

# OPTOMETRIC EDUCATION

Volume 35, Number 2

Winter 2010

## ASSESSMENT METHODS FOR FINAL YEAR OPTOMETRY STUDENTS

### Also inside:

- World Wide Web: As Easy as 1.0, 2.0, 3.0
- Changes in Study Practices of First Year Optometry Students
- Is the Era of Private Practice Over?

# Association of Schools and Colleges of Optometry

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

## OFFICERS AND MEMBERS

### BOARD OF DIRECTORS

#### Executive Committee

#### President

**Melvin D. Shipp, OD, MPH, DrPH**  
Dean  
The Ohio State University  
College of Optometry  
Columbus, OH 43210-1240

#### President-Elect

**Earl L. Smith, III, OD, PhD**  
Dean  
University of Houston  
College of Optometry  
Houston, TX 77204-2020

#### At-Large Member

**\*Larry J. Davis, OD**  
Dean  
University of Missouri at St. Louis  
College of Optometry  
St. Louis, MO 63121-4499

#### Secretary-Treasurer

**Kevin L. Alexander, OD, PhD**  
President  
Southern California College of  
Optometry  
Fullerton, CA 92831

#### Immediate Past-President

**\*John F. Amos, OD**  
Professor  
University of Alabama at Birmingham,  
School of Optometry  
Birmingham, AL 35294-0010

#### Executive Director

**Martin A. Wall, CAE**

### BOARD MEMBERS

#### Arol R. Augsburger, OD

President  
Illinois College of Optometry  
Chicago, IL 60616

#### Linda Casser, OD

Dean  
Pennsylvania College of Optometry  
At Salus University  
Elkins Park, PA

#### Michael Cron, OD

Dean  
Ferris State University  
Michigan College of Optometry  
Big Rapids, MI 49307

#### H. S. Ghazi-Birry, MD, OD, PhD

Founding Dean  
University of The Incarnate Word  
School of Optometry  
San Antonio, TX 78209

#### David Heath, OD, EdM

President  
State University of New York  
State College of Optometry  
New York, NY 10036-8003

#### Elizabeth Hoppe, OD, MPH, DrPH

Founding Dean  
Western University of Health Sciences  
College of Optometry  
Pomona, CA 91766-1854

#### Dennis M. Levi, OD, PhD

Dean  
University of California at Berkeley  
School of Optometry  
Berkeley, CA 94720-2020

#### \*David S. Loshin, OD, PhD

Dean  
Nova Southeastern University  
College of Optometry,  
Ft. Lauderdale, FL 33328

#### Rod Nowakowski, OD, PhD

Interim Dean  
University of Alabama at Birmingham,  
School of Optometry  
Birmingham, AL 35294-0010

#### Andres Pagan, OD, MPH

Dean  
Inter American University of Puerto Rico  
School of Optometry  
Bayamon, PR 00957

#### Douglas K. Penisten, OD, PhD

Dean  
Northeastern State University  
Oklahoma College of Optometry  
Tahlequah, OK 74464

#### Richard W. Phillips, OD

President  
Southern College of Optometry  
Memphis, TN 38104

#### \*Hector Santiago, OD, PhD

Dean  
Midwestern University  
Arizona College of Optometry  
Glendale, AZ 85308

#### P. Sarita Soni, OD, MS

Interim Dean  
Indiana University School of Optometry  
Bloomington, IN 47401

#### Clifford Scott, O.D., MPH

Dean  
New England College of Optometry  
Boston, MA 02115

#### Jennifer Smythe, OD, MS

Dean  
Pacific University College of Optometry  
Forest Grove, OR 97116

*\*Past President*

### ASCO Affiliate Members

Dr. Jacques Gresset, Director  
University of Montreal Optometry  
Montreal, Quebec H3C 317

Dr. Thom Freddo, Director  
University of Waterloo — Optometry  
Waterloo, Ontario, Canada N2L 3G1

Ms. Pamela Happ, Exec. Dir.  
College of Optometrists in  
Vision Development  
Aurora, OH 44202

Mr. Robert Williams, Exec. Dir.  
Optometric Extension Program  
Foundation  
Santa Ana, CA 97705-5510

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

Dr. Jairo H. Gardia, Dean  
Universidad de la Salle  
Facultad de Optometria  
Bogota, Columbia

### Editorial Review Board

Editor:  
Elizabeth Hoppe, OD, MPH, DrPH

Associate Editor:  
Aurora Denial, OD, FAAO

ASCOTECH Coeditors:  
Dominick M. Maino, OD, MEd  
Geoffrey W. Goodfellow, OD

Communications Editor:  
David Damari, OD

Diane T. Adamczyk, OD  
John Baker, OD, MSc  
Etty Bitton, OD, MSc  
Nancy B. Carlson, OD  
Joseph B. Fleming, OD  
Michael G. Harris, OD, JD, MS  
Christopher W. Lievens, OD, MS  
Nada J. Lingel, OD, MS  
Gregory J. Nixon, OD  
Erin R. Nosel, OD, MS  
Jeffrey Nyman, OD  
Hector Santiago, OD, PhD  
Julie A. Schornack, OD, MEd  
Marlee M. Spafford, OD, MSc, PhD  
Mark Swan, OD, MEd  
Michelle Welch, OD  
Suzanne M. Wickum, OD  
Timothy Wingert, OD

VOL. 35  
NO. 2

## CONTENTS

WINTER  
2010

## The Journal of the Association of Schools and Colleges of Optometry

## FEATURES AND DEPARTMENTS

Industry News 47

Editorial: On Preparedness and  
Empowerment 50  
Aurora Denial, OD, FAAOGuest Editorial: Perspectives on  
Health Care Reform 52  
Elizabeth Hoppe, OD, MPH, DrPHThink Tank: Is the era of private practice  
over? Is entry into private practice a viable  
option for new graduates?  
How should optometric education  
respond? 53My Best Day in Optometric Education 62  
Richard London, MA, OD, FAAOASCOTech: World Wide Web as Easy as  
1.0, 2.0, 3.0 63  
Dominick M. Maino, OD, MEd, FAAO,  
FCOVD-A  
Geoffrey W. Goodfellow, OD, FAAO

Past issues of Optometric Education are available  
on the ASCO Web site at  
<http://www.opted.org/i4a/pages/index.cfm?pageid=3404>.  
Funding for archiving was generously  
provided by Transitions Optical.



## ARTICLES

Investigation of Assessment Methods for  
Final Year Optometry Undergraduate  
Students

Hannah Bartlett, BSc (Hons), PhD,  
MCOptom, PGCertEd, FAAO  
Mark Dunne, BSc, PhD, MCOptom  
David Anderson, OD  
Frank Eperjesi, BSc PhD MCOptom Dip  
Orth FAAO MHEA PGCertHE

A retrospective study designed to investigate the  
factors that influence performance in examina-  
tions comprised of multiple-choice questions, short-  
answer questions, and essay questions in an un-  
dergraduate population.

65

(Continued on page 46)



## The Journal of the Association of Schools and Colleges of Optometry

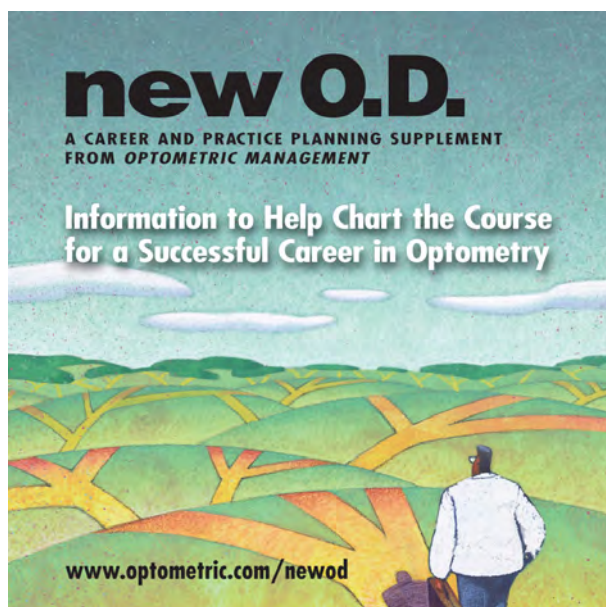
### Then and Now: Changes in Study Practices of First Year Optometry Students

Barbara McGinley, MA

Nancy B. Carlson, OD, FAAO

*A study to determine if first year students revise their undergraduate study methods to deal with increased volume and depth of material in optometry college.*

74



Cover design: courtesy of Kerri McTigue, Graphic Designer

*OPTOMETRIC EDUCATION* is published by the Association of Schools and Colleges of Optometry (ASCO). Managing Editor: Virginia Pickles. Graphic Designer: Kerri McTigue. Business and editorial offices are located at 6110 Executive Boulevard, Suite 420, Rockville, MD 20852 (310) 231-5944. *Optometric Education* is published three times per year. As of the Fall 2007 issue, *Optometric Education* is free to members and the general public. To access *Optometric Education* online, please go to [www.opted.org](http://www.opted.org). Postage paid for a nonprofit, tax-exempt organization at Rockville, MD. Copyright © 2010 by The Association of Schools and Colleges of Optometry. Advertising rates are available upon request. *OPTOMETRIC EDUCATION* disclaims responsibility for opinions expressed by the authors. Indexed in Current Index to Journals in Education (ERIC).

## INDUSTRY NEWS

The following companies support ASCO's national programs and activities benefiting the schools and colleges of optometry in the United States and Puerto Rico.

**Patrons**

**(\$50,000 - \$99,999)**

Essilor  
Walmart Stores, Inc.

**Benefactors**

**(\$25,000 - \$49,999)**

Alcon Laboratories  
CIBA Vision Corporation  
Vistakon Division of Johnson & Johnson Vision Care, Inc.

**Supporters**

**(\$15,000 - \$24,999)**

Carl Zeiss Vision  
Hoya Vision Care, North America  
Luxottica/EyeMed Vision Care  
M&S Technologies  
Transitions Optical, Inc.  
Vision Service Plan

**Friends**

**(\$10,000 - \$14,999)**

Abbott Medical Optics  
Allergan, Inc.  
Bausch+Lomb, Inc.  
Compulink Business Systems  
Genzyme  
Haag-Streit  
Keeler Instruments  
Marco  
Optos North America  
TLC Vision  
Volk Optical

**Contributors**

**(\$5,000 - \$9,999)**

CooperVision  
Marchon Eyewear  
Ophthonix, Inc.  
Optovue, Inc.  
Safilo Group  
Vision Source!

### **Alcon Acquires Ophthalmic Pharmaceutical Assets From Sirion**



Alcon will purchase the rights in the United States for two FDA-approved topical ophthalmic products from Sirion Therapeutics, Inc. The two products are Durezol, an ophthalmic corticosteroid approved for the treatment of inflammation and pain associated with eye surgery, and Zirgan, an antiviral for the treatment of acute herpetic keratitis. In addition to these products, Alcon also acquired the global rights, excluding Latin America, for Zycloin, a product that is currently in clinical development to treat dry eye and other ocular surface diseases.

### **OneSight Announces Dr. Stanley Pearle Scholarship Fund**



The OneSight Research Foundation announced a call for entries for the Dr. Stanley Pearle Scholarship Fund. Ten \$2,000 scholarships will be awarded in 2010 to students seeking a degree in optometry. Qualifying applicants are encouraged to apply. Deadline for applications is April 15.

The scholarship program is part of OneSight's focus on preventative eye care. This includes funding research to address eye health issues and investing in the next generation of optometric professionals through scholarships and education. View the application at <http://www.onesight.org>, or contact Trina Parasiliti at [tparasil@onesight.org](mailto:tparasil@onesight.org).

### **Luxottica Retail Launches Optometric Career Services**



Luxottica Retail, parent company of LensCrafters, Pearle Vision, Sears Optical, and Target Optical, has launched Optometric Career Services. The chief goals of Optometric Career Services are to inform optometrists, optometry students, and paraoptometric staff about career opportunities related to Luxottica, and to enhance collaboration with optometry schools and industry organizations to ease entry into the profession, and to facilitate practice development and transition for optometrists at each stage of their careers.

According to the company, the number of career alternatives for optometrists at Luxottica Retail and with other Luxottica-affiliated businesses is at an all-time high. Optometric Career Services will help optometrists find positions that are well-suited to their experience and career aspirations, including full-time or part-time employment with the company or with another doctor or group, franchise ownership, independent subleases, affiliation as a wholesale customer or EyeMed provider, and OneSight volunteer.

For more information, go to <http://luxretaildocs.com> or contact Luxottica Retail North America, Attn: Larry Long c/o Optometric Career Services Department, 4000 Luxottica Place, Mason, Ohio 45040; or Larry Long, Senior Director, Optometric Career Services at (678) 206-5673 or [llong@luxotticaretail.com](mailto:llong@luxotticaretail.com).

## **B+L Unveils New Logo, Launches Accommodating IOL**

### **BAUSCH + LOMB**

B+L recently unveiled its redesigned company logo and icon. According to the company, both incorporate hues of the company's traditional blue and green colors, while introducing the plus (+) symbol to represent the organization's strong commitment to innovation and partnership with practitioners as a leader in eye health. The new logo and B+L icon will be phased in over the next 18 to 24 months as product packaging and other materials are updated.

In other news, B+L launched the Crystalens Aspheric Optic (AO) Lens, the first aberration-free accommodating IOL with aspheric optics. The Crystalens AO has prolate aspheric surfaces and is designed to be free of spherical aberration. According to the company, it is designed to improve retinal image quality without compromising depth of field and, therefore, provides greater quality of distance and intermediate vision. For information, go to <http://www.crystalens.com>.

## **Ophthonix Launches Polarized Lenses**

Ophthonix recently launched customized iZon SL Polarized Lenses. As with all iZon Lenses, this lens is customized to the patient's optical fingerprint, or iPrint, that contains all 2nd to 6th order aberrations of the eye measured by the Z-View Aberrometer. The iPrint, coupled with the company's proprietary algorithm, is used to determine the best sphere-cylinder fit for the back surface of the iZon SL Polarized Lens. According to the company, this lens can address many of the vision challenges associated with higher-order aberrations, such as difficulty seeing in reduced contrast conditions, general lack of clarity around images at a distance, and shadows or double images. The iZon SL Polarized Lens is 1.6 index with premium scratch-resistant, antireflective and super-hydrophobic coatings. It provides 100% UVA and UVB blocking. It is available in gray and brown tints and can be ordered for single-vision and PAL wearers.

## **View Far Peripheral Retinal Tears With New Volk Lens**



A new option for detecting far peripheral retinal tears is the HR Wide Field from Volk Optical. A contact-type lens, the HR Wide Field requires a coupling solution within its contact area. Although adding a step to the examination, this lens allows you to clearly visualize retinal tears or lesions across the retinal surface to the ora serrata. It provides a panretinal view, which is not possible with a noncontact slit lamp or BIO lens, and a clear view of the entire retina, which is not possible with a 3-mirror lens that needs to be rotated. It is distortion-free across the entire viewing area. Viewing power with 0.50x magnification is contained in a low-profile, reduced-size housing to simplify manipulation of the lens within the orbit, especially with deep-set eyes.

## **Transitions Introduces Darker Everyday Lenses**



Transitions XTRActive lenses are the darkest everyday Transitions lenses available. They offer moderate darkness behind the windshield of a car and have a slight tint indoors. Like Transitions VI lenses, Transitions XTRActive lenses darken in ultraviolet light, however, they use different photochromic dyes that activate in the lower spectrum of visible light. This visible light activation allows the lenses to get darker in direct sunlight and to activate moderately in the car during the day. Unlike Transitions VI lenses, Transitions XTRActive lenses were designed to have a slight tint indoors. The new technology also has a gray tint with a slight green undertone to help eye care professionals differentiate it from Transitions VI.

Transitions XTRActive lenses will be available in March in a range of poly-

carbonate, Trivex, and 1.67 materials, and in single-vision and progressive designs. For more information, visit <http://www.TransitionsXTRActive.com>, which will be live in mid-February.

## **New Mini Loupes From Keeler**



Keeler's new Mini Loupes provide high resolution 2.5x magnification and weigh just 34 grams. Mini Loupes use the same antireflective coated Schott glass as Keeler's standard Galilean system. The loupes provide good visualization at a working distance of 34cm to 50 cm, while minimizing edge distortion. Mini Loupes are 26% lighter than the standard Galilean Loupes system, and they feature a flip-up hinge system for viewing and posture angle flexibility. The Loupes are attached to a metal mounting bar that ensures optical stability while in use.

All Keeler loupes are available on the Keeler Sport frame in a range of colors. The Keeler Sport frame can be worn over glasses, or a prescription can be incorporated into the supplied holder. For more information, go to <http://www.Keelerusa.com>; call (800) 523-5620; or contact your authorized dealer.



# Have you thought about the future of Optometry?

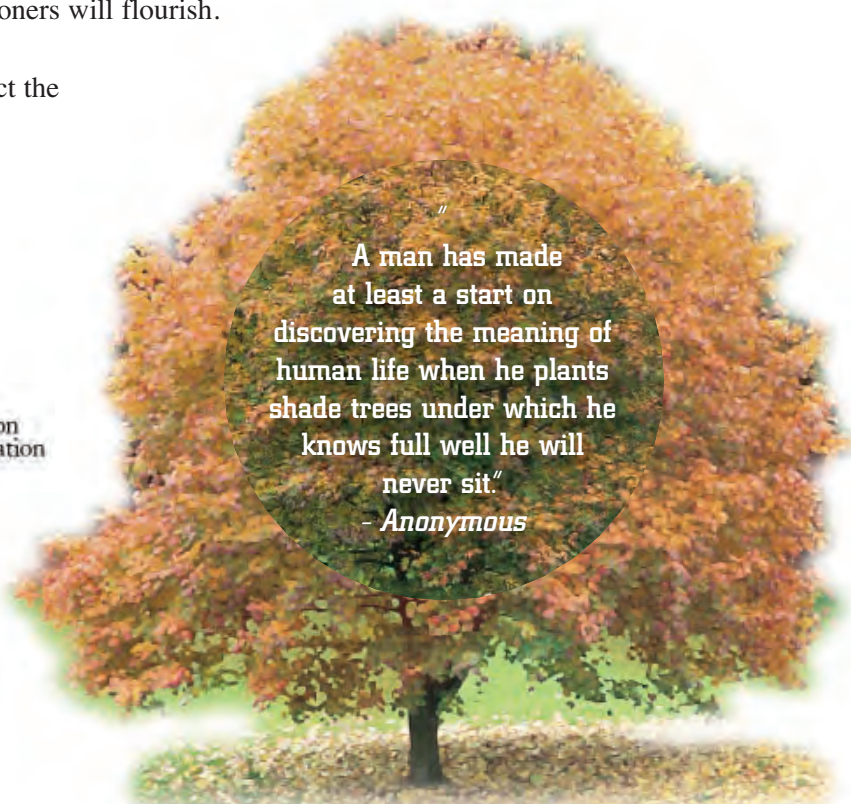
## We have!

The Partnership Foundation for Optometric Education is planting, cultivating, and nurturing. Together, this “true partnership” of state, regional, and national organizations is making a long-term investment in tomorrow. With the investment we make today in optometric education, future generations of practitioners will flourish.

For more information, contact the Partnership Foundation at [www.opted.org](http://www.opted.org) or 301-231-5944, ext 3018.



Partnership Foundation  
for Optometric Education



A man has made  
at least a start on  
discovering the meaning of  
human life when he plants  
shade trees under which he  
knows full well he will  
never sit.”  
- Anonymous

# EDITORIAL

## On Preparedness and Empowerment

Aurora Denial, OD, FAAO



In the United States, there are approximately 34,800 practicing optometrists.<sup>1</sup> Today, doctors of optometry enjoy a variety of practice modalities, including private practice, community health centers, hospitals, commercial establishments, industry, and academia, along with other options. The American Optometric Association estimated that, in 2008, 25%

of all optometrists were self-employed in private practice or with other health care professionals.<sup>2</sup> Practice opportunities are expected to grow 24% between 2008 and 2018.<sup>3</sup> This is due, in part, to the epidemiology of eye diseases and a growing population of baby boomers who value eye care. Additionally, 25% of all practicing optometrists are approaching retirement age, which will open up even more potential practice opportunities.

Each year, approximately 1,400 optometry students graduate from optometric institutions. Once these graduates have been granted a license in their desired state, they are ready to enter the job market. Have optometric institutions prepared graduates to be successful in any practice modality? All optometric institutions teach the required knowledge base and necessary clinical skills. They provide opportunities for upper-level students to be trained in a variety of specialty areas while experiencing a number of different practice modalities. Many institutions offer courses in practice management, public health, and electronic medical records to help prepare students for future practice. In addition, career centers at optometric institutions often invite alumni and guest speakers to present information about their practice modalities to provide role models and resources for students. Mentorship programs can be helpful in giving new graduates a link to the vast number of practice modalities available to them.

What qualities or skills are needed to be successful in a particular practice modality? I can hypothesize that for success in most practice modalities, graduates must be adaptable, motivated, confident, self-directed, able to accurately evaluate their skills and needs, and able to access and utilize available resources. Many of these characteristics are personal

qualities that must be possessed by the individual. Optometric institutions may be able to provide opportunities to develop and further expand these qualities. Self-directed learning, early clinical experiences, and clinical experiences, such as those provided through participation in organizations such as Volunteer Optometric Services to Humanity, provide opportunities for students to demonstrate independence, deepen their motivation, and build confidence. A student's level of confidence at graduation is one outcome of his learning and clinical experience.

To accurately evaluate if optometric education is preparing students for any type of practice modality, more information is needed. Educational research is needed to ensure that optometric education is meeting the needs of students and new graduates.

What skills are needed to be successful in each practice modality? What personal qualities are needed to be successful? Where do students develop the qualities and skills needed for success? Are those qualities innate or can they be developed? What experiences best prepare students? How do students learn best? Is it from course work, experiences, observation, or simulation?

This issue of *Optometric Education* explores some relevant themes to help us gain perspective on these difficult questions. In this issue, McGinley and Carlson acknowledge that demanding curricula are required to prepare graduates for entry-level practice and to enable students to pursue their preferred practice modalities. Their work explores the methods students use to cope with educational challenges through their choices in study techniques.

Bartlett and colleagues critically analyze assessment methods that ultimately determine a student's readiness for practice. Accurate methods of assessment are used to evaluate knowledge base, clinical thinking, and ability to integrate information. Students must meet certain educational criteria before they are deemed ready to practice. The design of examination material has potential influence on our outcomes measures.

Also in this issue, contributors to the Think Tank feature share their insights about one practice choice: private optometric practice. Are our students prepared, and what should we, as educators, be doing to help them pursue this option?





# EDITORIAL

---

## (continued)

Information will empower institutions. Institutions will then empower students, with the ultimate impact benefiting the patients our profession serves. In what practice modality will our students serve these patients, and will they be prepared? It is up to us to make it happen.

### References:

1. Bureau of Labor Statistic, accessed Jan. 30, 2010 at <http://www.bls.gov/oco/ocos073.htm>, modified Dec. 17, 2009.
2. AOA Web site.
3. Bureau of Labor Statistics, accessed Jan. 30, 2010 at <http://www.bls.gov/oco/ocos073.htm>, modified Dec. 17, 2009.

## INVITATION TO PARTICIPATE

### Implementing the Teaching of Critical & Clinical Thinking

The teaching of critical and clinical thinking has reached the forefront of educators in all fields. In most professions, including optometry, critical thinking as related to clinical decisions and patient care is a specific outcome of the educational process.

In recognition of these educational outcomes, many optometric institutions have initiated courses dedicated to teaching critical thinking, clinical decision-making, and integration of knowledge. In the spirit of the scholarship of teaching and learning, *Optometric Education* would like to announce a future theme edition, which will focus on courses designed to achieve the goals of teaching critical thinking, clinical decision-making, and integration of knowledge. We invite all educators involved in these courses to participate in the theme edition. We are sending out this invitation early to allow for adequate time to design appropriate evaluative or interventional studies. The theme edition is tentatively scheduled for Fall 2010 and the deadline for submissions is Aug. 1, 2010.

The scholarship of teaching and learning is a “deep curiosity about how, when, where, and why people learn and how best to teach to create optimal learning opportunities.” For additional information on this concept, go to [http://academics.georgiasouthern.edu/cet/sotl\\_info.htm](http://academics.georgiasouthern.edu/cet/sotl_info.htm).

Accepted manuscripts will include: innovative teaching methodologies, course description and assessment, research on how, when, and why students learn about clinical thinking, or teaching interventions that increased learning.

For additional information on the theme edition contact Dr Aurora Denial, Associate Editor, [deniala@neco.edu](mailto:deniala@neco.edu).

# GUEST EDITORIAL

## Perspectives on Health Care Reform

Elizabeth Hoppe, OD, MPH, DrPH



**T**he ultimate structure and potential impact of health insurance reform legislation remains uncertain. And we know from the sage philosopher, Yogi Berra, that “It’s tough to make predictions, especially about the future.” So instead of making predictions or discussing a snapshot of current legislative initiatives, I will take this opportunity to share some of the work

being done to frame the “ideal future” of a health care system. Many of us in optometric education are accustomed to approaching complex problems with optimism and idealism, so keeping our eyes on the best and most desirable future can serve as a valuable guide.

I would like to share the perspectives of two national associations, both of which are dedicated to improving and protecting the health of the public, while supporting collaboration between health disciplines. I am proud to say I am a member of both organizations. I find the information I receive from the associations to be extremely helpful, and I would encourage every optometric educator to learn more about what these organizations offer.

The first perspective comes from the National Academies of Practice (NAP). The NAP is an interdisciplinary organization of health care professionals representing ten disciplines. The NAP’s mission is to serve as distinguished advisors to health care policymakers in Congress and elsewhere through the development of public policy papers, interprofessional dialogue, and interprofessional forums. Through its analysis process, the NAP has put forth a recommendation for an accountable, coordinated health care system that promotes and supports a variety of health care professionals in providing integrated, patient-centered health care and optimal health care outcomes across all care settings, types of care, and throughout a patient’s lifespan.

The NAP has several recommendations regarding the steps necessary to achieve an accountable, coordinated health care system in the United States. Most relevant to optometric education are recommendations for federal investment in “cross-professional” training within health professions schools and through graduate internships and the development of interdisciplinary teams.

The second perspective comes from the American Public Health Association (APHA). The APHA is the oldest and most diverse organization of public health professionals in the world and has been working to improve public health since 1872. The APHA represents a broad array of health professionals striving to promote the scientific and professional foundation of public health practices and policy. The Association has 27 primary sections that represent major public health disciplines or public health programs, including vision care professionals.

Through its analysis and advocacy processes, APHA also has developed recommendations for health care reform. APHA’s policy states that we must ensure coverage for quality, affordable health care for all, emphasizing that this means covering the more than 46 million individuals who are uninsured, while also improving the quality and safety of the health care system, and building a modern health information infrastructure.

The association makes a number of recommendations for reform, including several that have the potential to impact optometric education. The APHA asserts that health reform legislation must significantly increase support and funding for programs that provide loan repayments, scholarships, and other grants for the training of public health personnel, primary care physicians, nurses, and other health providers. It must also improve the distribution and diversity of health professionals in medically underserved communities, as well as ensure there is a capable health workforce able to provide care for all Americans and respond to the growing demands of our aging and increasingly diverse population.

I don’t know what to expect as we continue to observe the legislative process, but I do know I have the opportunity to stay informed about what is happening in Washington. And I also have the opportunity to work toward a brighter future, where we are able to make these recommendations a reality through our ongoing interprofessional collaborations here at WesternU.

## *“Is the era of private practice over? Is entry into private practice a viable option for new graduates? How should optometric education respond?”*

**T**he era of private practice is not over, far from it. Reward and success will follow calculated risk, and this idea is a powerful motivator.

Reward and success is personal, but it can be whatever you want it to be. Many opportunities will be available for new or recent graduates, but it is their responsibility to seek out these opportunities.

Entry into a private practice situation is absolutely a viable option for new or recent graduates. It simply depends on the opportunity or situation, and this may take many different paths. The beauty of joining an existing practice as an associate, partner, or owner is the established patient base. This simply creates stability and an opportunity to make positive changes. Starting out “cold” has obvious pitfalls and challenges, but without question, it has a high reward and success potential, and yes, it can still be done.

Any private practice situation will not provide success overnight. Just like making a long-term investment, it will take research, good decisions, hard work, time and, most importantly, patience. The first opportunity may not be the “dream job,” but at minimum, it is still a valuable learning experience.

Optometric education is available to provide knowledge and tools to allow for informed choices about modes of practice. We are able to capture students early in their optometric career and discuss these options. The attempt is made to get them excited about their choices and move them in the direction that best suits them. Every step of the way, there are mentors to offer advice.

I currently have the unique luxury of practicing optometry in a dynamic situation that balances academics and private practice. It was after I completed a residency in ocular disease that I joined Southern College of Optometry to hold a full-time faculty position. During this time, I continued to work part-time in an optometry-oriented comanagement surgical center. I later joined a large progressive practice as an associate, but left to start my own private practice with Dr. Jared Powelson almost seven years ago. I still proudly hold a full-time associate professor appointment at Southern College of Optometry, where I split time between patient care, teaching, administration, and private practice. All of these past and current experiences have provided me with the knowledge and clinical skill to be successful.

---

Michael Gerstner, OD  
Associate Professor, Southern College of Optometry  
Chief, Advanced Care Ocular Disease at the Eye Center  
Partner, Midtown Eye Care  
Memphis, Tenn.



## Think Tank ...

I was in private practice optometry for 25 years, and I am currently a full-time faculty member at Western University of Health Sciences, College of Optometry in Southern California.

I do believe that entry into private practice is still a viable option for our new graduates; however, I also believe the face of private practice will change in the near future. The focus of private practice in the past has been materials first and professional services second. In the future, it will need to be professional services first and materials second.

I envision the era of solo practitioners will end, and the era of group practices of optometrists and multidisciplinary group practices will be the mode of practice in the future. The cost of new, technologically advanced optometry equipment is prohibitive for our optometry students, most of whom have student loans, to consider opening a new solo private practice.

Optometric education will respond with an emphasis on residency training, clerkship and externship clinical experiences for optometry students in multidisciplinary settings, and practical practice management courses that encourage skills that lead to successful placements for optometry graduates in group practices and multidisciplinary clinics.

Kristy Remick-Waltman, OD, FCOVD  
Director of Community Outreach and  
Assistant Professor  
Western University of Health Sciences  
College of Optometry

*The era of private practice is not over. Although competition from ophthalmology and corporate optometry make it challenging to maintain a viable private practice, I feel the right entrepreneurial types can be successful in small or medium-sized practices. There are many resources today to help the private practitioner compete. Industry-sponsored programs, one-on-one consulting, and even journal columns can give practitioners strategies to better compete in a difficult market.*

*The optometry schools are also developing programs to enhance practice management skills for their students and alumni. Southern College of Optometry has the Hayes Center for Practice Excellence, and Nova Southeastern has an Optometric Practice Enhancement Program, which hopes to support independent practitioners. The schools can do more, however. More emphasis on practice management, especially in the latter half of the curriculum, in small group discussions and practice settings can help make the topic more relevant to students preparing to strike out on their own. Working in well-run private practices as a requirement over summers or even before entering school may also be beneficial.*

*In the end, a graduating optometrist who has the interest, motivation and communication skills to take on private practice can find the resources and support from other practitioners to succeed in today's market.*

Ronald Watanabe, OD  
Associate Professor of Optometry  
New England College of Optometry

---

I believe private practice is a viable option for recent or new graduates for several reasons. I have tried several different types of optometric practice. I worked for four years in a corporate-owned comanagement center, where I also completed a fellowship. I worked for three years in an established practice as an associate optometrist with the hope of buying the practice. I have done fill-in work at several practices, including commercial settings. I am currently an assistant professor at the Southern College of Optometry on a part-time basis. Dr. Michael Gerstner and I started our practice from scratch six and a half years ago.

I learned countless lessons in these different modes of practice. I have seen qualified ODs try to set their own fees in a commercial setting. Because these individuals refused to participate in a commercial marketing plan that provided for inexpensive eye exams, their lease was taken away from them. As an associate optometrist in an existing private practice, I learned the necessity of getting a detailed written contract for buying into a practice before beginning work. Otherwise, six months turns into three years with nothing to show for it.

Most of all, I learned two things. First, I like having control of how I practice optometry. Dr. Gerstner and I can charge what we think our time is worth, instead of charging what a corporation thinks our time is worth. We determine how many patients we

can see per hour while maintaining the highest quality of care. Second, I learned that as an employee, your earning potential will always have an upper limit. As a practice owner, the only limitations are those that you impose on yourself.

For these reasons, I still see private or group practice as a viable option for recent graduates. We had no problems getting start-up loans for our new practice. There are several companies that specialize in providing loans for health care practices. The equipment that is purchased in an optometry practice serves as collateral for the loan.

My only regret about my work experience is that I had to rebuild my patient base at least three times. Every career move I've made has given me invaluable experience: primary care optometry, tertiary care optometry, employee management, billing and coding, accounting and business practices, frame adjustment and repair, etc. However, because the places I've worked are geographically separate, I had to build my patient base again mostly from scratch. In many ways, I wish I had gone ahead and opened a practice straight out of school.

*Jared T. Powelson, OD  
Assistant Professor, Southern College of Optometry  
Partner, Midtown Eye Care  
Memphis, Tenn.*

Think Tank ...

### Is the era of private practice over?

I do not think that private optometric practice will ever be over. Patients continue to need eye care, and private practitioners can deliver it to them at a very high level. I truly believe "value" still motivates people, even in the current managed care environment. If a private practitioner is able to provide a level of care and service that their patients will value, then these patients will continue to return to the private practice. Health care decisions are often driven by cost, but service and quality still play a significant role. Private practice optometrists need to demonstrate the value in their services to every patient.

Optometry is unique in that it combines medical care with retail sales. Very few professions have these two sources of income. Many health professions try to incorporate retail sales into their practices. For example, dentists often sell home teeth-whitening systems, chiropractors sell special pillows, physical therapists sell vitamins/nutritional supplements, and the list goes on. All of these health professionals are looking for an additional income stream as their professional reimbursement rates have declined over the years. Only optometry has the unique capability of prescribing a device and then selling that device to the patient. In my years in private practice, I saw my patient base transition from 80% private-pay patients to 80% third-party patients in just 10 years. With proper study and strategizing, however, I was able to maintain my net income at a comfortable level, largely due to my management of optical sales.

Another new consideration for optometry will be the impact of health care reform in the United States. If the President and Congress do pass a wide-ranging law that provides increased access to health care but at much lower reimbursement rates, all physicians' net income will suffer. Private practice optometry, however, will have protection from this decrease in professional fees because of the retail side. I have confidence that optometry will fare well. In fact, if the government looks closely at cost and access to care, optometry stands to gain a larger patient base. Many "doomsday" pundits are out there, but some ODs are predicting that health care reform will provide increased income for private practice optometrists. Their logic is based on the concept that in the health care reform era, more patients will have insurance to help them pay to have their eyes examined by optometrists, but they will not have insurance to pay for eyewear. Therefore, as patient volume increases, private pay optical sales also will increase. I think this stream of logic is a bit premature, considering no one knows what will emerge from Washington, D.C., but I do remain optimistic about the future of private practice optometry.

### Is entry into private practice a viable option for new graduates? Why or why not?

I believe entry into private practice is a viable option for new graduates. I study student debt each year, and I am fully aware of the significant financial responsibilities our new graduates face, but I still believe in private optometric practice. Specifically, I believe in the model of a young graduate buying an established practice. If a young OD is able to obtain owner financing from the seller (something all sellers should agree to if they really want to sell!) or has some external financial backing, buying a practice is a great option, in my opinion. When you buy an established practice, you buy an income stream. Opening a practice cold does not provide this important daily income. For example, if a young OD buys a prac-

tice for \$350,000 and has a monthly debt service of \$4,500, he can manage it if the practice is viable. For a practice to be worth \$350,000, its gross income could be estimated to be \$600,000 per year. This means the daily income for this practice is approximately \$2,500 per day. Therefore, in two days of work, the young OD would generate enough income to manage the monthly debt service. This would not occur if a young OD borrowed \$350,000 to open a new practice. His income the first month might not reach the \$4,500 monthly debt service, and without significant financial back-up (operating capital), the practice may fail.

### How should optometric education respond?

At Nova Southeastern University College of Optometry, we responded to the changing practice environment in a variety of ways, but all of them are aimed at increasing our students' knowledge of the business aspects of optometry. For example:

- The main practice management courses are taught toward the end of the curriculum (third and fourth year), so students will see more relevance in the material being presented.
- We switched to a team approach, with three faculty members teaching the practice management courses. All three faculty members have advanced business degrees and experience in private practices prior to teaching.
- We begin discussing educational debt during the first days of orientation, and we reinforce the importance of minimizing the amount of money students borrow each year.
- We instituted an Individual Plan for Success project, whereby each fourth year student calculates his total indebtedness and looks at the best ways to manage this debt. Through a series of lectures, the students are exposed to different methods and ideas for maximizing practice success and growth.
- We formed a partnership with the H. Wayne Huizenga School of Business and Entrepreneurship at Nova Southeastern University, where our rising fourth year students can take a 1-week (40 classroom hours) intensive course in business management taught by the executive education faculty of the business school.
- We stress proper coding of all procedures and diagnoses. The use of electronic medical records has aided in this area by counting the components of each patient visit and suggesting the proper coding level.
- We formed the Nova Optometry Practice Management Association three years ago as an official student organization. With more than 100 members, this club explores aspects of practice management on a monthly basis by inviting expert speakers to present to this organization.

The environment and business of optometry has changed over the past decade, but our profession is still strong and viable. With good education, hard work, and an entrepreneurial spirit, private optometric practice will continue to be a great opportunity for new ODs.

Michael Bacigalupi, OD, MS, FAAO  
Assistant Dean for Student Affairs  
Nova Southeastern University College of Optometry



The practice of optometry has evolved into a mix of private practices and corporate type practices. The number of private practices along the South Shore in Massachusetts has remained stable for the last 20 years, with one to three practices per town. In Plymouth, we opened a new practice in December 2007, and the business showed a profit for 2009. Patients will go to a practice that offers quality eye care and excellent customer service. This is one of the keys to a successful private practice.

The entry into a new private practice by a new graduate is possible but unlikely, because realizing a profit normally takes two to five years. If the graduate could enter an established practice and be mentored by a seasoned optometrist, this would give the new graduate the best chance of owning his own practice.

*US News & World Report in December listed "optometrist" as one of the best careers of 2010. This outlook is due to the increasing elderly population and improvements in eye care technology, predicting 8,500 new jobs for the profession from 2008 to 2018.*

*From the student's perspective, the practice of optometry is a profession and a business. The profession of optometry allows one to evaluate and treat the visual system relative to the whole body and its surrounding environment. The business of optometry allows one to make a living while effectively evaluating and treating this visual system.*

*What are a student's options upon graduation? Mode of practice possibilities include: hospital-based optometry, corporate or commercial practice, independent private practice, ophthalmological and/or optometric association, government affiliation, such as the military, Veteran's Administration or Indian Health Service, advanced training in a residency program, or teaching at a school or college of optometry.*

*In July 2009, Review of Optometry reported that approximately two-thirds of 2009 optometry graduates surveyed by Practice Advancements Associates would prefer to go into private practice, with the ultimate goal of owning or co-owning their own practices. Seventeen percent expected to be employed in a corporate setting.*

*The perceived advantage of private independent practice is control. This includes control of the range of services and the scope of practice, as well as fees, hours, policies, personnel, and overhead expenses for equipment, technology, stock, supplies, etc. The perceived advantage of corporate or commercial practice is immediate, significant income with employer-supplied benefits and organizational support. This usually means guaranteed, contracted income with minimal investment, overhead expense, and control.*

*Independent private practice was considered the desirable option by most students upon graduation. In addition, the increasing specialization of optometric practice is also attracting graduates to private practice optometry. Optometric specialty practices include: general practice, low vision, pediatrics, geriatrics, sports vision,*

*The substantial debt that most new graduates owe may preclude the above possibility. These graduates may have to work in corporate optometry to pay down their debt before entering the private practice arena.*

*Optometric education needs to prepare our graduates for all of these possibilities by offering business management courses and rotations in private practices. Within these business courses, students should learn how to determine if a region can support a new optometric practice and how to evaluate an optometric business for purchase. Students need to learn the ins and outs of optometric practice management, such as hiring staff, managing the books, and purchasing products that they will market. This should help ensure that our graduates will succeed in the private arena.*

*James Mertz, PhD, OD  
Assistant Professor of Optometry  
New England College of Optometry*

*contact lenses, vision therapy, ocular disease, behavioral optometry, and developmental optometry. Independent private practice also can have a corporate or commercial affiliation.*

*Even though private practice is the preferred choice, the driving force of substantial debt – some still left over from undergraduate studies – typically prompts the new optometrist to explore, at least temporarily, commercial or corporate employment to pay down this debt or as supplemental income while also developing a solo private practice or association. Debt incurred while in school can easily reach \$200,000.*

*Since time immemorial, graduates have reported they are well prepared for the clinical and practical aspects of optometry, but poorly prepared in the business, financial, and management aspects of practice. What is needed and what students require is a strategy to develop an understanding of how to manage debt while at the same time developing their ideal practice, no matter which mode of optometric practice they choose.*

*The challenge of optometric education is to provide students the necessary business skills and financial training to succeed in practice. This should include, at a minimum, the art of the business proposal, practice location, renting and leasing, office floor planning, hiring and firing practices, marketing, equipment, office supplies, office manual, practice promotion, Web design, contract law and, most importantly, a long range plan.*

*At Western University College of Optometry, students experience optometric practice in their first year with community outreach and clerkships at private practice locations. Early experience in optometric practices combined with business management education and exposure to all types of practice during the entire educational process is necessary to help formulate a true business sense that complements the students' clinical skills. It is probably time to consider that pre-optometry advisors at the undergraduate level recommend additional business coursework that would create a foundation for the business side of professional practice. Would business courses added as prerequisites at the undergraduate level also be a helpful option?*

---

*Donald J. Egan, OD, FAAO  
Western University of Health Sciences*

**D**uring my time in optometric education and practice, I have observed changes in students' attitudes toward private practice. In this time, I have seen private practice being basically the only choice, corporate commercial practice being the necessary choice, and, finally, a swing back to private practice.

In the 1970s, the concept of corporate practice was not well defined nor was there active recruiting. This was a time when tuition for optometric colleges was not overwhelming. Working part-time while going to school was doable. Coming out of optometry school with a manageable debt made private practice attractive, as well.

Optometric education changed in the 1980s and 90s, reflecting the increase in optometric usage of medical diagnostic and therapeutic procedures, as well as pharmaceuticals. These two aspects changed optometric education and the direction of the profession. The 1980s and 90s also saw a tremendous increase in tuition to optometric colleges, as well as an increase in tuition at undergraduate colleges and universities. Graduation from an optometric institution with significant debt was the norm, and because of increased academic and clinical time while in school, fewer students were able to work outside of the academic program. I believe this aspect of increased debt load was a major contributor to the lack of interest in private practice.

In the 1980s and 90s, the optometric profession was not, and to a certain extent is not now, prepared to have established practices take on partners at an income level necessary for the new graduate to survive economically. This holds true for the outright sale of a practice at an initial price that would allow the new graduate to survive economically. A practice management strategy program that would allow the new grad to integrate into an established office without disruption, and maintain a steady flow of established patients was not available.

The optometric graduate of the 1980s and 90s found it necessary to seek a professional position with relatively high, stable income to allow the repayment of debt as well as live. Optometry school debt was as high as \$1,500 per month for approximately a 15-year commitment. This 15-year period was a good portion of a new practitioner's creative and productive professional life. Starting a private practice after 15 years of corporate practice would be challenging. There was more comfort in having no responsibility for the business end of the optometry practice; therefore, private practice produced very little reward for increased risk.

The 1980s and 90s produced a tremendous increase in women optometric students and, therefore, practitioners. At the time, the general female perspective on private practice was not favorable. Marriage and the responsibility of raising a family were priorities after graduation, and the commitment to private practice was not perceived as possible or practical. Many women graduates from this time wanted to practice

their optometric skills without the burden of the business side of the profession and, therefore, worked part-time, usually in a corporate setting. When the professional day ended, there was no need to look at the business side. The practitioner could simply go home at the end of the assigned time and leave the professional day at the office. There was also the ability to work flexible hours during the day or evening, with some control over the schedule. These individuals had little incentive to go into private practice because the corporate setting offered income virtually without risk.

A certain percentage of graduates during the 1980s and 90s feared owning a business and decided to work for someone else. This someone else could worry about the business side of the practice. Until recently, many optometric practice management courses did not recognize this fear of business in the course structure. This compounded the problem by possibly discouraging individuals from going into private practice.

Looking at a list of the business knowledge base necessary to go into private practice, it becomes clearer why many decide not to go down this path. Here is a basic list of necessary items that can intimidate a new practice owner:

1. **Contracts.** Contracts of any type – with established practices, contractors, and landlords – can be intimidating. How do you find a good attorney?
2. **Practice location.** The practice owner must understand the traffic flow, as well as the needs and wants of those who will be served professionally in the selected location.
3. **Insurance.** Navigating the complexities of insurance can be daunting. The many details that challenge practice owners include:
  - a. Understanding insurance and how to bill insurance for procedures that are performed
  - b. Understanding the types of insurance that may have limitations for optometry
  - c. Training someone in the office to file insurance claims and how to handle insurance questions.
  - d. Deciding which insurance plans to accept
  - e. Understanding Medicare and all government assistance programs
  - f. Making sure to apply for all provider codes, licenses, and PINs.
4. **Legal responsibilities.** This includes all liabilities, not only professional, such as laws governing access for the handicapped, fire and building codes, parking, etc.
5. **Equipment selection.** This includes equipment for the business side as well as the professional side.

6. **Physical aspects of the practice.** This includes providing a comfortable atmosphere; looking at lighting, water availability, and electrical needs; possibly hiring a professional to design the office to meet your needs and proper trades people to perform the work to code.
7. **Demographics.** The practice owner must learn the vision-correction and eye health needs and wants of patients in the practice location.
8. **Ophthalmic partners.** Finding a quality ophthalmic laboratory that can supply all materials to the necessary specifications in a timely manner is important to a practice's success.
9. **Inventory management.**
10. **Record-keeping.** This includes designing forms, as well as choosing and staying current with an electronic health records system.
11. **Professional and material pricing structure.**
12. **Hiring staff and delegating duties and responsibilities.**
13. **Managing salaries and benefits.**
14. **Taxes.** Practice owners must comply with all laws related to federal, state, and local taxing entities, as well as workers' compensation, 401(k) plans, etc.
15. **Advertising and promotions.**
16. **Cash flow.** This includes deciding whether or not to accept credit cards and then which cards to accept.
17. **Community service.** Getting out in the community and becoming involved can occur through local clubs and organizations, as well as through schools and local industry.
18. **Retirement planning.**

My observations suggest another change in attitude toward private practice during the last decade. The optometric knowledge base is still expanding exponentially as it did in the 1980s and 90s, and the debt upon graduation from an optometric college is the same or higher. The biggest change is that students today seem to feel more comfortable with their debt load. Today's students look at the track record of their predecessors and know survival and success is the norm. These new graduates simply have adapted to living with debt. Today's students are asking questions of private practitioners and deciding that this form of practice has some definite advantages. The thought of being in control of the practice environment through private practice has become an exciting challenge, and I believe it will gain in popularity, with more individuals becoming successful. Having to add debt to open a private practice still has a sobering effect, but with proper planning and knowing what to expect, the prospect of control is becoming the norm. Today's students are tougher

mentally when it comes to debt and debt management. Part of this is because the colleges of optometry have recognized the need to inform prospective students of what the debt load will be after four years of postgraduate study, and they are offering the strategies necessary to manage the debt. Planning from day one of optometry school has empowered students so they can be in control of their debt. This control and the debt management strategies have started a new thinking toward private practice. The control factor will allow students to enter into private practice and reap the rewards that are there.

To take this control factor to its highest level, the colleges of optometry need to prepare students for private practice, not only in professional knowledge base, but also the strategy of business. The goal should be not only to handle a patient's health, but also to handle the economics involved. The following is a proposal that may encourage students to enter private practice.

## Colleges of Optometry

1.
  - a. Take an active interest in students' mindset of life after school.
  - b. Bring in "real world" encounters in the lecture hall.
  - c. Bring in clinical corollaries to the academic world that make private practice a viable route.
2. Make available to new and recent graduates a mechanism for success in private practice. Make faculty with expertise in practice and business management available to new and recent graduates who are looking at the private practice sector. This would include help with:
  - a. Reading contracts
  - b. Selecting a location
  - c. Hiring and training office staff
  - d. Ophthalmic frame considerations
  - e. Building a business model for the individual and the individual practice setting.
  - f. Help with interpreting data that enters into the business model and how to read and adjust the business model.

Colleges of optometry should offer these services at no charge and consider them part of the academic knowledge base, applied after graduation. Faculty members should be compensated by the college for these services, as well as all associated travel expenses. Each faculty member should be available for follow-up visits to monitor progress. Experienced alumni who serve as mentors to the new private practitioner can supplement this process.



The benefit from this would be an increase in the private practice sector of optometry, a sector that has been overlooked for many years. The colleges of optometry can make the integral and determining factor in helping graduates choose private practice to apply their expertise. The indirect benefit may be in successful private practitioners supporting and giving more monetarily to their institutions.

3. Business management courses taught at the colleges of optometry need to look at partnering with business schools for complete business education.
4. Business management must be taught in all segments of the curriculum, especially in clinical encounters. The cost of tending to a patient's needs should be discussed at each clinical encounter.

## American Optometric Association

The AOA leadership must do more to encourage private practice. At the very least, they should work with the colleges of optometry in making their practice management gurus available to new graduates at no cost to the graduate or the institution. Those AOA members who have expertise in practice management must take an active role in the success of the profession in the private sector by making their time and knowledge available to the new or recent graduate who is entering private practice.

## Ophthalmic Industry

The ophthalmic industry has many resources that can be used for the new graduate going into private practice. These resources need to be used without the expectation of monetary gain. The industry as a whole must set aside its differences and competition and join together to help new graduates in private practice. This sounds idealistic, but it is necessary that the entire ophthalmic community join forces with a common goal, helping those who will support the industry in the future. Industry sponsors must be willing to aid the new practitioner who is going into private practice by:

1. Help to defray the cost to the colleges and the AOA as they provide the necessary experts to consult at no charge with the new graduate who is going into private practice.
2. Provide equipment at reduced cost, at least during the first few years of practice.
3. Provide frames on consignment until the practice can sustain an inventory of frames on its own, or at least provide frames at a reduced cost.
4. Provide professional frame counseling as to the types of frames that would fit the practice philosophy.

5. Provide ophthalmic lens services at a reduced cost initially, and provide consultation services to new private practice practitioners.
6. Provide at no charge or at a significant reduction, service contracts for equipment. Also, provide loaner equipment, at no charge, for equipment in need of repair.

The private practice of optometry never went away, it just wasn't economically available. Private practice is not for everyone, but I believe many young practitioners would enter private practice if optometry allows it to happen. We are all in this health care field together, and it is our duty to make sure every one of us has an opportunity to be successful in our chosen mode of practice.

*Neil R. Hodur, OD  
Illinois College of Optometry*

# My Best Day in Optometric Education: And I Wasn't Even Present

Richard London, MA, OD, FAAO



**F**ive years ago, my teaching career entered a new phase. For the first time, I had the unique privilege of teaching in all three years of our didactic academic program, as well as the fourth year clinical program.

Teaching in each year of the curriculum, from the entering class's first semester through graduation, allowed me to see the remarkable development of the nervous first-year students, who wonder if they can get through the demanding program, to confident competent clinicians. Seeing them and their families during graduation is always a high point for educators, but it means even more to me now that I have followed them through the whole of their optometric education.

As in most optometric programs, we begin in the first year by emphasizing basic knowledge and tools while simultaneously introducing integration. While the students progress in school, the integration of accumulated knowledge and application to clinical situations takes a more central role.

My first lecture of an entering class's first semester begins: "You are no longer students. You are doctors-in-training. This requires a different frame of mind, concentrating on what is needed to care for patients rather than simply learning to pass tests." This message holds – at least until they approach the first exam. By the third year, however, they get it.

They are truly becoming doctors.

A second message I give the students (which some have named London's axiom) is: "Accept the fact that if you can't apply it, you don't know it (at least not well enough)." The intention is to encourage them to take responsibility for their education and recognize the impact that errors can have on patient care.

All this leads to an example of my best day as an optometric educator. Our goal is to develop excellent and self-sufficient clinicians, with a strong knowledge base and the ability to integrate that information to provide quality patient care, with the knowledge to make the proper diagnosis and the confidence to stick by it when challenged.

Ironically, my best day in optometric education happened when I wasn't even present. I was lecturing out of state, and a colleague filled in for me. A patient was referred to our clinic with the diagnosis of esohypotropia of the left eye. The preceptor agreed with this diagnosis. One of my interns, however, remembered to check the alignment in different positions of gaze and compare those findings with her ocular motility findings. She said, "I don't think the problem is in the left eye at all, nor is it an esotropia. I think this patient has fixation duress and the real problem is a superior oblique palsy of the right eye."

Although doubtful, the preceptor listened as the intern explained that fixation duress occurs when a patient has a dominant or preferred eye that he chooses to use for fixation, even though that eye may have some disadvantage, such as a muscle paresis or fibrosis. The patient, therefore, fixates under muscle duress. This can confuse a clinician who, for instance, expects the result of a stroke to be a left esotropia, yet the patient presents with a right esotropia. In

this case, the patient preferred to fixate with his right eye, even though a superior oblique palsy was present. The result was that the left eye appeared hypotropic. Over time, the phoria also manifested and the eso became obvious.

Childhood photos of the patient confirmed he had a marked left head tilt to compensate for the right superior oblique palsy. The good news was the patient's prognosis improved with the new diagnosis of a superior oblique palsy with compensating head tilt. With proper treatment, he now had a chance to reclaim binocularity.

When my colleague told me about the case later that week, he was clearly impressed. So was I – and proud. What could be better for an educator than to hear about an intern who could remember what you had taught her didactically, then apply it to a difficult case – of a type she had never seen before – make the correct diagnosis, and have the courage to defend it.

*Dr. London is a professor at Pacific University College of Optometry.*



# ASCOTech: World Wide Web as Easy as 1.0, 2.0, 3.0

Geoffrey W. Goodfellow, OD, FAAO  
Dominick M. Maino, OD, MEd, FAAO, FCOVD-A

As educators, we are all familiar with the World Wide Web. Some of us have been plugged in since its beginning in the early 1990s. The dot-com world is now so pervasive that it is hard to imagine there was a time pre-Google.

Recently, you may have noticed a lot of chatter about Web 2.0 and its role during your surfing experiences. There's also been a great deal of discussion about how Web 2.0 tools can serve the educational environment, as well. If you're thinking, "I don't even remember Web 1.0," then you're not alone.

Web 1.0 is a retronym that describes the original World Wide Web experience of flat text on static Web pages. Those were the days of dial-up connections to the Internet and an era dominated by Netscape. Web 1.0 was not interactive and was defined by proprietary software whose code could not be shared. A single Webmaster would post information on a page that other people could read.

Nobody quite knows exactly when Web 2.0 burst onto the scene, but sometime around 2004, people started using Web 2.0 to describe a browsing experience that is highly interactive, where people can make connections with other people through sites like MySpace or Facebook.<sup>1</sup> Twitter and YouTube are also the offspring of Web 2.0. The ability to blog or update a Wiki captures the spirit of what Web 2.0 is all about. Web 2.0 also has ushered in the idea of *open source* applications, where the source code of the program is freely available for other users to use, improve, and build new applications. With Web 2.0, most users are averaging 1 megabit of bandwidth, which has greatly expanded the use of photos and video on the Web.

To a great extent, the ideals of the Web 2.0 experience mirror education's recent interest in *active* learning. A timely *Campus Technology* posting describes how, with the advent of Web 2.0, the traditional classroom with one speaker and many listeners is so...well...Web

1.0. "With so many ways to create knowledge now very rapidly and collaboratively, we are freed from the necessity of a singular approach to teaching."<sup>2</sup> The Web 2.0 learning experience is really suited for a discussion rather than a lecture.

Some pioneers in higher education are engaging all that Web 2.0 has to offer. Class blogs, collaborative Wikis for students' projects, and Facebook discussions about course content are increasing. Sugato Chakravarty, a professor of consumer sciences and retailing at Purdue University, recently outlined his experience using Twitter with students during his classes. Students can submit questions anonymously from their cell phones or laptops directly to him during lectures. Although heralded as a way to keep students more engaged and give them more control during class, Mr. Chakravarty says embracing this communication method is not easy as a faculty member. "You are vulnerable out there. Students don't hold back. If you

---

*Dr. Goodfellow is an associate professor and Dr. Maino is a professor at the Illinois College of Optometry. They invite your feedback about this and all ASCOTech columns and your suggestions for future columns. Are you using Web 2.0 tools in your teaching? They would love to hear about it. E-mail [dmaino@ico.edu](mailto:dmaino@ico.edu) or [ggoodfel@ico.edu](mailto:ggoodfel@ico.edu). Also, please visit <http://www.Mainos-Memos.blogspot.com>.*



say something wrong or something they don't agree with, they'll let you know, and everybody else will see it."<sup>3</sup>

Before you get too overwhelmed with Web 2.0, however, the corporate tech dreamers are already scheming on the advances of Web 3.0. With Web 3.0, users are expected to experience 10 megabits of bandwidth full-time. Some people have even described this as the full-video Web. Web 3.0 is expected to be the semantic Web, where personalization and intelligent searching are standard. Imagine a surfing experi-

ence where search engines understand who you are, what you've been doing, and where you're likely to go next. As if we're not plugged in enough already, Web 3.0 is also expected to be the truly portable personable Web.

#### References

1. Maino DM, Goodfellow G. Digital Social Networking and Health Care Education. *J Optom Ed*. 2009;35:19-21. Available at [http://www.opted.org/files/public/JOE\\_FALL\\_2009\\_final.pdf](http://www.opted.org/files/public/JOE_FALL_2009_final.pdf). Accessed December 2009.
2. Batson T. Why is web 2.0 important to higher education? *Campus Technology*. 2009 April 15 [cited 2009 Nov 25]; Available from: <http://campustechnology.com/articles/2009/04/15/why-web-2.0-is-important-to-higher-education.aspx>
3. Young JR. Teaching with Twitter: not for the faint of heart. *Chronicle of Higher Education*. 2009 November 22 [cited 2009 Nov 25]; Available from: <http://chronicle.com/article/Teaching-With-Twitter-Not-for/49230/>

# Investigation of Assessment Methods for Final Year Optometry Undergraduate Students

Hannah Bartlett, BSc (Hons), PhD, MCOptom, PGCertEd FAAO

Mark Dunne, BSc, PhD, MCOptom

David N Anderson, BA(Hons), PgD, MSc, FHEA

Frank Eperjesi, BSc, PhD, MCOptom, Dip Orth, FAAO, MHEA, PGCertHE

## Abstract

*This retrospective study was designed to investigate the factors that influence performance in examinations comprised of multiple-choice questions (MCQs), short-answer questions (SAQs), and essay questions in an undergraduate population. Final year optometry degree examination marks were analyzed for two separate cohorts. Direct comparison found that students performed better in MCQs than essays. However, forward stepwise regression analysis of module marks compared with the overall score showed that MCQs were the least influential, and the essay or SAQ mark was a more reliable predictor of overall grade. This has implications for examination design.*

**Key Words:** *Assessment, essay questions, higher education, multiple choice questions, written examination.*

## Background

The aim of this retrospective study was to evaluate assessment methods for the final year of the optometry undergraduate program (BSc Optometry), with particular reference to the format of the sessional (end of year) examination. Undergraduate teaching of optometry students involves summative and formative methods of assessment. Formative assessment occurs “when the intention is to identify scope and potential for improvement,”<sup>1</sup> and this is most often achieved via the provision of feedback.<sup>2</sup> Formative assessment is reported to improve standards,<sup>3</sup> and many studies report this form of assessment aids lower-achieving students more than others. Summative assessment has been described to consist of judgments which, “for the immediate future form the basis of one or more decisions that stem from that judgment,”<sup>1</sup> In the undergraduate optometry degree program, students are assessed summatively in clinical practical sessions and in the form of written examinations at the end of each teaching year. The results of these assessments are used to grade and accredit learners at the end of the program. For optometry students, the results also indicate their suitability or not for professional optometric training.

According to the final year program handbook, the majority of modules are assessed via an end-of-year closed-book examination. Throughout this manuscript the term *module* will be used to refer to a particular course within the final year of the optometry undergraduate degree program. The breakdown of modular assessment methods is shown in Table 1, where the term *sessional exam* refers to the end-of-year closed-book examination.

As most final year assessment is summative in nature, this study took the course of investigating differences in examination question types to assess if the current format of the final examination, which is comprised of an equal split of multiple-choice questions (MCQs), short-answer questions (SAQs), and essay questions, is optimum. This report also includes a review of the literature in this area, along with discussion of the appropriateness of this assessment technique for optometry students.

*Dr Bartlett is Lecturer on the Optometry programme at Aston University, UK.*

*Dr Dunne is Senior Lecturer and Admission Tutor on the Optometry programme at Aston University, UK.*

*Dr Eperjesi is Senior Lecturer and Optometry Subject Group Convenor at Aston University, UK.*

*Mr Anderson is a registered psychologist with specific interests in academic development, professional practice, and technologies to support students' learning.*

In recent years, there has been a shift in the assessment of student learning from the traditional testing of knowledge toward assessment of learning.<sup>4,5</sup> An assessment culture aims to assess the acquisition of high-order thinking processes and competencies instead of factual knowledge and low-level cognitive skills, as was the case in testing culture.<sup>6,7</sup>

Traditional examination techniques, which in this case refers to the end-of-year closed-book examination, have been criticized because of their use of a limited number of assessment strategies and heavy reliance upon unseen essay questions and MCQs. As one assessment method is unlikely to measure all aspects of learning, reliance on one method may lead to bias in results. It has been noted that, “traditional assessment practices, consisting pre-eminently of the assessment of essay and problem-type final examinations and similarly constructed coursework, cannot adequately test for imponderables like independent critical thinking and creativity, and this is particularly so for time-limited examinations.”<sup>8</sup> The marking of essay questions has been found to be unreliable, and traditional examination feeds the student’s desire for the certificate rather than the learning it signifies.

It has also been argued that in the present day, the closed-book, invigilated final examination is an anachronism, in that it does not assess deep conceptual understanding and process skills.<sup>10</sup> This form of assessment tends to encourage “cramming” the night before an examination and “data dumping” on the day, with little knowledge retention afterward. However, advantages of the traditional examination include the fact that it helps students “bring things together,” that it is “short and sharp,” and that it is a straightforward test of “what they have at their fingertips.”<sup>11</sup>

In recent years, there has been a change in optometry examination format from purely essay questions, to a system of equally-weighted MCQs, SAQs, and essays. This tri-band system was designed to benefit the students by assessing knowledge in more than one way. Additionally, this format permits simpler and quicker marking of examination papers, which is of benefit to students and teachers alike, particularly with large student numbers. This study was designed to investigate the factors

**Table 1**  
**Breakdown of modular assessment methods for the final year undergraduate optometry program.**

Module	% of assessment	Assessment method
Anterior Eye & Therapeutics (AET)	100	Sessional exam
Binocular Vision (BV)	100	Sessional exam
Clinical Practice	100	Practical assessment
Elective Study	10	Written project outline
	70	Written project (double-masked marked)
	10	Viva voce with two examiners
	10	Meetings log/supervisor interaction
Abnormal Ocular Conditions (AOC)	100	Sessional examination
Low Vision & Pediatrics (LVP)	100	Sessional examination
Ophthalmic Drugs (OD)	100	Sessional examination
Occupational & Professional Studies (OPS)	100	Sessional examination
Posterior Eye (PE)	100	Sessional examination

that influence performance in examinations comprised of MCQs, SAQs, and essay questions, and to answer the following questions:

1. Do different summative assessment modalities bias degree classification?
2. If so, what is the level of bias?
3. Is this level of bias constant across modules/teaching styles?
4. Is the level of bias consistent from one year to the next?
5. Is there a gender difference between performance in the different question types?

The aim was to take the first steps in identifying best practice for assessment of optometry students by optimizing the design of end-of-year examination papers.

## Methods

This was a retrospective study carried out on the examination results of two final-year optometry student cohorts from 2004-2005 (labeled 2005) and 2005-2006 (labeled 2006). We looked at average marks overall and by module and the distribution of degree classification (level of degree obtained),

ranging from first class (highest grade) to upper second class, lower second class, and third class (lowest grade) for each examination question style. As essay questions are the traditional examination modality, we used essay marks as our gold standard, to which MCQs and SAQs were compared. Data were analyzed using SPSS 12.0.1 for Microsoft Windows XP software, and graphs were produced using Sigmaplot for Microsoft Windows XP software.

## Results

The overall mean marks for MCQs, SAQs, and essays in 2006 were collated and the differences between essays and MCQs, and essays and SAQs calculated. These differences were plotted against the mean values for each comparison and are shown in Figures 1 and 2.

One sample t-test showed a significant bias in 2006 between essays and MCQs, but not essays and SAQs. That is, students scored significantly higher in MCQs than in essays ( $t=-8.880$ ;  $P<.001$ ) with a mean bias of  $6.7\pm7.5\%$ , but although the students scored higher in SAQs than in essays (mean bias= $1.6\pm8.9\%$ ), this difference was not significant ( $t=-1.808$ ,  $P=.074$ ).

The distribution of data within Figures 1 and 2 does not suggest a relationship between the bias and the mean percentage score; and correlation analysis confirms this for the comparison between essays and MCQs ( $r=.040$ ;  $P=.698$ ) and the comparison between essays and SAQs ( $r=-.012$ ;  $P=.909$ ). This indicates the ability of the student is not a factor in the bias between examination question types.

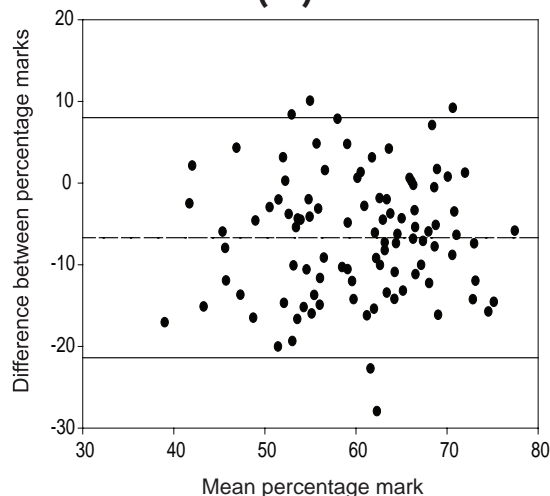
The same analyses were conducted on the 2005 data and, again, students scored significantly higher in MCQs than essays ( $t=-5.332$ ;  $P<.001$ ) with a mean bias of  $3.8\pm7.5\%$ . This cohort, however, scored significantly slightly higher in essays than SAQs (mean bias  $=1.5\pm7.2\%$ ;  $t=2.264$ ;  $P=.026$ ). There was also a small significant correlation between the difference and the mean for

the essay: MCQ comparison ( $r=.389$ ;  $P<.001$ ) and a medium significant correlation for the essay: SAQ comparison ( $r=.282$ ;  $P=.002$ ) (see Figures 3 and 4). In other words, the higher the average mark, the more likely the student was to score higher in the essay questions.

In addition, looking at statistical differences in bias for percentage score,

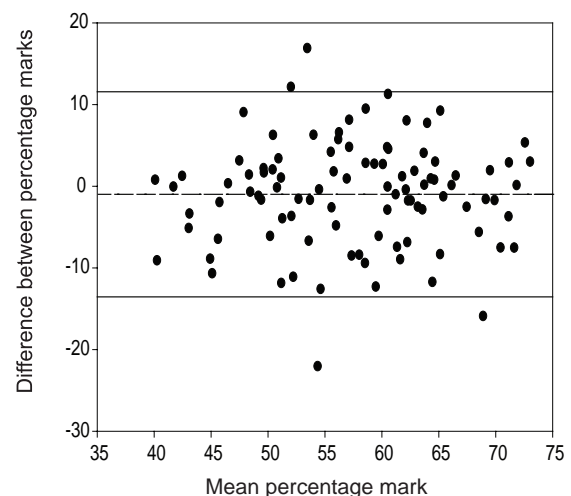
**Figure 1:**

**Difference versus the mean plot for the comparison between essays and MCQs in 2006 (n=99). The dashed line represents the mean bias, and the solid lines represent the 95% confidence interval (CI).**



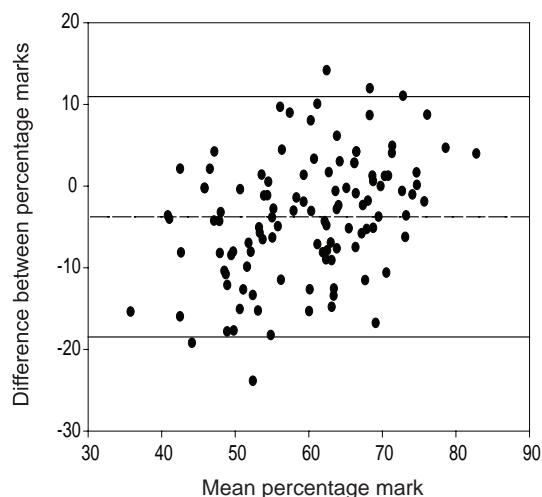
**Figure 2:**

**Difference versus the mean plot for the comparison between essays and SAQs in 2006 (n=98, one outlier removed). The dashed line represents the mean bias, and the solid lines represent the 95% CI.**



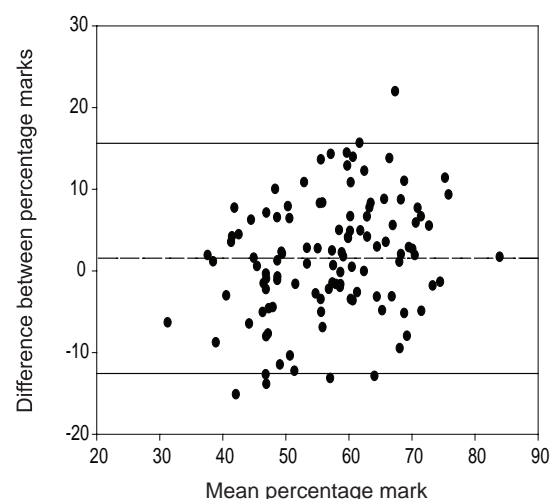
**Figure 3:**

**Difference versus the mean plot for the comparison between essays and MCQs in 2005 (n=113). The dashed line represents the mean bias, and the solid lines represent the 95% CI.**



**Figure 4:**

**Difference versus the mean plot for the comparison between essays and SAQs in 2005 (n=113, one outlier removed). The dashed line represents the mean bias, and the solid lines represent the 95% CI.**





we wanted to assess whether or not the differences would affect final degree classification. We collated the mean differences in classification between essays and MCQs, and essays and SAQs for all modules and then took the average value. The mode, median, and inter-quartile range for each comparison is shown in Table 2. The results show that in 2006, students were most likely to score one degree classification higher in MCQs compared with essays, but were most likely to achieve the same degree classification in essays and SAQs. In 2005, students were most likely to achieve the same degree classification in essays and MCQs as well as essays and SAQs.

The mean bias was also calculated for individual modules and results are shown in Tables 3 (2006) and 4 (2005).

The data in Table 2 show that students scored higher in MCQs than essays for all modules in 2006, and that this bias was significant for five out of seven of these. The results for the comparison between essays and SAQs are mixed, with students scoring higher in SAQs than essays in three modules, and higher in essays than SAQs in four modules.

A mixed between-within subjects ANOVA was carried out on the essay-MCQ data and the essay-SAQ data to investigate the effect of module (or teaching style) and year on the results. For both comparisons, there was a significant effect for module and for year, suggesting there were differences in how students within each cohort performed in each module, and also that there was a difference in performance between the 2005 and 2006 cohorts. There was a significant interaction effect, which means that there was a difference in how students performed in each module, between the two cohorts.

For the essay-MCQ comparison, the effect size was 0.731 ( $P < .001$ ) for module, 0.037 ( $P = .005$ ) for year, and the interaction effect size was 0.079 ( $P < .001$ ). For the essay-SAQ comparison, the effect size was 0.645 ( $P < .001$ ) for module, 0.037 ( $P = .005$ ) for year, and the interaction effect size was 0.053 ( $P < .001$ ).

The data in Table 3 show that for the essay-MCQ comparison, the mean bias results are similar to those from the 2006 cohort, with the exception of module D. In 2006, there was no significant difference between essay and MCQ scores in module D, whereas in 2005, the students scored significantly

**Table 2**  
**Median and inter-quartile range values for the differences between examination modalities. MCQ = multiple-choice question; SAQ = short-answer question.**

Comparison	Mode change in degree classification	Median change in degree classification	Inter-quartile range
Essay – MCQ 2005	0	0	0 - 1
Essay SAQ 2005	0	0	-1 - 0
Essay – MCQ 2006	1	1	0 - 1
Essay – SAQ 2006	0	0	0 - 1

**Table 3**  
**Mean bias and statistical significance for all modules in 2006. MCQ = multiple-choice question; SAQ = short-answer question.**

Module	ESSAY:MCQ		ESSAY:SAQ	
	Mean bias (%) $\pm$ SD	<i>P</i> value	Mean bias (%) $\pm$ SD	<i>P</i> value
A	-12.0 $\pm$ 21.9	< .001	-4.0 $\pm$ 18.6	.034
B	-4.9 $\pm$ 14.7	.001	-13.1 $\pm$ 14.9	< .001
C	-10.1 $\pm$ 16.7	< .001	-13.8 $\pm$ 18.2	< .001
D	-0.6 $\pm$ 13.2	.652	9.5 $\pm$ 13.5	< .001
E	-13.4 $\pm$ 14.4	< .001	2.6 $\pm$ 13.3	.058
F	-5.2 $\pm$ 11.9	< .001	5.3 $\pm$ 41.9	.211
G	-1.9 $\pm$ 12.1	.126	2.3 $\pm$ 14.7	.130

**Table 4**  
**Mean bias and statistical significance for all modules in 2005.**

Module	ESSAY:MCQ		ESSAY:SAQ	
	Mean bias (%) $\pm$ SD	<i>P</i> value	Mean bias (%) $\pm$ SD	<i>P</i> value
A	-10.3 $\pm$ 20.5	< .001	-1.0 $\pm$ 17.9	.537
B	-0.4 $\pm$ 14.8	.795	-5.0 $\pm$ 16.6	.004
C	-12.1 $\pm$ 18.0	< .001	-5.1 $\pm$ 18.6	< .001
D	21.7 $\pm$ 13.3	< .001	15.4 $\pm$ 14.2	< .001
E	-19.0 $\pm$ 14.2	< .001	-13.7 $\pm$ 15.0	< .001
F	-6.3 $\pm$ 15.1	< .001	13.6 $\pm$ 17.8	< .001
G	0.0 $\pm$ 14.4	.978	6.5 $\pm$ 16.9	< .001

higher in essays than in MCQs. This goes against the trend for other modules in which students tended to score higher in MCQs than essays. This anomaly may account for the statistical difference found between the 2005 and 2006 cohorts.

Again, the results for the comparison between essays and SAQs are mixed for the 2005 cohort. The students scored higher in SAQs than essays in four modules, and higher in essays than SAQs in three modules.

The data were split according to gender and are shown in Table 5.

The data in Table 3 show significant bias for men and women between essays and MCQs. Women scored higher in MCQs than essays in 2005 and 2006, whereas men scored lower in MCQs than essays in 2005 and higher in MCQs in 2006. This gender difference in bias between MCQs and essays was significant in 2005 ( $P<.001$ ) but not in 2006 ( $P=.200$ ). The difference in scores between essays and SAQs was not significant for either gender in 2005, but the women scored significantly higher in SAQs in 2006. The gender difference in bias between SAQs and essays was significant in 2006 ( $P=.036$ ), but not in 2005 ( $P=.629$ ). These results show a counterintuitive trend for higher achievement by women in MCQs than essays, and higher achievement by men in essays than MCQs.

So far, data analysis has focused on comparing MCQs and SAQs individually with essays, with the rationale that essays were the traditional gold-standard examination question type. However, some may argue that essays are not the ideal as they allow students to write around the subject and gain some marks even if the answer is not known with certainty. To address this criticism, a four-way ANOVA was carried out for the 2005 and 2006 cohorts in which there were three between-group factors (module, gender, and academic ability) and one repeated measure (question type). Academic ability was established for each student by averaging the percentage marks across all question types and modules to determine a single percentage. The median value for both cohorts was then determined prior to classification of students as above or below median ability. All effects and interactions yielding a probability of 0.05 or less were considered statistically significant.

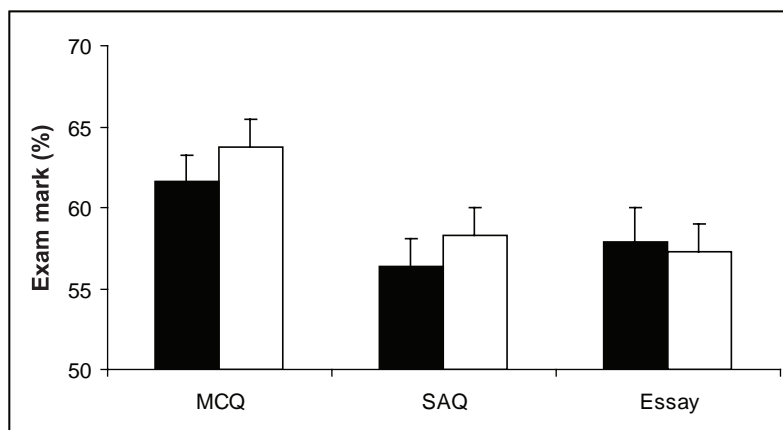
**Table 5**  
**Mean bias and statistical significance for overall results for males and females. MCQ = multiple choice question; SAQ = short answer question.**

	2005				2006			
	ESSAY:MCQ		ESSAY:SAQ		ESSAY:MCQ		ESSAY:SAQ	
	BIAS (%) ±sd	P Value	BIAS (%) ±sd	P Value	BIAS (%) ± sd	P Value	BIAS (%) ±sd	P Value
MEN	4.0±7.4	.004	2.0±8.0	.153	-5.2±8.7	.001	-0.7±7.1	.552
WOMEN	-3.6±7.1	<.001	1.3±6.8	.089	-7.5±6.3	<.001	-2.0±5.8	.009

Analysis revealed the following statistically significant effects:

1. Question type altered examination performance in both student cohorts (2005:  $F_{2,152}=45.93$ ,  $P<.001$ ; 2006:  $F_{2,1302}=74.39$ ,  $P<.001$ ). Figure 1 summarizes the results. Bonferroni post hoc tests revealed that MCQs were easier than the other question types ( $P<.001$ ) for both student cohorts. Differences in examination performance for SAQ and essay questions were only statistically significant for the 2005 cohort ( $P=.014$ ).
2. Module (or teaching style) influenced the manner in which question type altered examination performance in both student cohorts (2005:  $F_{12,1526}=45.65$ ,  $P<.001$ ; 2006:  $F_{12,1302}=30.01$ ;  $P<.001$ ).
3. Gender did not influence the manner in which question type altered examination performance in either of the student cohorts (2005:  $F_{2,1526}=1.06$ ,  $P=.346$ ; 2006:  $F_{2,1302}=2.94$ ,  $P<.053$ ).
4. Academic ability influenced the manner in which question type altered examination performance only in the 2005 student cohort

**Figure 5:**  
**Mean exam marks (%) for multiple-choice (MCQ), short-answer (SAQ) and essay questions of students sitting final examinations in 2005 (black bars) and 2006 (white bars). Error bars represent 95% confidence limits.**



(2005:  $F_{2,1526}=6.47$ ,  $P=.002$ ; 2006:  $F_{2,1302}=0.69$ ,  $P<.501$ ).

- From the results presented above, it is evident that all but one of these effects were consistently found in consecutive cohorts of students.

More general statistically significant effects were:

- Module (or teaching style) influenced examination performance in both cohorts (2005:  $F_{6,763}=20.68$ ,  $P<.001$ ; 2006:  $F_{6,651}=12.76$ ,  $P<.001$ ).
- Gender influenced examination performance in both cohorts (2005:  $F_{1,763}=11.71$ ,  $P<.001$ ; 2006:  $F_{1,651}=5.98$ ,  $P=.015$ ). Women gained higher examination marks in both cohorts.

More complicated interactions were found in which module and academic ability affected overall academic ability (2005:  $F_{6,763}=6.79$ ,  $P<.001$ ; 2006:  $F_{6,651}=4.21$ ,  $P<.001$ ) and the manner in which question type altered examination performance (2005:  $F_{12,1526}=2.48$ ,  $P=.003$ ; 2006:  $F_{12,1302}=3.32$ ,  $P<.001$ ). Although these effects were statistically significant, detailed examination of the data failed to reveal any clear trends that were consistent for both cohorts.

Finally, we thought it would be of value to identify which examination question type was most influential in determining overall score. This was assessed for each module using a forward stepwise regression analysis (SPSS 12.0.1 software). The overall score was calculated as an average of the MCQ, SAQ, and essay marks for each student, and this score was entered as the dependent variable. Forward stepwise regression analysis involved sequential entry of each question type into a regression model. The first question type considered for entry was that with the largest partial correlation with the overall mark. This question type was entered only if the probability associated with its partial correlation was equal to or less than 0.05. The question type with the second largest partial correlation was considered next. This procedure continued until all three question types had been considered.

The coefficient  $R^2$  of the regression model at each step was expressed as the percentage. This figure represented the percentage of the variance of overall mark that could be accounted for by

the first (ie most influential) question type entered into the model and the additional variance that could be accounted for by successive addition of the remaining question types. In other words, for each module type we could identify (a) the most influential question type, (b) its contribution to the variance of the aggregate module mark, and (c) a measure of the benefit of using additional question types. For example, if for a certain module, the first question type turned out to be essays and this accounted for 100% of the variance in the aggregate module mark, then it follows that SAQs and MCQs would be redundant for that module. If, on the other hand, the variance accounted for by essays alone was 80%, essays plus SAQs was 95%, and essays plus SAQs plus MCQs was 100%, then

the conclusion would be that (a) essays were the most influential question type, (b) essays accounted for 80% of the variation, and (c) addition of SAQs and MCQs would, respectively, account for only +15% and +5% more variance.

To get an overview of the most influential question types in each student cohort (2005 and 2006), the percentage marks of essays, SAQs, MCQs, and aggregate marks were averaged across all modules and subjected to forward regression analysis. The results are shown in Table 6 and Table 7.

There are clear differences in the results between the two cohorts. Overall, the results show that:

- The results are not consistent across modules or from one student cohort to the next.

**Table 6**  
**Analysis of 2005 student cohort. Key: E = essay, S = SAQ, M = MCQ, 1st = most influential question type, 2nd = second most influential question type, 3rd least influential question type.**

Module	Question type (100 x $R^2$ , %)		
	1st	1st + 2nd	1st + 2nd+ 3rd
A	E (68)	+S (+23)	+M (+9)
B	E (85)	+S (+11)	+M (+4)
C	M (56)	+S (+27)	+E (+17)
D	E (63)	+M (+26)	+S (+11)
E	S (64)	+E (+25)	+M (+11)
F	S (75)	+E (+19)	+M (+6)
G	<b>E (80)</b>	<b>+S (+16)</b>	<b>+M (+4)</b>
<b>Overall</b>	<b>E (86)</b>	<b>+S (+10)</b>	<b>+M (+4)</b>

**Table 7**  
**Analysis of 2006 student cohort. Key: E = essay, S = SAQ, M = MCQ, 1st = most influential question type, 2nd = second most influential question type, 3rd least influential question type.**

Module	Question type (100 x $R^2$ , %)		
	1st	1st + 2nd	1st + 2nd+ 3rd
A	S (77)	+E (+13)	+M (+10)
B	E (68)	+S (+23)	+M (+9)
C	E (81)	+S (+12)	+M (+7)
D	S (68)	+E (+20)	+M (+12)
E	M (61)	+E (+29)	+S (+10)
F	S (81)	+M (+12)	+E (+7)
G	M (56)	+E (+25)	+S (+19)
<b>Overall</b>	<b>S (88)</b>	<b>E (+8)</b>	<b>+M (+4)</b>



2. The most influential question type accounted for 56% to 85% of the variance in aggregate module marks.
3. Addition of a second question type had the benefit of increasing the variance accounted for by +11-26%.
4. Addition of a third question type had the benefit of further increasing the variance accounted for by +4-19%.
5. Overall, essays or SAQs tended to be the most influential question type with MCQs being largely redundant.

## Discussion

We have investigated the effect of examination question type on student performance to determine the optimum examination paper format for optometry undergraduate students. We approached the questions in two ways: first, by considering the essay-type question as the gold standard and comparing the MCQs and SAQs to it; and second, by constructing a four-way ANOVA to determine the effects on final overall mark of module, gender, academic ability, and examination question type.

### *Students score significantly better on MCQs than essays*

Investigation of the bias between essays and MCQs, and essays and SAQs found that MCQs were significantly easier than essays for both 2005 and 2006 cohorts. Although there was no significant difference between essays and SAQs in 2006, in 2005, essays were significantly easier than SAQs. Direct comparison of marks found that students performed better in MCQs than essays in both cohorts, but that the difference between SAQs and essays was significant only in 2005.

It has been argued that a problem with MCQ testing is that it is not representative of any real-world setting. Supporters of the MCQ argue it is possible to construct questions that respond to complex cognitive objectives. For example, assertion-reason type MCQs are more sophisticated in their structure, requiring more reasoning on the part of the student than is the case with traditional MCQs.<sup>10</sup> However, it may be that the complexity of the language used in assertion-reason type MCQs may pose more of a problem to the student than the complexity of the problem framed within the question.

In an investigation of the impact of a change to the format of examination of a large module in economics, essay questions were replaced by MCQs so that the examination paper included MCQs and SAQs.<sup>12</sup> Students reported that breadth and depth of understanding, as well as critical thinking, were required for the examination. Within the exam, the SAQs seemed to focus on the application of theory to cases, and were perceived by the students to require understanding. The MCQs required the students to focus on coverage and factual knowledge, and were perceived by the students to require memorization, as well as some understanding.

Investigators found the students who performed well in the examination were more likely to take a deep approach rather than a surface approach. They concluded the addition of MCQs to SAQs in the examination did not have the exclusively negative effect that was anticipated. Both quantitative and qualitative data suggest the change in examination format produced a combination of surface and deep approaches to studying. The students perceived the examination was testing breadth and depth of understanding, and these perceptions mapped quite well to the intentions of the staff. The results of the study support the hypotheses that memorization and understanding are more closely linked than has been previously assumed.<sup>13</sup>

Positive characteristics of MCQs include high reliability of scoring, economy of staff time in the task, and ability to test breadth of knowledge. However, considerable skill is required to write objective tests that measure higher level intellectual skills. MCQs are made up of a stem (or the question) and four or five alternative answers. Of these answers, one is correct, and the others are distracters. Various factors should be considered when using MCQs<sup>14</sup>, and these are listed below:

- Make sure the content is important and relevant, and the standard is appropriate for the group being tested.
- The main content of the question should be in the stem and the alternatives should be kept as short as possible.
- Eliminate redundant information from the stem.
- Ensure that each distracter is a plausible answer that cannot be

eliminated from consideration because it is irrelevant or silly.

- Avoid giving clues to incorrect or correct answers that have nothing to do with the content of the question by:
  - o Making sure correct and incorrect responses are similar in length.
  - o Checking the grammar, particularly when the alternative is written as a completion of the statement in the stem.
  - o Distributing the place of the correct response equally among positions one to five, or one to four.
  - o Avoiding “always” or “never.”
- Generally avoid “all of the above” and “none of the above” as alternatives.
- Avoid negatives.
- Do not try to write trick questions.
- For technical reasons, use at least four alternative answers. Five are preferable but are more difficult to prepare.

Despite the positive value of MCQs, the results show that if the final year examination were changed from tri-band style to purely MCQs, students would score higher than they do with the current system. Although testing in this way would make grading examination papers less subjective and faster, significant time would have to be spent on creating suitable MCQ questions. Forward stepwise regression analysis of the module marks compared with the overall score showed that MCQs were the least influential, and that the essay or SAQ mark was a more reliable predictor of overall grade.

Tables 2 and 3 show that in both years, the bias between SAQs and MCQs was not significant for all modules. Short-answer questions are similar to MCQs in that they are useful for assessing retention of factual material.<sup>15</sup> Like MCQs, SAQs have limited scope for addressing main ideas and themes. However, they have the advantage over MCQs that they are less susceptible to test-taking strategies. In other words, the answer cannot be deduced via a process of elimination. They require active recall rather than just recognition. Short-answer questions are easier for the examiner to construct, but not as easy to score as MCQs.<sup>15</sup>

When comparing essays to SAQs, the former yielded higher marks in some modules, whereas the latter did so in others. These findings are supported by the ANOVA, in which module was found to have a significant effect on overall mark for both years (2005:  $F_{12,1526}=45.65$ ,  $P<.001$ ; 2006:  $F_{12,1302}=30.01$ ,  $P<.001$ ).

### *Women score higher than men.*

It has been suggested that women perform better in essays than they do in MCQs owing to their reluctance to guess the correct answer. The findings of this study refute that claim as investigation of the bias between essays and MCQs revealed higher score in MCQs for women than men in 2005 and 2006. The gender difference in bias between essays and MCQs was statistically significant in 2005 but not in 2006. In 2005, there was no significant bias between SAQs and essays for men or women, but in 2006, women scored significantly higher in MCQs. The gender difference in bias between essays and SAQs was significant in 2006 but not in 2005. The ANOVA revealed a significant effect of gender on examination performance in both cohorts (2005:  $F_{1,763}=11.71$ ,  $P<.001$ ; 2006:  $F_{1,651}=5.98$ ,  $P=.015$ ). Women gained higher examination marks in both cohorts.

Key themes that have recurred in the discussion of education and gender over recent years are summarized by Pirie.<sup>16</sup> They include the following:

- Females generally outperform males at key levels in their education, most notably GCSE A level and degree achievement.
- This is partly a function of changes made in the modes of assessment at each of those levels.
- These changes could be perceived to pose a challenge to masculinity and to national standards of educational excellence.

Pirie claims that past assessments at secondary and tertiary level "... tended to reward the qualities which boys were good at ... risk-taking and grasp of the big picture," new style assessments favor "... the more systematic, consistent, attention-to-detail qualities which favor girls." He also states that "... girls began to do better, not because boys slumped, but because the exams were feminized."<sup>16</sup> Pirie also considers that the introduction of continuous assessment alongside the unseen examination favors the female

approach. Although he does not state that the female approach to studying is worse than the male approach, he does suggest that males tend to prefer the final exam approach, and females prefer a program of modules and coursework.

These issues have also been discussed elsewhere. The fact that females are presumed to prefer coursework and are likely to be better at it than males because their average personality type coincides with skills required to perform well at this form of assessment has prompted the assumption that females are advantaged by the introduction of formally assessed coursework in their assessment portfolio.<sup>17</sup> Studies have shown that males favor and are favored by examinations.<sup>18-20</sup>

The results of this study do not support these theories. In 2005 and 2006, women scored higher overall than men, despite the fact that the assessment was 100% exam-based. As an additional analysis, the relationship between the average examination mark (mean of all module examination marks) and the mark awarded for the elective study module (all coursework) was investigated. There was no significant difference in elective study marks between men and women ( $t=1.627$ ,  $P=.107$ ); and there was no significant correlation between examination mark and elective study mark for men ( $r=-.139$ ,  $P=.06$ ) or women ( $r=-.028$ ,  $P=.83$ ). There was a significant difference, however, between examination and elective study marks for men ( $t=2.798$ ,  $P=.008$ ) and women ( $t=4.436$ ,  $P<.001$ ), with both genders scoring higher on the elective study. This may suggest that different skills are tested, using these different assessment techniques.

Assignments and coursework are not affected by time limitation or the need to rely on memory. As the student is able to consult many sources, a broader knowledge base is developed, which leads to deeper learning. A disadvantage of this assessment technique is that plagiarism is easier than with the invigilated examination.<sup>15</sup>

### *Relationship between essay mark and overall performance.*

There was a small positive correlation between examination performance and bias toward a higher mark in essay questions compared with MCQs and SAQs in 2005 but not 2006. This finding is

supported by the ANOVA, in which academic ability affected the manner in which question type altered examination performance in 2005. Stepwise regression analysis in 2005 identified the essay questions as the best predictor of overall score. In 2006, however, the SAQs were the best predictor.

## **Conclusions**

Overall, we have found that different examination question styles yield different marks from the same cohort of students. This supports the opinion that within the closed-book examination, over-reliance upon one question style may be detrimental, as many aspects of learning are not measured by one assessment method alone. We have shown that teaching style (or module) has a significant effect on student performance in different question styles, and this supports the fact that marking of essays, for example, has been found to be unreliable.<sup>21</sup> These inconsistencies are amplified with large group sizes, where students find the learning experience impersonal and the assessment methods bureaucratic.<sup>11</sup>

The essay question was traditionally used as the format for the end-of-year examination. Essays are the only means available of assessing a student's ability to compose an answer and present it in effective prose.<sup>14</sup> The continuing popularity of essays as an assessment method in higher education also may be related to the assumption that the production of written language and the expression of thought are notable scholarly activities. For one of the cohorts, the essays were the strongest indicator of overall score. However, grading of essays is time-consuming, and there is potential for unreliable grading.

A lack of reliability associated with assessment is a common cause of student discontent,<sup>22</sup> and although, in the past, the power balance related to traditional examination may have prevented students from questioning this reliability, more recently, students expect their concerns to be addressed. Although the results suggest that use of MCQs would inflate the marks obtained, if the MCQs could be designed so that they assessed high-level intellectual skills, the issues of reliability of marking could be eliminated. Adopting this examination style would also lead to more timely grading of papers. The difficulty would be in

bringing the questions for each module up to the required standard.

Short-answer questions require a clear grading key, especially if more than one answer is correct or if several processes are needed to find the final answer.<sup>14</sup> An advantage of SAQs over essays is that more questions can be fitted into the same time period. They have the advantage over MCQs that cueing is avoided, and that the student is required to give an answer, rather than select or guess from a range of options.

In terms of the overall final year assessment method, changes could be made. At present, the majority of assessment takes place via end-of-year, closed-book exams. Seven out of nine modules are assessed purely by one end-of-year exam, which means that most of the assessment that takes place addresses declarative knowledge.

Multiple-choice questions and SAQs are ideal for assessing basic factual knowledge. Short-answer questions may more easily identify misunderstandings, and so could be useful as part of a mid-year test. One of the more difficult aspects of optometry training is bringing elements of different modules of the course together. For example, learning about an eye disease and its symptoms may be relatively simple, but then being able to link that to the type of clinical test that can be best used to detect or quantify the disease may not. This kind of cross-referencing has been labeled *discipline knowledge*,<sup>15</sup> and one method of assessing it is by asking students to write a "letter to a friend," whereby the students describe their experiences of the course to an imaginary or real friend. A good attempt will provide integrated accounts of how the different elements of the course fit together. This exercise also provides a useful source of feedback to the teacher. This form of assessment could be included mid- and end-of-year to encourage students to take a more global approach, and it would be particularly useful preparation for the professional training year.

Although we have determined that for the end-of-year closed-book exams, students generally perform best in MCQs, perhaps the most important finding is that the difference in student scores for the three question types differs with module. This means it is not possible for us to make general assumptions about the optimum examination paper style

across the board.

## References

1. George, J. and J. Cowen. A handbook of techniques for formative assessment. Mapping the student's learning experience. 1999, London and Sterling VA: Kogan Page.
2. Wiliam D, Black P. Meanings and consequences: A basis for distinguishing formative and summative functions of assessment? *British Educational Research Journal*. 1996;22:537-548.
3. Wiliam D, Black P. Inside the black box: raising standards through classroom assessment. *Phi Delta Kappan*. 1998;80:139-148.
4. Segers M, Dochy F. New assessment forms in problem-based learning: the value added of the students' perspective. *Studies in Higher Education*. 2001;26:327-343.
5. Dochy F, Segers M, Sluijman D. The use of self- peer- and co-assessment in higher education: a review. *Studies in Higher Education*. 1999;24:331-351.
6. Birenbaum M, Dochy F. Alternatives in assessment of achievements, learning processes and prior knowledge. 1996, Boston MA: Kluwer Academic Publishers.
7. Gulikers J, Bastiens T, Kirschner P. A five-dimensional framework for authentic assessment. *Educational Technology Research & Development*. 2004;52:67-86.
8. Elton L, Johnson B. Assessment in universities: A critical review of research. 2002, London, UK: LTSN Generic Centre.
9. Race, P. Why fix assessment? A discussion paper. 2002, University of Leeds, UK.
10. Williams, J. The place of the closed-book, invigilated final examination in a knowledge economy. Education Media International. 2006;43:107-119.
11. Miller C, Parlett M. Up to the mark: a study of the examination game. 1974, Society for Research into Higher Education: London, UK.
12. Reimann, N. Introducing multiple choice alongside short answer questions into the end-of-year examination: the impact on student learning in first year economics. in European Association for research on Learning and Instruction (EARLI) 11th Biennial Conference August 2005. 2005.
13. Entwistle, N. and D. Entwistle. Preparing for examinations: the interplay of memorising and understanding, and the development of knowledge objects. *Higher Education Research & Development*. 2003. 22:19-41.
14. Cannon, R. and D. Newble. Assessing the students, in A handbook for teachers in universities and colleges. 2000, Kogan Page Ltd: London. 165-206.
15. Biggs, J. Assessing for learning quality II: practice, in Teaching for quality learning at university, H. Eggins, Editor. 2003, SRHE and Open University Press: Buckingham. 170-212.
16. Pirie, M. How exams are fixed in favour of girls. *The Spectator*. 2001;January 20:12-13.
17. Bishop, K., K. Bullock, S. Martin, and J. Thompson. Students; perceptions of coursework in the GCSE: the effects of gender and levels of attainment. *Educational Studies*. 1997;23:295-310.
18. Chapman, K. An analysis of degree results in Geography by gender. *Assessment and Evaluation in Higher Education*. 1996;21:293-313.
19. Arnot, M., M. David, and G. Weiner. Closing the gender gap: postwar education and social change. 1999, Cambridge: Polity Press.
20. Marks, J. Girls know better: educational attainment of boys and girls. 2001, London: Civitas.
21. Falchikov, N. Improving assessment through student involvement, practical solutions for aiding learning and higher and further education. 2005, London: Routledge.
22. Ashcroft, K. and L. Foreman-Pack. Managing teaching and learning in further and higher education. 1994, London & Washington DC: The Falmer Press.



# Then and Now: Changes in Study Practices of First Year Optometry Students

Barbara McGinley, MA  
Nancy B. Carlson, OD, FAAO

## Abstract

**Purpose:** The purpose of this study was to determine if first year students revise their undergraduate study methods to deal with increased volume and depth of material in optometry college. **Methods:** Prior to matriculation, the Class of 2010 completed an online survey about their undergraduate study habits. Results indicated that the students' study habits would be inadequate. Upon their arrival, results were shared with students and recommendations for changes were discussed. In the spring, students compared their undergraduate study methods with their current study methods. **Results:** Individual observations were compared to determine if significant changes in students' study habits had occurred. There were a total number of 45 comparisons in which 15 were significantly different from chance at the 0.05 level or better by a chi-square test. **Conclusions:** Areas that showed the most significant change included motivation for studying; how far in advance students studied; and consistency of studying. Based on these results, the surveys and discussions on study habits will be continued

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

## Introduction

As the scope of the profession of optometry changes along with the content and format of licensing examinations, optometric educators review curricula to ensure that entry-level practitioners possess the necessary knowledge and skills to successfully manage their patients. Curriculum changes often include adding new topics into an already crowded lecture, lab, and clinic schedule.<sup>1-8</sup> Students are expected to absorb an ever-increasing volume of material and to recognize how to apply this learning to patient care. Yet concerns about the way students studied as undergraduates and about grade inflation in high school and college have surfaced.<sup>9-11</sup> Anecdotally, students themselves admit to cramming before exams and staying up all night before exams, yet receiving good grades. Many students expect the study methods they used as undergraduates to produce the same results in a doctoral level program. Will they be able to respond to the demands of doctoral level work? Will their study methods enable them to become proficient practitioners?

In a previous study, the authors asked the Class of 2010 at the New England College of Optometry (NECO) prior to matriculation, to complete an online survey about their undergraduate study habits.<sup>12</sup> The survey probed nine areas, including preferred learning style, motivation, how far in advance of exams they studied, study methods, support services and resources used, time management, memorization skills, and consistency of studying. The results of that survey showed the students' study habits would be inadequate for the demands of the optometry curriculum because they were not spending enough time studying; they were over-reliant on cramming; they were dependent on reviews by faculty for exam preparation; and they used memorization rather than studying for depth of understanding.<sup>13,14</sup> When the students enrolled at NECO, the results were shared with them during a 2-hour seminar, and they were given recommendations for changes in their study habits to maximize their success in the program. As a follow-up, the authors wanted to determine if and how students changed their study habits during their first year of optometry school. The purpose of this paper is to report on the results of the follow-up survey.

Ms. McGinley is the Director of Student Services at the New England College of Optometry. Dr. Carlson is a professor of optometry at the New England College of Optometry and Chair of the Department of Primary Care.

## Methods

Paper surveys were distributed to the 104 members of the Class of 2010 at the

end of the spring term of their first year. In this follow-up survey, the students were asked to compare their undergraduate study methods (THEN) with

their current study methods (NOW). (See Table 1.) Eighty-one students (78%) completed and returned the survey. Items included: preferred learning

**Table 1: Survey of Study Habits THEN and NOW**

THEN and NOW			
Last summer, many students in the Class of 2010 filled out an online survey that asked about undergraduate study habits. This is a modified version of that survey that asks you to compare undergraduate methods THEN with current methods NOW. Please do not put your name on this paper, so your answers can remain anonymous. You may circle more than one answer. Thank you.			
1. Please circle your preferred learning style.			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Visual</li> <li>• Auditory/Aural</li> <li>• Read/Write</li> </ul>	<ul style="list-style-type: none"> <li>• Don't Know</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Visual</li> <li>• Auditory/Aural</li> <li>• Read/Write</li> </ul>	<ul style="list-style-type: none"> <li>• Don't Know</li> <li>• Other, please specify</li> </ul>
If your style changed, please explain.			
2. Please circle your main motivation to study.			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Increase your knowledge</li> <li>• Get into graduate school</li> <li>• Grades</li> </ul>	<ul style="list-style-type: none"> <li>• Receive merit scholarship</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Increase your knowledge</li> <li>• Get into graduate school</li> <li>• Grades</li> </ul>	<ul style="list-style-type: none"> <li>• Receive merit scholarship</li> <li>• Other, please specify</li> </ul>
If your style changed, please explain.			
3. Please circle how far in advance you studied			
THEN		NOW	
<ul style="list-style-type: none"> <li>• 1 night</li> <li>• 2-3 nights</li> <li>• 2-3 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Throughout the term</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• 1 night</li> <li>• 2-3 nights</li> <li>• 2-3 weeks</li> </ul>	<ul style="list-style-type: none"> <li>• Throughout the term</li> <li>• Other, please specify</li> </ul>
If you studied differently, please explain.			
4. Please circle what study method you used most often			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Read the text</li> <li>• Review my own notes</li> </ul>	<ul style="list-style-type: none"> <li>• Meet with a study group</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Read the text</li> <li>• Review my own notes</li> </ul>	<ul style="list-style-type: none"> <li>• Meet with a study group</li> <li>• Other, please specify</li> </ul>
If you used a different study method, please explain.			
5. Please circle what support services you used to study.			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Peer tutoring</li> <li>• Review sessions taught by TA's</li> <li>• Review sessions taught by faculty</li> </ul>	<ul style="list-style-type: none"> <li>• Study groups</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Peer tutoring</li> <li>• Review sessions taught by TA's</li> <li>• Review sessions taught by faculty</li> </ul>	<ul style="list-style-type: none"> <li>• Study groups</li> <li>• Other, please specify</li> </ul>
If you used different support services, please explain.			
6. Please circle the resources you used.			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Textbook</li> <li>• My own notes</li> <li>• Old exams</li> </ul>	<ul style="list-style-type: none"> <li>• Recommended readings</li> <li>• Handouts</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Textbook</li> <li>• My own notes</li> <li>• Old exams</li> </ul>	<ul style="list-style-type: none"> <li>• Recommended readings</li> <li>• Handouts</li> <li>• Other, please specify</li> </ul>
If you used different resources, please explain.			
7. How would you rate your time management skills:			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Excellent</li> <li>• Good</li> <li>• Fair</li> </ul>	<ul style="list-style-type: none"> <li>• Nonexistent</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent</li> <li>• Good</li> <li>• Fair</li> </ul>	<ul style="list-style-type: none"> <li>• Nonexistent</li> <li>• Other, please specify</li> </ul>
If changed, please explain.			
8. How would you rate your memorization skills?			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Excellent</li> <li>• Good</li> <li>• Fair</li> </ul>	<ul style="list-style-type: none"> <li>• Nonexistent</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent</li> <li>• Good</li> <li>• Fair</li> </ul>	<ul style="list-style-type: none"> <li>• Nonexistent</li> <li>• Other, please specify</li> </ul>
If changed, please explain.			
9. How consistently did you study?			
THEN		NOW	
<ul style="list-style-type: none"> <li>• Every day</li> <li>• Once a week</li> <li>• Twice a week</li> </ul>	<ul style="list-style-type: none"> <li>• Just before exams</li> <li>• Other, please specify</li> </ul>	<ul style="list-style-type: none"> <li>• Every day</li> <li>• Once a week</li> <li>• Twice a week</li> </ul>	<ul style="list-style-type: none"> <li>• Just before exams</li> <li>• Other, please specify</li> </ul>
If changed, please explain.			

Please feel free to make any other comments about how you studied THEN and how you study NOW. Thank you.

style, main motivation to study, length of advance study, the students' rating of the effectiveness of their time management and memorization skills, consistency of study, study method used, support services used, and resources used. Students were given the opportunity to comment after each section and were also instructed that multiple responses to each question were acceptable. Students were assured their responses would remain anonymous.

## Results

Survey results were accumulated in a Table of Observations in which the number of students responding to each item was tabulated. Individual observations were compared to determine if significant changes in students' study habits had occurred. There were a total of 45 comparisons for the nine areas questioned; 15 were significantly different from chance at the 0.05 level or better by a chi-square test.

## Discussion

Students' preferred learning styles showed no significant change from when they were undergraduates. As expected, students chose "increase knowledge" as the main motivation to study and "get into grad school" was no longer a motivator. This was an obvious expected decrease and should be disregarded. Twenty-five percent of the students wrote comments that they now were studying to become a good doctor.

There was a significant decrease in the number of students who reported they studied only 1 night in advance of exams or only 2 to 3 nights in advance; there was a significant increase in the number of students who reported they studied 2 to 3 nights in advance or 2 to 3 weeks in advance. Several students commented, "There is too much information to postpone."

**Table 2: Table of Observations**  
Significant differences are highlighted in yellow

1. What is your preferred learning style?			
	n Then	n Now	Chi Squared
Visual	47	57	0.96
Auditory/aural	21	35	3.50
Read/Write	56	63	0.41
Don't know	1	0	1.00
Other	1	2	0.33
2. What is your main motivation to study?			
	n Then	n Now	Chi Squared
Increase knowledge	23	71	24.51
Get into grad school	60	3	51.57
Grades	58	43	2.23
Receive merit scholarship	5	7	0.33
Other	0	7	7.00
21 (25%) responded, "To become a good doctor".			
3. How far in advance did you study?			
	n Then	n Now	Chi Squared
1 night	9	1	6.40
2-3 nights	52	6	36.48
2-3 weeks	11	25	5.44
Throughout the term	8	49	29.49
Other	1	0	1.00
21 (25%) responded, "There's too much information to postpone."			
4. What study methods did you use most often?			
	n Then	n Now	Chi Squared
Read the text	50	45	0.26
Review my own notes	65	73	0.46
Meet with a study group	9	28	9.76
Other	2	8	3.6
5. What support services did you use to study?			
	n Then	n Now	Chi Squared
Peer tutoring	16	21	0.68
Review sessions taught by TA's	43	58	2.23
Review sessions taught by faculty	51	57	0.33
Study groups	13	37	11.52
Other	11	6	1.47
6. What resources did you use in studying?			
	n Then	n Now	Chi Squared
Textbook	60	53	0.43
My own notes	73	79	0.24
Old exams	40	58	3.31
Recommended reading	14	33	7.68
Handouts	44	61	2.75
Other	0	2	2.00
7. Rate your time management skills			
	n Then	n Now	Chi Squared
Excellent	9	13	0.73
Good	34	53	4.15
Fair	31	13	7.36
Nonexistent	5	0	5.00
Other	0	0	
8. Rate your memorization skills			
	n Then	n Now	Chi Squared
Excellent	10	8	0.22
Good	44	53	0.84
Fair	24	18	0.86
Nonexistent	1	0	1.00
Other	0	0	
9. How consistently did you study?			
	n Then	n Now	Chi Squared
Every day	11	48	23.20
Twice per week	25	20	0.56
Once per week	11	3	4.57
Just before exams	32	6	17.79
Other	0	2	2.00



Students reported their study methods did not change from their undergraduate days, although more students reported they use “meeting with a study group” as a study method. Students reported the support services they used did not change significantly from undergraduate, except for meeting with a study group.

Students also reported no change in the resources they used in studying, except that more students reported they did the recommended reading.

The number of students reporting “good” time management skills increased significantly; and the number of students reporting “fair” or “nonexistent” time management skills decreased significantly. The authors believe the increased workload plus the responsibilities of living on one’s own off-campus, perhaps for the first time, demands an increased level of time management.

Students reported no change in their memorization skills.

Consistency of studying showed a significant difference: more students reported they studied every day, and fewer students reported they studied only once per week or only just before exams.

In a doctoral level program, as time passes, students change their previous attitudes toward studying and retention of knowledge. The authors believe that early patient care exposure (which at NECO takes the form of sending students on screenings starting as early as week 4 of their first year) plays an integral part in the transition from undergraduate student mindset to doctor-in-training approach.<sup>15</sup> This early exposure compels students to develop a deeper understanding of the three-part relationship between studying, learning, and application of knowledge to patient care.

Twenty-one students chose to clarify their response to item #3, how far in advance you studied. Comments included:

- One student admitted “just studied for the test before,” implying that now studying is for the sake of knowledge application.
- One student reported he studied for “longer durations and more frequently.”
- Fourteen students mentioned in-

creased workload or volume of material.

- Four students mentioned keeping up with the material to avoid cramming.
- Not enough time, and just the word “hard!” were written by two students.
- Other comments included: “Need to attend to each subject more intensely.” “Need to start earlier to do well.” And “It’s simply impossible to cram!”

## Conclusion

Most optometry students experience a natural evolution from undergraduate study methods to obtain the deeper levels of understanding needed to master the first-year optometry curriculum. Learning how to effectively study is a process of relearning how to study by shedding old methods, especially in the area of time management, that no longer produce good grades and do not lead to good patient care. Our hope for our students is that this epiphany comes sooner rather than later.

At The New England College of Optometry, during admissions interview days, students are asked to think about how doctoral level work differs from undergraduate, and then they are told about the resources available to them: peer tutoring, clinical tutoring, and study skills strategies. To improve student performance on their first midterms and to decrease the possibility of poor performance on same, faculty and student service personnel should encourage students to rethink their approaches to studying: to study for mastery of material rather than relying on cramming and memorization to pass exams.

## References

1. Hobson RS. Challenges to future dental education. *Br Dent J*. 2009;206:125-126.
2. Michels KS, Hansel TE, Choi D, Lauer AK. A survey of desired skills to acquire in ophthalmology training: a descriptive statistical analysis. *Ophthalmic Surg Lasers Imaging*. 2007;38:107-114.
3. Schwartz SH, Nehmad L, Rosenfield M, et al. Teaching basic science courses using web-based clinic

cases: Experiences with BACIC. *Optometric Education*. 2006;32:23-28.

4. Lee AG, Volpe N. The impact of the new competencies on resident education in ophthalmology. *Ophthalmology*. 2004;111:1269-1270.
5. Peltier WL. Core Competencies in neurology resident education: a review and tips for implementation. *The Neurologist*. 2004;10:97-101.
6. Harris MG, Kashani S, Saroj N. An evaluation of the new curriculum at the University of California, Berkeley, School of Optometry. *Optometric Education*. 2001;26:83-87.
7. DiStefano AF, Dayhaw-Barker P, Oleszewski S, Dell WM. The Pennsylvania College of Optometry transforms its curriculum for the preparation of 21st century optometrists. *Optometric Education*. 2001;27:11-19.
8. Woodruff CE. The evolution of optometric education in America. *Optometry*. 2001;72:779-786.
9. Sax, LJ Our incoming students: What are they like? *About Campus*. 2003;8:15-20.
10. [http://Studyskills.suite101.com/article.cfm/college\\_student\\_study\\_mistakes](http://Studyskills.suite101.com/article.cfm/college_student_study_mistakes), accessed on July 24, 2009.
11. <http://gradeinflation.com>, accessed on July 24, 2009.
12. McGinley B, Carlson N, Hoppe E. What were they thinking? Surveying study practices of entering students. *Optometric Education*. 2008;33:59-63.
13. Semones, JK. Effective Study Skills. Fort Worth: Holt, Rinehart and Winston, Inc. 1991.
14. Longman, Debbie and Atkinson, Rhonda. College Learning and Study Skills, 3rd Edition. Minneapolis/St. Paul: West Publishing Company, 1993.
15. Lyons S, Jamara R, Carlson N, Kurtz D, McGinley B, Moore B. Assessment of the New England College of Optometry’s first year students screening program: a pilot program. *Optom Vis Sci*. 2001;78:264.