctors throughout the state of Maine. (For more information about the Partnership Foundation, contact Christine Armstrong, Director, at 301-231-5817 or carmstrong@opted.org.)

More Vistakon News

The Customer Development Group (CDG) of Vistakon has introduced a new e-invoicing program, which allows for online review of invoices and monthly statements. Under the new program, doctors can stop receiving daily paper invoices and weekly invoice summaries. The new program also provides doctors and staff an opportunity to reprint past invoices and monthly statements, and dramatically improve reconciling their account. “Offices have already seen improvements through more intuitive monthly statements,” says Jack Rawle, Senior Director, Customer Development, Vistakon. “We expect to make even more drastic reductions in paper waste later this year.”

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Industry News

(Continued from page 38)

**The M&S Technologies, Inc.
Advantage in Computerized
Vision Testing Systems -
Serving the Vision Care
Industry for 18 years**

M&S is a leader in computerized visual acuity, contrast sensitivity, and video display systems, including the Smart System 2020™ and patented Holladay Automated Contrast Sensitivity System (HACSS).™ The systems offer visual

acuity tests, which are fully randomizable, customizable, and programmable into standardized protocols. Contrast sensitivity testing is offered with letter and linear sine gratings and our exclusive sinusoidal bulls-eye used on the Holladay Automated Contrast Sensitivity System (HACSS).™ M&S systems are E-ETDRS/ATS certified for clinical trials and meet or exceed ANSI/ISO standards. They also have a custom interface with Eyemaginations™ patient education, OfficeMate EMR, Marco, and Topcon Autophoroptors. Our new SystemLink™ technology makes the

M&S Smart System fully capable of simultaneously operating any software package while running the Smart System.



Have you thought about
the future of optometry?

We have!

The Partnership Foundation for Optometric Education is planting, cultivating, and nurturing. Together, this “true partnership” is making a long-term investment in tomorrow.



Partnership Foundation
for Optometric Education

EDITORIAL

Focusing on Students

Elizabeth Hoppe, O.D., M.P.H., Dr.PH.

It's the students, stupid! This year's presidential election rhetoric has been reminding us all to take a complex situation and find the underlying essence. In other words, to remember what really matters most. This issue of the journal brings us a similar message by interweaving a variety of perspectives and viewpoints, all with a common theme. The six articles all include some element related to students.

The different phases of student development and the different parts of the curriculum are included in this issue. From the study habits formed during undergraduate education, as described by McGinley et al.; to the student-patient interactions in the clinical environment described by LaMotte et al. and clinical performance evaluated by Denial and Deng; to the interactions between students and their preceptors described by Nehmad et al., the various roles and responsibilities of the students are explored. Schwartz and Rafaeli bring a unique application of social learning theory that encompasses student life from their earliest influences to life roles beyond graduation. Lyons reminds us that our role as mentor begins with students and continues with alumni. Sherstinsky and Contreras add an international perspective, where faculty became students and, then, in turn, incorporated what they learned as students in their roles as faculty.

Although each of these articles gives us insight into a focus on our students, many educators believe that the ultimate emphasis on students embraces an educational reform movement known as student-centered learning. Educational

experts have recommended changes in the traditional approach to education to create a much greater focus on the student learners. Terms such as *student-centered teaching and learning*, *problem-based learning*, *case-based learning*, *critical thinking*, and *evidence-based practice* have replaced traditional terminology typically associated with health professions education.¹ So what is student-centered learning? One definition describes it as "an approach to education focusing on the needs of the students, rather than those of others involved in the educational process, such as teachers and administrators."²

The Wikipedia entry goes on to say that student-centered learning impacts the design of curriculum, course content, and interactivity of courses.² To provide one example, educational theory suggests that in a traditional course focused on learning optics, the faculty member would choose areas of optics to include in the curriculum and methods of teaching the content that might be considered irrelevant by the student, because he or she cannot make the connections from optics to clinical applications. In contrast, a student-centered approach to optics would address the needs of the target student audience to learn to solve clinically related problems using some specific aspects of optics.

Expert educators advise that student-centered learning is primarily focused on the student's needs, interests, and abilities, with the teacher serving as a facilitator of learning. Student-centered learning requires students to be active, responsible participants in their own learning. Student-centered programs also identify learning outcomes that are reflective of current clinical prac-

tice and provide learning experiences that move students toward the achievement of outcomes. In contrast, more traditional, teacher-centered learning has the teacher at its center in an active role and students in a passive, receptive role.^{2,3}

I hope this inaugural free-access, online-only issue provides our readership with useful and interesting information that can help us provide the best quality education for our students. Whether we fully embrace a student-centered approach or blend elements of case-based learning, problem-based learning, and traditional lecture formats, it really is all about the students. Whether our emphasis is on didactic teaching, clinical teaching, or student relations, we are all striving to create the next generation of leaders for our profession. The online format of this Journal provides access to anyone who is interested in these topics, including health professions educators from all types of health disciplines, many of whom are facing very similar issues.

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Dr. Hoppe is founding dean of Western University of Health Sciences College of Optometry.

Participants from the ASCO Summer Institute for Faculty Development Discuss How the Schools and Colleges of Optometry Can Attract and Develop the Next Generation of Faculty Leaders

- Recruiting individuals who possess a true passion for teaching is the key ingredient for success in attracting and developing the next generation of optometry faculty leaders. There seems to be no traditional pathway, no cookbook methodology for achievement in the arena of professional school academia. In fact, in my 17-year career, I have yet to meet a colleague who set out to be a career academician in optometry. Everyone has a different story to tell but most seem to have found their “teaching feet” by accident rather than design.
- Early recruitment within the professional programs themselves would go a long way in portraying academia as the career treasure that it is. Because most career academicians report “falling into” their careers by happenstance after graduation from optometry school, perhaps we are not planting the seeds of academic discovery early enough.
- Student loan repayment programs for new faculty members.
- Look in “the trenches” for time-honored academic recruits. Seasoned practitioners can attest to life in the real world and connect with students in a powerful way.
- Implement mentor programs in all schools and colleges of optometry for junior faculty. Learning the ropes blindfolded is frustrating and leads to disillusionment with the academic process.
- Faculty retreats and faculty development workshops, such as ASCO’s Summer Institute for Faculty Development, promote professional camaraderie and growth.

Start with a heart for teaching. Many future professors just do not know it yet.

*Melanie S. Crook, O.D.
Assistant Professor of Optometry
University of Alabama at Birmingham,
School of Optometry*

The next generation of faculty leaders will come from today’s student body. Schools and colleges of optometry must start now to attract those who have the passion, dedication, and enthusiasm for our profession. This begins with current faculty setting the example as role models in the areas of intellectual curiosity, diverse academic backgrounds and interests, intellectual competence, research, and professional service along with providing superior service to our clinic patients. Current faculty must display the attributes of leaders in the profession and inspire students to pursue optometric education.

On graduation, few will consider academia as a career path. Even those who will pursue residencies will do so to position themselves in the public sector in venues such as referral centers. Our institutions must be competitive in salaries as well as provide an academic culture that will attract the best candidates to academia. Once in academia, the development of faculty leadership must begin with an effective mentoring program. Junior faculty will need to know the institution’s expectations in the areas of research, teaching, and service. In addition, providing new faculty with a mentor early in their academic careers allows junior faculty to assess their strengths and weakness, which will assist in the development of career goals and objectives. Therefore, schools can start today by nurturing current faculty in developmental programs such as ASCO’s Summer Institute for Faculty Development.

*Tiffenie Harris, O.D., F.A.A.O.
Clinical Assistant Professor
Indiana University School of Optometry*

Many optometrists avoid academia because of the perceived lack of pay. Schools and colleges need to emphasize the many benefits to working in an academic setting, like flexible schedules, ability to attend conferences, and benefits (i.e., retirement, vacation, sick leave). Additionally, faculty who are passionate about teaching can serve as great inspiration for students considering a career in academia. Schools should provide guidance for young faculty. Employing enthusiastic senior faculty who are willing to serve as mentors is essential. The ASCO Institute for Faculty Development is an excellent resource for new faculty. It provides young faculty with an opportunity to learn and set goals regarding scholarly, teaching, and service opportunities.

Nicole Patterson, O.D., F.A.A.O., Chief, Low Vision and Geriatric Services, Nova Southeastern University

Leaders are born! Is this correct? Numerous published examples obtained using post hoc analysis have demonstrated that leaders showed signs of greatness or genius at an early age. This, if correct, would mean nature beats nurture. If this is the case, one might reach the conclusion that there is no chance of innovation, development, or progress and, ultimately, no chance of change. But isn't change the most definite thing? Circumstances change, surroundings change, and people change. There is also significant evidence to suggest that change is bidirectional; sometimes change is for good and other times for bad. This evidence leads to the belief that surroundings and environment cannot only influence but have a significant role in the making of an individual, thus proving nurture's role in the making of a leader. I am of the camp that nature and nurture both dictate the outcome and making of leaders. The schools should hire young faculty who are well trained and, if possible, with all of the advanced training available today. Provide a nurturing environment and slowly but surely demand results from the faculty. Just as we treat children, first teach them to walk, and once taught certainly expect them to run! A school, above all, should provide them a chance and make way in allowing them to take charge of situation to become leaders. Because no matter what, one has to live and learn to gain the valuable experience that current leaders have.

Pinakin Gunvant, B.S. Optom., Ph.D., F.A.A.O.
Assistant Professor, Southern College of Optometry
Adjunct Assistant Professor, University of Louisville

Think Tank . . .

Attracting future faculty leaders will always be a struggle because we must convert young men and women who have set out to be practicing clinicians to academia, not only because they must change the picture they have of their future but because they have immense amounts of educational debt. Developing future faculty leaders will be best achieved if individual optometric institutions encourage junior faculty to receive further training. Junior faculty who are teaching didactic courses or providing clinical supervision need to develop their teaching skills through formal pedagogical training. We can better achieve the goals of attracting and developing future faculty leader if optometric institutions support junior faculty members in this type of training with financial assistance and release time.

Vision scientists also make up the ranks of faculty at many optometric institutions. These faculty members are discovering what to teach tomorrow's students. Vision science research at optometric institutions is the best kept secret in scientific research. Other areas of science are vastly overtraining Ph.D.s. We need to actively recruit undergraduates with research aspirations to dual O.D./Ph.D. programs before they are used and discarded by other areas of science, where tenure-track faculty positions are almost impossible to find. We can best attract and develop these individuals by beginning more undergraduate summer training programs to introduce young scientists to vision science.

Melissa D. Bailey, O.D., Ph.D.
Assistant Professor
The Ohio State University College of Optometry

At a recent multinational optometry meeting, a well-respected senior educator shared some thoughts of his years in education in which he noted that, "There has never been a better time to be in optometric education." Although I share his optimism, I was left to ponder as to his reasons for making this claim and wonder what steps should be taken, at a personal and institutional level, to ensure that this sentiment is sustained?

As ironic as it is, many of us would admit that we answered the calling of optometric education rather blindly. We were intoxicated by the idea of enlightening future generations of optometrists as well as the prospect of advancing our beloved profession. What many of us soon realized was that we have no understanding of how to achieve professional growth in this mode of practice. By establishing criteria and protocols for advancement, schools and colleges of optometry have taken the initial step toward fostering professional growth. Nevertheless, institutions must be available to address, integrate, and adapt these guidelines to best serve the needs of their constituency. Creating a self-directed committee focused on faculty enrichment, whose aim is to facilitate goal-setting and the process of reaching one's professional objectives, would promote active participation by all faculty while reducing any languorousness in the process.

As administrators push to advance their respective programs to address the evolving dynamics of our profession, there must be a commitment to provide the necessary tools to their faculty who are being called on to implement these changes. Gone are the days of simply reading the owner's manual before flipping the switch. More in-depth personal experience and guidance are essential to ensure the success of these novel programs. Providing a forum for intercollegial interaction or assembling a mentorship network would facilitate the establishment of exciting collaborations and professional advancement for both the individuals as well as the institutions involved.

Time is a social construct, not a commodity, yet its value within society is often beyond measure. Administrators should perceive the allotment of development time as an investment in their faculty that will pay dividends only if allowed to mature. Faculty members should be afforded the opportunity to explore an interest in various areas including research, politics, or scientific writing. Realizing however that linking a potential opportunity to a predetermined outcome measure (e.g., grants, publications) may not always be an effective means to incite interest.

If necessity is the mother of invention, opportunity should be deemed the mother of innovation; it provides the potential to create or re-create oneself. For faculty, the opportunity to enhance the educational experience in a manner that they judge to be beneficial is a powerful means to reaffirm one's belief in his/her purpose as a contributing cohort. Administrators should take an active role in identifying the strengths and interests of their faculty and in turn create opportunities to expand those interests and showcase their faculty's skills, so as to provide immediate rewards for their students, their faculty, their programs, and the profession.

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Southern California College of Optometry

My Best Day in Optometric Education Mentoring For Life

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I am a graduate of the New England College of Optometry (NECO) and completed a residency program in pediatric optometry thereafter. My academic career path began on July 1, 1989. For the first 9 years of my career, I held a half-time position with the college and developed a private practice in Cambridge, MA. However, in 1998, I joined the faculty in a full-time capacity to concentrate on optometric education, with a specific focus in clinical education and developing a pediatric clinical program. I was excited to take the charge of expanding the pediatric presence at NECO, developing a progressive, cutting-edge team to advance the clinical educational program, and increasing and enhancing services provided. Primarily though, I was excited to mentor student interns.

On the day I was approached to write this article, I received a telephone call from a former student of mine who was seeking some advice regarding a case she had been contemplating. We discussed the case and addressed the direction she wanted to take with it. We had a lovely conversation, as she was proud to update me on the past 10

years of her career. I followed up to our call by sending her some recent literature regarding the case subject matter. A message was then returned to me thanking me for the articles. In her remarks, she mentioned that when this case presented to her, she knew I was a resource she needed to explore. She thanked me for my continued mentorship.

My academic career is devoted to clinical instruction and practice. Being able to impact the student's clinical education through one-to-one student interactions, being readily available and serving as an active student mentor, role modeling clinical thought processes, and incorporating an interdisciplinary approach to care are the most exciting facets of my day. Educating students to refine their clinical skills, enhance their knowledge base, develop patient management strategies, and develop a sense of confidence and professionalism is my biggest thrill. When my interns take an active role in their patient care responsibilities, when they acquire the knowledge and techniques needed to fully care for their patients, and when connections are made that "these eyes" are linked to a patient—that would be my best day in optometric education.

Because my background is not in education, I think about how my philosophy of teaching has developed over the years and I have to thank my mentors who shaped its foundation.

However, even as curricula change, the fundamental aspects of my clinical teaching philosophy revolve around direct patient care issues and incorporation of the teaching of critical thinking skills and the promotion of the idea that

clinicians are lifelong learners.

Even though I have always stressed the concept of developing clinicians that are lifelong learners, I have always thought of the teaching process to be finite, from the time a first-year student enters the campus, to the graduation day when these new colleagues walk across the stage.

This call was not unlike the hundreds of calls I have received from my former students and residents over the past 20 years. Only now, when I think of the mentoring, it extends well beyond the four-year program, for learning about optometric patient care is truly a lifelong process.

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Patient and Student Attitudes About Wearing Masks During Direct Ophthalmoscopy

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Abstract

Transmission of respiratory diseases to health care workers is a substantive concern. The authors investigated the willingness of students to wear masks and patient acceptance of mask use. Students wore masks during direct ophthalmoscopy (DO), and questionnaires were completed by students and patients. Both thought masks were effective, but students did not think they should be used during DO. Although patients generally accepted mask use, students underestimated the percentage of patients with a positive attitude about using a mask. Students may not be willing to wear masks, but there are circumstances where mask use is necessary and students should be trained in the proper use of respiratory protection.

Key Words: mask, respirator, respiratory disease, respiratory protection

Introduction

Health care professionals and patients today are more aware of the need to prevent the spread of communicable diseases in the health care setting. Concern in the past was related to acquired immune deficiency syndrome (AIDS) and other blood-borne diseases, but recent media attention regarding severe acute respiratory syndrome (SARS) and avian flu has called attention to respiratory diseases. Doctors and assistants come into close contact with a number of individuals every day during examinations, and studies have shown that transmission of respiratory diseases should be a concern to the health care worker because the transmission rate of respiratory disease is higher from patient to health care worker than it is in the general public. As an example, the transmission rate of respiratory viral pathogens from patient to dental surgeons is higher than transmission in the general population, as evidenced by a higher prevalence of antibodies to influenza A and B and respiratory syncytial virus in a study group of surgeons compared with control subjects. Influenza, respiratory syncytial virus, and other viral respiratory diseases are highly infectious and are a significant cause of illness

that occasionally result in serious complications. These viruses can be transmissible even when in an asymptomatic state, and this further increases the risk of infection spreading from patient to doctor.¹

The spread of tuberculosis (TB) to health care workers receives more attention than viral respiratory diseases perhaps because of the morbidity and mortality involved with this bacterial disease. Worldwide, eight million people develop TB each year and several million die.² The incidence of TB in the United States was declining until the mid 1980s when there was a resurgence of the disease.³ Attention to basic public health practices reversed this trend, and the rate of tuberculosis in the United States is at present lower than it was in the early 1980s.⁴ As the rates of TB have declined, the distribution of TB has been primarily confined to identifiable populations, mostly urban and immigrant communities. In addition, a marked geographic variation in TB case rates has emerged, and one cannot assume that a lowered TB rate now exists in every population and area of the United States.⁵

TB is certainly a threat to health care professionals, as shown by a study that found almost 25% of 351 physicians in a university-affiliated hospital tested positive for *Mycobacterium tuberculosis*.⁶ As expected, those working with TB patients are at greater risk, and over a three-year period 11% of pulmonary fellows in 14 U.S. training programs "converted" from negative to positive TB skin tests.⁷ Heightening the concern and focus on workplace exposure has been the appearance of multi-drug-resistant strains of TB (resistant to mainstay drugs, isoniazid and rifampin) in health care settings and prisons, leading to employee disease and death. Fatality from multi-drug-resistant TB ranges from 12% in individuals not infected with human immunodeficiency virus (HIV) to 90% in those infected with HIV.⁸

Microbial aerosols from the flora of the human body are released by activities such as sneezing, coughing, shouting, and even normal breathing. Studies have shown that 92.8% of the bacteria are contained in droplets that are 4 microns or larger in diameter, and surgical masks will filter these aerosols.⁹ Indeed, particles that are under 5 microns in diameter are the vehicles for virtually all transmission

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of the TB bacteria from person to person.⁴ Tests have shown that filtering is not dependent on the size of the bacteria but on the size of the aerosol droplets in which they are suspended.⁹

Viral particles are much smaller than bacteria, ranging from 20 to 300 nm, and can penetrate deep into the respiratory system, causing several viral diseases.¹⁰ Some experts believe that larger respiratory droplets may also be the vehicles of transmission of the virus particles of rhinovirus and pneumococci.¹¹ Thus, a mask may not need to filter particles as small as the nanometer range to reduce inhalation of at least some viruses.

Transmission of TB bacteria among unprotected humans is greatly influenced by the duration and closeness of the exposure to the source.⁴ Generally, pathogenicity of bacteria and viruses depends on the number of inhaled particles.

Respiratory protection such as a mask worn by a health care worker would seem to be an obvious solution to protect against pathogens expelled from patients as they breath, sneeze, or speak. Surprisingly, controversy has accompanied the use of masks to protect health care workers since they were recommended in the early 1990s by the U.S. Centers for Disease Control and Prevention (CDC) in response to increasing reports of nosocomial transmission and outbreaks of TB among health care workers.¹² The 1992 CDC guidelines recommended disposable respiratory protection devices called dust-mist respirators. These respirators looked similar to cup-shaped rigid surgical masks but offered more protection. Questions were immediately raised about the protection against droplet nuclei and face-seal leakage. Health care workers were also concerned about esthetics, in addition to an intimidating appearance of respirators and the effect on patients.¹²

In 1995 CDC's National Institute for Occupational Safety and Health (NIOSH) issued new standards and classifications for particulate respirators based on their minimum allowable laboratory filtering efficiency when challenged with 300 nm particles.^{11,13} There are three standards of filtering efficiency: 95%, 99%, or 99.97%. In addition, a letter designation indicates the resistance to oil aerosols. The recommended respirator to prevent transmission of TB is a type N95 half-mask.¹³ These respirators cost about \$40 for a box of 10.¹⁴

The terms *mask* and *respirator* have been used interchangeably in the literature in a bewildering manner. A *respirator* by definition is a device with high filtering capacity and is usually recommended to protect the user. Of lesser filtering capacity and quality, masks are rated by bacterial filtration efficiency (BFE), which is determined using an aerosol of *Staphylococcus aureus*.¹⁰ Masks are much less expensive and can be purchased for less than \$7.50 for a 10-pack.¹⁴ Generally, masks are thin, constructed of paper-like material, and have one supporting strap.¹⁵ Respirators have two supporting straps, are thicker, and are marked with the protection provided (e.g., N95) and "NIOSH".

Despite their role as health care workers, optometrists have not traditionally worn respiratory protection to conduct routine examinations. This calls into question if either optometric students or patients think that the wearing of masks during optometric exams (or more specifically during close contact such as direct ophthalmoscopy) is appropriate. The purpose of our study was to evaluate these attitudes. A 1996 study¹⁶ also addressed this question, and we discuss the findings of that study along with ours.

METHODS

This was an observational, cross-sectional study using questionnaires to collect data. Our study population included both patients being seen for primary care eye exams at the Eye Care Clinic (ECC) in Fullerton, California, and the student clinicians examining these patients. There were no exclusion criteria such as age, race, or ocular health conditions. All participants, however, had to be able to speak and read English to read and answer the questionnaire. This study was approved by the Institutional Review Board of the Southern California College of Optometry.

We used a sample of convenience by choosing a population that is easily accessible to us: third- and fourth-year students at the Southern California College of Optometry and their patients at ECC. Patients who were asked to participate were the regularly scheduled patients who the student clinicians would be seeing for primary care at ECC. Both the patients and the clinicians were asked

to fill out a questionnaire after direct ophthalmoscopy had been performed during the primary care examination.

A questionnaire (Table 1) was given to the patient and another version was given to the clinician (Table 2) at the start of the examination. At that time, instructions were given to the clinician about the proper use of the mask. In the exam room, the purpose and procedures of the research were explained to the patient. The mask was worn by the clinician during direct ophthalmoscopy and the patient completed the questionnaire when the clinician left the room to confer with a staff doctor before he/she checked the procedure. The mask was only worn by the clinician during ophthalmoscopy and the patient did not wear a mask. The clinician completed his/her questionnaire after completion of the examination and returned both surveys to us at the end of the day. The questionnaires and procedures were identical to those used in the 1996 study.¹⁶

The clinicians wore Aseptex 1800+ fluid-resistant, molded masks manufactured by 3M (St. Paul, MN). They are marketed for use in infection control and are claimed to have 96% BFE.¹⁵ These masks are inexpensive, easy to put on and take off, and likely to be used by optometrists in private practice. A similar 3M mask was used in the 1996 study.¹⁶

RESULTS

Thirty eight clinicians wore masks during direct ophthalmoscopy and returned questionnaires completed by themselves and their patients. The responses are expressed as percentages in the text and can be found in Tables 3 and 4 and Figures 1 and 2. We used Pearson's chi-square test to statistically compare the questionnaire responses of clinicians with those of patients. Chi-square results and the resulting *p* values are included in the text.

Interestingly, very few patients (7.9%) or clinicians (7.9%) had been exposed to the use of a mask during an eye examination before the study, as shown in the results of Question 1. Based on our findings, it seemed obvious that the use of respiratory protection, even during the close proximity of direct ophthalmoscopy, is uncommon in optometry.

Attitudes on how patients and clinicians felt about the use of masks during direct ophthalmoscopy (Question 2) dif-

Table 1
Questionnaire Provided to Patients at the
Start of Their Examinations

1. Have you ever been examined prior to today by an optometrist who has worn a mask? Y N
 2. How did you feel about your clinician wearing the mask?
5 4 3 2 1
Very positive Very negative
 3. How well do you think a mask prevents the spread of infections?
5 4 3 2 1
Very positive Not at all
 4. Do you think clinicians should wear a mask when looking inside your eye?
Y N
- Comments:

Table 2
Clinician Version of the Questionnaire

1. Have you ever worn a mask while performing an exam?
Y N
 2. How did you feel about wearing the mask during direct ophthalmoscopy?
5 4 3 2 1
Very positive Very negative
 3. How well do you think a mask prevents the spread of infections?
5 4 3 2 1
Very positive Not at all
 4. Do you think clinicians should wear a mask during direct ophthalmoscopy?
Y N
 5. How did you perceive your patient's attitude towards you wearing the mask?
5 4 3 2 1
Very positive Very negative
 6. How many times have you used a mask? _____
 7. Would you use a mask in the future?
Y N
Why or why not?
- Comments:

ferred between the two groups (Figure 1). One half of the patients felt either very positive or positive about the experience. This was contrasted with the clinician view. Only 23.7% of clinicians felt very positive or positive using a mask. There was a significant difference ($\chi^2(4) = 10.152, p = 0.038$) between the responses of the patients and clinicians.

Regarding the perception of the effectiveness of the mask's ability to prevent the spread of infection, both groups agreed that the mask can be beneficial (Question 3). Most of the clinicians (60.5%) believed that a mask prevented the spread of infection, whereas 71.1% of patients agreed. Only 7.9% of clinicians and 2.6% of patients felt that the masks were not effective. There was no significant difference in the responses ($\chi^2(3) = 1.645, p = 0.649$) between the two groups.

Question 4 asked both patients and clinicians whether a mask should be worn by the clinician during direct ophthalmoscopy (Figure 2). Only 34.2% of clinicians responded they thought masks should be worn, whereas almost 52.6% of patients had the opinion that the clinician should wear a mask. The difference between patient and clinician answers was not significant ($\chi^2(1) = 3.409, p = 0.065$) but showed a trend toward significance.

The difference between the patients' actual attitudes toward masks (Question 2) and the clinicians' perception of the patients' attitude (Question 5) was not statistically significant ($\chi^2(3) = 4.442, p = 0.218$). Still, 50% of patients were very positive or positive about the clinician wearing a mask, whereas only 36.8% of clinicians perceived the patient's attitude as very positive or positive about the clinician wearing a mask. When asked if they would use a mask in the future, the clinicians were evenly divided, with 47.4% saying yes and the same number saying no.

Comparison to 1996 Study

Because of the similarity of this study to the one done in 1996, we compared our results with the previous research. Responses from 46 patients and 43 students were examined in the previous study.¹⁶

Regarding previous exposure that people had with a mask in the past (Question 1), the patients from both studies had little previous exposure to a mask (7.9%, current study vs. 4.4%, previous study). However, there was a noticeable difference between the two

Table 3
Responses to Patient Questionnaires
(No. of Responses in Parentheses)

1. Have you ever been examined prior to today by an optometrist who has worn a mask?				
Yes (3)	No (35)			
7.9%	92.1%			
2. How did you feel about your clinician wearing the mask?				
5(15)	4(4)	3(15)	2(3)	1(1)
39.5%	10.5%	39.5%	7.9%	2.6%
Very positive		Neutral		Very negative
3. How well do you think a mask prevents the spread of infections?				
5(15)	4(12)	3(10)	2(1)	1(0)
39.5%	31.6%	26.3%	2.6%	0%
Very well		Neutral		Not at all
4. Do you think clinicians should wear a mask when looking inside your eye?				
Yes (20)	No (16)		Undecided (2)	
52.6%	42.1%		5.3%	

Table 4
Responses to Clinician Questionnaires
(No. of Responses in Parentheses)

1. Have you ever worn a mask while performing an exam?				
Yes (3)	No (35)			
7.9%	92.1%			
2. How did you feel about wearing the mask during direct ophthalmoscopy?				
5(4)	4(5)	3(18)	2(7)	1(4)
10.5%	13.2%	47.4%	18.4%	10.5%
Very positive		Neutral		Very negative
3. How well do you think a mask prevents the spread of infections?				
5(14)	4(9)	3(12)	2(2)	1(1)
36.8%	23.7%	31.6%	5.3%	2.6%
Very well		Neutral		Not at all
4. Do you think clinicians should wear a mask during direct ophthalmoscopy?				
Yes (13)	No (25)			
34.2%	65.8%			
5. How did you perceive your patient's attitude towards you wearing the mask?				
5(7)	4(7)	3(20)	2(2)	1(2)
18.4%	18.4%	52.6%	5.3%	5.3%
Very positive		Neutral		Very negative
6. How many times have you used a mask ?				
Never (33)	86.8%			
Once (3)	7.9%			
Twice (1)	2.6%			
7. Would you a mask in the future?				
Yes (18)	No (18)		Maybe (2)	
47.4%	47.4%		5.3%	

studies for clinicians; 7.9% in the current study and 41.9% in the previous study indicated they had worn a mask before the study.

Patient attitudes about wearing a mask (Question 2) were similar in that 50% of the patients currently felt very positive or positive toward the mask and 63% had the same attitude in the previous study. Fewer clinicians (28.9%) felt negatively about wearing a mask in the current study compared with the previous study (41.8%).

Even though access to health care issues has become easier over the past nine years, there has been a slight decrease in patients' beliefs that masks prevent the spread of infection, as asked in Question 3 (80.4%, previous vs. 71.1%, current). Clinicians also showed a decrease in this opinion (86%, previous vs. 60.5%, current).

The contrasting opinion of patients and clinicians on whether a mask should be worn during ophthalmoscopy (Question 4) remained relatively the same in our study compared with the 1996 study; the majority of the patients in both studies believed that a clinician should wear a mask, and most clinicians believed that they should not. The patient response in 1996 was 73.9% "yes" but dropped to 52.6% in the recent study. The current response of 65.8% "no" by clinicians was slightly higher than the 62% negative response to the question in 1996.

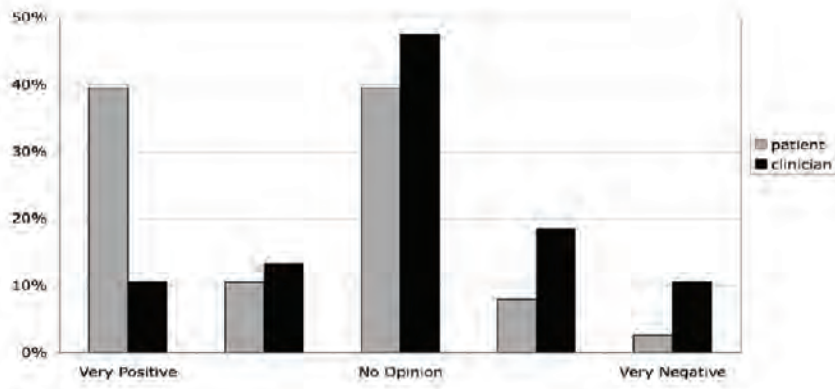
There has been little change in the fact that the clinicians underestimate the attitudes of the patients toward the mask. Only 36.8% of the clinicians in our study versus 32.5% of the clinicians in the previous study viewed the patients as feeling very positive or positive about the use of a mask (clinician Question 5). Yet 50% of the patients in the current study had a very positive or positive opinion of the clinician wearing a mask (patient Question two) and 63% had the same view in 1996. The difference between patient Question 2 and clinician Question 5 was significant in the 1996 study ($\chi^2(3) = 8.636, p = 0.035$).

Clinicians in the 1996 study reported more use of a mask during an exam (Question 1) than in our study, but other than that, the results of all questions were similar between our study and the 1996 study.¹⁶

DISCUSSION

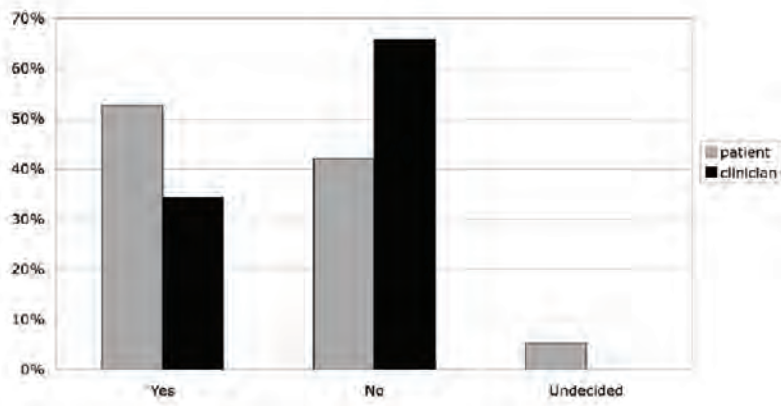
Our results generally demonstrated that patients accepted the use of a

Figure 1
How Patients and Clinicians Felt About the Clinician Wearing a Mask During Direct Ophthalmoscopy (Question 2)



Note: Patients and clinicians had contrasting opinions. The percentages of questionnaire responses are indicated on the y axis.

Figure 2
Responses to Question 4 From Patients and Clinicians: Do You Think Clinicians Should Wear a Mask?



Note: A majority of patients thought clinicians should use a mask during direct ophthalmoscopy. The percentages of questionnaire responses are indicated on the y axis.

mask by the clinicians but that there was resistance on the part of the clinicians to wearing a mask. This was true even though both groups believed that the masks prevent the spread of infection. Only 10.5% of the patients had a very negative view of the clinician wearing a mask during direct ophthalmoscopy. This is not surprising, as the mask does not affect the patient and, in fact, they cannot even see it during the procedure. On

the other hand, only 10.5% of clinicians felt very positive about using the mask. Clinicians found the masks objectionable for a variety of reasons, as expressed to us in the comments section of the questionnaire. Many seemed disturbed by the discomfort and inconvenience of the masks. Several of the clinician comments expressed a feeling of suffocation or difficulty breathing with the mask, and some complained that their glasses

were fogged and direct ophthalmoscopy was more difficult. Despite general acceptance of the mask by patients, only about one third of the clinicians perceived the patients' attitude as very positive or positive.

We used the same questionnaire and method as the 1996 study,¹⁶ and neither the attitudes of the patients nor the clinicians have changed significantly in the ensuing decade. On the other hand, some changes have occurred in the production of respiratory protection. Most important, respirators meeting current standards, such as N95, filter smaller particles than the dust-mist respirators recommended by the CDC in 1992.¹⁸ The industry that produces masks and respirators is also now struggling to defend itself against more than 300,000 lawsuits filed over asbestos and lung ailments.¹⁹ Ironically, the industry regards the current demand for respiratory protection, resulting from avian flu concerns, as possible rescue from their financial difficulties. (N95 respirators are recommended as protection against avian influenza just as they were recommended for SARS.²⁰)

Our results showed that masks are seldom used during eye exams. This and the resistance we have found on the part of clinicians to wear masks mean that it is not likely that either masks or respirators will be worn on a regular basis by optometrists. However, there are circumstances in which respiratory protection is necessary for the safety of the optometrist or the patient. Protection of the optometrist is a consideration when the patient has TB or a virus such as influenza or rhinovirus, which are communicable by respiratory excretions; the examiner should wear respiratory protection under those conditions to avoid inhaling these pathogens. On the other hand, certain patients such as those who are immunocompromised (people with AIDS or organ transplant recipients taking immunosuppressants) need and appreciate the protection that is afforded them when an examiner wears a mask that will filter airborne particles expelled by the examiner. Students should be taught the necessary information regarding selection and use of respiratory protection. This includes information about advantages and disadvantages of masks and respirators. Such information is readily available from vendors on the Internet.¹⁴ The proper use of respiratory protection goes beyond selection. A mask or respi-

rator must fit properly and be worn in such a manner that the interface between the face and device is leak-free. NIOSH publishes an extensive guide to the fitting and use of personal respiratory protection that is a useful reference for a presentation of this subject.²¹

This study investigated the attitudes and perceptions of student clinicians and their patients after the clinicians had worn a mask during direct ophthalmoscopy. The study did not address the issue of the effectiveness of masks in preventing the spread of communicable respiratory diseases. Neither did we use the higher level of filtering protection because the increased bulk and cost of the N95 respirators, which makes them unlikely candidates for use by optometrists. We feel the size, weight, and dual supporting straps of N95 respirators would have been more unfavorably received by clinicians than the less cumbersome, midlevel masks we used.

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The Universidad Autónoma de Aguascalientes/ State University of New York Affiliation for the First Master of Optometric Science Degree Program in Mexico

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Abstract

In 2006, the Universidad Autónoma de Aguascalientes (UAA) conferred the masters of optometric science degree on 11 of its optometry faculty. The purpose of this article is to (a) give a brief background of the history of optometric education in Mexico, and in particular at UAA; (b) describe the UAA/State University of New York optometry affiliation for the first optometric Master program in Mexico; (c) present the results of a program evaluation to assess the program's effects; and (d) offer recommendations for future similar affiliations between optometric institutions.

Key words: optometry, education, Mexico, master degree, international

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INTRODUCTION

The first optometry school in Latin America at the Instituto Politécnico Nacional in Mexico City opened in 1950, and today there are over 30 Latin American optometric universities or training programs, in 10 different countries. These schools are generally undergraduate programs that accept students directly from high school.¹ There are currently five optometry schools in Mexico (Table 1) that award a licenciatura (bachelor's equivalent) on graduation. The Universidad Autónoma de Aguascalientes (UAA) optometry program curriculum is 4.5 years (9 semesters) long. Students enter this undergraduate program when they are approximately 18 years old and have received 12 years of education (6 years elementary, 3 years middle school, and 3 years high school) prior to entrance. The city of Aguascalientes, located 300 miles from Mexico City, is the capital of the same-named Mexican state of Aguascalientes. Housed within the university's School of Biomedical Sciences, the department of optometry-established in 1979 and considered one of the most prestigious in Mexico-serves approximately one million residents of the city. Aguascalientes has a large, tradition-

al, agricultural-based economy in its surrounding rural area and has also recently become one of Mexico's fastest growing, local, corporate-industrial economies, and the new home to such firms as Texas Instruments, Wal-Mart, and Nissan.

To consolidate the profession of optometry with other health sciences, as recommended by the federal Program to Improve the Education of Teachers (PRÓMEP), UAA recognized the need to raise the academic level of their optometric faculty members, who, like Mexican optometry faculty at the other schools, generally held only a highest level licenciatura degree. In 2003, shortly after the formation of the Association of Latin American Education and Faculties in Optometry (ADELFO), which was created in part to strengthen ties between North and Latin American optometry institutions, UUA and the State University of New York State (SUNY) College of Optometry signed an agreement to implement Mexico's first master's degree program in optometry (herein referred to as "the program"). This collaboration, financed by the Mexican federal government, led to the first advanced (i.e., greater than bachelor's equivalent) optometric degree program offered and awarded in all of Latin America (with the exception of the Inter American University in Puerto Rico (IAU-PR), which offers an American Council of Optometric Education (ACOE)-accredited doctor of optometry degree).

Eleven faculty members of UAA received their maestría en ciencias optométricas (MCO; master of optometric science) degree. The specific goal of the UAA-SUNY affiliation was to establish an MCO program at UAA with the initial assistance of SUNY faculty and to subsequently have the program taught and overseen by the same graduating UAA faculty from the inaugural UAA class. The program was a significant first step in strengthening and expanding the optometric knowledge, skills, and research experience at UAA. All 11 candidates successfully completed the program and received their MCO by March 2006, making them the first optometry faculty in Mexico to attain master level degrees in optometry.

The purpose of this article is to (a) give a brief background on the history of optometric education in Mexico and, in particular, at UAA; (b)

Table 1
Optometry Programs in Mexico Offering a Licenciatura (Bachelor's Equivalent) Degree

- Centro de Estudios Universitarios, Xochicalco (Mexicali, Baja California)
- Instituto Politécnico Nacional (Mexico City, Federal District)
- Universidad Autónoma de Aguascalientes (Aguascalientes, Aguascalientes)*
- Universidad Autónoma de Ciudad Juárez (Juarez, Chihuahua)
- Universidad Nacional Autónoma de México (Mexico City, Federal District)

*Master degree offered as of 2006

Table 2
Curriculum of the UAA-SUNY Affiliation for Master of Optometric Science Program

Module 1 (June-July 2003):

- Neuro-ophthalmics
- Introduction to Research
- Vision Science I (Vision Perception, Optics)

Module 2 (January 2004):

- Research Methods
- Accommodation
- Vision Science II (Oculomotor Systems, Binocular Vision)

Module 3 (June-July 2004):

- Research Seminar II
- Research Ethics
- Electrodiagnostics
- Vision Science III (Oculomotor Disorders, Vision Therapy, Amblyopia, Strabismus)
- Vision Science III (Vision Perception, Vision Development, Infant and Child Development, Brain Injury and Vision, Aging and the Eye)
- Contact Lens*
- Ocular Disease*

*Elective course. The students chose to attend either course.

Table 3
Titles of Research Projects of the UAA-SUNY Affiliation for Master of Optometric Science Program

- Eye movements and the vestibulo-ocular reflex
- Binocular status of anisometropic amblyopes
- Effect of wearing time on orthokeratology
- Contrast sensitivity function in keratoconus patients
- Accommodation in keratoconus patients
- TH1/TH2 cytokines and giant papillary conjunctivitis
- Success of bifocal contact lenses in Mexico
- Saccadic eye movements in golfers
- Validation of a new perceptual test in children
- Comparison of AC/A measurement techniques*
- Comparison of clinical heterophoria measurement techniques*

*Published papers.

describe the UAA-SUNY affiliation for the inaugural MCO program; (c) present the results of a program evaluation conducted at the end of its conclusion, which was meant to assess its effects; and (d) offer recommendations for future similar affiliations between optometric institutions.

The Program

The two phases of the program consisted of the didactic portion and the individual research portion. Both are discussed below.

The Didactic Portion of the Program

Six visiting faculty from SUNY taught the majority of the didactic portion. These courses were approximately 3-week intensive courses with an associated laboratory requirement for each. The students were required to pass an exam given at the end of each course. Nonoptometry UAA home faculty also taught three courses in the program: basic statistics, didactic/pedagogical methods, and neuroscience research review. The SUNY courses, taught in English, were administered in three time modules (Table 2).

The Individual Research Portion of the Program

The students were required to complete original research projects and submit a final written report on their research (Table 3). SUNY research faculty, based in New York, supervised the projects and written reports by distance electronic communication from New York. UAA science faculty supervised an oral examination on the research projects. All of the candidates visited SUNY at least once to meet with their research supervisors and to observe the various clinical services at SUNY. One SUNY faculty member, who also taught in the didactic portion, was the dedicated general supervisor for the completion of the research projects.

Evaluation of the Program

The evaluation was administered in March 2006, 2 years after the conclusion of the didactic portion, and consisted of two parts: a survey and a curriculum evaluation.

The survey (Appendix 1) was administered to all 11 UAA faculty who participated in the program, to determine what effect the program had on their practice. The survey inquired in qualitative and quantitative terms about the program's usefulness in the

academic and professional practice of the faculty, barriers to further carrying out the program's goals, English-language barriers, changes to the UAA optometry curriculum as a result of the program, and future plans to implement aspects of the program into UAA curriculum and private practice. The survey and directions were given in English, with an accompanying Spanish version. We also evaluated the UAA optometry curriculum for any significant changes as a result of the program and for general highlights.

Evaluation Results

Survey

There was an 100% response rate (11/11) to the survey (Appendix 1).

Curriculum Evaluation

In examining how the UAA curriculum has changed as a result of the program, two main changes were noted. The most significant change, and one of the major goals of the program, was the initiation of a Master Program in Optometry, based on the program and taught solely by the same UAA faculty who graduated from the inaugural class. This second cycle of the program commenced in August 2006, with 17 entering students, all licensed optometrists in Mexico, including 4 from Aguascalientes. The new program-open to all Latin American optometrists desiring to obtain an MCO-has a 2-year cycle and welcomes international visiting optometric faculty to teach courses. The curriculum for the program follows the curriculum from the inaugural program (Table 2), with one exception: The three optional courses offered in the new program are glaucoma, strabismus, and neuro-ophthalmics (the inaugural program optional courses were contact lens or ocular disease).

The other major change based on the program is the introduction of a binocular vision course into the undergraduate optometry curriculum.

Discussion

The results of the evaluation show that the program was of significant value to the participants. The average quantitative responses for each course showed that the information from the didactic portion of the program has been useful for the UAA faculty in their practice, in and out of the univer-

sity. On average, all classes were taught at an appropriate level, and there was a unanimous satisfaction with the program, as all 11 respondents would recommend the program to other colleagues. Due to the program, 8 of 11 respondents revised, at some level, the course material that they teach. Seven of 11 respondents wrote that the program positively affected their optometric practice outside the university, namely in terms of an improvement in patient care. Ten of 11 respondents have additionally read, studied, or taken course material related to the program in various topics. Four respondents expressed a desire to pursue additional graduate studies. Because a PhD in vision science is not offered at UAA, the prospect of pursuing a PhD at SUNY was made available. None have applied thus far.

The favorite aspect of the program, from the UAA faculty's perspective, was the exchange of knowledge and the least favorite was the time-intensive nature of the courses. The issue of time was a major one, yet difficult to modify logistically, because keeping SUNY faculty members away from their institution for more than a few weeks was impractical; also, the modules were specifically scheduled during the academic recess of UAA faculty, so that the program would not conflict with their teaching responsibilities. In the future, consideration should be given to long-term faculty educational leave for higher degree programs such as this.

The lack of equipment and resources were the biggest barrier to using the knowledge and skills learned in the program; an analysis of home institution resources should be performed before the start of any program. It is important to understand the practicality of teaching certain technological procedures (e.g., performance and interpretation of a visual field analyzer), because if the home institution does not possess the technology for further use and practice, the application of this knowledge can be quite limited. For example, as part of the neuro-ophthalmics course, a class on automated static visual fields was given, but UAA only owned a Goldmann kinetic visual field at the time. Although the topic was considered important, the efficacy of the course was in question due to the lack of equipment.

Most respondents indicated that the language barrier was not a major issue, although two respondents noted that some instructors lectured beyond the

level of their English comprehension. UAA now requires all entering undergraduate optometry students to be proficient in English and, perhaps, should also offer or require intensive English language training (as is required of all UAA optometry faculty) once the undergraduate students are admitted. Because many optometric textbooks, manuals, and articles are not available in Spanish, this language instruction would benefit students and teachers by making materials (and ultimately, communication among international scholars) more accessible.

The topic of each individual research project was chosen together by the UAA student, the visiting SUNY general research supervisor, and the SUNY individual supervisor (located in New York), after assessment of UAA material, financial resources, and student areas of interest and expertise. The areas of vision therapy/binocular vision, contact lenses, and perception were general strengths of the UAA optometry faculty, and, thus, the majority of the general topic areas reflected these study areas (Table 3). One UAA student's interest in biochemistry as well as a UAA science faculty's research interests allowed for the student's basic science research project on cytokines.

The introduction of a Master Program in Optometry at UAA is the most significant achievement of the program, and makes the UAA MCO program the first advanced optometric degree to be offered in Latin America, with the exception of IAU-PR's ACOE-accredited OD degree. The optional MCO class in glaucoma is also being considered for the undergraduate curriculum. The introduction of this dedicated glaucoma class is significant, because it is an important first step toward reducing the rate of glaucoma-related blindness in Mexico. The raising of education standards is the logical and legal predecessor to obtaining clinical privileges for optometrists, as has been the case in the United States. Currently, Mexican optometrists do not diagnose, manage, or treat glaucoma, the second leading cause of global blindness³; yet, glaucoma education could lead to a future of glaucoma detection and management by optometrists in a country with over 100 million people,⁴ where almost 2.5% of the population is estimated to have open-angle glaucoma and where fewer than 50% of those with glaucoma are aware of their disease,⁵ partly due to a

lack of access to eye care providers.

On a global level, educational and professional hemispheric exchange between North and Latin American optometric institutions is seen as vital to further coordinate and strengthen optometry. Educational development can then influence policy and planning on a federal level in Latin American countries, hopefully with a similar expansion of rights that the U.S. profession of optometry saw in the last century. The mobilization of eye care professionals in a country like Mexico, with an underserved population (especially in rural areas), is in line with global public health initiatives like *Vision 2020: The Right to Sight*, a program of the World Health Organization and International Agency for the Prevention of Blindness, which strives to eliminate preventable blindness worldwide by the year 2020.

The program benefited SUNY clinical faculty in that it provided an exchange of knowledge and new teaching opportunities, especially to some of who were junior faculty.

Conclusion

The UAA/SUNY affiliation led to the first advanced optometric degree program in Mexico and helped to strengthen and expand the optometric knowledge, skills, and research experience of the UAA faculty. The program provided an exchange of knowledge and new teaching opportunities for SUNY clinical faculty. The most significant outcome of the program has been the establishment and continuation of the first Mexican masters of optometric science program, which is open to all Latin American optometrists. The first

glaucoma masters-level class and an undergraduate binocular vision class, both based on the inaugural program, have been implemented into the UAA optometry curriculum. Thus, the program has taken a successful step toward the raising of optometric education standards and ultimately the quality of eye care and promotion of optometry and visual public health in Mexico. The UAA faculty have responded to the program favorably. As a result of this evaluation, the recommendations for future similar international affiliations between optometric institutions are the following:

- Because time restrictions for these programs can be rigid or fixed, continuing education tools (e.g., video lectures, review materials, correspondence courses) should be integrated into the program.
- Sufficient practical/laboratory time is critical in the program, because there is little or no opportunity for patient care in an intensive program with time limitations.
- Ideally, the students should have an adequate level of English proficiency, to comprehend lectures, research articles, and textbooks, many of which are only available in English. Also, intensive English language training should be given to all optometry students after they are admitted, especially those who become graduate program candidates.
- Financial and logistical resources are key for the home institution; without the necessary equipment and teaching tools, education and patient care cannot continue. An analysis of home institution equipment, funds, and teaching resources

should be performed before the start of a program. For example, a visual fields course may be impractical if there are no visual field analyzers available.

- A dedicated faculty member at the visiting institution should serve as a liaison between the two institutions for academic and logistical support after the program ends.
- An available route for an advanced degree (i.e., Ph.D.) should be established if the home institution does not offer one. Thus, consideration for long-term faculty educational leave should be given for higher degree programs.

Acknowledgments

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Appendix 1

Survey of the UAA-SUNY Affiliation for Master of Optometric Science Program (Results Included in Body of Survey)

Survey (Quantitative)

Below are the 3 quantitative questions from the survey, with the resulting answer averages (in bold) and answer ranges (in parenthesis). The "N/A" designation connotes courses that were either elective courses, or the respondent did not choose to answer the question.

Please tell us how much you agree or disagree with the following statements for each class in the program, using the following scale (or N/A if you did not take the class). Circle one number for each course:

1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree, N/A = Not applicable

1) The following class was useful to me, such that I currently use information from the class in my practice at the university.

- | | |
|----------------------|---------------------------------|
| 1. Neuro-ophthalmics | Avg (range)
3.7 (1-5) |
| 2. Research Methods | 4.4 (1-5) |

3. Vision Science I	3.8 (2-5)
4. Research Seminar I	3.4 (1-5)
5. Accommodation	3.7 (2-5)
6. Vision Science II	3.9 (2-5)
7. Research Seminar II	3.2 (1-5) 1 N/A
8. Research Ethics	3.0 (1-5)
9. Electrodiagnostics	3.5 (2-5)
10. Contact Lenses	4.2 (3-5) 6 N/A
11. Ocular Disease	4.5 (2-5) 5 N/A
12. Vision Science III (Part I)	4.0 (2-5) 2 N/A
13. Vision Science III (Part II)	4.2 (2-5) 1 N/A

2) The following class was useful to me, such that I currently use information from the class in my professional practice outside of the university.

	Avg (range)
1. Neuro-ophthalmics	4.2 (3-5) 2 N/A
2. Research Methods	3.4 (2-5) 3 N/A
3. Vision Science I	4.0 (2-5) 2 N/A
4. Research Seminar I	2.9 (2-4) 3 N/A
5. Accommodation	4.4 (3-5) 3 N/A
6. Vision Science II	4.0 (2-5) 2 N/A
7. Research Seminar II	3.0 (2-4) 3 N/A
8. Research Ethics	3.8 (2-5) 3 N/A
9. Electrodiagnostics	4.1 (3-5) 2 N/A
10. Contact Lenses	4.8 (4-5) 7 N/A
11. Ocular Disease	4.8 (4-5) 5 N/A
12. Vision Science III (Part I)	4.5 (3-5) 3 N/A
13. Vision Science III (Part II)	4.6 (4-5) 2 N/A

3) The following class was taught at an appropriate level, such that I had sufficient background to take it.

	Avg (range)
1. Neuro-ophthalmics	3.7 (3-5)
2. Research Methods	3.6 (3-5)
3. Vision Science I	4.1 (3-5)
4. Research Seminar I	3.4 (2-4)
5. Accommodation	4.1 (3-5)
6. Vision Science II	4.0 (3-5)
7. Research Seminar II	3.4 (2-5)
8. Research Ethics	3.1 (1-4)
9. Electrodiagnostics	4.0 (3-5)
10. Contact Lenses	4.4 (4-5) 6 N/A
11. Ocular Disease	4.4 (4-5) 4 N/A
12. Vision Science III (Part I)	4.1 (3-5) 1 N/A
13. Vision Science III (Part II)	4.6 (3-5)

Survey (Qualitative)

Below are qualitative questions about the program, with a selection of the substantive and most common answers included. The number of similar responses appears in parenthesis.

4) What did you like MOST about the Program?

Exchange of knowledge (6)
 The professors & course material (2)
 Vision Science (1)
 Contact Lenses (1)

5) What did you like LEAST about the Program?

Not enough time for the courses/courses were too intensive (6)
 Not enough practice (e.g., contact lens fitting) (3)
 More time was needed at SUNY for practice (1)
 The modality of testing was poor (1)
 Research ethics (1)
 Research (1)
 Vision science III, since I don't practice in this area (1)

6) Would you recommend this program to other colleagues? Yes 11 No 0

7) What, if any, barriers do you perceive in using the knowledge and skills you learned in the Program?

Lack of equipment, resources (e.g., books in Spanish) and lack of experience with equipment (4)
 Teachers at UAA with necessary skills (2)
 No barriers (3)
 UAA does not allow me to modify classes for administrative reasons (1)

Appendix 1 (cont'd)

Please answer the following questions, using the scale below:

1 = not at all, 2 = minimally, 3 = moderately, 4 = in a major way

8) Have you changed or revised any of your courses based on the Program?

1 (3) 2 (2) 3 (5) 4 (1)

If you have made any changes or revisions (2, 3, or 4), what are they?

Since I teach preclinical procedures, no changes have occurred, but video and digital support has been implemented for teaching purposes and demonstration (1)

Neuro-ophthalmics, accommodation, binocular vision, VT, strabismus, amblyopia were included in my course (1)

Ocular disease; vision science (1)

I learned to be more tolerant with students, according to their skills and effort to learn (1)

A lot of concepts from the Program (1)

I made no changes, since my classes are focused on contact lenses (1)

9) Have you changed how you practice outside of UAA based on the Program?

1 (3) 2 (2) 3 (3) 4 (2)

If you have changed your practice outside of UAA (2, 3, or 4), what have you changed?

I am able to better handle difficult patient cases (2)

Improved patient care (6)

I investigate patient systemic health more (1)

Better diagnosis skills; more tests used (1)

10) Since the end of the Program, have you further read, studied, or taken classes on material related to the Program?

1 (1) 2 (2) 3 (7) 4 (1)

If yes, what have you read or studied?

• Binocular vision (2)

• Contact lenses (1)

• Vision science (1)

• Neuro-ophthalmics, accommodation problems, electrodiagnostics, vision perception, and ocular disease; most of this investigation has been done by Internet or books (1)

• Contact lenses, ocular disease, electrodiagnostics, research methods (1)

• As part of theoretical foundation of my thesis project, it was necessary to study and understand aspects related to refractive amblyopia which were included in binocular vision, motor and sensory development parts of the Program (1)

11) What, if any, plans do you have to pursue studies related to the Program in the future?

• I would like to study in a doctorate program (3)

• More research in ocular disease treatment (1)

• Contact lenses, ocular disease, neuro-ophthalmics, research methods, and maybe vision science (1)

Please answer the following question, based on a scale of 4 to 1.

(extremely difficult) 4-----3-----2-----1 (no difficulty)

12) How difficult was it for you to take the courses in English?

4 (0) 3 (2) 2 (7) 1 (2)

13) Please make any suggestions or comments that may be helpful for future programs

Criticisms made of instructors' teaching abilities (2)

Some instructors lectured beyond my level of English (2)

Extend our time of the visits at SUNY (2)

It is essential that more time is used for practical aspects; otherwise, it is impossible to practice the theory, especially since our discipline is mostly practical (2)

Find modalities of learning in which we can continue learning after the exchange (1)

Indicate the objectives of the program more clearly (thus will be easier to evaluate if the objectives were carried out) (1)

More time spent on research and vision science (1)

Social Learning Theory and the Career Trajectory of Optometry Students

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Abstract

Social learning theory posits that career choice is influenced by gender-based stereotypes learned early in life as a child. This theory has implications for the career paths that optometry students follow once they graduate from optometry school. In this article, the authors present a psycho-educational program designed to encourage optometry students to explore and challenge gender-based stereotypes regarding career options.

Introduction

Social cognitive theory defines human behavior as a dynamic, reciprocal interaction of personal factors, behavior, and environment.¹ Proponents of social learning theory believe that learning cannot take place unless it occurs within a social context. People learn by watching what others do, and this in turn gives them the framework from which to take action or make decisions. Furthermore, social learning theory asserts that behavior is largely regulated through cognitive processes; it is the expectation of reinforcement or punishment of particular behaviors, based on the modeling and observa-

tions of others that will influence one's internal thoughts and beliefs.¹

Social learning theorists argue that career choice is strongly influenced by societal expectations and norms. Individuals make career decisions by observing others and coding this information to serve as a guide for personal action. This does not preclude a host of other factors, including personality, talents, and opportunity, from contributing to career decisions.

Those expectations about career choice that are linked to gender are learned early in life, before the age of 10 years.^{2,3} Boys may learn that men do not usually become nurses, and girls may learn that women do not usually become engineers. Gender-biased career identification is robust, and it has been suggested that, when selecting a career path, individuals may be unlikely to select their interests if they are in conflict with societal expectations for their gender.⁴ That is, a girl who is interested in engineering may sacrifice her interests rather than challenge her assumed gender bias

that woman do not enter engineering. (It should be noted that an individual's identity-e.g., ethnicity, race, sexual orientation, and class-may also interact with societal expectations and norms to play a role in career choice. These factors are beyond the scope of this article.)

Cultural stereotypes may be accepted by an individual without awareness of this acceptance. This well-known phenomenon occurs among various groups, including racial minorities.⁵ Moreover, whereas one may be able to see stereotypical behavior in others, internal recognition of such behavior is less common.

Contributions to the study of social learning theory have stimulated an enormous amount of research on learning and behavior. This research has also been extremely fruitful in developing techniques for promoting behavior change. For example, *rational emotive behavioral therapy (REBT)*,⁶ a form of cognitive behavioral therapy created by Albert Ellis, is an action-oriented approach that strives to help a person recognize unhelpful or destructive patterns of thinking, evaluate whether these patterns are realistic or accurate, and learn to see the connections between one's thoughts, feelings, and actions. REBT practitioners help individuals uncover their individual set of beliefs (attitudes, expectations, and personal rules) that frequently lead to emotional distress. The practitioners then provide a variety of techniques to help people reformulate their dysfunctional beliefs into more sensible, realistic, and helpful ones.

Until relatively recently, optometry has been a male-dominated profession. Although women now constitute the solid majority of optometry students in the United States (according to the ASCO Website, 64% of the 1996 entering class in the United States was female), the private practice of optometry continues to be male dominated. Although there are notable exceptions, the societal norm has been (at least until relatively recently) for men-not women-to be entrepreneurs and to establish and develop small businesses. Is it possible that the gender-based societal stereotypes learned by female optometry students (as children) act as barriers to entering private practice? Given this possibility, what role can the schools and colleges of optometry play in supporting students as they challenge societal norms?

This research was funded by a grant from Vision Service Plan. Dr. Schwartz is on the faculty at the State College of Optometry, State University of New York and a fellow at the Albert Ellis Institute. Dr. Rafaeli was a fellow at the Albert Ellis Institute and is in private practice.

Acculturation to societal bias is subtle and can be strongly ingrained. Because intellectual understanding may not be sufficient to bring about change in an individual, lectures or reading material assigned to optometry students, in isolation, may be of limited usefulness.² Gender-based stereotypes must be challenged in a supportive psycho-educational environment, under the guidance of a professional who is familiar with these issues. In this article, we describe such a program that was piloted at the State University of New York, College of Optometry.

Implementation

Students were recruited from at the State University of New York, College of Optometry. E-mail announcements were sent to all professional students (about 300 students; about 70% female), inviting them to participate in “a study that looks at how gender-based stereotypes may affect optometry students’ attitudes toward private practice.” The announcement described the study as consisting of five small discussion group meetings led by an outside facilitator. Potential participants were informed that the meetings would occur at noon and that lunch would be provided. Participants were encouraged, but not required, to attend all five sessions. Study protocols were approved the college’s Institutional Review Board.

The psycho-educational sessions were moderated by the second author, who was a postdoctoral fellow at the Albert Ellis Institute in New York City. Although the sessions were psycho-educational in nature and did not involve psychotherapy, supervision was provided by a licensed psychologist. Participants were taught to dispute irrational and unhelpful cognitions using the cognitive approach pioneered by Ellis.⁷ Goals for the psycho-educational discussion groups, which were based on social learning theory, are given in Table 1.

After obtaining informed consent at the first session, participants were asked to read a two-page paper entitled “Gender and Career Pathways,” which explained the basic concepts of social learning theory. They then completed a brief entrance survey (Likert scale, with 1 to 5 as the scale anchors: 1 = *strongly disagree* and 5 = *strongly agree*; 15 items) that elicited their views regarding the influence that societal expectations and gender may have on career choice.

At the conclusion of the fifth group meeting, participants were asked to complete an outcome survey that was similar to the entrance survey but which included several discussion questions. The group facilitator prepared a qualitative evaluation of the project.

Description of Group Discussions

Five group discussions were held over a period of 6 weeks. All participants were either first- or second-year students, and all but one were female. Two students attended all five sessions, one attended four sessions (the last four), one attended three sessions (the first three), one attended two sessions, and two attended one session.

During the psycho-educational groups, participants discussed social learning theory and its possible implications for the career decisions they had made and would be making as they graduated. In line with the general principles of this theory, participants talked about the role of societal expectations for boys and girls and how these observations throughout their own development may have affected the manner in which they currently viewed their

career options. The influence of these expectations on the decision to practice as an employee or private practitioner was emphasized. Table 2 summarizes the five psycho-educational sessions.

During the first meetings, the participants posited that female optometrists had the same practice options and opportunities as male optometrists, yet only one was able to name a female optometrist who was in private practice and had a family. The students initially attributed the paucity of role models to career decisions made by female optometrists, without consideration of the potential role of societal bias and learned preferences.

The participants were taught that the societal gender bias they learned as children could be engrained and difficult to recognize. Social learning theory concepts, such as observational learning, imitation, and modeling, were highlighted and discussed to emphasize this inevitable process of social influence, which is often acted on without awareness.

A cognitive-behavioral approach, along the lines of rational emotive behavioral therapy (REBT) developed by Ellis,⁷ was presented to the participants so that they could better recognize and dispute learned preferences.

Table 1: Goals for Psycho-Educational Groups

- Understand how childhood experiences may influence an individual’s behaviors and choices as an adult
- Understand the concept of gender identity
- Understand the role of cultural norms in determining gender identity
- Understand how gender identity may influence career choices
- Understand how a career choice may not be congruent with gender identity, and how this may be resolved
- Be able to dispute learned preferences through REBT-like disputation
- Be able to substitute chosen preferences for learned preferences

Table 2: Summary of Sessions

Session 1	Read and discussed article, “Gender and Career Pathways”
Session 2	Reviewed highlights from previous discussion with more focus on personal and professional experiences
Session 3	Introduced rational-emotive behavioral therapy (REBT) as a means for challenging assumptions about assumed gender roles; participated in role play to practice disputing “irrational beliefs” related to career/gender
Session 4	Continued practicing REBT and reviewed core issues, (particularly dogmatic demands, global self-rating)
Session 5	Finish outcome survey; facilitator shared with group her own experience opening a private practice

For example, if a participant were to say that raising a family was incompatible with private practice, she would be asked to question this belief and perhaps adopt a more helpful and rational belief (e.g., "Having a practice and a family has its challenges, but it is certainly possible to do both.").

In the language of REBT, a learned preference may be an "irrational belief" that hinders adaptive emotions and behaviors. A belief echoed by the majority of women participants was that women optometrists are best suited to work in a clinic. Participants cited the high number of female optometrists staffing the college's clinic and concluded that these optometrists chose the clinic over private practice because of family considerations. Using the disputing techniques of REBT, the facilitator posed questions (e.g., "Why must women work in clinics if they choose to have a family?" and "Would a group private practice offer the flexibility I am looking for?") that challenged participants to consider the validity of the belief.

Role-playing exercises were used to encourage the participants to dispute irrational beliefs they may hold related to gender and career options. For example, students were asked to respond to the following scenario:

In a study group, a male student starts talking about his future plans and says, "Working in a clinic for me is just a stepping stone for going into private practice." A female replies to that, "I couldn't start a practice myself."

Students were asked to respond, taking into account what they had learned about the role that gender stereotypes play in influencing career choices. When a female participant voiced a concern about her business competence by stating, "If I went into private practice, I would have to work with a man because men are better at business," she was challenged to provide evidence for this belief.

The use of role play was particularly effective because, initially, most of the participants did not believe that learned preferences had influenced their own views. They were, however, willing to assume that other students had learned preferences and were willing to challenge these. Gradually, as members exchanged past and present experiences through this structured activity, they revealed thoughts and behaviors that were linked to their own beliefs about gender stereotypes.

We found the participation of a male student in the group discussion was important in helping the other participants view their beliefs from a different perspective. It is not clear if greater male representation in the groups would have been as useful or even inhibiting.

Conclusion

In spite of aggressive recruitment through e-mail solicitation, participation in the project was minimal. Students are very busy with coursework and the lack of an incentive, other than lunch, may have been a factor. It is also possible that students may discount the role that gender-based societal stereotypes could have played in the development of their career interests, making participation in the study of little interest and perceived value. To increase participation in future implementations, it seems that the recruitment process should include an educational component, perhaps presented directly and personally to the students. In this educational component, social learning theory could be explored more thoroughly, with the understanding that raising conscious awareness of how gender stereotypes may influence one's thinking and, consequently, one's behavior is a complex and delicate process.

Furthermore, research studies on the implementation of cognitive-behavioral techniques generally run 14-16 sessions to help participants fully develop an awareness of their cognitions and identify patterns of healthy or unhealthy consequences. Along with a stronger commitment to recruitment, future projects may also consider extending the meetings to allow for such development.

Due to the small sample size, it was not possible to conduct a meaningful quantitative evaluation to determine the impact of the discussion groups in informing student opinions and perceptions. Although the sample was self-selected, the descriptive data available from the surveys and the facilitator's qualitative evaluation (personal reflective notes) revealed certain information that may be useful in further development of this project.

The intake survey ($N = 5$) showed that the participating students agreed with certain major premises of social learning theory. They agreed with the statements, "The role models that children are exposed to early in life

influence their career choices" ($M = 4.4$, $SD = 0.9$), "The way that I learned to view the world as a child influences the career choices that I make today" ($M = 4.6$, $SD = 0.5$), and "The accepted career paths of women are influenced by the culture or society in which they are raised" ($M = 4.4$, $SD = 0.9$). They did not, however, think that they were influenced by societal expectations for their gender, responding to "Societal expectations for my gender have influenced my career choice" with a mean score of 2.2 ($SD = 1.2$). Although no conclusions can be drawn with such a small sample, these data suggest that although the students recognized the impact that societal expectations may have on others, they believed that they were not influenced by expectations for their gender. The facilitator's report and participants' responses to the open-ended survey questions were consistent with the survey results. These data support the notion that although societal influences on the behavior of others may be clear, the effects of these influences on our own behavior may not be so obvious.

Optometry students have been raised in a culture where gender-based stereotypes persist. To what extent these stereotypes have been internalized and the role of this internalization on career choices are matters of interest to developmental psychologists. It seems that they should also be subjects of further exploration by the schools and colleges of optometry.

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What Were They Thinking? Surveying Study Practices of Entering Students

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Abstract

Purpose: Concerns exist about the readiness of students for higher education, at both undergraduate and graduate levels. Increased volume and depth of doctoral work require better study techniques and practices than undergraduate-level coursework. Assessing the study habits and expectations of the entering class of 2010 at the New England College of Optometry was a first step in designing appropriate programming.

Methods: The online 2010 Entrance Survey of Study Practices was e-mailed to all first-year optometry students in the summer of 2006 before matriculation.

Results: Undergraduate study practices may be inadequate for the increased volume and depth of the optometric curriculum and may need to be changed.

Conclusions: Administrators need to assist students in adapting their study practices to meet curricular demands at the undergraduate and graduate levels.

Key Words: academic preparation, academic success, learning process, learning styles, study skills

Introduction

The majority of optometry students enter the professional program directly from college. They bring with them their skills, knowledge, hopes, and expectations. As optometric educators, we should be aware of potential concerns about the depth of entering students' knowledge.^{1,2} Do student study practices result in appropriate levels of knowledge? To successfully acquire knowledge and skills, will a generation raised on multimedia require innovative teaching methods not yet in place?³ Other worrisome topics include lack of readiness for the world of work and an increase, noted within the last 10 years, in the number of students with learning disabilities or emotional disorders.³⁻⁵ It follows that, as the undergraduate student population changes

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from the former traditional 18- to 22-year-old single student to a more diverse, nontraditional student population, the graduate student population will reflect these changes as well.⁵

What skills do first-year optometry students bring with them? With concerns about potentially inadequate entering study skills at both the undergraduate and graduate levels, how can optometric educators determine if entering students have skills appropriate to the demands of the optometric curriculum? In the face of increasing emphasis on learning outcomes as well as increasing collaboration between student affairs professionals and faculty, we worked to develop a survey instrument.^{6,7} The 2010 Entrance Survey was used to gather facts about undergraduate study habits and expectations of workload at the New England College of Optometry (NECO). The purpose of the survey was to determine what the academic needs of NECO students would be before deciding how to address them, beyond the usual services of peer tutoring and study skills strategies. This was done for three reasons: first, to gather factual information on our new students' levels of study skills; next, to decide if new programming was needed, based on the information we received back from students; and, last, to avoid the dreaded "midterm wake-up call." Poor grades on midterms, perhaps unlike grades ever received prior to optometry school, can jolt a student into realizing that changes need to be made in approaches to studying. These low grades create enormous pressure for students to raise final exam grades, which is further complicated by an insecure knowledge base.

In the summer before matriculation, incoming students receive numerous communications from various departments at NECO. Some of these e-mails reference the fact that the curriculum will differ from undergraduate school in increased volume and intensity as a means to prepare students for the challenges of doctoral-level work.

Methods

In May of 2006, a survey was sent out to discern incoming students' self-reported methods of studying and learning and their expectations of what their first year at NECO would

bring. The survey and its results are shown in Figure 1. All admitted members of the Class of 2010 were sent a link to the online 2010 Entrance Survey. Students were told that their responses would help NECO develop an orientation program that best met their needs. In hopes of increasing response rate, students were assured that the survey was anonymous and could not be traced back to respondents. The survey provided space for students to write in additional comments, and students were also told they could choose more than one response per question.

The 2010 Entrance Survey was divided into two parts. The first section, consisting of 16 questions, asked students about their undergraduate study methods. The next part, focusing on student expectations of their first year, was composed of 4 questions.

Results

Responses by percentages for each survey item are tabulated in Table 1. From a class size of 110, we received 88 responses (80%), with 100 visits to the Zoomerang (MarketTools, Inc., San Francisco, CA) survey. It is unknown whether 12 students read the survey but declined to participate, or if they responded at a later time.

For Question 1, "What is your preferred learning style?", 69% of respondents chose visual, meaning a preference to charts, pictures, and diagrams rather than to text or spoken word. Auditory or aural learners, who prefer to learn by listening or speaking, represented 30% of students. Learning by reading and writing was preferred by 48% of the students. Another large percentage, those who learn by doing, totaled 57% of our student population.⁸ Question 4, "How far in advance did you study for exams?", showed the majority of students, 66%, studying 2 to 3 nights before an exam; 38% answered that they studied 10 to 14 hours per week; and 32% said they studied just before the exams. These responses raise concern as to the adequacy of time devoted to studying. The volume of material in optometry college demands consistent study throughout the term, and last-minute cramming proves to be ineffective. Question 6, "What support services did you use to study?", indicated that 53% relied on review sessions taught by teaching assistants and 65% relied on review sessions

taught by faculty. Question 14, "How many hours per week did you study?", showed a majority (38%) stating 10 to 14, followed closely by 33% reporting 15 to 19. In Question 13, the majority (56%) rated their memorization skills as excellent. This would be consistent with those who had used rote memorization as a study method rather than attempting to learn material at a deeper level of understanding.

■

With 69% of students listing a preference for a visual learning style, we hope that lectures, which are given for several hours each day each semester, contain images students can use as opposed to PowerPoint slides dense with text.

Part 2 of the survey asked questions about incoming students' expectations of NECO. A large majority, 88% of respondents, recognized that the workload would be greater than their undergraduate load. Slightly more than half (52%) felt their current study methods would be less effective, whereas 41% believed their current methods would be as effective. Major concerns about the first year at NECO included mastering doctoral-level work (64%), having enough money (60%), living in a new city (44%), making new friends (36%), and being on one's own (31%).

Discussion

The survey confirmed assumptions that undergraduate study methods would be inadequate for the workload and expectations of the optometry curriculum. Retention of knowledge and continuing acquisition of new information are important not only for progress in the academic program but in practice as well. In particular, 66% of respondents said they study 2 to 3 nights prior to the exam, 38% answered that they studied 10 to 14 hours per week, and 32% said they studied just before the exams. These responses raise concern as to the adequacy of time devoted to studying. The volume of material at NECO demands that students study on an ongoing basis, keep up with the material, and use time before exams to review, not to learn material for the first time. The students' lack of recognition that the demands of the program, particularly in time spent in lecture, laboratory, or clinic, is of concern. In addition, NECO has no on-campus housing, and travel time to and from school plus time needed for food shopping and other house-keeping chores also reduce study time. Responses to Question 6, reliance on review sessions taught by teaching assistants and faculty, is also a concern, as these sessions are not routinely offered at NECO, although upperclass students frequently provide reviews.

Preferences in learning styles raise concerns as well. With 69% of students listing a preference for a visual learning style, we hope that lectures, which are given for several hours each day each semester, contain images students can use as opposed to PowerPoint slides dense with text. Most teachers prefer read/write methods of learning and are inclined to teach in their preferred learning style, which is a boon for the 48% of students who also prefer read/write styles.⁸ Auditory/aural learners, although a much smaller percentage, tend to find lectures helpful, as well as smaller seminar classes where participation is emphasized. Kinesthetic learners, those who learn by doing, should do well in hands-on laboratory sessions but must still master written material for exams.⁸

The response to what support services students expected to use shows a disconnect between what students felt they need and the help they actu-

Figure 1: Zoomerang Survey Results

In order to plan our Orientation Program, please fill out the following survey. Your answers will be helpful to you throughout your career at NECO as we will design programs for you based on your needs. When necessary, please chose more than one answer per question. All answers are anonymous; your answers cannot be linked to your identity.

How Did You Study As An Undergrad?

1. What is your preferred learning style?

visual	61	69%
auditory/aural	26	30%
read/write	42	48%
kinesthetic/learn by doing	50	57%
don't know	2	2%
other, please specify	2	2%

2. What was your main motivation to study?

grades	59	68%
increase your knowledge	51	59%
get into graduate school	43	49%
receive merit scholarship	5	6%
other, please specify	1	1%

3. What kind of test did you take most often?

multiple choice	64	73%
essay	25	28%
fill in the blank	17	19%
short answer	52	59%
other, please specify	1	1%

4. How far in advance did you study for exams?

1 night	6	7%
2-3 nights	58	66%
2-3 weeks	21	24%
throughout the term	17	19%
other, please specify	7	8%

5. What study method did you use most often?

read the text	47	53%
review my own notes	79	90%
met with a study group	19	22%
other, please specify	9	10%

6. What support services did you use to study?

peer tutoring	11	13%
review sessions taught by TA's	45	53%
review sessions taught by faculty	55	65%
study groups	39	46%
other, please specify	6	7%

7. What resources did you use?

textbook	76	86%
my own notes	83	94%
old exams	74	84%
recommended readings	20	23%
required readings	56	64%
handouts	69	78%

8. What is your study style?

study alone	75	85%
study with 1-2 other people	33	38%
study in a group	2	2%

9. How would you rate your time management skills?

excellent	9	10%
good	57	65%
fair	21	24%
nonexistent	2	2%
other, please specify	0	0%

10. How would you rate your note-taking skills?

excellent	25	28%
good	42	48%
fair	21	24%
nonexistent	0	0%
other, please specify	1	1%

11. How would you rate your reading comprehension skills?

excellent	20	23%
good	45	52%
fair	22	25%
nonexistent	1	1%
other, please specify	0	0%

12. How would you rate your problem-solving skills?

excellent	23	26%
good	47	53%
fair	18	20%
nonexistent	0	0%
other, please specify	0	0%

13. How would you rate your memorization skills?

excellent	19	22%
good	49	56%
fair	18	20%
nonexistent	2	2%
other, please specify	0	0%

14. On average, how many hours per week did you study?

30 or more	3	3%
20-29	22	25%
15-19	29	33%
14-19	33	38%
other, please specify	7	8%

Figure 1: Zoomerang Survey Results (cont'd)

15. How consistently did you study?

every day	35	40%
once a week	7	8%
twice a week	24	27%
just before exams	28	32%
other, please specify	11	13%

16. How did you stay focused during long periods of study?

coffee	35	40%
red bull	6	7%
my own prescription medication	1	1%
a friend's prescription medication	1	1%
sheer determination	68	77%
other, please specify	17	19%

What Are Your Expectations At NECO?

17. Will the workload be

the same as undergrad	6	7%
less work	2	2%
more work	77	88%
don't know	4	5%

18. Will your current study methods be

as effective	36	41%
more effective	6	7%
less effective	46	52%
explain why	26	30%

19. What support services are you expecting to use?

peer tutoring	60	69%
review sessions taught by TA's	69	79%
review sessions taught by faculty	79	91%
study groups	69	79%
ADA accommodations	9	10%
personal counseling	12	14%
other, please specify	5	6%

20. What is your main concern about your first year at NECO?

living in a new city	39	44%
being on my own	27	31%
having enough money	53	60%
mastering doctoral level work	56	64%
finding roommates	15	17%
making new friends	32	36%
other, please specify	5	6%

ally pursued. Ten students replied that they would request testing accommodations of a private test room and extended time under the Americans With Disabilities Act. However, even after repeated verbal and e-mail reminders of the process, not one student who filled out the survey applied for accommodations. Also noteworthy was that 12 students, or 14% of the entering class, reported expected use of counseling services. Due to privacy and confidentiality requirements, it is not possible to determine how many first-year students have accessed NECO counseling services or have seen outside therapists.

Several limitations to the study should be noted. During the summer, the composition of the entering class changes, as students withdraw to attend other colleges or for other personal reasons and new students are admitted to take their places. Newly admitted students receive the same information as those already admitted, so it is not possible to determine how many of the 88 respondents actually enrolled at NECO. In addition, we did not ask for any demographic information such as gender, age, undergradu-

ate major, or year of undergraduate or other degrees earned.

The survey was mentioned during the fall orientation program. Past experience shows us that little information is retained during orientation, as students are concerned with meeting their new classmates, getting settled in their apartments, and finding their way around the city (Boston, MA). Students were told that survey results would be shared during their Integrative Seminar sessions, a program in which groups of students meet with a clinician and a researcher to integrate basic science and clinical skills in a problem-based learning setting.⁹ In the fall of 2006, first-semester students attended five Integrative Seminar sessions. Previously, Integrative Seminars were offered to first-year students only in the spring. The focus of these five sessions was to introduce the students to critical thinking skills, with the hope that these skills would become well-integrated into the students' habitual way of thinking. The director of student services was asked to facilitate one of the five sessions, discussing how to approach study skills and learning strategies from a critical thinking perspective. The 2-hour ses-

sions were the second of the five and provided a perfect opportunity not only to review the critical thinking concepts introduced in the first session but to report survey results and have students analyze the effectiveness of their reported practices, based on the workload they were beginning to encounter. It also gave the chance to discuss concerns students noted in the survey and to promote the availability of college resources.

Conclusions

Our study showed that undergraduate study methods would not be adequate for the volume and intensity of the optometric curriculum. An inadequate amount of time spent each week in study, dependence on reviews by teaching assistants and faculty, and reliance on memorization of material rather than deeper understanding of concepts were reported by the majority of respondents.

As a result of students' responses, NECO developed programs to encourage students to change their study modes. These programs were ongoing and presented periodically during the fall semester to reinforce

the importance of changing study habits. The programs consisted of:

1. Communications from administrators and current optometric students
2. Panel discussion at orientation
3. Presenting survey results in integrative seminar
4. Individual student meetings to discuss study methods for students identified as being at-risk due to poor midterm performance

We hope that more effective study methods will decrease the amount of student stress associated with exams as well as improve performance. We plan to repeat the survey, with modifications, during the spring semester, to compare students' current study methods with their previous methods and to ask if they changed their study practices, and, if so, what motivated them to do so. When meeting with students who had not performed well

academically, the director of student services asked students, "What else can I do, before you matriculate, to encourage you to anticipate making changes in your study strategies and habits?" The answer most often given, after moments of thought, was "Nothing. You have to let us learn from our own mistakes." We plan to keep trying despite that advice.

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Overseeing Student Clinical Education: The Role of the Educational Facilitator

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Each third-year facilitator handles 35-40 students, whereas the fourth-year facilitator handles 70-80 students. The reason for the differences in number of students per facilitator is due to third-year interns having less clinic experience. Third-year interns generally require more intensive supervision and are more likely to need clinical remediation, necessitating a greater amount of the facilitator's time. In addition, at any given time, half the fourth-year class is assigned to externships outside of the campus-based optometric clinic and, therefore, has little, if any, daily involvement with activities on campus.

Approximately 40% of the faculty member's overall time is spent in the role of facilitator. The balance is devoted to a range of clinical and classroom teaching, scholarly work, and additional academic and administrative responsibilities. This allows the facilitator to interface with broad segments of the college faculty and administration to ensure that clinical education is well-represented.

Introduction

The primary aim of optometric education is the training of proficient optometric clinicians. Clinical education has traditionally been the main role of clinic supervisors (the clinic attending doctors) who are responsible for instructing and evaluating students in patient care. Although this arrangement provides a basis for clinical education, it risks neglecting other areas critical for assuring optimal clinical training. To fill this gap, the chairman of the Department of Clinical Sciences at the State University of New York State College of Optometry, in collaboration with the academic dean and clinic administration, developed the position of educational facilitator. The facilitator position has become well-established and has developed into a broad and integral component of the student's clinic education.

The facilitator oversees the student's clinical training by serving as the third- and fourth-year student's clinical coordinator, advocate, liaison, and advisor in the educational process. This article discusses the mis-

sion, goals, and responsibilities of the facilitator, and the impact the facilitator has had on clinical education at the college.

During the summer between the second and third years of optometry school, all students are assigned to a facilitator. This assignment coincides with the onset of the student's internship at the college's optometric clinic. (All clinical training takes place at the college during the third year.) Third-year students are divided between two facilitators, whereas one facilitator handles the entire fourth-year class.

The Duties of the Facilitator

The duties of the facilitator are wide-ranging and are summarized in Table 1.

Clinic Orientation: The First Meeting With Students

The relationship between student and facilitator begins with student clinic orientation at the beginning of the summer of the third year of optometry school. The facilitator describes his or her role and responsibilities to the students. The students are then presented with an Intern

Table 1
Duties of the Facilitator

- Orienting students to clinic
- Participating in ongoing student conferences devoted to developing intern clinical proficiency
- Monitoring student grades and clinical performance
- Student remediation
- Monitoring student attendance
- Clinical scheduling
- Devising adjunct clinical educational programs
- Serving as liaison among student, faculty, and administration
- Providing input into grading and externship placement
- Participating in conferences with dean and chair of Department of Clinical sciences
- Serving on educational, curricular, and administrative committees
- Facilitating faculty calibration

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**Table 2
Intern Clinical Expectations**

	SUBJECTIVE	OBJECTIVE	ASSESSMENT	PLAN	PROFESSIONAL RESPONSIBILITY
LEVEL 1 3rd Year First/Second Quarters	<ul style="list-style-type: none"> Establishes the chief complaint and <u>accurately</u> performs a comprehensive history for communicative patients 	<ul style="list-style-type: none"> <u>Accurately</u> performs basic and <u>Level 1</u> optometric tests on cooperative patients, in accordance with clinical skills protocols* Knows expected normal values 	<ul style="list-style-type: none"> Recognizes and describes <u>abnormalities</u>. Identifies and documents <u>Level 1</u> conditions 	<ul style="list-style-type: none"> Formulates a plan for <u>Level 1</u> diagnoses <u>Communicates</u> plan to the patient with limited guidance 	<u>Preparedness for Clinic</u> <ul style="list-style-type: none"> Room is prepared Ready to pick up patient at designated start time Have all necessary equipment in working condition prior to start of clinic <u>Infection Control</u> <ul style="list-style-type: none"> Maintain neat, clean exam rooms
LEVEL 2 3rd Year Third Quarter	<ul style="list-style-type: none"> Performs <u>efficient</u> case history Asks appropriate follow-up questions to refine the cc and explore other relevant findings 	<ul style="list-style-type: none"> <u>Efficiently</u> performs all appropriate procedures 	<ul style="list-style-type: none"> Identifies and documents <u>Level 2</u> conditions Prioritizes a diagnosis list with limited guidance 	<ul style="list-style-type: none"> Formulates a plan for <u>Level 2</u> diagnoses <u>Effectively communicates</u> plan to the patient 	<ul style="list-style-type: none"> Wash hands and swab off all equipment in presence of patient No eating in presence of patients <u>Documentation and Coding</u> <ul style="list-style-type: none"> Record is legible and complete Coding is accurate and complete Grade sheets complete/timely
LEVEL 3 3rd Year Fourth Quarter	<ul style="list-style-type: none"> Develops and prioritizes tentative <u>differential</u> diagnoses 	<ul style="list-style-type: none"> <u>Selects relevant tests</u> based on patient history and examination findings 	<ul style="list-style-type: none"> Identifies and documents <u>Level 3</u> conditions Correlates exam data with patient history and symptoms to make diagnoses with <u>minimal guidance</u> 	<ul style="list-style-type: none"> Formulates a plan for <u>Level 3</u> diagnoses including additional tests and follow-up <u>Effectively communicates</u> plan to the patient 	<u>Dress</u> <ul style="list-style-type: none"> Dress is neat and professional In compliance with UOC dress code <u>Interpersonal Relationships</u> <ul style="list-style-type: none"> Treat patients with compassion, courtesy and respect
LEVEL 4 4th Year First Half	<ul style="list-style-type: none"> Develops an <u>examination plan</u> based on the history and the tentative differential diagnoses 	<ul style="list-style-type: none"> <u>Accurately and efficiently</u> performs <u>advanced clinical procedures</u> based on clinical findings 	<ul style="list-style-type: none"> Identifies and documents <u>Level 1V</u> conditions 	<ul style="list-style-type: none"> Formulates a plan for <u>Level 4</u> diagnoses <u>Effectively communicates</u> plan to patient 	<ul style="list-style-type: none"> Address adult patients by proper titles (Mr., Ms, Dr., etc) Relates to supervisors, staff and colleagues with respect and courtesy Displays a courteous/enthusiastic demeanor
LEVEL 5 4th Year Second Half	<ul style="list-style-type: none"> Identifies visual needs in <u>unresponsive</u> or non-English-speaking individuals 	<ul style="list-style-type: none"> <u>Improvises</u> examination technique to handle difficult or non-communicative patients 	<ul style="list-style-type: none"> <u>Independently</u> formulates an assessment for each diagnosis 	<ul style="list-style-type: none"> <u>Independently</u> formulates a plan of action for <u>each diagnosis</u> including coordination of care, treatment and patient education 	<ul style="list-style-type: none"> Practices high ethical standards

Table 3
Levels of Knowledge and Procedures for Clinical Conditions

Level 1 (3rd-Year Summer and Fall Quarters)

Knowledge

- Basic refractive conditions and techniques
- Binocular vision disorders (nonstrabismic): diagnosis
- Common congenital anomalies
- Basic anterior segment abnormalities
- Basic glaucoma
- Pharmacology
- Clinical medicine/systemic disease

Procedures

- Lensometry on all types of lenses
- Keratometry
- Neurologic screening examination
- Physical assessment
- Auxiliary procedures - indications and interpretation
- Exophthalmometry
- Photostress test
- Amsler grid
- Laser interferometry
- Potential acuity
- Tonopen and Perkins tonometry
- Scleral depression
- Punctal plugs, lacrimal dilation and irrigation,
- Pressure patching
- Gonioscopy
- Epilation
- Lacrimal dilation/irrigation
- Color vision testing
- Visual fields
- Contact lenses: soft lenses, spherical and toric

Level 2 (3rd-Year Winter Quarter)

Knowledge

- Diagnosis and treatment of nonstrabismic functional vision disorders
- Amblyopia: diagnosis and management
- Strabismus: diagnosis and management

- Contact lenses: rigid (including aspheric and bitoric)
- Special needs patients
- Advanced anterior segment diseases (including systemic relationships and treatment)

Procedures

- Book retinoscopy
- Stress retinoscopy
- Bell retinoscopy
- Corneal mapping: indications, procedure and interpretation
- Autism, cerebral palsy, Down syndrome examination techniques, ocular findings
- Free space binocular testing
- Visual acuity testing: Cardiff cards, Lea symbols, FPL

Level 3 (3rd-Year Spring Quarter)

Knowledge

- Learning-related vision problems
- Basic posterior segment diseases
- Advanced glaucoma

Level 4 (Fourth Year)

Knowledge

- Children with special needs
- Contact lenses: specialty soft and rigid (CL service externs)
- Advanced posterior segment diseases
- Neuro-ophthalmic disease
- Visual pathway disease
- Laser and surgical concepts
- Low vision disorders

Procedures

- Infant exam
- Vision therapy
- Management plan for all nonstrabismic binocular vision problems
- Management plan for visual-perceptual problems

Clinical Expectations table (see Table 2), consisting of the body of knowledge and procedures for clinical conditions (Table 3) that are expected of an entering third-year intern. The expectations were devised by the course instructors of record, chair of the Department of Clinical Sciences, and facilitators, in consultation with the entire clinical faculty. Expectations are divided by quarter, to be commensurate with what the student has been exposed to in their coursework to date. The expectations are embedded in an electronic grading form as well as posted in clinic conference rooms for easy reference by both faculty and students. This assures that students are aware of what is expected of them and that faculty is aware of what is expected of students.

The expectations are categorized into the subjective, objective, assess-

ment, and plan (SOAP format) components of the case. Naturally, expectations build on each other over time, expanding in knowledge and complexity with each quarter, beginning with the common refractive conditions and techniques at the onset of third year, advancing to more specialized areas such as management of amblyopia later in the third year, to fitting specialty contact lens and examining infants in the fourth year. Outlining in specific terms to both faculty and student what is expected at each phase of clinical training serves to promote consistency in evaluation of student performance and allows interns a means of guiding and assessing their own performance. The facilitators reinforce the expectations with faculty on an ongoing basis to assure that consistency in grading is maintained.

The orientation covers additional issues involving the facilitator's role, such as a description of the grading policy, remediation plans for students with clinical deficiencies, student self-evaluation programs, and adjunct clinical education courses. Last, general clinic responsibilities, such as inventory and equipment repair, absence policy, standards of dress, and issues of professional responsibility, are presented. The orientation thus provides a map of the structure and scope of the student's two-year clinical experience within which the facilitator-student relationship will take place.

Ongoing Facilitator-Student Meetings

Individualized meetings take place between student and facilitator throughout the year, with there being at least one meeting per quarter.

Because students may be evaluated by many different supervisors in a number of clinics during their third and fourth years of optometry school, their educational feedback may be fragmented. The facilitator provides the student with one contact person who can pull together information from a variety of sources. Students are required to meet with facilitators each quarter to discuss their performance at midterm and sooner if problems arise. They can schedule an appointment with their facilitator any time.

Topics commonly discussed include a review of the student's clinical performance as well as student questions, concerns, issues, and problems with regard to clinic. With the assistance of an outside educational consultant, the grading system was designed by the Clinical Sciences Department in conjunction with the facilitators and is reviewed on a continuous basis to optimize consistency and accuracy in grading.

Monitoring Student Grades and Clinical Performance

In the primary care clinic, students are graded on each clinical encounter. Each encounter is given a grade based on the four general SOAP components of the case. The student's degree of professional responsibility during the encounter is also figured into the grade. In each category, as well as for the overall exam, the student is graded as "meets expectations," "does not meet expectations," or "exceeds expectations." Term grades follow these guidelines: Students are given an A if 50% or more of their overall encounter exceed expectations and an F if 25% or more of their overall grades, or grades in any one category, do not meet expectations. If 15%-24% of their encounters overall or in any one category do not meet expectations, the student's performance is borderline passing and the clinic chief consults with the facilitator for his or her input in determining whether the student passes or fails the clinic.

Facilitators continuously monitor student grades electronically for each patient encounter. The electronic grading program also provides an ongoing tabulation of the student's overall grade. Both the facilitator and student have access to grades for all encounters as soon as they are submitted and can review the most up-to-date grades during their meetings. Thus, clinical issues can be addressed

in a detailed, contemporaneous, and ongoing basis.

It is important to note that the facilitator is not the individual responsible for assigning the student his or her grade. This could conflict with the facilitator's role in acting as a student advocate. The facilitator position is designed to allow the student to feel as comfortable as possible in approaching and working with the facilitator without fear of being graded negatively. That is not to say that the facilitator has no input at all into the student's grade, but the input is limited. The facilitator communicates on a regular basis with clinical faculty who evaluate the student, particularly if there are areas of concern.

Facilitator-student meetings tend to be more frequent and intensive during the early part of the third year because the students require more support in clinic. During the first half of the third year, the facilitators coordinate a student DVD recording of their exam. The student records the entire comprehensive exam with a patient, and then critically views it while filling out a self-evaluation form to discuss with the facilitator. This allows the intern and facilitator to hone in on student strengths and weaknesses and to educate accordingly. Students have repeatedly found the experience of observing and critiquing themselves during a clinical encounter to be a highly valuable educational experience.

Student Remediation

Student clinical deficiencies may become apparent either through the reporting by clinic supervisors or by the students themselves. These deficiencies are always addressed in student-facilitator meetings. Sometimes the facilitator's intervention may consist of clinical instruction in a particular area of difficulty. If the student is having difficulty with neutralizing prismatic lenses, for example, the student may be given a set of lenses to neutralize under the facilitator's supervision. If the issue is more related to case analysis, the student may be asked to bring in questions from a case that he or she examined in the past week, or to discuss sample cases from a case bank, with an emphasis on improving case analysis skills. Other times, the problem may be more amenable to consultation with an outside source, such as a textbook, journal article, or photo library, which

the facilitator may recommend to the student.

If more intensive remediation is needed, the facilitator will schedule the student to perform extra clinic sessions, which are closely observed by the facilitator. In general, these are not graded but used for educational purposes in evaluating and remediating student clinical skills. For students with more widespread, persistent clinical difficulties, an individualized education plan (IEP) is developed, identifying the student's particular weaknesses along with goals and plans for achieving those goals. The plan is developed in conjunction with the student and clinic supervisors and agreed to by all parties. The facilitator and student track the student's progress and report this to the service chief and chair of the Department of Clinical Sciences.

By identifying clinical problems and providing remediation to interns in as early a time frame as possible (usually during the student's third year), clinical problems necessitating remediation during the fourth year and failure at externships (off-campus clinical sites) have been substantially reduced.

Discussion in facilitator meetings may broaden beyond present clinical performance to include educational or career choices such as residencies and externships. The facilitator maintains a database on externship and residency programs with which to inform the student and discuss which might be the best according to student needs. The facilitator thus serves as an information and referral source within the optometric profession.

The presence of a facilitator provides the intern with a faculty member to go to in the event of a clinical problem. An intern may request a meeting with the facilitator if he or she is having a problem with a particular clinic supervisor. At times the facilitator may simply listen to the intern's complaint, serving as a sounding board, which may be sufficient to make the intern feel relieved. If engaging the supervisor is deemed to be beneficial, the facilitator may encourage the intern to speak with the supervisor to address the problem, discussing with the intern as to how best to approach the faculty member. Other times the facilitator may arrange a three-way meeting with the faculty member and student, or speak to the faculty member individually.

In addition to school-related issues, students may be sometimes troubled by personal issues outside of school that impact academic performance. Sometimes these are brought up in meetings with the facilitator and discussion takes place. However, in this area, the facilitator's role is limited. He or she may refer the student to other individuals such as an on-campus social worker who is trained in addressing issues of a personal nature.

Monitoring Student Attendance

Attendance is a professional responsibility that is carefully monitored by the facilitators. Students who miss clinic must report their absence to their facilitator. Excessive absence requires a face-to-face meeting with the facilitator to determine whether there are any personal or physical issues with a student that might impact patient care. If this is the case, measures are taken to ensure that the issues are addressed prior to continuing in clinic. With the exception of pre-approved educational leave, absences are factored into the clinic grade and the facilitator reports absentee information to service chiefs.

Students wishing to be excused from clinic for educational reasons are also required to seek approval by their facilitator. This includes requested time off to attend institutionally approved educational conferences. If the facilitator deems that the student's clinical performance is weak, to the extent that taking time off would be educationally detrimental, he or she is not granted leave time. The facilitator will honor leave requests based on the student's clinic performance, professional habits and past attendance.

Scheduling and Educational Planning

A comprehensive, balanced student clinical exposure is essential for optimum internship training. Being familiar with the entire range of clinics at the university, the facilitator works to assure that the student is exposed to an adequate mix of clinics, cases, and procedures. For example, each quarter, third-year interns typically have a mix of primary care clinic and specialty clinic assignments. Thus, the facilitator may schedule the intern for a different specialty clinic each quarter, rotating between Specialty Contact Lens, Ocular Disease, Pediatric, and Low Vision clinics. This helps to assure that

scheduling is based on student educational needs. Prior to the process being overseen by the facilitator, there had been a greater tendency for clinical imbalance in the schedule, as administrative concerns were given a disproportionate weight to those of intern education.

Placing the scheduling in the hands of the facilitator also allows for individualized scheduling when needed. For example, if a student is having difficulty in a particular area, the facilitator may schedule the student for additional clinic time in that subspecialty. Or, if a student's performance indicates that he or she is not competent to perform at a clinical site outside of the campus-based clinic, the facilitator works to arrange postponement of the external rotation until the student is appropriately remediated and minimum clinical competency is achieved.

Devising Adjunct Clinical Educational Programs

For the third-year student, facilitators design and coordinate a clinical decision making (CDM) course, in the form of small-group seminars. The group consists of six or seven students and a clinical faculty member and meets three hours per week over the course of each quarter. Each week, students present cases that they have encountered in the clinic. The case may be one they have had difficulty with and need assistance from the group. At other times, the case may be presented for illustrative purposes, to identify a concept or clinical practice issue for the group. For half of the sessions, the student may bring a case on any topic. The other half is devoted to cases on predetermined topics. The topics are geared to the students' level of clinical development. The facilitators select the topic and provide an outline for questions that will be discussed by the group. Early on, the topics focus on eye exam basics such as case history, refraction and impression, and plan. As the year progresses, more advanced topics are introduced such as glaucoma, red eye, examining patients with reduced vision, strabismus, amblyopia, postoperative care, and contact lenses. For example, a CDM session devoted to the pediatric examination might focus on case history questions particular to children, unique tests performed on children, special considerations in prescribing spectacles or medications for chil-

dren, and techniques for examining poorly attentive children.

The CDM topics are coordinated with those the students are being taught at the time in their didactic classes. This fosters integration between classroom and clinical education as well as consistency in clinical teaching. For some sessions, the group is led by a fourth-year student, which enables the third-year student to receive the perspective of an upper-class student. Facilitators consult with faculty to select the most appropriate topics for discussion based on student needs. Students find CDM useful as it provides a relatively informal small-group setting to address important clinical issues with their peers and clinical faculty, while allowing them to look back on recent cases that they have seen. Because time constraints may prevent the intern from having as full a discussion as possible with their clinical supervisor at the time of the exam, CDM offers them another opportunity to follow up on any additional areas of questions or concern.

For fourth-year students, the facilitator is involved in the implementation of a Grand Rounds Program that addresses the need for small-group discussions. It is held on a weekly basis. Students are assigned in groups of approximately 15 members. During the sessions, students present cases to their peers and selected faculty members for the purpose of scholarly discussions and sharing of ideas. To promote participation, the setting is relaxed and informal. Students are instructed to select cases that were particularly beneficial to their learning process so that their peers may derive the same benefit. The facilitator is present for all sessions and monitors student contributions to the program, and these contributions are factored into grading. The facilitator also uses the time to address clinical concerns that are reported by the students as well as by clinical faculty and staff.

Liaison With Faculty and Administration

Part of the work of the facilitators involves acting as a liaison between the student and faculty. Meeting with the entire clinical faculty at regularly scheduled clinical department calibration meetings, facilitators act as a conduit between the student and faculty to voice clinical concerns from both the perspective of the student and faculty. These issues are discussed by the

faculty as a whole in an effort to address them programmatically. Some areas of concern for students may include fairness in grading clinical encounters, the desire for more comprehensive feedback with respect to their clinical performance, and more specific delineation of clinical expectations. Areas of concern from the point of view of the faculty may include student difficulty in critical thinking, case presentation, or professional responsibility. Videotapes of students conducting an exam and supervisors interacting with students during an exam have been used as demonstrations to facilitate discussion of these topics. Standards are developed to improve clinical teaching and implement new educational programs. Progress toward meeting these goals is monitored at quarterly faculty calibration meetings by way of facilitator reports to the faculty.

In addition to meeting with the faculty as a whole, facilitators meet on an ongoing basis with the chair of the Department of Clinical Sciences. At these meetings, third- and fourth-year student clinical performance is reviewed to make sure that student educational goals are being met. Educational strategies are mapped out that address problem areas. By providing an additional voice in support of student education at the level of the department chair, the facilitator can serve as a catalyst in the creation of department policy initiatives that require the involvement of clinical faculty or in designing faculty training programs to enhance clinical teaching.

Facilitators are also represented on a number of committees throughout the college. On the Curriculum Committee, facilitators have been instrumental in contributing to the

development of curricular changes addressing student clinical preparation and ongoing education. On Clinic Council, a policy-setting committee chaired by the chair of the Department of Clinical Sciences and comprising clinic chiefs as well as the dean of academic affairs and members of the college's clinic administration, the facilitator provides input on a weekly basis from the perspective of the individual overseeing student clinical education. Facilitators also attend Course and Standing Committee meetings, held to evaluate students in academic difficulty. The facilitator participates in the discussion regarding decisions the committee may make with respect to student status such as academic probation or dismissal, but does not have a vote. Facilitators are also present in quarterly meetings with the dean and student class representatives who discuss the curriculum.

Facilitators meet with the director of externships and instructor of clinical procedures classes to assign the student to an appropriate externship site. Externships take place during the student's fourth year and are primarily located at off-campus sites such as hospitals, neighborhood clinics, and tertiary-care centers. Among the factors taken into account in matching the student with the site are student preference, clinical aptitude, and knowledge base. The facilitator is in a unique position to provide input regarding the student's overall suitability for a particular site because he or she is the faculty member most likely to have the greatest knowledge of the student's particular clinical needs, strengths, and weaknesses. Prior to the establishment of the facilitator position, externship assignments were determined by a process

that was more randomized and less individualized.

Conclusion

Student educational areas that may be incompletely addressed include the need for (1) a faculty advocate or advisor, (2) exposure to an adequate mix of cases and procedures, (3) individualized, timely, intensive intern clinical remediation, (4) a liaison between the student and faculty/administration to assure that educational goals are being met, and (5) the maintenance of adjunct clinical education programs, tailored to addressing class problem areas.

By acting as an overall educational coordinator, the facilitator is uniquely charged with the responsibility of seeing that these needs are met. Through ongoing collaboration with students, faculty, and the chair of the Department of Clinical Sciences, facilitator contributions have included the establishment of a student clinical advisor; implementation of a standardized, consistent intern grading system; closer monitoring of clinical performance; enhanced, timely intern remediation; implementation of small-group case discussion-clinical decision-making courses; intern schedule balancing; intern self-evaluation programs; faculty calibration; and curriculum modification.

The educational facilitator represents a successful strategy to enhance student clinical training by supplementing traditional educational practices that may omit factors necessary for developing more proficient clinical practitioners. The facilitator role may serve as a model for optometric clinical education.

Predicting Clinical Performance

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Abstract

Purpose: The purpose of this study was to evaluate the accuracy of using information gathered during the first 3 years of optometric education to predict clinical performance in the final year of education. The research questions were: Which variables are the best predictor of clinical performance? How do the variables in combination work to predict clinical performance?

Methods: Seventy-eight students from the New England College of Optometry (NECO) participated in this study. The predicting variables of interest were: optometric grade point average (GPA), National Board of Examiners in Optometry (NBEO) Part 1, third-year clinical performance, and standardized scores of critical thinking and disposition. The outcome variable was final-year clinical evaluations.

Results: The results suggested that there was limited accuracy in the ability of the data to predict fourth-year clinical performance. Past clinical performance was the strongest predictor for fourth-year clinical performance. Although, the association between the third- and fourth-year performances was significant, the variability explained by third-year clinical performance alone was only 14.3%. The other predictors studied did not add enough information to account for the variability.

Conclusions: This study demonstrated limited ability to predict fourth-year clinical performance. The information gained by the study demonstrates the importance of accurate and timely clinical evaluations in the third year of optometric education.

Key Words: clinical performance, clinical education, clinical prediction

Introduction

In 2000 the Association of Schools and Colleges of Optometry (ASCO) identified specific entry-level competency skills that must be obtained before graduation with a doctorate degree in optometry.¹ These skills include the appropriate cognitive and motor skills needed to prevent disease and manage clinical conditions within the scope of the profession.¹ Cognitive skill involves the application of critical thinking and knowledge base in patient care and is often referred to as clinical reasoning or thought process.² The final year of optometric education involves an intense, full-time clinical experience. To achieve the ASCO goals, students must master their cognitive skills in analysis and evaluation of information and treatment plans, the use of inductive and deductive reasoning to form a hypothesis, and determining inferences based on the best available information. The mastering of these skills facilitates a student's ability to provide the highest level of patient care.

Most students thrive in the clinical environment. However, each year some students find themselves struggling with clinical success. The ability to predict clinical performance of all levels in the final year of optometric education would be beneficial to students, clinical faculty, and patients. Accurate prediction of clinical skills would allow for early remedial intervention, appropriate clinical placement, and adequate support systems. By the final year of their education, students have invested a significant amount of time, energy, and money into their careers. Clinical failure at this point is highly detrimental. Students who experience clinical failure suffer emotional stress and performance anxiety.³ Students who are not achieving clinically may compromise patient care and hinder the efficiency of the clinical site they are assigned. Clinical optometric educators are often faced with the challenge of providing excellent patient care while finding efficient and effective remediation strategies to address cognitive

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weaknesses. In many cases, cognitive weaknesses are apparent only when the student is exposed to more complex ocular and systemic patient care scenarios and are held to higher expectations for efficient exams and independent decision making. The ability to predict clinical weakness before the fourth year of education would enhance the clinical educational experience and prevent the costs and difficulties associated with failure late in the educational process.

The focus of many research studies across several disciplines involves preadmission criteria as predictors of academic and clinical performance. Several studies in medicine and other health care professions have demonstrated a limited ability of preprofessional school credentials, such as undergraduate grade point average (GPA), science GPA, standardized entrance test, and interviews, to predict academic and clinical success.⁴⁻⁹ Because critical thinking is a component of clinical reasoning, studies have also researched the use of standardized critical thinking test scores to predict clinical reasoning skills. Williams et al., in 2006, reported that standardized scores on critical thinking tests were a statistically significant predictor of early clinical reasoning ability in allied dental education.¹⁰ In addition, these critical thinking test scores were a stronger predictor than other traditional admissions criteria.¹⁰ Previous research in the field of optometry has demonstrated a positive association between evaluations of clinical performance and critical thinking skills.^{11,12}

In the field of optometry, there is limited consensus on the validity of preadmission criteria to predict academic and clinical success.¹³⁻¹⁵ In addition, much of the research was conducted more than 10 years ago. Because of these limitations, other measures of predicting student achievement are needed.

There is a paucity of information regarding predicting clinical success based on information gained during the first 3 years of optometry school. Although an association between critical thinking and clinical performance has been demonstrated, researchers have not determined the strength of scores of critical thinking skill and disposition to predict clinical performance. The purpose of this study is to evaluate the ability of information gathered during the first 3 years of

optometric education (optometric GPA, third-year clinical performance, National Board of Examiners in Optometry [NBEO] Part 1) and test scores of critical thinking (CT) and disposition to predict clinical performance in the final year of study. Specifically, which of the variables—optometric GPA, third-year clinical performance, NBEO Part 1, or test scores of critical thinking and disposition—is the best predictor of clinical performance? How do these variables work in combination to predict clinical performance?

Methods

Seventy-eight students from the New England College of Optometry (NECO) participated in this study. The study group represented the entire class of 2006. The group was composed of 48 female and 30 male students between the ages of 25 and 42 years. GPAs, NBEO (Part 1), and standardized tests of critical thinking and disposition were measured at the end of the students' third year of optometric education. At this point in the NECO curriculum, students have completed all of the didactic course work and three clinical rotations. The predicting variables of interest were: optometric GPA, NBEO Part 1, third-year clinical performance, and standardized scores of CT and disposition. To evaluate CT skills and CT disposition skills, the students were given the California Critical Thinking Skill Test (CCTST) and California Critical Thinking Disposition Inventory (CCTDI).^{16,17} The CCTST and CCTDI were administered using the recommended guidelines from Insight Assessment.¹⁶ The CCTST and CCTDI are both standardized validated tests.^{16,17}

The CCTST is designed to measure the skills involved with CT. The CCTST is content neutral: Questions are not related to science or optometric knowledge base. Therefore, the test can measure basic critical thinking skills that are not influenced by the test taker's knowledge base, educational background, educational emphasis, or type of professional degree program. The instrument is based on the American Philosophical Association's definition of critical thinking and tests the cognitive skills identified for successful clinical practice.^{18,19} The items cover a variety of topics; some include concrete scenarios and some are more abstract in

nature. The test contains 34 questions, with a 45-minute time limit. The five areas tested by the CCTST are: analysis, evaluation, inference, deductive reasoning, and inductive reasoning. The tests were scored by Insight Assessment,¹⁶ which reported both a total score and individual subsets.

The CCTDI is designed to measure the disposition toward CT. CCTDI responses are registered using a forced-choice Likert scale that requires the respondent to either agree or disagree with each item.¹⁷ The seven areas tested are: truth seeking, open mindedness, analyticity, systematicity, confidence in reasoning, inquisitiveness, and maturity. The test consists of 75 questions to be answered in a 15-minute time limit. The CCTDI was also scored by Insight Assessment,¹⁶ which reported both a total score and individual subsets. The CCTST and CCTDI were completed by all the students in the allotted timeframe.

The cumulative optometric GPA at the conclusion of the third year (encompassing the entire didactic curriculum) was calculated and reported by the registrar at NECO. NBEO (Part 1) scores were reported to the college by the National Board of Examiners in Optometry.

The third-year clinical experience at NECO is composed of three primary care or ocular disease rotations. Third-year clinical performance was evaluated according to the clinical evaluation grid in use at NECO at that time.²⁰ Students were evaluated in 14 areas: case history, refraction, functional, neurological, glaucoma, anterior segment, posterior segment, systemic disease, contact lens, psychosocial, vision therapy, low vision, ophthalmic materials, and communication. The evaluation grid yielded a grade of honors, pass, remedial, or fail. The students are graded midway through the quarter and then again at the end of the quarter. Clinical performance was then grouped as follows: Group 1—any grade of remedial or fail at midterm or final; Group 3—two or more final grades of honors; Group 2—all of the others (no remedial or fail and less than two final grades of honors). The clinical performance grades were reported by the program administrator.

The fourth-year clinical experience at NECO is composed of four 3-month rotations. Each student rotates through a Veteran Administration Hospital, a community health center, a site that deals with special popula-

tions (e.g., low vision, geriatrics, pediatrics), and their choice of an elective site (tertiary care, military base, private practice, or international site). All clinical sites are affiliates of NECO, and all clinical instructors are granted adjunct faculty status. The outcome variable, clinical performance in the final year, was evaluated using a nine-domain rubric validated by expert consensus. The domains evaluated were: technical skills, knowledge base, analytical skills, diagnostic skills, management and treatment, communication skills, efficiency, attitude, and professionalism. This evaluation tool yielded a numerical grade, which was reported by the program administrator. The NECO Clinical Policy and Procedure Manual provides the criteria that direct all NECO evaluations. The evaluations are reported through a computerized standardized system.

Descriptive statistics summarized the students' academic performances and CT scores in each clinical group. Correlation analyses among the four continuous predictor variables were computed to examine the degree of their association.

Analysis of variance (ANOVA) was used to determine the association between the third-year clinical perfor-

mance and the fourth-year clinical performance. Simple linear regression was conducted to assess the predictability of a single, continuous, explanatory variable on clinical performance. Hierarchical multiple regression analyses were used to assess the extra variance explained by CCTDI and CCTST beyond that explained by GPA, NBEO (Part 1), and third-year clinical group.

The study was reviewed by the Institutional Review Board at the New England College of Optometry.

Results

Baseline data on GPA, NBEO (Part1), CT disposition, and CT skill for each clinical group is presented in Table 1. Overall, Clinical Group 3, the highest performing clinical group, had higher GPA, CT skills, and NBEO (Part1) scores. The differences in total CT skills and NBEO (Part1) were statistically significant. The total CT disposition scores across the three groups were similar.

The correlations among predictor variables are displayed in Table 2. Both GPA and NBEO (Part1) demonstrated students' academic performance and were highly correlated ($r = .89$). The CT skills showed moderate

correlation with GPA and NBEO (Part1) ($r_s = .45$ and $.43$, respectively), indicating that CT skill played a partial role in the learning and exam process. These correlations were statistically significant. The other associations were weak and nonsignificant.

The assessment of association between a single predictor and the response variable was carried out through the univariate linear regression for the four continuous predictors and ANOVA for the categorical predictor. The results are displayed in Tables 1 and 3. There were moderate to strong associations among predictors (Table 1). We used a hierarchical multiple regression analysis to evaluate the unique contribution of critical thinking and academic performance in predicating the fourth-year clinical performance. The third-year clinical performance was the first to enter the regression; GPA and NBEO (Part1) were then added, followed by CT skills. The final model included all predictors under consideration. The model R , the R^2 change, and fitness of model change (F-change) are listed in Table 4. Results suggest that the third-year clinical group caused the largest proportion of the variance (R^2 change = $.143$). The contribution to the increase in R^2 by other predictors was

Table 1
Baseline Characteristics (Mean [SD]) in Three Clinical Groups

3rd-yr Clinical Performance Group	GPA	Total CT disposition	Total CT skills	NBEO 1	4th-year clinic grade
1	2.54 [0.356]	299.8 [34.07]	16.5 [2.43]	307.8 [69.73]	107.0 [4.34]
2	2.90 [0.508]	307.3 [28.09]	19.2 [4.14]	377.7 [102.88]	115.1 [6.06]
3	3.10 [0.438]	303.9 [23.22]	22.8 [3.48]	433.7 [105.0]	116.0 [5.03]
ANOVA (p values)	0.07	0.788	0.002	0.04	0.005

Note. p values less than or equal to $.05$ were considered statistically significant. CT, critical thinking.

Table 2
Correlations Among Predictor Variables

	GPA	Total CT disposition	Total CT skills	NBEO 1
GPA	1	0.07	0.45	0.89
Total CT disposition		1	0.15	0.02
Total CT skills			1	0.43
NBEO 1				1

Note. Correlations in bold are significant at the $.05$ level.

Table 3
Univariate Regression Analysis of 4th-Year Overall Clinical Evaluation Score

Variable in the model	Slope	R ²	p
GPA	3.516	0.08	0.015
NBEO1	0.016	0.07	0.021
CT Disp	0.046	0.04	0.085
CT Skill	0.337	0.05	0.050
Clinical Group	NA	0.14	0.005

Note. p values less than or equal to .05 were considered statistically significant. CT disp, Critical Thinking Disposition Test; CT Skill, Critical Thinking Skills Test.

Table 4
Regression Model: Relationship of Predictor Variable to Clinical Performance

Variable in the model	Model R	R ² change	F change	p
Clinical Performance Group	0.378	0.143	5.782	0.004
Clinical Performance Group , GPA, NBEO1	0.429	0.041	1.657	0.198
Clinical Performance Group , GPA, NBEO1, CT skills	0.433	0.003	0.353	0.555
Clinical Performance Group , GPA, NBEO1, CT skills, CT Disp	0.463	0.027	2.222	0.141

Note. p values less than or equal to .05 were considered statistically significant. See Table 3 for acronym definitions.

minimal and nonsignificant. Academic performance predictors (GPA and NBEO, Part 1) collectively explained 4% of the variance, whereas CT disposition and CT skills combined explained 3%.

Discussion

The results of the study suggest that the optometry school data analyzed had limited ability to predict fourth-year clinical performance. Clinical performance in the third year was the strongest predictor for fourth-year clinical performance. Those students who did poorly in third year were at risk for doing poorly in the fourth year. Students at risk need remedial intervention to address weaknesses and perform better. If students do receive appropriate intervention or are not in a receptive state of mind to accept the intervention, little change in performance can be expected. Alternatively, those students who have adequate skills in the third year can be expected to apply and

further develop their clinical skills in the fourth year. Although in this study, the association between the third- and fourth-year performances was significant, the variation explained by third-year clinical group alone was only 14.3%.

Overall, the variables alone or in combination demonstrated limited ability to predict final-year clinical performance. Several potential explanations for these results are as follows: Different factors were measured by the predicting variables versus those that were evaluated in clinical performance, and the unreliability of evaluations of clinical performance due to the subjectivity of the process and homogeneity of the student pool by the end of third year.

The predicating variables measured knowledge base, technical skills, problem-solving abilities, and a person's tendency to use a problem-solving strategy. The evaluations of clinical performance were based on technical skills, knowledge base, analytical skills, diagnostic skills, man-

agement and treatment, communication skills, efficiency, attitude, and professionalism. Although there was overlap between the predicting and outcome variables, the predicting variables did not take into account communication skills, efficiency, attitude, or professionalism. Several researchers have found that affective measures such as motivation, maturity, and disposition may be able to predict student performance.¹⁰ The predicting variables were not sensitive to all of the criterion areas that were used to evaluate clinical performance.

Clinical grades may provide inaccurate measures of actual clinical skills. Evaluations of clinical performance, although guided by a detailed rubric, have a subjective component. Personal attributes of the students such as maturity, personality, and enthusiasm may unconsciously influence the grading process. The ability to accurately assess the student's clinical performance across several different sites may also be influenced by variability in clinical sites, instructors,

students, and patients. These factors may affect clinical scores in a subjective and unpredictable way.

Each year, students must maintain an adequate GPA and clinic grade to remain in good standing within the institution. By the end of the third year of education, most of the students with significant weaknesses have been identified. The students are either dismissed or allowed to continue with remediation. Therefore, the homogeneity of the subject pool may have contributed to the lack of predictability of the variables.

Despite the lack of predictability of fourth-year clinical performance, this study demonstrates the need for aggressive and accurate clinical evaluations in the third year of education. Sources of inexactness in third-year clinical evaluations may involve limited patient encounters and lower expectations for the student clinician. Clinical educators also face the dual role of taking care of patients and educating students. Therefore, time and clinical obligations may hamper an effective evaluation system. In medical education, barriers to accurate clinical evaluations include lack of documentation, lack of knowledge of what to document specifically, anticipating an appeal or legal action, and lack of remediation options.²¹

Conclusion

Hierarchical multiple regression analysis reveals that third-year clinical performance was the strongest predictor of the fourth-year clinical grade. The other predictors studied did not add much information to account for the variability observed in

the students' fourth-year clinical performance grade. This study demonstrates the importance of accurate and timely evaluations in the third year of study. Additional studies are needed to find ways to quantify and identify factors that contribute to students' clinical performance in both the third and fourth years of education.

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