The Journal of the Association of Schools and Colleges of Optometry

OPTOMETRIC EDUCATION

Volume 24, Number 4 Summer 1999

The Accelerated Doctor of Optometry Program

Association of Schools and Colleges of Optometry

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OPTOMETRIC EDUCATION

ISSN 0098-6917

VOL. 24
NO. 4

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1999

The Journal of the Association of Schools and Colleges of Optometry

COMMUNICATIONS

DEPARTMENTS

Cover Photo: *Graduates of the Accelerated Doctor of Optometry Program at The New England College of Optometry, courtesy of Lifetouch National School Studios.*

OPTOMETRIC EDUCATION is published by the Association of Schools and Colleges of Optometry (ASCO). **Managing Editor:** Patricia Coe O'Rourke. **Art Director:** Carol Nansel, IMTEK Office Solutions. Business and editorial offices are located at 6110 Executive Boulevard, Suite 510, Rockville, MD 20852 (301) 231-5944. **Subscriptions:** JOE is published quarterly and distributed at no charge to dues-paying members of ASCO. Individual subscriptions are available at $20.00 per year, $30.00 per year to foreign subscribers. Postage paid for a non-profit, tax-exempt organization at Rockville, MD. Indexed in Current Index to Journals in Education (ERIC).

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EDITORIAL

A Call for Scholarly Contributions in Optometric Education

Roger Wilson, O.D.

Teaching, service, scholarship, and clinical practice are common faculty performance categories which are assessed in promotion and tenure proceedings. These elements of academic life are viewed as necessary to an institution's vitality, giving credibility and prestige to academic programs and faculty. Students and ultimately patients are the direct beneficiaries of an innovative, renowned faculty. Indeed, the Council on Optometric Education is careful to include in its accreditation standards the areas of research and scholarly activity as essential to the successful advancement of an institution's mission and a requirement for continuing accreditation.

In this issue of *Optometric Education,* the Drs. Mary Beth Woehrle and Sanford Gross look at barriers that impact scholarly pursuits by faculty at the Illinois College of Optometry. Their work discovered, among other factors, that some faculty believe their research skills and resources are not sufficiently developed, thereby hindering their efforts at scholarship. Drs. Woehrle and Sanford recommend comprehensive, individualized, and multiaceted faculty development programs to enable faculty to gain the necessary skills to engage in research. Their paper also discovered a wide variation in faculty responses, indicative of the differences in the backgrounds of faculty who responded to the survey.

Dr. Wilson is the editor of Optometric Education, effective July, 1999.

The findings of the Woehrle and Gross study are most likely representative of many of the schools and colleges of optometry. Commitment to research and scholarship in its various forms is a shared responsibility. The schools and colleges of optometry are interested in fostering development of their faculty and their scholarly pursuits. Faculty are motivated to contribute to the knowledge of the profession, are interested in developing a professional identity and attaining expertise in their respective fields. Yet often there is a difference of opinion between the faculty and the institution regarding the need for development of faculty research skills, availability of institutional resources, and faculty time allocated to scholarly pursuits.

Time for scholarship and the opportunity to engage in research within my own institution, and at others, seems to depend on a wide variation of circumstances. There is no doubt that faculty hold widely diverse views of what constitutes scholarship, and what an institution should provide by way of support for their efforts. Many faculty feel that they do not know how to conduct legitimate original research. While the creation of new knowledge is highly valued and encouraged at every institution, few faculty acknowledge that they have the background to engage in this type of research. Still fewer have the knowledge or experience to write a grant application to fund their studies. Some faculty, typically clinical faculty, are more comfortable making scholarly contributions through the publication of case reports, literature reviews, and writing textbooks. To date few faculty at the schools and colleges of optometry have engaged in health services or educational research.

The Association of Schools and Colleges of Optometry (ASCO), the American Academy of Optometry (AAO), and the American Optometric Association (AOA) have long recognized that research is vital to the future of our profession. All of these organizations have sponsored or actively continue to sponsor research symposia, seminars on grant writing, and workshops on developing research protocols and clinical trials. Many faculty from ASCO member institutions have attended and have benefited from these programs. Yet faculty continue to express concerns about how to get started with research and other scholarly pursuits.

Optometric Education is an ideal venue to publish information about the art and science of teaching and learning. The number of papers that we publish in the category of original educational research is much smaller than those in other disciplines. Why is this the case? Why have optometric educators not embraced optometric education as a legitimate form of scholarship? Are the challenges for faculty interested in this area of scholarship similar to those discovered at the Illinois College of Optometry? If so, what can ASCO, AAO, and the AOA do to support educational research?

One thing is certain - the problem of preparing faculty for a life in academia is not unique to one school

(Continued on page 106)

INDUSTRY NEWS

Alcon Launches New Opti-Free *EXPRESS*

Alcon Laboratories Consumer Products Group announced the launch of new formula OPTI-FREE *EXPRESS* Multi-Purpose Disinfecting Solution. Studies have shown that the new solution achieves a microbe reduction level like a one-bottle hydrogen peroxide system and meets newly established Food & Drug Administration (FDA) stand-alone criteria for a *"disinfecting solution." EXPRESS* contains ALDOX, an anti-microbial agent that continues working while lenses are stored for up to 30 days. Alcon is the exclusive patent holder of ALDOX, a broad-spectrum anti-microbial agent designed to penetrate cell walls of fungi and acanthamoeba cysts, without being toxic to human corneal cells.

Total Alcon sales for 1998 exceeded $2.1 billion, with activity in more than 170 markets. Housed at the company's headquarters in Fort Worth, Texas is the 400,000 square-foot William C. Conner Research Center. Over the next five years, Alcon plans to spend nearly $1 billion on eye-related research, more than any entity outside of the National Eye Institute.

W-J Study Reveals Specialty Lenses More Profitable

A comprehensive study of contact lens profitability by Wesley Jessen reveals that specialty contact lenses actually deliver more profit to practitioners than clear disposable lenses, the segment with the largest retail sales volume. Believed to be the most comprehensive study of its kind ever conducted, it provides estimates of the total value of consumer purchases of soft contact lenses, excluding professional fees, as well as the gross profit to practitioners from these sales.

The Wesley Jessen Profitability Study reports that sales of soft lenses to consumers totaled $2.278 billion in 1998, up 4% versus 1997. Gross profit to practitioners generated from the sales in 1998 was $1,137 million, or 50% of retail value.

While clear disposable lenses generated nearly $1 billion in retail revenue, they generated a gross profit of just 41%, or $398 million during 1998. That represented 35% of total soft lens profits to practitioners.

Specialty soft lenses, defined as soft torics, bifocals, cosmetic lenses and premium spheres, generated $423 million in gross profit. Of that total, soft torics contributed $200 million in practitioner profits and cosmetic lenses another $158 million. Specialty lenses accounted for 37% of practitioner profits during 1998, a share that has steadily increased over the past five years.

"It's not what you put in the cash register that counts; it's what's left after the bills are paid," said Dwight H. Akerman, O.D., Wesley Jessen's director of professional services. "This study clearly demonstrates the value of specialty lenses to a practice, in a market that has come to be dominated by commodity lenses."

B & L Will Sponsor Educational Seminars

Bausch & Lomb announced that the PureVision Breakthrough Tour 1999, consisting of seminars designed to acquaint eye care practitioners with the lens and its performance, will travel cross-country. B & L recently launched the PureVision lens in the U.S. with FDA approval for up to seven days and six nights of uninterrupted wear. According to B & L, the lens is an advance in contact lens technology and its unique balance of material, surface properties and lens design provide comfort and convenience to contact lens wearers.

The Purevision Breakthrough Tour 1999 will be conducted by B & L representatives and eye care practitioners, who will share their personal experiences and evaluations of PureVision lens performance with other practitioners. The tour will take place in 12 cities in the U.S. and Canada. For more information on the seminars, call 1-800-549-3656.

New Titanium Styles Introduced by Marchon

In the 1999 ophthalmic collection from Superthin by Marchon, dispensers will find innovative new colors and progressive shapes in the lightest, strongest of eyewear materials — titanium. A departure from traditional titanium designs, the Superthin styles utilize subtle temple detailing and tone-on-tone accents to create a beautiful, delicate look, bringing heightened fashion to the functionality and durability of titanium eyewear, according to a Marchon spokesperson. The titanium introductions are complemented with a selection of coordinating, CR-39 sun clip-ons, offering 100% UVA/UVB protection.

Paragon Receives CE Mark Approval For Flexlens® Products

Paragon Vision Sciences, one of the world's leading developers and manufacturers of innovative oxygen permeable materials and specialty soft contact lenses, has received certification for Medical Device Directive 93/42/EEC, Annex II (excluding section 4), in addition to ISO 9001 and EN 46001 certification for its line of Flexlens soft lens products. The CE mark can now by used on all Flexlens soft contact lenses made from methafilcon A & hefilcon A materials.

Paragon's oxygen permeable materials business is a multi-million dollar operation. Through efforts with the U.S. National Aeronautics & Space Administration (NASA) to investigate the polymerization of materials in space, Paragon HDS(r) (Hyperpurified Delivery System) and most recently, Paragon Thin® were introduced. These new oxygen permeable materials combine excellent wetting, optics and stability with effi-

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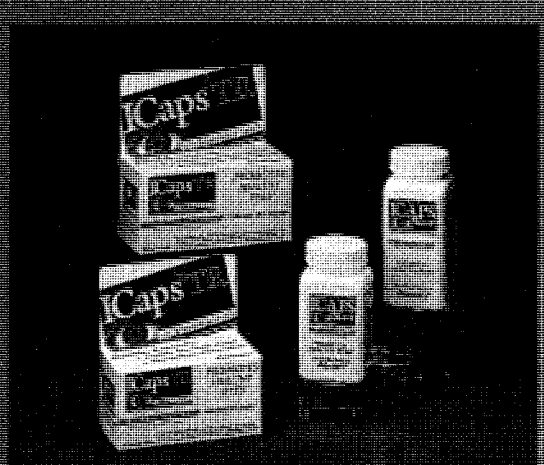

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LABORATORIES

GUEST

EDITORIAL

Experience Is No Substitute For Knowledge

The Need for Evidence-Based Clinical Education in the Ambulatory Setting

Michael H. Heiberger, O.D., M.A.

Optometric education has significantly more experience than medical education in the provision of clinical training in ambulatory settings, but far less experience in carrying out research on the effectiveness of that training. Medical clinical education has been traditionally carried out in the inpatient (hospital) setting. Recent changes in health care delivery have recessitated a shift from impatient to ambulatory settings and this trend, for medical education, is likely to be a permanent one.

In a recent article, Bordage et al.[1] reported on a 1996 conference of some 30 medical educators, clinicians and policymakers that identified important research questions about teaching and learning in ambulatory settings. A total of 51 distinct questions in nine major categories were produced. Why are medical educators so concerned about developing theories and research priorities about teaching and learning in the ambulatory setting? It is because they have built such theories and research priorities in the traditional inpatient setting over many years and are uncomfortable with how this knowledge can be applied to the newer ambulatory settings.

Bordage et al.[1] state that "Efforts to redesign education in ambulatory settings are hampered by a lack of rigorous and coherent research on the learning process in these settings..." Notwithstanding, David Irby[2] reports on 101 data-based published research articles on teaching and learning in medical ambulatory care settings published between 1980 and 1994. Even with this volume of research activity, the 1996 conference of medical educators concluded that "The learning outcomes of clinical experiences in such (ambulatory) settings have been neither clearly identified nor consistently measured."[1]

The settings in which clinical optometric education occurs, whether at school-based clinics or at externally affiliated clinical sites, have increased in numbers and complexity over the years. The newest standards for accreditation, published by the Council on Optometric Education[3], address the need to develop "...clinical competency for each student for entry level practice." In addition, the standards state that "Meaningful outcome measures must be published and utilized in a continuous process of evaluating the outcomes of the school's or college's programs."[3] This leaves it to each institution to identify and measure its clinical teaching and learning outcomes. There is, however, no consensus on what those outcomes should be or how best they might be measured.

Not only are published data-based research studies, with regard to clinical education, practically non-existent in optometry, the basic questions concerning learning in the optometric clinical setting have yet to be posed. High on the list of questions for optometry, as it is for medical education in the ambulatory setting, should be: (1) What are the desired outcomes of education in the ambulatory setting? (2) What process and outcome indicators can be used to measure those products? and (3) How do factors such as curriculum and instructional strategies, faculty development, and cost impact teaching and learning?

Optometric institutions are increasingly accountable to external constituencies such as governing boards and state legislatures; not to mention their own students and the general public. If clinical education is central to each school's mission, as it most certainly must be for all schools and colleges of optometry, the significant track record in the provision of optometric clinical services in ambulatory settings must be augmented by systematic and objective inquiry into the effectiveness of the learning process in those settings. Experience in delivering care alone will not carry us into the next millennium.

Dr. Heiberger is director of planning and evaluation at the State College of Optometry, State University of New York.

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1. Bordage G, Burack JH, Irby D, Stritter, F. Education in ambulatory settings: developing valid measures of educational outcomes and other research priorities. Acad Med 1998; 73(7): 743-49.
2. Irby D. Teaching and learning in ambulatory care settings: a thematic review of the literature. Acad Med 1995; 70(10): 898-909.
3. Accreditation Manual: Professional Optometric Degree Programs. Council on Optometric Education 1998.

Editorial

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or college of optometry. The responsibility of faculty to contribute at a high level to the knowledge of the profession, whether it is basic science, clinical science, or educational research is paramount to the survival of optometry. Drs. Woehrle and Gross have reminded us yet again that for many faculty research and other scholarly pursuits may not come naturally. Faculty need time, resources, mentoring, and opportunities to engage in research. The schools and colleges should continue to support faculty development in these areas and encourage faculty to take risks to reach higher levels of scholarship and produce scientifically based research.

Our editorial board welcomes manuscripts that highlight original research in optometric education including teaching methodologies, new curriculum initiatives, distance education, research in faculty development, international optometric education, and any other original ideas that advance the science of education. Our expert panel of reviewers and consultants stand ready to help you with the successful publication of your work.*

If you are looking for an "author-friendly" publication for your research, consider submitting your work to *Optometric Education.* We are the only journal in our field with a commitment to highlighting the process of education as a legitimate form of research.

*Publication Guidelines for *Optometric Education* are found on page 124 of this issue.

CORRECTION

"A Comprehensive Approach to Critically Evaluate an Examination"
Dr. Ruth A. Trachimowicz
Dr. David Y. Lee
Vol. 24, No. 3, p. 81

The first paragraph of the second column should read, "Using our system of evaluation, questions were classified as statistically flawed if they had either a negative DI value or if they had a difficulty level that was less than 50% along with a DI value <0.20." *Optometric Education* apologizes to the authors for the error that occurred in the published DI value.

The Accelerated Doctor Of Optometry Program: Outcomes Assessment

Depew M. Chauncey, Ph.D., O.D.

ABSTRACT

The Accelerated Doctor of Optometry Program at The New England College of Optometry requires a doctorate degree in science and for admission. The primary goal of The Accelerated Doctor of Optometry Program is to provide faculty members with advanced training in the basic sciences for optometric education. The first class matriculated in 1972. The graduates through 1995 were surveyed in an attempt to evaluate the success of the program relative to its stated goals. Information was obtained in the areas of student performance, professional practice, professional success, scientific contributions to the vision related literature and service to the profession. More than seventy percent of the graduates returned the survey. The results indicated that a significant number of these graduates are active in optometric education and vision related research. They are also successful in a variety of roles in health care, contributing significantly to the profession in the areas of research, optometric and medical education, professional practice, and service. Compared to the graduates of the four-year program, they are more likely to: (1) be engaged in education/research and (2) attend and/or participate in the annual AAO and ARVO meetings and less likely to: (1) participate in commercial optometry, (2) be a member of the AOA or (3) be employed by an ophthalmologist.

Key Words: *optometric education, accelerated program, special programs, pod program*

Introduction

Educational institutions have an obligation to their students and to the public to provide quality programs. It is especially true when the institution is producing graduates of health care programs. To some degree the health of the nation depends on the quality of these graduates. Quality assurance is crucial and outcomes assessment is a critical element of this process.

What is outcomes assessment as it relates to an educational program? Basically, it is the act of collecting and analyzing data that describe the product of the program and address the question, "Are we accomplishing the established goals of the program and are the graduates successful in their desired profession?"[1]

In designing an outcomes assessment of the Accelerated Doctor of Optometry Program, also known as the POD Program, at The New England College of Optometry, it was important to assess the program at the following levels:

1. Performance as students
2. Success in being licensed to practice professionally
3. Professional success

Dr. Chauncey is associate professor and instructor of record for the second year Problem-Based Learning course at The New England College of Optometry, and clinic director of The Pine Street Inn Eye Clinic, Boston.

Program Goals[2]

When the program was initiated in 1972, the primary goals were established as:

1. To provide optometric education with faculty having experience in advanced study and research within basic science fields that are important to the advancement of the profession.
2. To bring into the profession individuals likely to contribute significantly to the advancement of optometry.
3. To prepare the students to practice vision care in the highest professional manner.

This outcomes assessment of the Accelerated Doctor of Optometry Program is comprised of a survey, which was mailed to all of the graduates of the program. The results were compared to an analogous survey of the graduates of the four-year program. The student achievement portion was published earlier[3] and will be summarized here. The post graduation assessment is also based on the survey returns. Each survey contains two elements: success at entering the profession and professional success, which includes service and other contributions to the profession.

Methods

A questionnaire was mailed to all of the graduates of the Accelerated Program through 1995 and to the 1990-1995 graduates of the four-year program. Of the one hundred forty graduates of the Accelerated Program, one hundred and one were returned, an excellent return rate of 72% (Table 1). The response rate from the graduates of the four-year program was 29%. Not all of the respondents to either survey answered all of the questions.

Table 1
Survey Responses

	Graduates	Responses	
Accelerated Program	140	101	72%
Four-Year Program	452	141	29%

Results

Unless noted otherwise, the results are expressed as a percentage of the total number of respondents.

Student Achievement

An assessment and comparison of student achievement in the three professional programs at The New England College of Optometry has been reported earlier[3] and will be summarized as it relates to each program.

During the academic portion of their optometric education the members of the accelerated program earn a cumulative grade point average of 3.62 which is significantly better than the 3.03 attained by the students in the four-year program. (Table 2) These students receive academic honors at about twice the rate of the four-year students, 40% v 19%, whereas clinical honors go more frequently to the four-year students, 45% v 25%. Academic warning is almost unheard of in the accelerated program and, though rare among the four-year students, it occurs at a rate of about 3%. Clinical warnings are fairly rare in each group and are received by about 5% of each.

Table 2
Student Achievement*

NBEO	Accelerated Program	Four-Year Program	Natl. Avrg.
Basic Science	585	NA	381
Clinical Science	565	NA	407
Grade Point Average	3.62	3.03	
Academic Honors	40%	19%	
Clinical Honors	25%	45%	
Academic Warning	None	3%	
Clinical Warning	5%	5%	

*Heath et al. JAOA 1994; 65 (12): 865-871.

Table 3
Regional Clinical Examinations

Accelerated Program	Took	Pass
NBEO (III)	27%	100%
TMOD	48%	100%
NERCOATS	16%	86%
Four-Year Program	**Took**	**Pass**
NBEO (III)	69%	91%
TMOD	91%	97%
NERCOATS	64%	88%

Table 4
Number of State Licenses

	States	Canada*	Puerto Rico
Accelerated Program	39	3	1
Four-Year Program	38	4	0

*Provinces

NBEO- Basic Science (Part I), Clinical Science (Part II)

The qualifying examinations administered by the NBEO are widely accepted as measures of achievement for optometric students. Students in the accelerated program average at least one hundred points higher than the national average on both the basic science and clinical science examinations. (Table 2)

NBEO Clinical Examination (Part III)

Graduates of the accelerated program have an excellent record at passing the clinical examinations given by the NBEO. (Table 3) Of the graduates taking the clinical examination, all have passed on the first attempt. Of those taking the Treatment and Management of Ocular Disease (TMOD) all have passed on the first attempt.

Regional Clinical Examinations

A significant number of the graduates have taken the local regional clinical examination (NERCOATS) with 86% passing the first attempt. (Table 3)

State Licensure

The graduates have been very successful in obtaining licensure in thirty-nine states, three provinces of Canada and Puerto Rico. (Table 4) The vast majority (90%) received their licensure on the first or second attempt. (Table 5)

Early in the history of the accelerated program, graduates were denied the opportunity to obtain a license in Tennessee because they did not graduate from a four-year program. However, the situation must have changed because several graduates are now licensed and practicing in Tennessee. The reason for this change is unknown.

TPA Certification

Of the respondents, sixty-three percent are TPA certified in at least one state. Note: These data no not include those who are licensed only in Massachusetts since the state did not have use of TPA's when the data were collected. They do include those who practice in Massachusetts but are certified in other states.

Demographics

Geographic Distribution

Geographically the graduates are located in 29 states throughout the country, Canada, Puerto Rico and Spain. (Tables 6, 7) The majority are located in the Northeast (37%) with an equal distribution (approximately 12-13%) in the Mid-Atlantic, Southeast, Southwest, Midwest and West Coast sections.

Professional Demographics

Mode of Practice

Graduates of the accelerated program are found in a variety of modes of practice. (Table 8) The majority are either self-employed (37%), in opto-

Table 5
State Clinical Examinations Passed

First Attempt	Second Attempt	
Accelerated Program	82%	8%
Four-Year Program	87%	6%

Table 6
Geographical Distribution

Area	Accelerated	Four Year
Northeast	35%	54%
Mid-Atlantic	11%	20%
Southeast	13%	8%
Midwest	13%	4%
West	12%	2%
West Coast	13%	4%
Canada	3%	8%
	100%	100%

Table 7
States With Graduates

Arizona	Minnesota	Tennessee
California	North Carolina	Texas
Connecticut	New Jersey	Utah
Colorado	Nevada	Virginia
Florida	New York	Vermont
Georgia	Ohio	Washington
Hawaii	Oklahoma	Wisconsin
Illinois	Oregon	
Massachusets	Pennsylvania	Canada
Maryland	Rhode Island	Puerto Rico
Maine	South Carolina	Spain

Table 8
Professonal Distribution

	Accelerated Program	Four-Year Program
Self-Employed	37%	37%
Group Employed	4%	25%
HMO	1%	7%
Hospital	6%	5%
Ophthalmologist	5%	21%
Commercial	12%	21%
Research	12%	0%
Education	22%	6%
Non-Optometry	1%	2%
100%	124%	*

*Total exceeds 100% due to individuals inmultiple practice modes.

metric education/research (34%), or commercial optometry (12%). A small number are employed by hospitals, health maintenance organizations (HMO) or ophthalmologists (12%), and only 1% are not involved in health care or health related research.

Educators

Of the respondents, 30 have full-time involvement in optometric education or research and an additional five are part-time educators. Of these, two are full-time administrators in optometric institutions. (Tables 9, 10) Several others have held administrative positions in the past but are currently primarily involved in teaching.

These alumni are located in eleven of the schools and colleges of optometry and three prominent medical schools in the United States. (Table 10)

Scholarship

Many graduates of the accelerated program continue to participate in scholarly activities and to publish scholarly works. Forty-one percent of the respondents are actively producing scholarship in one form or another including research, academic publications, scientific books, text books and/or academy/ARVO presentations. As of the survey date, alumni of the program have produced a total of 1,335 scholastic items or an average of 2.5 items per respondent per year. (Table 11, 12)

Professional Organizations

Graduates of the program join the major professional organizations at a significant rate. (Table 13) The membership of The American Optometric Association (AOA) includes 68% of the respondents; the American Academy of Optometry (AAO) and the Association for Research in Vision and Ophthalmology (ARVO) include 33% and 18% respectively.

Service

The level of participation in service to the profession and the community is significant. (Table 14) Eighteen percent of the respondents report some level of service at either the local, state or national level. Some examples include the following:

1. Local committees
2. State optometric societies as members and office holders.
3. AOA state and national committees
4. NBEO Curriculum Committees
5. NBEO Examination Committee
6. NBEO Examiners

Discussion

While in student status, there is no question that the students in the Accelerated Program perform well.[3] The average Cumulative Grade Point Average is considerably higher than that of the four-year students and their average scores on Parts I and II of the NBEO Exam are more than one hundred points higher than the national average. (Table 2) They are twice as likely to achieve academic honors as

Table 9
Education/Research Accelerated Program

Total*	35
Full-Time	
Education	25
Research	3
Admin.	2
Part-Time	
Education	5

*Seventeen are involved in clinical education only.

Table 10
Academic Institutions With Faculty From The Accelerated Program

Institution

Harvard Medical School, Harvard University
Illinois College of Optometry
Inter-American University of Puerto Rico, School of Optometry
Michigan College of Optometry at Ferris State University,
Northeastern State University, College of Optometry
Nova Southeastern University, College of Optometry
Pacific College of Optometry
Pennsylvania College of Optometry
Southern California College of Optometry
State University of New York, State College of Optometry
State University of New York, Health Science Center, Syracuse
The New England College of Optometry
University of Houston, College of Optometry
University of Maryland, Medical School, Baltimore

the four-year students. During the entire existence of the program, only three people have been dismissed for lack of academic achievement. While students in the four-year program are seldom placed on academic warning, they are more likely to be on academic warning than the students in the accelerated program.

In the clinical portion of their education the students in the accelerated program perform well. They are less likely to achieve clinical honors than students in the four-year program but they are placed under clinical warning at the same rate (5%). (Table 2) There are no reliable data that explain why these students do not reach the level of outstanding clinician as frequently as the four-year students. However, it may be related to the lack of time in such a condensed program to reflect on and to assimilate the newly acquired knowledge and to translate it into the clinical setting. It is important to note that this does not become problematic in seeking licensure to practice. This is evidenced by the fact that the accelerated students pass regional clinical examinations at a higher rate than the four-year students and state licensing examinations at about the same rate.

Upon entering the profession about one-third of the graduates of the accelerated program are self-employed and another one-third are involved in education/research. (Table 8) They are less likely to be employed by an ophthalmologist or to join a commercial practice than alumni of the four-year program.

Graduates of the accelerated program are more likely to be active in the professional optometric organizations and the annual meetings of these organizations. They are somewhat less likely to be members of the AOA but much more likely to belong to the AAO and ARVO. Reports of attendance at annual meetings indicate that graduates of the accelerated program are more likely to attend both the ARVO and AAO meetings by a notable factor. (Table 15) Interestingly, the two groups are active in their state societies at the same rate.

The question of leadership and service to the profession was interpreted as actually performing service in the role of committee memberships, holding office or other positions of responsibility rather than just membership in professional organizations. The graduates of the accelerated program are more than twice as likely to participate in committees or to hold office in the state or national organizations. Numerous graduates have held significant leadership positions within the profession.

Table 11
Scholarship

	Papers/Posters	Presentations	Total
Accelerated Program	32%	25%	41%
Four-Year Program	6%	11%	15%

Education

Graduates of the accelerated program are much more likely to become involved in education than the graduates of the four-year program. For the graduation period included in these data, more than one third (35%) are involved in research and/or education. (Table 9) In addition several have entered the optometric education profession from the classes graduating following the completion of data collection. Of the thirty-five educators, four individuals hold full-time faculty appointments in medical schools. This includes all respondents who hold some type of faculty appointment except those whose only link to education is delivering continuing education. The faculties of most of the schools and colleges of optometry contain graduates of this program. (Table 10) Several are or have been involved in administration full-time, but the majority are teaching in didactic and/or clinical programs.

Scholarship

Considering the fact that graduates of the accelerated program are more likely to be involved in education or research, it follows that they are also more likely to produce scholarship, and the data confirm this expectation. Their scholarship appears in the usual forms of papers/posters, presentations, books and chapters within edited books. Of the respondents, 22%

Table 12
Total Scholarship Accelerated Program

Activity	Total Number
Papers/Posters	584
Presentations	734
Books	3
Chapters	14
Total	1335

Average number of items per person-per year is 2.53.

Table 13
Professional Organizations (Membership)

	AOA	AAO	ARVO
Accelerated Program	68%	33%	18%
Four-Year Program	73%	12%	<1%

Table 14
Number of State Licenses

	States	Canada*	Puerto Rico
Accelerated Program	39	3	1
Four-Year Program	38	4	0

*Provinces

Table 15
Professional Meetings

	Accelerated Program	Four-Year Program
ARVO	27%	0%
AAO	36%	20%
AOA	19%	30%
STATE SOC.	58%	58%

have authored some form of scholarship. They report having produced 1,335 items of scholarship, which averages 2.5 items per person per year since graduation. Publications prior to matriculation at The New England College of Optometry were not included. This group regularly appears on the scientific programs of the American Academy of Optometry (AAO) and the Association for Research in Vision and Ophthalmology (ARVO). For example, at the annual ARVO Meeting in May 1998, nine alumni were listed as authors on 32 papers or posters.

Table 16
Academics By Year

Class of:	Education/Research
1974	3
1975	2
1976	0
1977	2
1978	2
1979	2
1980	5
1981	3
1982	1
1983	1
1984	3
1985	0
1986	1
1987	2
1988	1
1989	1
1990	0
1991	1
1992	3
1993	0
1994	2
Total	35
Average	1.7/Year

Conclusions

Relative to the first goal of the accelerated program, the data support the conclusion that the program is a success. Almost one third of the graduates are involved in either optometric education, medical education and/or research. If one considers the production of educators on an annual basis, a larger proportion of the earlier graduates elected to become educators than in more recent years.

However, it is important to note that there has been a steady flow of graduates into education throughout the life of the accelerated program. The peak year was the class of 1980 when five of the seven graduates became professional educators. On the average, 1.7 graduates have become educators or employed in full-time research per year. One possible explanation for the larger number of educators from the earlier years is the changing demand for educators. In this period, 1974 through the early eighties, many of the schools and colleges of optometry were in the process of improving the basic science portion of their programs in preparation for the profession becoming more primary care oriented. During this time there was a much greater need for faculty with advanced training in the basic sciences. Following this period there has been a steady but smaller demand for faculty with credentials of this type. (Table 16)

The second goal of the program: to bring into the profession individuals likely to contribute significantly to the advancement of optometry, is also being satisfied. Graduates of the accelerated program are contributing to the profession in terms of service and the creation of new knowledge. A significant number of graduates either currently hold or have held positions of leadership within the profession. The following are representative examples:

Director, Optometry Service, Department of Veterans Affairs
President, American Academy of Osteopathic Surgeons
President, Massachusetts Society of Optometry
Member, Maine State Board of Optometry
Curriculum Committee, National Board of Examiners in Optometry (NBEO)
Examination Construction Committee (NBEO)
Presidents of several regional, state or local optometric societies

The survey has revealed a significant number of graduates serving in leadership positions in the professional organizations at the national, state and local level and in other service organizations such as Save Your Vision, local literacy programs, VOSH and vision programs for under-privileged children.

The contribution of scholarship in the form of research, papers/posters, books and book chapters is also an important outcome of the accelerated program. Graduates of the program are routinely participants in the scientific programs of the annual meetings of the American Academy of Optometry and the Association for Research in Vision and Ophthalmology, the two most prestigious professional organizations for optometrists. Some of the areas in

which these people are making significant contributions include non-invasive diagnostics, epidemiology, contact lenses, binocular anomalies, pediatrics and pharmacology.

The third goal of the program— producing highly qualified practitioners— is defined by the success rate on the licensure examinations, by the successful practice rate[2] described in the earlier report and by the number of people occupying positions of leadership within the professional organizations.

When judged against the goals established by the college, one must conclude that the program is a success. It is an important source of faculty, and the alumni have and are making significant contributions to the profession. Optometric education will continue to need new faculty, although not at the level of the late seventies to early eighties. In order for the profession to continue developing, there will be an ongoing need for new knowledge, and this is much more likely to be developed by graduates of the accelerated program than those from the four-year program.

Future plans include enrolling ten to fifteen students each year with an increased emphasis on recruiting potential leaders and educators.

Note: Dr. Chauncey was the Director of the Accelerated Doctor of Optometry Program at The New England College of Optometry from 1980 to 1996.

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Industry News

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cient oxygen delivery. This is made possible by purifying the silicone used in the material formulations well beyond that historically available. For further information, contact Paragon at 1-800-223-3539 or by E-mail at paragon@paragonvision.com

W-J Reports Global Soft Lens Market Trends

Wesley Jessen has published two special reports — 1998 U.S. Soft Lens Market Update and Global Soft Contact Lens Market: 1998 Update. According to the reports, U.S. sales of soft contact lenses in 1998 increased 3% while worldwide manufacturer sales were up 6% to $2.416 billion. U.S. sales accounted for 47% of worldwide volume. In Europe, sales were up 7% in 1998 and in Japan they were up 14%. U.S. manufacturers dominate the worldwide market, accounting for 90% of total sales. For additional information, contact Dr. Dwight H. Akerman, director, professional services.

ASCO Meetings Calendar

Ophthalmic Optics Educators SIG Meeting
July 30 - August 1, 1999
Englewood, Colorado
Contact: Carol Brubaker

Clinic Directors/ Administrators SIG
September 30 - October 3, 1999
Fullerton, California
Contact: Carol Brubaker

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

Perceived Barriers To Faculty Achievement In the Area of Scholarly Activity

Mary Beth Woehrle, O.D., FAAO, FCOVD
Sanford M. Gross, O.D., FAAO

ABSTRACT

A key element of productivity for optometric faculty is scholarly activity. This survey project served as a needs assessment for the Illinois College of Optometry (ICO) faculty concerning their perceived barriers to scholarly activity. Included in the survey were the following areas: time management, communication skills, knowledge of research design and statistics, computer literacy, institutional support, utilization of human/material resources, and library resource skills. Participants rated their abilities on a Likert scale. The following results were shown: 1) a majority of faculty perceived their skills or resources were not sufficient in a wide array of areas, 2) no significant differences were found among the means for each category, and 3) evaluation of standard deviations indicated high variability among individual faculty members. This assessment illustrates that the faculty development program at ICO needs to be both comprehensive and multi-phasic. Additionally, both individual initiatives and formal programs are required in order to successfully meet the faculty's perceived needs in the area of scholarly activity.

Key Words: *faculty development, research, scholarly activity, optometric education*

Introduction

Calls for further research and discussion in the area of faculty development have occurred recently in the optometric literature.[1] Lipetz, Bussigel, and Foley have reported that research regarding the outcomes of faculty development offerings in higher education is indeed sparse. They, as well as others, further elucidate that successful development programs are contingent upon tailoring an intervention that is unique to that institution and as specific as possible to the individual needs of its faculty.[2,3] Boice writes, until "we take the time to discover what hinders and what helps them, we can all too easily get off on the wrong track. The vital act in setting up new support programs is paying attention to the most basic of skills and attitudes that new faculty must master."[4]

Dr. Woehrle, an assistant professor at the Illinois College of Optometry, is chair of the Faculty Development Committee. She is also an attending faculty in the Pediatric/Binocular Vision Clinic of the Illinois Eye Institute and an associate clinical professor at the University of Chicago Department of Ophthalmology and Visual Sciences. Dr. Gross, an assistant professor at the Illinois College of Optometry, is a member of the Faculty Development Committee. He is also a module chief in the Primary Care Service of the Illinois Eye Institute.

This survey project was intended to serve as a needs assessment for the Illinois College of Optometry (ICO) faculty, concerning the barriers they perceive to scholarly activity and publication. Research has shown active faculty participation in this phase to be critical in creating, administering and evaluating faculty development programs[5] Faculty of institutions of higher learning represent a diverse cross section of abilities, interests, and levels of professional development. According to Bland, successful faculty members possess a broad range of skills and perform complex activities. Further, she states that the specific skills necessary for academic success have not been extensively delineated or specifically taught.[6] Therefore, we expect that the results of this survey will show a diverse profile for responses among the constituents, not a single dominant pattern.

However, there should be some general trends that are representative of that institution's academic culture. These trends could be analyzed and possibly prioritized via communication between the institution's administration and faculty. Following this collaborative analysis, an instructional program could be designed to enhance faculty development in the identified areas. Research has clearly shown that faculty development programs are most successful when there is inclusion and ownership by individual faculty members.[6] Utilizing a survey tool in the initial planning of a faculty development program takes into account this necessity of faculty inclusion and ownership. Participation in a survey may also help faculty to self-assess their needs/abilities and allow them to adjust their long-range planning to account for any perceived areas of weakness or strength. Anonymous survey results can serve as an instrument of communication between faculty and administrators with the advantage of decreasing fears of reprisal.

The demonstration of appropriate scholarly activity is often cited as one of the principal barriers to promotion and career development in the academic setting of colleges and universities.[4] The working definition for scholarly activity used in the context of merit and promotion for ICO is "original work or new knowledge that is shared with the profession and the academic community." Success in the area of scholarly activity requires

the concurrent use of diverse skills and resources, as well as challenging the precarious balance between teaching and publishing obligations.[4, 7] Further hindering success is the false assumption made in previous faculty development efforts that the primary focus should be on pedagogical skills.[2] Therefore, the scholarly activity area of academic responsibility was chosen as the subject of our research.

Methods

A questionnaire was designed to assess several skill and resource categories, which are necessary for scholarly activity. These categories included time management, academic support, support staff, research design, learning resources, computer skills, and communication skills. All full-time and part-time faculty were contacted through the internal college mail system. Distributed with the qestionnaire were written guidelines detailing the process of participating in the study, as well as the nature and the purpose of the study (Appendix 1). Included in the guidelines was a statement that by completing and returning the survey the faculty member was participating with informed consent. This method of implied informed consent was used to ensure confidentiality for all faculty. Participation was clearly identified as being voluntary, and faculty were identified with a 4-digit code known only to themselves. Participants were asked to rate their abilities in several areas by numerically ranking a series of statements along a Likert Scale using a range from 1-5. The scaled numbers were identified as follows: (5) = strongly agree, (4) = agree, (3) = neutral, (2) = disagree, and (1) = strongly disagree. The participants were instructed to complete the questionnaire on a Scantron form and to return it to the co-investigators via the internal-college mail service.

Results

Of the 54 surveys distributed to the entire ICO faculty, 49 went to full-time faculty and 5 to part-time faculty. Thirty-five were returned anonymously. Mean responses were calculated for each item, as well as for each category. The data showed that a majority of the faculty perceived that their skills or resources were not sufficient for several items within all categories. Two-thirds or more responded with either neutrality or disagreement to these skills statements. Within each category, there was a broad array of perceived skill levels indicated among the individual items.

The individual survey items with their mean response values and standard deviations are shown (Table 1). Positive response rates (meaning either strongly agreed or agreed was selected) for each individual item were calculated and the results are also shown (Table 1). Of the 40 survey items, six received affirmative responses by two-thirds or more of the participating faculty. The category with the highest mean response for its individual survey items was library resources (mean = 3.76) while computer literacy resulted in the lowest (mean = 2.72).

Percentages of respondents who either agreed or strongly agreed with the survey resource statements for each category were also determined (Figure 1). The greatest number of faculty responded positively to the survey items related to learning resources while the least number responded positively to those items related to academic support.

Conclusion

The survey results indicate the following:

1. A majority of ICO faculty perceived that their skills or resources were not sufficiently developed in a wide array of areas. They responded either negatively or with uncertainty to the vast majority of survey items.
2. While there was some relative ranking of the means among the categories, these differences were not found to be of practical significance. This is especially evident when considering the variability of faculty perceptions within each category.
3. The standard deviations for responses to each item indicated a large degree of variability among individual faculty members. This would be expected from a faculty of diverse backgrounds, clinical and academic experience, and professional interests.
4. The overall assessment illustrates that the faculty development program at our institution will need to be both comprehensive and multiphasic in order to successfully meet the faculty's needs in the area of scholarly activity.

We propose that the ICO community continue to expand its faculty development program. A potential mechanism for this expansion has been established in the "Vision for Excellence" program. The ICO community has adopted "Vision for Excellence" as a strategic plan to guide the College and the Illinois Eye Institute. Within the strategic plan are specific goals and action items to

Figure 1
Percentages of Faculty Responding Positively

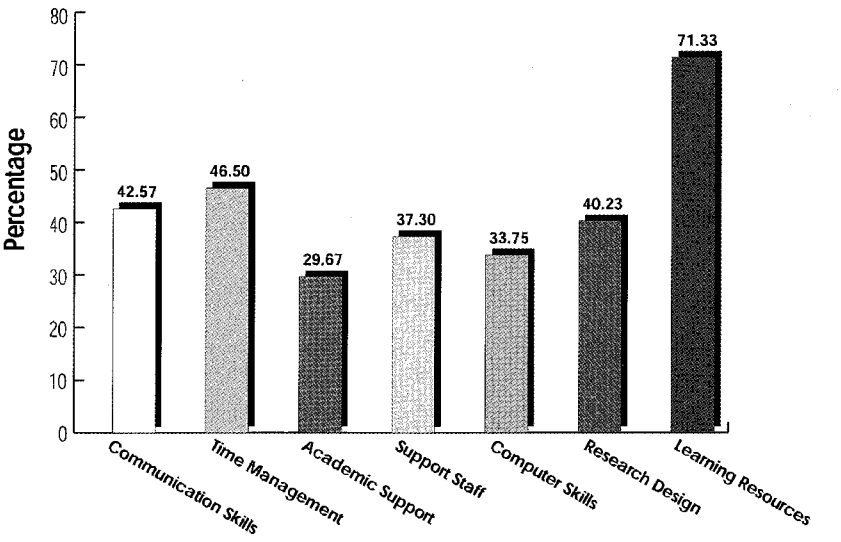

Table 1
Means and Standard Deviations for Survey Items

Likert Scale: (5) strongly agree, (4) agree, (3) neutral, (2) disagree, (1) strongly disagree

Time Management Survey Items (condensed)	Mean	Standard Deviation	Positive Responses
01. Perceived ability to prioritize day to day tasks	2.9	±1.2	28%
02. Perceived ability to break down larger goals into manageable tasks	2.5	±1.1	22%
04. Perceived ability to recognize tasks to be delegated to support personnel	3.4	±0.9	64%
08. Perceived ability to give support staff reasonable time to complete tasks	3.8	±0.8	72%
Academic Support Survey Items			
03. Perceived whether schedule allows sufficient time for achievement	2.1	±0.9	06%
14. Perceived library accessibility during convenient times	3.2	±1.0	50%
24. Perceived access to clinical population for clinical investigation	3.5	±1.1	50%
37. Perceived understanding of policies for the utilization of work-study students	2.3	±1.0	14%
39. Perceived understanding of institution's expectations of scholarly activity	3.3	±1.3	41%
40. Perception that resources are available to meet institution's expectations	2.6	±1.0	17%
Support Staff Survey Items			
05. Perceived the support staff completing tasks in a timely manner	3.4	±0.9	49%
06. Perceived the support staff having skills necessary to perform tasks	3.0	±1.1	34%
07. Perceived the support staff demonstrating willingness to complete tasks	3.0	±1.3	29%
Research Design Survey Items			
20. Perceived ability to generate research ideas	3.5	±1.1	48%
21. Perceived ability to generate sound research projects from ideas	2.9	±1.1	28%
22. Perception of writing skills for publication	3.9	±1.0	78%
23. Perceived knowledge of research protocols using human subjects	3.6	±1.1	56%
25. Perceived knowledge in areas of statistical analysis/outcome measures	2.0	±0.9	06%
26. Perceived ability to ethically sight work in research and publication	3.6	±1.1	61%
27. Perceived knowledge of appropriate journals/stylistic requirements	3.5	±1.0	52%
28. Perception of adequate knowledge in area of educational theory	2.4	±1.0	14%
29. Perception of adequate knowledge of funding sources	2.3	±0.9	17%
31. Perception of knowledge in areas of Public Health and Epidemiology	2.2	±0.8	06%
32. Perceived ICO IRB protocol and function	3.9	±0.09	70%
33. Perceived ability to meet IRB standards for approval of research projects	3.3	±1.1	50%
38. Perceived ability to incorporate student scholastic projects	3.0	±1.2	37%
Learning Resources Survey Items			
11. Perceived awareness of Media Production Dept. capabilities	3.4	±1.3	56%
12. Perceived ability to use computer-based library search strategies	4.1	±1.0	86%
13. Perceived ability to utilize inter-library loan and search strategies	3.8	±1.1	73%
Computer Skills Survey Items			
15. Perceived ability to utilize the Internet / World Wide Web for research	2.3	±1.3	27%
34. Perceived adequacy of computer skills	3.5	±1.2	58%
35. Perceived knowledge to utilize SPSS software	1.9	±1.2	14%
36. Perceived adequacy of currently provided computer technology	3.2	±1.0	36%
Communication Skills Survey Items			
09. Perceived ability to give clear job description to support personnel	3.9	±0.7	80%
10. Perceived ability to outline concrete job expectations	3.8	±0.08	66%
17. Perceived ability to seek assistance from appropriate mentors	3.5	±0.09	55%
18. Perceived ability to request resources from administrators	3.1	±1.1	36%
19. Perceived adequacy of collaborative professional network	2.9	±1.2	33%
30. Perceived ability to request funding from appropriate sources	2.0	±0.6	03%

ensure administrative and financial support in the area of faculty development. The "Vision for Excellence" program is a "living document," which is further being developed with input from all constituents. The faculty development committee will also include results from this needs assessment in their recommendations for further modification and prioritization of current action items.

However, results of the study show that definitive prioritization of individual skill/resource areas is difficult to establish. Clearly enhancement would be beneficial in all categories. Therefore, effective development of faculty needs to be multi-dimensional. Integrating intervention within various areas of perceived skill deficiencies with modification of support structures should allow faculty to increase their success in scholarly output. Because of the variability of individual faculty members' development, intervention should also be multi-phasic, allowing the more entry-level skills to be taught prior to the more specialized skills. This finding supports the work of previous investigators who have argued that "in addition to the need for an expanded institutional response, such a response must be differentiated for different groups (or individuals) of faculty."[8] Furthermore, we propose that it is necessary to initiate less formal interventions, utilizing such modalities as self-instruction curricula, peer evaluation, and mentoring programs in order to realize significant gains in a timely fashion. The need for both individual initiatives as well as formal programs to achieve faculty development and academic vitality has been discussed in work by Irby.[9] Practically speaking, these initiatives are necessary to achieve compatibility with the institution's faculty merit and promotion cycle.

Henceforth, outcome assessments can be made for changes in faculty perception of perceived barriers, as well as actual scholarly output. These assessments should include both post-intervention surveys of participating faculty, as well as objective measurements of faculty's scholarly productivity. Furthermore, we hope to extend the boundaries of this study to include all of the institutions of optometric education within the United States. Such large-scale effort may increase cooperation and synergism among individual optometric faculty development programs.

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Appendix 1

Survey Participation Guidelines

Please read carefully the following items before deciding whether or not to participate in this survey:

- Participation in this survey is strictly voluntary and no one who declines will suffer any resultant adverse consequences.
- The data collected from this survey is also strictly confidential and participants will hereafter be followed only by reference I.D. numbers.
- The information gathered from this survey will play absolutely no part in the promotion/merit process or be used for administrative purposes.
- Neither we as investigators nor any ICO administrators will have access to the identities of individuals' submitted data. (Data is coded by I.D. numbers).
- The information gathered from this study will be used as part of a research project to determine the effectiveness and/or need of specific faculty development programs.
- The information gathered from this survey is used to identify areas in our present support of research scholarly activity that require further development. Programmatic interventions designed to also improve these areas will then be implemented over the course of several months. Subsequently, participating faculty will be re-surveyed to determine the effectiveness of our interventions.
- In the future, the general information gathered from these surveys may serve the additional benefit of justifying funding for certain faculty development programs.
- After carefully reading all the enclosed materials, participation in this survey will be construed as informed consent. Any faculty member may elect to discontinue participation at any time with no adverse consequences. This may be done by submitting a written refusal using only the participant's I.D. number.
- To maintain confidentiality, we are asking individual participants to utilize the last four numbers of their social security number as identification.
- It is likely that this same survey will be given to the faculty of other optometry schools in the future, for the purpose of a more global assessment. Once again, individual confidentiality will be strictly maintained.
- Any questions can be directed to Dr. Mary Beth Woehrle or Dr. Sanford M. Gross.

Appendix 1 — Survey

Individual survey results will be kept strictly confidential. No one outside of the primary researchers, which are Drs. Gross and Woehrle, will have access to your survey answers. Completion of the survey will be a confidential way of providing informed consent.

(a) strongly agree (b) agree (c) neutral (d) disagree (e)strongly disagree

1. I am able to prioritize day-to-day tasks sufficiently (clinical teaching, patient care, committees, etc.) to allow me to incorporate long-term goals of producing research and publications.
2. I am able break down the larger goal of scholarly publication or research into more manageable tasks that can be achieved within my regular schedule.
3. I feel that my current schedule allows sufficient time for achievement in the areas of scholarly publication/ research.
4. I am able to recognize tasks that could be delegated to academic support personnel.
5. Academic support staff complete assigned tasks in a timely manner.
6. Academic support staff have the skills necessary to enhance my efficiency by performing tasks that free my time
7. Academic support staff demonstrate a willingness to complete tasks that support me in my academic endeavors.

(for questions 8-10) In the delegation of tasks to academic support staff I ...

8. give them reasonable time to complete tasks
9. give clear job descriptions
10. outline concrete expectations so that they can successfully complete the tasks.
11. I am thoroughly aware of the capabilities of the media production service so that I can effectively use their services for scholarly research/publication.
12. I can use computer-based search strategies (such as VAL and PAL) to locate desired material.
13. I can effectively utilize inter-library loan and search strategies for research.
14. I am able to use the library at times that fit my schedule.
15. I am able to use the Internet and the www to facilitate my publication and research activities.
16. I communicate my personal availability to mentor faculty in the areas of scholarly research/publication.
17. I feel comfortable seeking assistance from appropriate mentors in the areas of scholarly research/publication.
18. I am able to request from administrators the resources necessary to achieve in the areas of research/publication. (Including time, materials, additional education, travel)
19. I have an adequate network of professionals to collaborate with and/or seek assistance from in the areas of research and publication.
20. I am able to generate ideas for potential research.
21. I am able to take my ideas and generate a sound research project from them.
22. I have the writing skills necessary to submit for publication my scholarly activity.
23. I have knowledge of the protocols that are necessary fro research utilizing IEI human subjects or medical data.
24. I have access to the necessary population for investigation in the clinical research areas in which I have interest.
25. I have adequate knowledge in the area of statistical analysis and outcome measurements necessary to interpret research data.
26. I know how to utilize the work of others with adequate citation, and modification for ethical publication.
27. I have adequate knowledge of potentially appropriate journals, as well as their stylistic requirements for submission.
28. I have adequate knowledge in the areas of current educational theory, to design research in these area. (i.e. education of adult learners, critical thinking skills, Bloom's Taxonomy etc.)
29. I have adequate knowledge of funding sources to support my research.
30. I know how to successfully request funding from these sources.
31. I have adequate knowledge in the areas of Public Health or Epidemiology to facilitate clinical research on related topics.
32. I am aware of the protocol and the function of the ICO IRB
33. I understand the process of IRB approval sufficiently to have my research projects meet their requirements at the initial submission.
34. I have adequate computer skills necessary to facilitate scholarly activity.
35. I have the knowledge to effectively utilize the SPSS software that is installed on my computer.
36. The computer system that I am using is appropriate to support my research data and publishing.
37. I clearly understand the policies of utilizing workstudies for research assistants.
38. I clearly understand how to incorporate students scholastic projects (i.e. 4th year independent study) into my scholarly activities.
39. I have a clear understanding of my institutions expectations in the area of scholarly activity.
40. Given my present resources the expectations are realistic.

Case History Skill Assessment: Breadth Versus Depth

Leon J. Gross, Ph.D.
Charles L. Haine, O.D., M.S.

ABSTRACT

The case history assessment of the National Board Clinical Skills section typically exhibits relatively poor performance. The purpose of this study was to determine whether this poor performance is the result of failure to inquire about major history issues, or failure to explore these issues thoroughly. Data were analyzed from the May 1997 Clinical Skills examination administered to 1266 candidates. Case history assessment, the longest (47 items) and most heavily weighted (120 points) of the 21 clinical skills examined, was analyzed with regard to difficulty and discrimination for initial and follow-up queries, and the progression of performance through the 11 item categories of questions (clusters) among which the 47 items were arranged. The results indicated that candidates generally addressed each of the clusters, but were weak in follow-up questioning. Performance in follow-up questioning was correlated with overall section performance. Candidates were no more or less likely to follow-up near the end of the case history assessment than they were at the beginning. The relatively poor performance in follow-up patient questioning suggests that this skill should receive greater emphasis in the clinical portion of optometric education.

Key Words: *case history skill, clinical assessment*

Clinicians' expertise in case history assessment may be regarded as one of the most important diagnostic clinical skills. This skill is typically the first involved in a patient encounter, and its interactive nature provides an opportunity for the clinician to establish rapport with the patient. More importantly, the information gleaned from the patient is vital in formulating clinical hypotheses, and in determining and prioritizing the subsequent clinical data. As the examination evolves, the data obtained may confirm or reject the clinical hypotheses, but the clinical approach is based on the case history data obtained.

Given its criticality, evaluation of case history ability should be a component of the licensure process. On the Clinical Skills section of the National Board Part III - Patient Care examination, case history assessment is the most heavily weighted of the 21 skills evaluated with respect to the number of points. The *Examination Guide* includes the checklist of evaluation items used by the examiners during the test (refer to Appendix A), to inform all candidates of the evaluation criteria.

Despite its importance and item disclosure, candidates traditionally perform relatively poorly on case history assessment. This phenomenon may result from failure to inquire about major history issues (e.g., ocular health) or failure to explore these issues thoroughly (i.e., failure to obtain sufficient follow-up information after the initial clinical inquiry). Although either pattern could represent inadequate skill, the different patterns would suggest different types of educational remediation needed. The purpose of this study was to determine if there is a predominant pattern among students as they complete their professional education and enter practice.

Dr. Gross is director of psychometrics and research at the National Board of Examiners in Optometry, Bethesda, Maryland. Dr. Haine was associate director for psychometrics and research and director of information systems at the National Board when this research was conducted. He is currently vice president of academic affairs at Southern College of Optometry, Memphis, TN. *An earlier version of this article was presented at the 1997 annual meeting of the American Academy of Optometry in San Antonio.*

Methods

As noted earlier, the case history assessment is the most heavily weighted of the 21 skills evaluated on the Clinical Skills section of the National Board. Case history assessment has the largest number of items (47) and points (120).

The 47 items are listed in a logical order, beginning with the patient's chief complaint, and are arranged in 11 categories (clusters) of questions. Each cluster focuses on a specific aspect of the patient's history (e.g., chief complaint). The clusters are designed so that the first item is the most obvious and important, and the subsequent items are follow-up queries.

Each item is weighted on a 1-10 criticality scale, as described by Gross and Haine[1]. These weights are excluded from the *Examination Guide* to preclude examiners from being distracted by the consequences of a "no" item assessment. Since examiners are instructed to conduct their evaluation as a performance audit in compiling a database of actions, rather than scoring or rendering pass-fail decisions, the item scoring weights are treated as confidential. For more detailed information regarding scoring and pass-fail standard setting, the reader is referred to Gross[2] and Gross and Haine[1].

The data evaluated were taken from the initial item analysis of the May 1997 Clinical Skills examination.

This section was administered to 1266 candidates in 16 test centers during three weekends. To date, this was the largest number of candidates to participate in this examination section.

Results

Table 1 displays the item analysis data for the 47 items comprising the case history assessment. The items are listed as items 2-48, since item 1 (Did the candidate greet the patient?) is considered to be a general station procedure that is applicable to all the clinical skills performed at the station, rather than an intrinsic component of any skill. Therefore, the general station procedure is scored separately. Each of the other four stations contains at least one general station procedure also.

The data in Table 1 are grouped into the 11 content clusters. For each item, three p-values, or difficulty indices, are listed. On written examinations, a p-value is the percentage of candidates answering an item correctly. On the Clinical Skills examination, a p-value is the percentage of candidates who are scored as a "yes," indicating that they performed the item correctly. The three p-values listed for each item reference the performance of the total population, candidates passing, and candidates failing. Also included is the discrimination index (P-F Diff), which for this examination, is the difference in p-value between the passing candidates and failing candidates. This statistic indicates the degree to which the item distinguished between passing and failing candidates, which is one of the most important item statistics in determining the quality of measurement.

The mean score for the May 1997 Clinical Skills examination was 89.2%. This is a typical level of performance for the national cohort. In comparison with written examinations, this mean is considered to be relatively high, an indication of an "easy" test. However, the Clinical Skills examination is designed as a mastery test, and candidates are expected to perform at significantly higher levels than they do on written examinations. The pass-fail standard is therefore set correspondingly higher to correspond to the expectation of superior performance, particularly since all candidates are informed of each of the evaluation items several months before the examination.

Table 1:
Item Performance Statistics

Cluster	Item	P Total	P Passers	P Failees	P-F Diff
1	2	100.0	100.0	100.0	0.0
	3	86.5	87.0	76.9	10.1
	4	63.5	64.5	46.2	18.3
	5	93.8	94.4	83.1	11.3
	6	77.8	78.1	72.3	5.8
	7	78.8	79.5	66.2	13.3
	8	76.2	77.2	56.9	20.3
2	9	94.8	95.3	84.6	10.7
	10	68.5	69.0	60.0	9.0
	11	51.2	52.8	21.5	31.3
	12	75.1	76.2	53.8	22.4
	13	68.1	69.6	41.5	28.1
	14	60.9	62.0	41.5	20.5
	15	67.3	68.7	41.5	27.2
3	16	84.1	85.4	61.5	23.9
	17	79.2	80.6	52.3	28.3
4	18	88.6	89.2	76.9	12.3
	19	79.3	80.3	61.5	18.8
	20	89.0	89.6	76.9	12.7
5	21	97.9	98.6	86.2	12.4
	22	88.7	90.2	61.5	28.7
	23	84.8	86.0	61.5	24.5
	24	55.4	56.6	33.8	22.8
6	25	86.6	87.7	66.2	21.5
	26	72.9	74.2	49.2	25.0
	27	74.3	75.9	44.6	31.3
7	28	93.8	94.8	75.4	19.4
	29	97.2	97.8	86.2	11.6
	30	55.5	56.7	32.3	24.4
	31	85.8	86.9	64.6	22.3
8	32	95.3	95.8	86.2	9.6
	33	74.2	75.5	49.2	26.3
	34	76.3	77.5	55.4	22.1
	35	56.0	57.6	26.2	31.4
	36	53.4	55.3	18.5	36.8
9	37	91.6	91.6	90.8	0.8
	38	66.1	67.9	32.3	35.6
	39	51.7	53.1	26.2	26.9
	40	76.0	77.4	50.8	26.6
10	41	88.8	89.9	69.2	20.7
	42	90.4	91.1	76.9	14.2
	43	63.9	65.4	35.4	30.0
	44	74.0	75.8	40.0	35.8
11	45	91.9	92.9	72.3	20.6
	46	91.9	92.8	75.4	17.4
	47	69.3	70.7	43.1	27.6
	48	78.4	80.0	49.2	30.8

p-values indicate the mean percentage of candidates scored as "yes" for an item

The mean p-values in Table 1 are higher for the passing candidates than for the failees. While the failees also exhibit high p-values (i.e., relative to a written examination) because of the mastery nature of the test, the failee p-values are considerably lower than the p-values for the passers. This differential is summarized in the P-F Diff, which, as noted earlier, is the discrimination index for the items.

A discrimination index correlates or compares performance on an item with performance on the test. Positive values indicate a positive relationship; specifically, candidates performing well on the item (i.e., scored as correct or "yes") perform better on the test than do candidates who "miss" the item (i.e., scored as "no"). Negative discrimination values indicate that candidates who miss the item perform better on the test. This is a displeasing index, for it suggests that the better the clinician - as determined by overall test score - the worse one performs on the item. As a negative discrimination can suggest that candidates are penalized for "knowing too much," negative values, particularly if they are high (i.e., between -.20 and -1.00) often reveal a conceptually flawed item that should be deleted from scoring.

For 46 of the 47 items, the discrimination index is positive, and in many instances, markedly so. Item 2 is the sole item for which there is no positive discrimination index. This item's lack of discrimination is the result of a p-value of 100.0 for both candidate subgroups, which precludes any differential.

Performance comparisons between initial and follow-up items was of particular interest. This comparison would indicate whether candidate scores were more affected by failure to initiate inquiry or failure to follow-up. This comparison between the performance on the initial items in each of the 11 clusters, and each of the 36 follow-up items, is contained in Figure 1. As this figure indicates, performance is significantly higher on the 11 initial items than it is on the 36 follow-up items ($F_{1,45}$=22.46; p<.01). The 11 initial items exhibited a mean p-value of (92.1%), while the 36 follow-up items exhibited a mean p-value of (73.7%). This strongly suggests that the relatively poor performance in case history assessment results primarily from failure to explore clinical issues thoroughly, rather than from omitting the major queries.

Figure 1
Performance on Initial and Follow-up Items

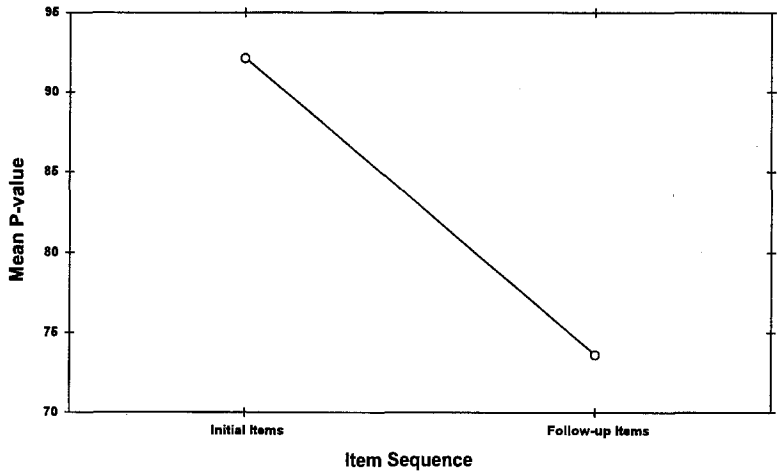


Figure 2
Item Sequence and Item Discrimination

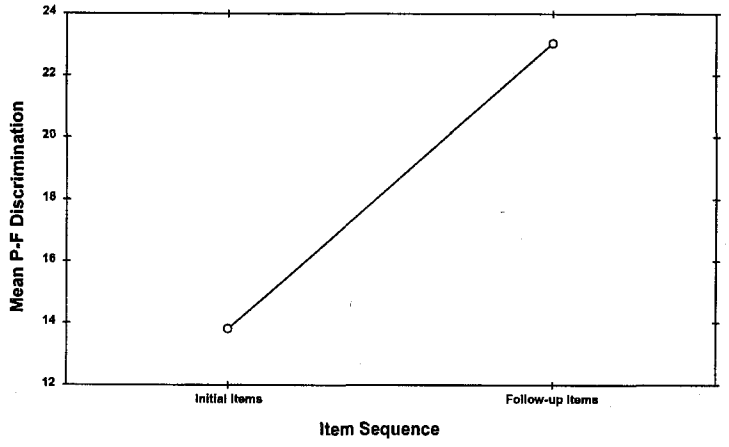


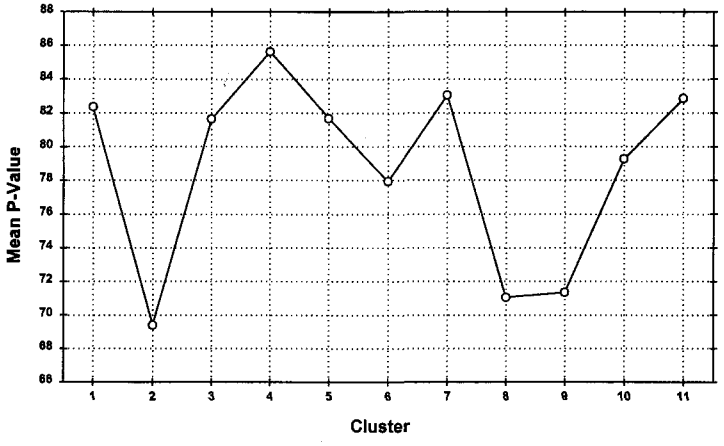
Figure 2 indicates that the follow-up items exhibited a significantly higher mean discrimination index ($F_{1,45}$=10.88; p<.01). The mean discrimination index was 0.14 for the initial items, and 0.23 for the follow-up items. This indicates that the failure to follow-up thoroughly is much more characteristic of failing candidates than passing candidates, and as such, contributes to inadequate performance on the National Board Clinical Skills examination.

The subsequent concern was whether the failure to follow-up adequately is related to specific content in the clinical clusters or progresses through the assessment. Figure 3 provides a plot of the mean p-value for the follow-up items in each of the 11 clusters. The non-linear (specifically, up-and-down) nature of the mean p-values of follow-up items by cluster indicates that there is no fatigue effect, and no statistical significance was observed ($F_{10,36}$=0.77; p>.05). Candidates are as likely to perform well or poorly on these follow-up items at the end of the case history assessment (cluster 11 vs. clusters 8-9) as they are on the beginning clusters (cluster 1 vs. cluster 2).

Conclusions

The results of this investigation are not pleasing. They suggest the need for improvement of entry-level gradu-

Figure 3
Cluster Sequence and Performance



Appendix A: Case History Evaluation Checklist

GENERAL CASE HISTORY / PATIENT COMMUNICATION - Station 1, Skill 1

General Station Procedure
- (Y) (N) (C) 1. Did the candidate greet the patient?

Case History: Data Gathering

A. Chief Complaint
- (Y) (N) (C) 2. What
- (Y) (N) (C) 3. Location
- (Y) (N) (C) 4. Degree of problem
- (Y) (N) (C) 5. First episode
- (Y) (N) (C) 6. Frequency
- (Y) (N) (C) 7. Duration
- (Y) (N) (C) 8. Relief

B. Secondary Complaints / Symptoms
- (Y) (N) (C) 9. What
- (Y) (N) (C) 10. Location
- (Y) (N) (C) 11. Degree of problem
- (Y) (N) (C) 12. First episode
- (Y) (N) (C) 13. Frequency
- (Y) (N) (C) 14. Duration
- (Y) (N) (C) 15. Relief

C. Additional Specific Visual Requirements
- (Y) (N) (C) 16. Work-related
- (Y) (N) (C) 17. Leisure-related

D. Patient's Ocular History

-Visual Correction
- (Y) (N) (C) 18. Type / purpose
- (Y) (N) (C) 19. Date of first Rx
- (Y) (N) (C) 20. Duration of current Rx

-Last Exam / Results
- (Y) (N) (C) 21. Date
- (Y) (N) (C) 22. Condition(s) noted
- (Y) (N) (C) 23. Treatment (if any)
- (Y) (N) (C) 24. Recommended follow-up

D. Patient's Ocular History (continued)

-Eye Disease / Trauma / Surgery
- (Y) (N) (C) 25. What
- (Y) (N) (C) 26. When
- (Y) (N) (C) 27. Current status / outcome

E. Last Physical Examination / Results
- (Y) (N) (C) 28. Date
- (Y) (N) (C) 29. Condition(s) noted
- (Y) (N) (C) 30. When first noted
- (Y) (N) (C) 31. Treatment (if any)

F. Medications Taken by Patient
- (Y) (N) (C) 32. Prescription / OTC
- (Y) (N) (C) 33. For what condition
- (Y) (N) (C) 34. Dosage
- (Y) (N) (C) 35. Compliance
- (Y) (N) (C) 36. Side effects

G. Patient's Allergy History
- (Y) (N) (C) 37. Environmental / drug allergen
- (Y) (N) (C) 38. Symptoms
- (Y) (N) (C) 39. Duration
- (Y) (N) (C) 40. Relief / treatment

H. Family Ocular History
- (Y) (N) (C) 41. Who
- (Y) (N) (C) 42. What
- (Y) (N) (C) 43. Duration
- (Y) (N) (C) 44. Treatment

I. Family Health History
- (Y) (N) (C) 45. Who
- (Y) (N) (C) 46. What
- (Y) (N) (C) 47. Duration
- (Y) (N) (C) 48. Treatment

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ates in conducting a clinical case history. On the National Board Clinical Skills examination, the candidate performance indicated an awareness of the major issues to address, but weakness in adequately following-up and obtaining sufficient information. Perhaps the most intuitively pleasing aspect of this study is that poor performance in adequately following-up is closely related to overall clinical performance. Candidates who do not follow-up effectively are more likely to perform poorly on the overall Clinical Skills examination than are candidates who follow-up effectively. Nonetheless, as case history assessment is one of the most important clinical skills, the relatively weak performance should provide a stimulus for educational and clinical remediation.

References

1. Haine CL, Gross LJ. Relationship between affective and psychomotor skill: an analysis from a national assessment." Paper presented at the annual meeting of the American Academy of Optometry, New Orleans, December 1995.
2. Gross LJ. Interrater reliability reconsidered: performance assessment using one examiner per candidate. Eval Health Prof 1994; 17:465-484.

Publication Guidelines

Optometic Education

Introduction

Optometric Education is the national quarterly publication of the Association of Schools and Colleges of Optometry. Its circulation includes all of the accredited optometric educational institutions in the United States, as well as students, practitioners, government leaders, and others in the health sciences and education. Established in 1975 as the *Journal of Optometric Education,* it is the forum for communication and exchange of information pertinent to optometric education. It is the only publication devoted entirely to optometric education.

Manuscripts submitted for publication are evaluated by any or all of the following:

1) journal editor, 2) members of a peer review board, and 3) two or more independent referees who are specially selected as nationally recognized experts in the subject area of the manuscript. Manuscripts are considered for publication with the understanding that they are original contributions and have not been submitted for publication or accepted for publication elsewhere.

International Style Guide for Uniform Submissions

In May 1987, a number of optometric editors and writers met in St. Louis, Missouri, to develop a standard set of publication guidelines for optometric journals. Optometric Education subscribes to these guidelines. The following instructions to authors reflect those guidelines (first published in 1989 by the Journal of the *American Optometric Association and the American Journal of Optometry and Physiological Optics),* but have been modified slightly to reflect the educational orientation of Optometric Education.

Optometric Education generally publishes four basic types of manuscripts:

1. Articles
2. Literature reviews
3. Communications
4. Editorials

I. Articles

A. Title

The title should be concise, meaningful and clear. It generally should not be in the form of a complete sentence. Subtitles may be used whenever needed for specific purposes relating to the title or text. Titles should indicate the content of the manuscript, serve as a guide to reference librarians, and facilitate communication.

B. Author

The name of the author should be typewritten and centered, one double-space below the title. Proper names should be in capital and lower case letters, and the appropriate academic degree(s) should be indicated. In a multi-authored manuscript, the person who has made the most significant intellectual contribution to the work should be listed first, regardless of academic rank or professional status. This list should include only those who have made a substantial contribution to the design and execution of the work and the writing of the manuscript. Authors should identify the name and address of the author to whom correspondence should be sent.

C. Abstract

Authors are required to submit abstracts with their papers. The abstracts should be typed on a separate sheet of paper in one paragraph, and it should not exceed 100 words. Abstracts should be as informative as possible and should contain statements regarding the nature of the problem studied, methods, results, and conclusions.

D. Key Words

Authors should select key words (about 5) that reflect the primary subject matter of the paper. The purpose of key words is to assist reference librarians and others in retrieval and cross-indexing. *Optometric Education* is listed in the computer databases Ocular Resources Review and Educational Resources Information Center (ERIC).

E. Text

The goal of scientific writing is effective communication. More specifically, its goal is to communicate abstract propositions, logical arguments, empirical observations, and experimental results, including their interrelationships and interactions.

Authors should use the active voice ("this study shows" rather than "it is shown by this study") and the first person ("I did" rather than "the author did"). The past tense is appropriate for describing what was done in an experiment; the present tense is suitable for referring to data in tables and figures.

Lens formulas and associated acuities should be expressed as in the following example: OD:+2.25 - 1.00 X 95, 20/20 (6/6).

Generic drug names should be used, followed by the proprietary name in parentheses at the first mention. Acronyms and abbreviations should always be spelled out at first mention.

Symbols and diacritical marks, when used, must be clearly drawn and identified in pencil in the margin, for example, "prism diopter sign."

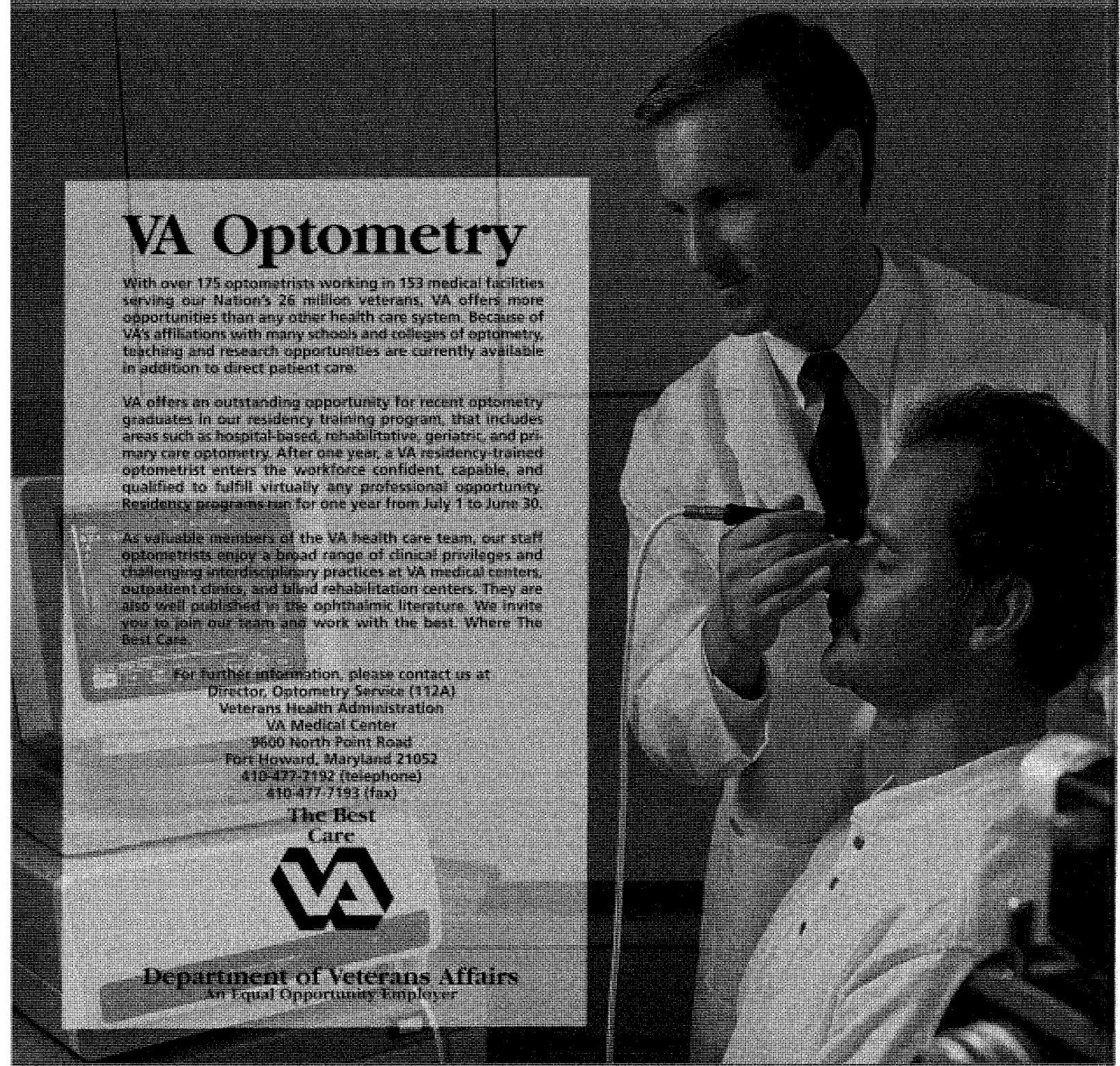
Manuscripts should be organized within the framework of a format outline. The standard outline for reporting of studies, experiments, or other research projects is as follows:

1. Introduction

   The introduction has several functions. It acquaints the reader with other relevant work performed in the subject area. Only contributions that bear on the interpretation of the results should be referenced. The introduction also presents the general nature of the problem to be addressed, the specific aspect of the problem that was studied, and the hypothesis and the manner in which it was tested.

(Continued on page 125)

Looking Toward the Future...



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Guidelines Continued from page 123

2. Methods
   The methods should be described in enough detail so that others could replicate them. However, if portions of the methods have been described elsewhere, a summary with appropriate citations is sufficient. It is essential to describe how case and control subjects were selected for study. It is important to describe any commercially available apparatus used in the study by identifying the manufacturer's name and address. Brief descriptions of methods that have been published but may not be universally understood should be presented. In addition, limitations of the methods employed should be presented, and new or modified methods should be described in detail. It is important to identify precisely all contact lenses, chemicals, drugs, or opthalmic lenses, including generic names, dosages, and administration where appropriate. It is inappropriate to publish names of subjects or patients, their initials or other personal identification. Also, it is inappropriate to use ethnic terms when they serve only to perpetuate unnecessary, unscientific or derogatory connotations.
3. Results
   The results should be presented in a logical order, emphasizing only important findings of the study without elaboration. Limitations of the results and any implications should be stated. The statistical analysis, if any, should be clear and relevant.
4. Discussion
   The discussion should elaborate on the data, noting the interrelationships among the results and relating them to the original question asked in the study. Acceptance or rejection of the hypothesis should be stated. In addition, the discussion should emphasize any unique or new aspects of the study, and discuss the relevancy of the results.

   It is important to draw those conclusions that can be supported by the results. Implications for basic and applied issues should be stated wherever possible.

F. Acknowledgements

Only those who have made a substantial contribution to the study should be acknowledged. Authors are responsible for obtaining written permission from those acknowledged by name, because readers may infer that acknowledged persons have endorsed the methods and conclusions of the manuscript. Many contributions justify acknowledgement, but not authorship. Such contributions might include acknowledgement of technical help, financial support, sources of materials, and persons who have contributed intellectually to the development of the manuscript. Also, any financial relationship that may be interpreted as a conflict of interest must be acknowledged.

G. References

A list of references is placed at the end of a manuscript following the corresponding author's address. References should be listed in sequential order as they are cited in the text by superscript numbers. Accuracy of citations is of major importance because it makes each specific reference retrievable by the reader. Authors should make every attempt to cite references that are relevant, original and current, and only references actually consulted. Manuscripts that have been accepted for publication but not yet printed, should be cited in the footnote section. Manuscripts that have been submitted for consideration for publication, but have not been accepted, should not be referenced. The list of references should be checked for accuracy against the original publications.

Most optometric journals have adopted the style of references used by the U.S. National Library of Medicine in the *Index Medicus*. The titles of publications should be abbreviated according to the style used in *Index Medicus*. A list of abbreviated names of frequently cited publications is printed annually in the January issue of *Index Medicus* as the "List of Journals Indexed."

Examples of the correct form of referencing are listed below:

Journal articles

1. Standard journal article
   (List all authors when six or less; when seven or more, list only the first three and add *et al.*)
   Alpar AJ. Botulinum toxin and its uses in the treatment of ocular disorders. Am J Optom Physiol Opt 1987 Feb;64(2):79-82.
2. No author given
   Anonymous. The OD-MD conflict: economic welfare. Optom Manag 1982 Jul; 18(7):23-7.
3. Journal paginated by issue
   Kloos S. How do TPAs impact practice? Optom Manag 1987Apr;23(4):14-21.

Books and other monographs

Personal author(s)
   Taylor S, Austen DP. Law and management in optometric practice. London: Butterworths, 1986.

4. Editor(s), Compiler(s), as Author(s)
   Barlett JD, Jaanus SD, eds. Clinical ocular pharmacology. Boston: Butterworth, 1984.
5. Chapter in book
   Mondino BJ. Bullous diseases of skin and mucous membranes. In: Duane T, ed. Clinical opthalmology, vol. 4. Hagerstown, MD: Harper & Row, 1980:1-16.
6. Published proceedings paper
   Norden Cn, Leach NA. Calibration of the ERG stimulus. In: Lawville T, ed. Proceedings of the XIV annual symposium of the International Society for Clinical Electroretinography. Doc Opthalmol Proc series 12, XIV ISERG Symposium, May 10-14, 1977. Louisville: XIV Annual Symposium of the International Society for Clinical Electroretinography, (ISERG), 1977:393-403
7. Monograph in a series
   Wurster U, Hoffman I. Influence of age and species on retinal lactate dehydrogenase isoenzymes. In: Hockwin O, ed. Gerontological aspects of eye research. New York: S Karger, 1978:26-39. (von Hahn HP, ed. Interdisciplinary topics in gerontology; vol 13).
8. Agency Publication
   United States Department of Health and Human Services. Fifth report to the President and Congress on the status of health personnel in the United States: Optometry, March 1986. Springfield, VA: United States Department of Commerce. National Technical Information Service, 1986; DHHS publication no. HRS-P-OD-86-1.

Footnotes

Optometric journals discourage excessive or improper use of footnotes, but realize that on specific occasions the footnote may be acceptable. Footnotes can be used to designate a non-retrievable citation, a personal communication, or institutional affiliation of the author. A footnote can also be used to identify sources of equipment or instruments. Footnotes should be identified with small superscript lower case in alphabetical order in the text, and referred to at the end of the text of the manuscript under a listing "Footnotes."

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The purpose of the review is to analyze, consolidate and synthesize the literature on a subject of interest. Topics should be relevant to the journal's readership. A review can make an important contribution to the literature by arriving at a supportable conclusion. Headings for the literature review do not usually follow the standard format (research manuscripts), but the author should use headings and subheadings that promote understanding of the topic.

III. Communications

This type of manuscript generally describes a program, teaching method or technique useful to the health professions educator. Manuscripts submitted in this category frequently discuss programs or methods, which might otherwise be a research article but for which an assessment of effectiveness has not been done. Communications can also review a body of literature on a specific subject for the purpose of providing the practitioner with guidelines or recommendations regarding the subject matter. Headings for a communications paper do not usually follow the standard format for a research paper, but the author should use headings and subheadings that promote understanding of the topic.

IV. Editorials

An editorial is generally a concise article consisting of a critical argument, a personal opinion, or emphasizing an important issue. An editorial does not necessarily depend upon literature support. Letters to the editor as an editorial submission are not encouraged by *Optometric Education*.

V. Tables, Figures and Appendices

A. Tables

Each table should be typed double-spaced on a separate page. Tables are usually not submitted as photographs. Tables should appear in consecutive order in the text designated by Arabic numerals (example: Table 1). Location of tables within the body of the text should be specified in the manuscript. An appropriate table title should be on the same page as the table to which it applies.

B. Figures

All figures, whether line drawings, black-and-white photographs, color photographs or 35-mm slides, should add to the presentation of a manuscript.

All figures should be of professional quality, whether they are drawings or photographs. Most computer-generated "drawings" are unacceptable. Figures should be submitted as 5x7 inch (13x18cm) black-and-white or color, glossy prints.

All figures, whether line drawings, black-and-white photographs or color photographs, should be designated as "Figures" (e.g., Figure 3). They should be numbered consecutively in Arabic numerals throughout the text of the manuscript. Locations of figures within the body of the text should be specified in the manuscript.

1. Legends
   The captions should be typewritten, double-spaced, in paragraph form, and on a separate sheet of paper. Legends should be kept as short as possible.
2. Labels
   Authors should label figures adequately. On the back of each print, the author should place a label that indicates the name of the author, the title of the article, the figure number, and the direction of the figure.

C. Appendices

Occasionally it is necessary for the author to supply subordinate information that is relevant to the study but that might distract the reader because of excessive detail, e.g., computer programs, mathematical formulas, address lists, surveys or other data that might be cumbersome to present in the text. Appendices should be labeled Appendix A, Appendix B, Appendix C, etc. Each should have a short, descriptive title.

VI. Submitting the Manuscript

A. General Guidelines

The manuscript should be typed double-spaced on a heavy grade of white bond 8 1/2x11 inch with margins of at least 1 inch. Print quality should be highly legible. For reviewing purposes, the original plus two photocopies of the manuscript should be submitted along with the original plus three high quality duplicates of each figure and table. All pages should be numbered consecutively, beginning with the title page, and the author's (authors') name(s) should appear only on the title page.

A cover letter should accompany all manuscripts and the letter should identify the corresponding author. The cover letter should also contain a statement that the manuscript has been approved by all of the authors of a multi-authored paper. In addition, the letter should indicate the type of article and whether or not the work has been submitted to other publications. Copies of letters of permission and other pertinent information should be included.

Authors should arrange manuscript pages as follow:

1. First page: Title, name of author(s), degrees and the institutional affiliations, if any
2. Second page: Abstract and key words
3. Text (start on a new page)
4. Acknowledgements (start on a new page)
5. Footnotes (start on a new page)
6. References (start on a new page)
7. Appendices (start on a new page)
8. Tables (each on its own page)
9. Figure legends (all on one page, if possible)
10. Figures (each separately)

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