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Abstract

Optometric practice has been shown to vary greatly between countries. Previous data has suggested much disparity between the level of optometric education and the scope of practice. There currently exists no comprehensive comparative data on the standards and scope of optometric education throughout the world. The goal of this project was to establish such a data source. A two-tiered survey was sent to various countries to establish a comprehensive computer database describing optometric education at various institutions and numerous countries worldwide. The general scope of optometric education is summarized for each country.

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Willard B. Bleything

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Subject Categories

Optometry

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THE CURRENT STATE OF OPTOMETRIC
EDUCATION WORLDWIDE

By

LORNE B. YUDCOVITCH, O.D.

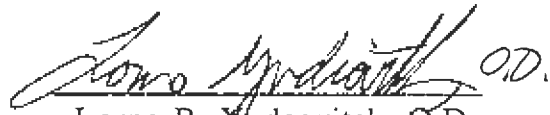
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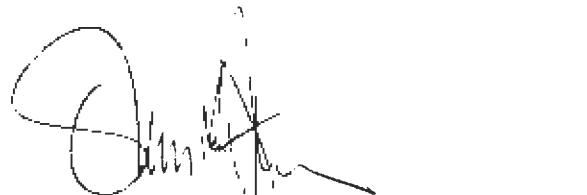
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BIOGRAPHY

Lorne Yudcovitch received his Bachelor of Science degree in Zoology from the University of Calgary in Canada, and a Doctor of Optometry from Pacific University College of Optometry. He is currently completing a Master of Science in Clinical Optometry at Pacific University while serving as a Teaching Fellow in the Faculty of Optometry. Lorne plans to serve the optometric profession in both private practice and education areas in the future.

The Current State of Optometric Education Worldwide



The Current State of Optometric Education Worldwide

Abstract

Optometric practice has been shown to vary greatly between countries. Previous data has suggested much disparity between the level of optometric education and the scope of practice. There currently exists no comprehensive comparative data on the standards and scope of optometric education throughout the world. The goal of this project was to establish such a data source. A two-tiered survey was sent to various countries to establish a comprehensive computer database describing optometric education at various institutions and numerous countries worldwide. The general scope of optometric education is summarized for each country.

Key Words

optometry, international optometry, optometric education, optometric curriculum, International Optometric and Optical League, World Council of Optometry

Introduction

There are over 40 million blind people in the world today¹. The leading causes are trachoma, xerophthalmia, onchocerciasis, trauma, cataract, glaucoma, and uncorrected refractive error². Two-thirds of blindness is preventable by the application of vision knowledge already in existence³. A manpower problem exists, however. It is estimated that optometric services required to help prevent these and other forms of blindness are available to only 20% of the world's population⁴. Compounding this is the fact that two-thirds of countries in the world know nothing of optometry as a profession; out of 116 countries developed enough to have their own currencies, about 90 do not have a law registering, licensing, or regulating optometrists⁴.

The WCO, or World Council of Optometry (formerly the IOOL - International Optometric and Optical League) was established in 1927. The organization's goals have been to improve the science and practice of optometry, advance education and research, and exchange optometric information throughout the world⁵. It serves an important role with schools, associations, and organizations on an international level. The WCO has recognized that education is the key to development of the profession in numerous countries; yet the level of education may vary widely and differ from the scope of practice⁶. The nations vary from having no optometric education whatsoever to education being limited by strict political or economic forces to full-scope optometric education and training. Work has been done to expand the scope of optometric education worldwide. International programs have been established at well-developed optometry schools⁷, and inter-country education standards are being developed that allow migration of graduating practitioners throughout a world region - an example being development of a Pan-European diploma in optometry through the ECOO (European Council for Optometry and Optics)^{8,9}.

There currently exists no comprehensive comparative data on the standards and scope of optometric education throughout the world. Previous data has suggested much disparity between the level of optometric education and scope of practice. Education deficits ultimately result in vision care deficits, so the educational standards within a country must be addressed. A standardized comparison of nations worldwide has not yet been established, however. As well, government awareness and understanding of the educational requirements of optometry is still lacking in many countries. The knowledge of optometric education worldwide would serve to inform government, health organisations and the public as to the scope and background of optometry. As well, the international connection between optometrists will ultimately be strengthened.

The purpose of this study was to establish a comprehensive database describing optometric education at various institutions and numerous countries worldwide.

Methods

A two-tiered survey (see Appendix) was developed and sent to each optometric institution (or a contact person affiliated with a vision organization or responsible for vision care information should an optometric institution not exist) in various countries. The optometric institutions and contact persons were obtained from the WCO international directories and ECOO Handbook⁸. 183 institutions were sent the detailed survey, with 90 responses. 65 countries which currently have no optometric educational base were sent the general survey. Surveys were sent and responded to in English. The detailed survey asked the institution specific questions in four areas:

- 1) Entrance Information
- 2) Institution Information
- 3) Curriculum Details
- 4) Other Professions

The general survey asked the contact person basic questions pertaining to ophthalmic training and practicing individuals, their numbers, future plans for optometric education, and other professions. A window of 6 weeks was given for each country to reply from the data of survey delivery, along with a later 6 week window to permit later submissions. This permitted adequate time for feedback.

Once the surveys were collected, a computer database was established using Claris Filemaker Pro 2.0. All information was entered into the database and alphabetized according to country. The database was organized into the five world region members recognized by the WCO and WHO (World Health Organisation)¹:

- 1) Africa
- 2) Pan America
- 3) Europe
- 4) Eastern Mediterranean
- 5) Asia-Pacific

An alphabetical listing of countries in each of these regions followed by an alphabetical listing of institutions within each country was made.

Obvious language and interpretation restrictions may have created error in the responses. As well, since countries vary widely in population, disease prevalence and incidence, and socio-economic need, it was concluded that raw statistical comparison between countries was unrealistic. Comparative information was thus restricted to general summaries for each country, with database information provided in table format. The general summaries address three main components of optometric instruction: refraction/optics, binocular function/perception, and ocular health. Optometry programs worldwide tend to have refraction as a common element, and this was considered present in all summaries. Averages were taken for any numerical response having a range, and written descriptors were, for the most part written verbatim, grammar-permitting.

Hardcopy surveys which included booklets, catalogs and other information sent by the country were bound and catalogued.

Results

54 countries (112 contacts) completed and returned the surveys. 47% of contacts surveyed responded.^a A basic summary of each country follows, indicating the source of data in each case:

Africa

BOTSWANA

Botswana Optical Association

Botswana currently has 30 university and college-trained opticians, 6 ophthalmologists and 18 refractionist-nurses providing vision care. About half of each of these vision care providers are trained in other countries; this includes some optometrists. The Botswanan Optometric Association is newly formed, although there are no current plans for optometric education.

GHANA

Kumasi University of Science and Technology

Kumasi University has a 7-year program that follows 12 years secondary school and includes 2 years basic sciences. 8 students per year are instructed by 2 full-time and 7 part-time instructors. Diagnostic pharmaceuticals are used practically, and therapeutics are used only in first aid measures. The curriculum is comprehensive with binocular function instruction. It excludes BIO, gonioscopy, and strabismus and amblyopia testing/treatment. Clinics and externship programs are offered. The program awards Doctorate of Optometry degrees.

GUYANA

Independent source

Vision care is provided by 2 technically-schooled opticians, 3 university/college-schooled optometrists, and 4 ophthalmologists. There are no future plans for optometric education.

KENYA

Independent source

Independent source

Kenya has approximately 10 apprentice opticians, 25 university/college-schooled optometrists and 15 ophthalmologists (all trained in other countries) providing vision care. The apprentice opticians provide services at the Chestofell Blind Mission in the country. There are no future plans for optometric education.

NAMIBIA

Independent source

Independent source

Namibia has an estimated 25 vision care providers at all levels, consisting of 10 university/college-schooled optometrists, 6 apprentice opticians, 5 technically-schooled opticians, and 4 ophthalmologists. All but one self-taught optician are trained in other countries. There are no teaching institutions for medicine, dentistry, and pharmacology. There are no future plans for optometric education.

MARITIUS

Maritius Optical Association

10 technically-schooled optometrists, 15 university/college-trained optometrists, and 15 ophthalmologists provide care. The practitioners come from Europe, South Africa, India, Russia, and the United States. There are no teaching institutions for the health professions, and no future plans for optometric education.

NIGERIA

University of Benin

Imo State University

University of Benin's 6-year program follows 12 years secondary school and includes 2 years basic sciences. 60 students per year are instructed by 15 full-time and 40 part-time instructors. Diagnostic pharmaceuticals are used practically, and therapeutics are used in glaucoma, ocular emergencies and disease management. Curriculum is complete, although the binocular function instruction excludes strabismus and amblyopia treatment. Clinics and externship programs are offered. The program

awards Doctorate of Optometry degrees. Imo State University is beginning a 6-year program that will parallel the University of Benin in terms of curriculum and requirements.

SOUTH AFRICA

University of Durban - Westville
University of the North
Rand Afrikaans University
Technikon Witwatersrand

Optometry schools in Africa have formerly been divided according to race. All programs are 4 years following 12 years of secondary schooling. University of Durban-Westville currently has a clinic but no externship. All schools have limited to no diagnostic and therapeutic pharmaceutical training. Curriculum for the most part is extensive and includes binocular function assessment and treatment. Disease and surgical co-management are excluded. All but one school award a Bachelor of Optometry; the Technikon Witwatersrand awards a National Diploma: Optometry after 3 years, a B.Tech after 4 years. The universities each provide over 3100 clock hours of instruction.

ZAMBIA

Independent source

Only 2 ophthalmologists provide vision care in Zambia. There are plans for training at the M'Bereshi Mission Hospital should funds be made available.

Pan America

BRAZIL

A.B.P.O.O. (Association of Brazilian Physicians and Ophthalmic Opticians) source

Brazil currently has legal difficulties with both government and ophthalmology groups in testing and prescribing spectacles. Technically-schooled opticians (300 in number), trained by an A.B.P.O.O. 2100-clock-hour program with help from Columbian optometrists) cannot test or prescribe under current law. No university/college-level school is present. Ophthalmologists, 7000 in number, can legally prescribe. Before 1994

about 2000 opticians were present; currently there are 6000 strong. There is no data on the number of optometrists trained in other countries. Plans include achieving a university-level course, a technical school (in Limeria; a 4980 clock-hour course with 40 applicant openings), and maintaining equal and superior standards in every school.

CANADA

University of Waterloo

University of Waterloo requires 12 years primary/secondary school followed by at least 1 year of undergraduate science for its 4-year programme. The 60 students per year experience a full curriculum including binocular function/perceptual assessment and treatment. Disease and full pharmaceutical use training is provided on required U.S. externships. Clinical rotations within the school along with vision screenings are also a component. Graduates are awarded a Doctor of Optometry degree.

COLUMBIA

University De La Salle

12 years of primary/secondary schooling are required by the 180 students entering the 5040 clock-hour, 5-year program. Curriculum is comprehensive including diagnostic and therapeutic drug use (under supervision of an ophthalmologist). Binocular vision assessment and treatment instruction is given. Clinic supervision is provided along with externships in government, public and private centers. The title awarded upon graduation is Optometrist.

MEXICO

Instituto Politécnico Nacional (C.I.C.S.)
National Polytechnical Institute (I.P.N.)
Universidad Autonoma De Agascalientes

Mexico's schools require 12 years primary/secondary school education (Universidad Autonoma 13 years) for the 5-year program (Autonoma 4.5 years). Clock-hours are between 4300 (Autonoma) to 8000 (I.P.N.). 35 to 80 students attend classes, with full curricula including binocular function assessment and treatment. Disease and surgery co-management are excluded. Diagnostics are used, but therapeutics are used only under ophthalmologist supervision. Clinical experience is present at all schools,

and externship at hospitals (I.P.N.) and social service centers (Autonoma) are offered. The title awarded is Licensure in Optometry.

PERU

Escuela Superior De Optometria Y Optica

12 years primary/secondary school are required for the 70 entrants of the 5200 clock-hour, 4-year program. Curriculum is limited to refractive testing and spectacle/contact lens fitting, direct ophthalmoscopy, tonometry, and strabismus/amblyopia and binocular vision testing. No pharmaceutical use is allowed. 760 hours is devoted to practical clinical training, but no externship is present. The title awarded is Optometrist.

PUERTO RICO

Inter-America University of Puerto Rico

3 years of prerequisites above the 12-year primary/secondary are required for the 40 applicants in the 4004 clock-hour 4-year program. Curriculum is comprehensive including binocular function assessment and treatment, and diagnostic and therapeutic drug use. Clinical training and externships are provided. The award given to graduates is Doctor of Optometry.

TRINIDAD AND TOBAGO

Independent source

Association of Dispensing Opticians

Independent source

Trinidad and Tobago have between 38 to 48 university/college-trained optometrists, 15 to 22 ophthalmologists, 21 technically-schooled opticians, and 30 self-taught opticians. All of these providers are trained elsewhere. 4 self-taught and 3 apprentice opticians also provide services. Continuing education courses must be acquired abroad. No school of optometry currently exists in Trinidad and Tobago.

URUGUAY

Independent source

Currently there are 200 ophthalmologists which provide all vision care in Uruguay. There are plans to establish a school of optometry once instructors and materials can be assembled.

U.S.A.

University of Alabama at Birmingham
University of California, Berkeley
Ferris State University
University of Houston
Illinois College of Optometry
Indiana University
University of Missouri - St. Louis
New England College of Optometry
Northeastern State University
Nova Southeastern University
Ohio State University
Pacific University
Southern California College of Optometry
Southern College of Optometry

The United States conforms to consistent full-scope curriculum for all entrants including binocular function assesment and treatment and diagnostic and therapeutic drug use. All schools require 12 years primary/secondary education followed by a minimum of 3 years undergraduate education, with class size varying from 26 to 100 students. Clinical rotations and externships are provided at all schools. Some schools provide experience with laser treatment along with advanced instrumentation training. Many schools offer B.S. degrees after the second year of the program. Masters and Ph.D. programs are offered at the university-based programs. Graduates are awarded the Doctor of Optometry degree at all schools.

Europe

BELGIUM

Centre d'Etudes des Sciences Optiques Appliquées
Institut D-Optique Raymond Tibaut
Institut Sainte Marie/Jambes

Primary/secondary schooling varies from 10 to 12 years, with 3 to 4 - year programs for between 20 to 90 students. Clock-hours exceed 3200 for all schools. Since treatment of disease is not legally allowed in Belgium by optometrists, the curriculum is based on refractive and corrective

devices. No binocular function assessment or treatment is provided. BIO, gonioscopy and tonometry are not taught, and no diagnostic or therapeutic pharmaceuticals are used. No externships are offered, and only one (Raymond Tibaut) provides clinical experience. Centre d'Etudes also offers Optometric Extension Program training. Diploma or Certificate in applied optics is awarded.

CZECH REPUBLIC

Masaryk University Medical Facility
Medical High School, Section D: Diplomed Eye Technician
Ophthalmic optics school

Following 13 years primary/secondary school, a 3 - year program encompassing over 2600 clock-hours is provided for classes (20 students at Masaryk, 50 at Medical High School). Curriculum is comprehensive, including binocular function assessment and treatment. Tonometry training is excluded at Masaryk, biomicroscopy training is excluded at Medical, and gonioscopy training is excluded at both. Only partial diagnostic pharmaceutical use is given, with no therapeutic use. Clinic instruction but no externships are provided. A technical diploma is awarded. There is one higher secondary school providing ophthalmic optics instruction.

FRANCE

Association pour l'Enseignement Privé de l'Optique
EOL: School of Optometry of Lille
Universite de Paris-Sud
Institut Françias d'Optometrie Fonctionnelle
University D'Aix Marseille III

Entrance requirements vary at schools in France from advanced level undergraduate education with 2-year optometric program (A.E.P.O.), to 12 years primary/secondary school with 3-year program (Lille) or 4-year program following licensure in opticianry (I.F.O.F.), to Marseille's 13 years primary/secondary school with 2-year (National degree) to 3-year (University degree) programs. Curriculum is refraction - oriented with no tonometry, gonioscopy or disease instruction taught at any school. France prohibits optometrists to use diagnostic and therapeutical pharmaceuticals, and these are not used in schools. Lille and I.F.O.F. provide clinical vision therapy training; however, no externships are provided at any institution.

A certificate in applied optics is awarded, except for Marseille which awards degrees. Graduates of the 2-year certificate program at these schools can practice, or continue on to the university degree program for a full degree.

GERMANY

Fachhochschule Aalen
Hoehere Fachschule Fuer Augenoptik
Staatliche Fachschule Fuer Optinology

Germany's schools, like France, have varied admission (11 to 13 years primary/secondary with 2.5 to 4-year programs) and all require 3 years vocational training as an optician before admission. Class size varies from 28 to 88 students per year. Curriculum is comprehensive and includes binocular vision assessment and treatment. Gonioscopy, posterior segment disease and surgical co-management are excluded. No pharmaceutical use is given. The degrees "Augenoptiker" or "Augenoptikermeister" are given.

GREECE

Optometriki S.p.A. source
Optical source

Optometry is prohibited by law (1975) in Greece. Approximately 1800 ophthalmologists (800 from other countries) provide vision care, along with 2500 technically-schooled opticians/optometrists (500 from other countries), 220 apprentice opticians (50 from other countries), and 250 university/college-trained optometrists from other countries. There are considerations for adding a year of refraction instruction at the Technical School for Opticianry in the future.

HUNGARY

Haynal Imre University

Formerly, this was only a 3 semester 300-hour training between 1987-1992. The program requires 12 years primary/secondary school, 2 years in a School of Optics and 2 years practice in an optical shop. 35 students now enter the 4-year 2713 clock-hour program each year, with a curriculum that excludes biomicroscopy, gonioscopy, disease, strabismus/amblyopia/binocular disorder treatment, and surgery comanagement. Pharmaceuticals are not used. 300 hours is spent in the clinics of Medical universities. No externship is provided. The title of Certified Optometrist is awarded.

ICELAND

Icelandic Optometric Association source

By law only ophthalmologists are permitted to test sight and prescribe visual aids in Iceland. However, of the 28 ophthalmologists in Iceland, there are 18 technically-schooled opticians, 10 apprentice opticians, and 6 self-taught opticians. Instruction from the United Kingdom is providing the Icelandic Optician Association with refraction and optometric instruction. The Scandinavian Optometry Association has prepared this instruction.

ITALY

Regione Lombardia source

Istituto Professionale Statale Per L'Industria E L'Artigianato

Istituto Regionale Studi Optici e Optometrici

Istituto Superiore Di Scienze Optometriche

Italy, like France and Germany, has varied entrance requirements from only 8 years primary school with 5-year program (I.P.S.I.A.) to 13-15 years with Diploma in Optics with 4 year program (I.S.O.O.) to 15 years including 2 years optics with 1-year program (I.R.S.O.O.) or 3-year program (I.S.S.O.). The schools provide between 1200 to 1500 clock-hours of instruction for classes ranging from 18 to 40 students. Curriculum varies between schools, with binocular function assessment and treatment given. However, ocular disease areas are lacking in instruction. Pharmaceutical use is not given. Clinical experience is provided, but no externships (except for 15 hours hospital experience at I.R.S.O.O.). Diplomas and Certificates in Optometry are awarded. Regione Lombardia is no longer providing optometric education.

LATVIA

Independent source

The University of Latvia is currently working B.Sc., M.Sc., and professional optometric programs into the curricula. Of recent, vision care is provided by 200 ophthalmologists (25 from other countries), 40 technically-schooled opticians (15 from other countries), 25 self-taught opticians, and 15 university/college-schooled optometrists (2 from other countries).

LUXEMBOURG

Federation Des Artisans source

40 ophthalmologists and 5 university/college-schooled optometrists provide vision care in Luxembourg (all from other countries). 38 technically-schooled opticians within the country fill the gap. Plans for the European Diploma in Optometry acceptance are in the works.

NETHERLANDS

Hogeschool van Utrecht

60 students enter the 4-year Hogeschool van Utrecht program following 11 years primary/secondary school. Curriculum excludes posterior disease, strabismus/amblyopia and binocular dysfunction therapy. Diagnostic drugs are allowed, but not therapeutics. Clinical experience in third year and a 1-year externship are offered. A Bachelor of Science degree is awarded.

NORWAY

SVGB source

Buskerud College

44 students enter the 3-year 2108 clock-hour Buskerud program each year following 12 years primary/secondary school. The curriculum excludes gonioscopy, disease, contact lenses, and surgical co-management. Binocular dysfunction assessment and treatment instruction is taught. No pharmaceutical use is taught. Clinic experience and vision screenings are provided in the college; however, no externship is present. A Diploma is awarded upon completion.

POLAND

Karol Marcinkowski University

The 23 students entering Karol Marcinkowski University Department of Optometry 2-year program must have 17 years schooling including qualification as an optician and university education. Instruction is limited to refraction techniques with spectacle/contact lens fitting, biomicroscopy, direct ophthalmoscopy, and binocular vision/strabismus-amblyopia testing. No pharmaceuticals are used. No clinical skills or externships are provided. Currently a certificate is awarded. Ophthalmology, with government support, has opposed a formal optometric program despite efforts to upgrade.

PORTUGAL

Biera Interior University

12 years primary/secondary school is required by the 40 entering students for the 3770 clock-hour 5-year program at Biera. Full curriculum excluding gonioscopy and phorometry is provided, with only fluorescein and rose-bengal as the diagnostics. No therapeutic drugs are used. No clinical training with patients is provided, but a 6-month externship is given. A Bachelor's Degree in Optometry is awarded.

ROMANIA

Universitatea Poitechnica diu Bucharest

Bucharest Polytechnic provides a 3-year 2700 clock-hour program for 30 students per year having completed 12 years primary/secondary education. Curriculum excludes instruction in BIO and gonioscopy, and disease/strabismus-amblyopia and surgery co-management. No pharmaceuticals are used. Clinical training is provided, but no externship is offered. Graduates receive the title Subengineer Optometrist.

RUSSIA

Moscow School of Optometry (at Helmholtz Institute)

Helmholtz Institute provides a Medical Middle school of 3 years following 11 years primary/secondary school for 15 students, comprising 432 clock-hours. Instruction is limited to refraction with spectacle fitting, tonometry, visual fields, and strabismus/amblyopia treatment. No pharmaceuticals are used. Clinical experience is provided; no externship is offered. Plans to upgrade the program at Russian Medical University are in the works. The title of Optometrist is awarded.

SLOVENIA

Independent source

No plans for optometric education are expected. Currently approximately 100 ophthalmologists, 30 technically-schooled opticians and 200 apprentice opticians provide vision care.

SPAIN

Escola Universitaria De Optica E Optmetria

Escola Universit ria D'Optica i Optometria De Terrassa

Universidad Complutense De Madrid
Universidad De Murcia

12 years primary/secondary school are required for the 3-year program at all of Spain's universities. Clock-hours are no less than 1900, and class size varies from 80 to 250 students per year. Curriculum for the most part is comprehensive, with some schools missing gonioscopy, BIO, disease, strabismus/amblyopia and surgical co-management. Only one school (Madrid) provides practical diagnostic and pharmaceutical instruction under ophthalmologists; the others have neither. Clinical training may be absent from some schools; no to minimal externship experience is provided. All award a Diploma in Optics and Optometry.

SWEDEN

Karolinska Institutet

40 students with 12 years primary/secondary schooling (from a Science and Technology school) enter the 3600 clock-hour 3-year program at the Karoliska Institute. Curriculum is complete excluding gonioscopy and surgical co-management. Binocular function assessment and treatment are taught. No pharmaceuticals are used. Clinical training is provided, but no externship is offered. A University Diploma in Optometry is awarded.

SWITZERLAND

Schweitz. Höhere Fachschule für Augenoptik

30 Swiss students complete 13 years primary/secondary school before entering the 2670 clock-hour, 2 year program. Curriculum is full excluding disease and surgical co-management, and no pharmaceuticals are used. Binocular function assessment and treatment are taught. Clinical training is provided along with externships with a private optometrist. Graduates are awarded the title Federal Diplomedated Optometrist.

UNITED KINGDOM

Glasgow Caledonian University
University of Manchester
Institute of Optometry

13 years primary/secondary school are required for both Universities. A pre-registration year is also required for each school. Glasgow is a 4-year

3000 clock-hour school, Manchester a 3-year 1800 clock-hour school. Curriculum is full for both institutions. Both schools provide binocular assessment and treatment instruction. The latter school also provides disease instruction and diagnostic pharmaceutical use. No therapeutics are used. Clinical instruction is provided at both schools. Manchester provides a one-year externship in optometric practice or hospital. The Institute of Optometry is a continuing education post-graduate center.

Eastern Mediterranean

IRAN

Mashhad Medical Sciences University

Iranian students must finish 12 years primary/secondary schooling for the 4-year 3917 hour-credit program. 20 applicants are accepted. Curriculum is comprehensive and includes binocular function assessment and treatment. Disease and surgical co-management are not instructed. Pharmaceuticals are not used. Clinical training comprises about two-thirds of the total credits; however, no externship is present. Graduates receive a B.Sc. in Optometry degree.

ISRAEL

Israel College of Optometry

12 years primary/secondary schooling is required for 40 students in a 4-year program. Curriculum is comprehensive, excluding disease and surgical co-management. Binocular function assessment and treatment are taught. Limited cycloplegic refractions and dilated fundus exams are allowed, although no therapeutic pharmaceuticals are used. No clinical experience is given, but an externship involving refractions and observation in a hospital setting is provided. The award given is B.Sc. in Optometry degree.

KUWAIT

Independent source

Kuwait has no plans for optometric education in the future. Vision care is

provided by 90 university/college-trained optometrists, 55 technically-schooled opticians, 26 ophthalmologists, 20 apprentice opticians, and 10 self-taught opticians. All of these vision care providers are from other countries.

Asia-Pacific

AUSTRALIA

University of Melbourne
Queensland University of Technology

The University of Melbourne and Queensland University instruct 35 to 36 students per class in a 4-year program that incorporates basic sciences. This follows 13 years primary and secondary education. The curriculum exceeds 2400 clock hours and is extensive (excluding posterior disease and surgical co-management at University of Melbourne). Queensland University also includes treatment of binocular dysfunctions in its instruction. Diagnostic but not therapeutic pharmaceutical agents are used. Clinical and externship rotations are given. There is a large emphasis towards vision research at both universities.

CHINA

Tianjin Professional University
Wenzhou Medical College

China's schools show variation in faculty, curriculum, and degree awarded. Tianjin University takes 25 to 30 students per year through a 1995 clock-hour 3-year program following 12 years primary and secondary schooling. The curriculum is extensive save for BIO, gonioscopy and disease treatment/ surgical comanagement. Interestingly, they report that diagnostic pharmaceutical agents are not used but therapeutics are. A Certificate of Optometry is awarded. Wenzhou Medical College is a 7774 clock-hour 7-year program for 30 students who have completed 12 years primary/secondary school, with full curriculum including binocular function instruction and diagnostic/therapeutics use. Clinical experience follows graduation, unlike Tianjin. A Bachelor Degree of Medicine (Optometry) is awarded.

FIJI

Independent source

3 technically-schooled opticians/optometrists, 4 university/college-schooled optometrists and 12 ophthalmologists provide vision care. All are educated in other countries. No plans for optometric education are set.

HONG KONG

Hong Kong Polytechnic University

The Hong-Kong Polytechnic University has an entering class of 30 students with a 4-year 2354 clock-hour extensive curriculum following 13 years primary/secondary education. Surgical co-management and pharmaceutical use are excluded along with binocular dysfunction treatment instruction. Clinic rotations are given, but no externships (although this is changing). A Bachelor of Science Degree with Honours is awarded.

INDIA

Elite School of Optometry

Gandhi Eye Hospital

Indian Optical Institute & Refraction Hospital

Institute of Management and Leadership Development

Municipal Eye Hospital

Premilila Vitaldas Polytechnic

All institutions in India require at least 12 years primary/secondary school (except Premilila, which requires only 10) for a 4-year program (except Gandhi Eye Hospital's 2-year, Municipal's 3-year, and Premilila's 2.5-year programs). Clock-hours vary from under 1200 to under 4000 for the schools, based on the number of years of the program. Class size varies from 12 to 33 students per year. Curriculum also varies considerably, with some schools having full-scope practical instruction including diagnostic and therapeutic drug use (Indian Optical Institute) to others allowing only diagnostics (all other schools) and limitation to only refraction-oriented procedures, ophthalmoscopy, tonometry, color vision testing, and visual fields (Premilila). Clinical rotations are present at all schools, with externships only at Premilila (the Indian Optical Institute and Gandhi Eye Hospital are considering this element). Only the Elite School awards a Bachelor of Science degree in Optometry; all others award a Diploma (D.R.Opt. at Gandhi, D.O.S. and post-D.O.S. D.C.L.P in contactology and D.Opt. in orthoptics at the Indian Optical Institute, D.Opt. at the Institute of Management and Municipal, and Diploma in Ophthalmic Technology at Premilila).

INDONESIA

Akademi Refraksi Optisi
Academy of Refractionist Optician Leprino

The Academies of Refractionists in Indonesia provide 3-year programs with over 2250 clock-hours of instruction. Both follow 12 years primary/secondary school, and take between 25 to 40 students. The curriculum is limited to refraction techniques and contact lens/spectacle/low vision - fitting only, with no pharmaceutical use. Some binocular vision and strabismus instruction is taught at the Leprino Academy. Clinical rotations and externships at hospitals are provided by both schools. Non-degree refractionist diplomas are awarded. Plans include changing to a 4-year curriculum in the future.

JAPAN

Kikuchi College of Optometry

Kikuchi College is a 4-year program for 60 students per class following 12 years primary/secondary education. The curriculum excludes BIO, gonioscopy, disease and strabismus/amblyopia treatment, and surgical co-management. No pharmaceuticals are used. There is extensive clinical training and instruction with 2 associated clinics, but no externship. A Certificate of Completion is awarded.

KOREA

Dongshin Junior College
Kimchon College
Masan College
Taegu Health Junior College

Most Korean schools require 12 years primary/secondary education for entrance (Dongshin requires 2 years additional training). All schools provide a 2-year curriculum, limited to refraction techniques and direct ophthalmoscopy. Only Dongshin teaches tonometry and diagnostics; no drug use is allowed at the other schools. Class size varies from 90 to 160 per year. Only refraction and dispensing techniques are used clinically (no clinic at Taegu) and no externship is available. The title awarded is that of Optician. There are plans for a university program in Korea in the future.

MALAYSIA

Universiti Kebangsaan Malaysia

The 4-year (soon to change to 3-year) program serves 24 students following 13 years primary/secondary schooling. The curriculum is comprehensive (excluding gonioscopy, disease and surgical co-management). Binocular function assessment and treatment are taught. Diagnostic pharmaceutical agents are used; therapeutics very little (topical antibiotics and anti-histamines only). Two clinics provide patient experience along with a 1 month externship in private practice. A Bachelor of Optometry degree is awarded.

NEPAL

National Society for Comprehensive EyeCare

Nepal has a 3-year training of paramedicals as ophthalmic assistants after high school. Basic eye disease, refraction, and operation theater observations are instructed in the program, which is recognised by the Ministry of Health, Public Service Commission and N.N.N.S.S.. 200 O.A.s are working in Nepal, followed by 85 ophthalmologists (10 of whom are from other countries).

NEW ZEALAND

University of Auckland

The University of Auckland is a 4-year 2560 clock-hour program with an entering class of 25 students following 13 years primary/secondary school. Curriculum is fully extensive including diagnostic pharmaceuticals, but no therapeutic pharmaceuticals. The clinical training incorporates instructors from Europe and North America, and an externship program is present. A Bachelor of Optometry is awarded.

PHILIPPINES

Cebu Doctors' College
Central Colleges of the Philippines
Centro Escolar University
Manila Central University
Mindanao Medical Foundation College
Southwestern University

All schools in the Philippines are 4 year programs requiring 12 years primary/secondary school (save Cebu and Centro Escolar which requires 10). Class size varies from 15 to 200 depending on the school. Curriculum

in general is comprehensive save for disease management. Clinic experience is present at each school, with some specialty areas such as contact lenses and vision training. No externships are provided (except for Southwestern University). Due to a legislative change in 1996, curriculum enhancement was made to increase all optometric programs to 6 years.

THAILAND

Thai Optometric Association
Independent source

Currently 1800 self-taught opticians (1000 trained elsewhere), 1000 apprentice opticians (500 trained elsewhere), 700 technically-schooled opticians, 30 university-schooled optometrists, and 900 ophthalmologists provide vision care. Future plans include raising the standard of technical skill in the optical business in Thailand.

Table Key: For items that were not given by the responder, and "x" was marked
 A number followed by a "+" indicates greater than the amount listed
 y = yes n = no () = limited use

For curriculum not included, practical training areas numbered are as follows:

TESTING:

- | | | | |
|---|-------------------------|----|-----------------------------------|
| 1 | Refraction (subjective) | 8 | Direct Ophthalmoscopy |
| 2 | Retinoscopy | 9 | Binocular Indirect Ophthalmoscopy |
| 3 | Biomicroscopy | 10 | Gonioscopy |
| 4 | Keratometry | 11 | Phorometry |
| 5 | Tonometry | 12 | Strabismus/Amblyopia Testing |
| 6 | Visual Fields | 13 | Binocular Disorder Testing |
| 7 | Color Vision Testing | | |

TREATING:

- | | | | |
|----|--------------------------|----|----------------------------------|
| 14 | Spectacles | 18 | Anterior Segment Ocular Disease |
| 15 | Contact Lenses | 19 | Posterior Segment Ocular Disease |
| 16 | Low Vision Magnifiers | 20 | Ocular Surgical Comanagement |
| 17 | Strab/Amblyope Treatment | 21 | Binocular Disorder Treatment |

DPAs - Diagnostic Pharmaceutical Agent use TPAs - Therapeutic Pharmaceutical Agents
 Clinic - Clinical rotation Exter - Externship rotation

Table 1: Country Profile for Africa Region

Country	Institution	Prereq Yrs	Class #	Study Yrs	Clock-Hrs	Curriculum Not Included	DPAs	TPAs	Clinic	Exter	Award
Ghana	Kumasi Univerisity	12	8	7	x	4, 9, 10, 11, 12	y	(y)	y	y	O.D.
Nigeria	University of Benin	12	60	6	4530	none	y	y	y	y	O.D.
	Imo State University	12	30	6	x	none	y	y	y	y	O.D.
South Africa	University of Durban-Westville	12	50	4	x	11	n	n	y	n	B.Optom
	University of the North	12	30	4	3528	10, 13, 17	n	n	y	n	B.Optom
	Rand Afrikaans University	12	80	4	3245	11, 19, 20, 21	(y)	(y)	y	y	B.Optom
	Technikon Witwatersrand	12	40	4	3130	9, 10, 21	n	n	y	y	N.Dipl., B.Tech.

Table 5: Country Profile for Asia-Pacific Region

Country	Institution	Prereq Yrs	Class #	Study Yrs	Clock-Hrs	Curriculum Lacking	DPA's	TPA's	Clinic	Extern	Award
Australia	University of Melbourne	12	36	4	2427	20, 21	y	y	y	y	B.Optom.
	Queensland University	12	35	4	2520	none	y	y	y	y	B.Appl.Sci.
China	Tianjin Professional Univerisity	12	25	3	1995	3, 9, 10, 17 -22	n	y	y	n	Cert.Optom.
	Wenzhou Medical College	12	30	5	7774	none	y	y	y	n	B.Medicine
Hong Kong	Hong Kong Polytechnic	13	30	4	2354	21	y	n	y	n	B.Sc.
India	Elite School of Optometry	12	20	4	3852	9, 11, 20	y	n	y	n	B.S.
	Ghandi Eye Hospital	12	30	2	x	3, 8-11, 15, 17, 19, 21	y	n	y	n	D.R.Opt.
	Indian Opt. Inst. & Refr. Hospital	12	15	4	2700	20	y	y	y	n	D.O.S.
	Inst. Mngmnt. & Ldrshp Dvlpmnt	12	15	2	x	9-11, 15, 16, 19-21	y	y	y	y	Dipl.Optom.
	Municipal Eye Hospital	12	12	3	1893	10, 11, 17	y	n	y	n	D.Optom.
	Premilila Vithaldas Polytechnic	10	33	2.5	x	9-13, 16, 17, 19-21	y	n	y	y	D.Ophthal.Tech.
Indonesia	Akademi Refraksi Optisi	12	25	3	2262	3, 5, 6, 8-10, 12, 13, 18-22	n	n	y	y	Dip.Refract.
	Acad. Rfnst. Optician Leprino	12	40	3	3117	5, 6, 9-11, 17-20	n	n	y	y	Dip. III Ref.Opt.
Japan	Kikuchi College of Optometry	12	60	4	x	9, 10, 17-20	n	n	y	y	Cert.Completi on
Korea	Dongshin Junior College	12	110	2	x	9, 10, 18-21	y	n	y	n	Optician
	KimChon College	12	100	2	1632	5-7, 10-13, 16-21	n	n	y	n	Optician
	Masan College	12	90	2	x	3, 5, 6, 9-13, 16-21	n	n	y	n	Optician
	Taegu Health Junior College	12	160	2	x	3, 5-11, 17, 20, 21	n	n	y	n	Optician
Malaysia	Universiti Kebangsaan Malaysia	13	24	4->3	x	10, 18-20	y	y	y	y	B.Optom
New Zealand	University of Aukland	13	24	4	2560	none	y	n	y	y	B.Optom
Philippine	Cebu Doctors' College	10	25	4	x	5, 9, 10, 16-21	n	n	y	n	O.D.
	Centro Colleges of the Philippines	12	30	4	x	9, 10, 17, 20, 21	n	n	y	n	O.D.
	Centro Escolar University	10	200	4	x	5, 9, 10, 16, 20	n	n	y	(y)	O.D.
	Manila Central University	12	100	4	x	18, 19	n	n	y	n	O.D.
	Mindanao Med Foundation College	12	15	4	x	9, 10, 17-21	n	n	y	n	O.D.
	Southwestern University	12	40	4	x	5, 10	n	n	y	y	O.D.

Table 3: Country Profile for Europe Region

Country	Institution	Prereq Yrs	Class #	Study Yrs	Clock-Hrs	Curriculum Not Included	DPAs	TPAs	Clinic	Extern	Award
Belgium	Centre D'Etudes ddes Sc. Opt. Appl.	12	50	3	3240	5, 9, 10, 14, 17-20	n	n	y	n	Dipl./Cert.
	Institut d'Optique Raymond Tibaut	12	90	4	3840	5, 6, 9-11, 17-21	n	n	y	n	Dipl.
	Institute Sainte Marie-Jambes	10	20	3	x	5-7, 9, 10, 12, 16-20	n	n	y	n	Cert.
Czech Republic	Masaryk University Med Facility	13	20	3	2625	5, 9-11, 17-21	n	n	y	n	Tech.Dipl.
	Med H.S. Section D: Dipl. Eye Tech	13	50	3	2820	3, 10, 11, 20	(y)	n	y	n	Tech.Dipl.
	Ophthalmic Optics School	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
France	Assoc. pour l'Ensein. Prive Optiq.	16	150	2	928	5, 10, 12, 16-21	n	n	y	n	Cert.Appl.Opt.
	EOL: School of Optometry of Lille	12	120	3	x	5, 6, 8-12, 17-21	n	n	n	y	Cert.Appl.Opt.
	Institut Francias d'Optom. Fonct.	x	9	4	x	5, 9, 10, 18-20	n	n	y	n	Cert. Appl.Opt.
	Universite de Paris-Sud	15	50	4	1300	18-20	y	n	y	y	Degree
	University D'Aix Marseille III	13	45	4	3750	5, 10-12, 17-21	n	n	n	n	Degree
Germany	Fachhochschule Aalen	12	80	4	x	10, 17-21	n	n	y	y	Degree
	Hoehere Fachschule F. Augenoptik	11	44	2.5	3280	10-12, 17, 19, 20	n	n	n	n	Augenoptiker
	Staatliche Faschule F. Opti	13	28	2.5	3600	5, 10, 19, 20	n	n	n	n	Augenoptiker
Hungary	Haynal Imre Univeristy	12	35	3	2713	3, 10, 17-21	n	n	y	n	Cert. Optom.
Italy	Regione Lombardia	closed	x	x	x	x	x	x	x	x	x
	Ist. Prof. Statele p. L'Ind. L'Art	8	20	5	1300+	5, 9, 10, 12, 16-21	n	n	y	n	Dipl., Mat.Prof.
	Ist. Region. Studi Optici e Optom.	15	40	1	1200	18, 19	n	n	y	n	Cert.
	Ist. Superiore Di Sc. Optome.	15	30	3	1536	9-13, 16-21	n	n	n	n	Cert.
Netherlands	Hogeschool van Utrecht	11	60	4	x	17-21	y	n	y	y	B.Sc.
Norway	Buskerud College	12	44	3	2108	9, 10, 15, 18-20	n	n	y	n	Dipl.
Poland	Karol Marchinkowski University	17	23	2	600	5-7, 9, 10, 16-21	n	n	n	n	Cert.

Portugal	Biera Interior University	12	40	5	3770	9, 10	y	n	y	y	Degree
Romania	Universitatea Poitech d Bucharest	12	30	3	2700	5, 9, 10, 18-20	n	n	y	n	Subeng.Optom
Russia	Moscow School of Optometry	11	15	3	432	4, 5, 7-13, 15, 16, 18-21	n	n	y	n	Optometrist
Spain	Esc. Univers. D Optica E Optom	12	80	3	2500	10, 11, 17-21	y	n	y	n	Dipl,
	Escola Univers. De Terrassa	12	200	3	2070	9, 10, 17, 19, 20	n	n	y	y	Dipl.Opt.Optom.
	Universidad Comlutense De Madrid	12	250	3	2070	9, 16, 20	y	y	y	y	Dipl.Opt.Optom.
	Universidad De Mucia	12	120	3	1900	10, 11, 17-21	n	n	n	n	Dipl.Opt.Optom.
Sweden	Karolinska Institutet	12	40	3	3600	10, 20	n	n	y	n	Dipl.Optom.
Switzerland	Stz.Höhere Fach für Augenoptik	13	30	2	2670	18-20	n	n	y	y	Fed.Dipl.Optom.
United Kingdom	Glasgow Caledonia University	13	50	4	3000	17-20	n	n	y	n	B.Sc.Optom.
	University of Manchester	13	64	3	1800	20	y	n	y	y	B.Sc.Optom.
	Institute of Optometry	N/A	N/A	N/A	N/A	continuing education school	N/A	N/A	N/A	N/A	N/A

(Table 3, continued)

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Table 4: Country Profile for Eastern Mediterranean Region

Country	Institution	Prereq Yrs	Class #	Study Yrs	Clock-Hrs	Curriculum Not Included	DPAs	TPAs	Clinic	Exter nship	Award
Iran	Mashhad Med Sciences University	12	20	4	3917	18-20	n	n	y	n	B.Sc.Optom.
Israel	Israel College of Optometry	12	40	4	x	18-20	y	n	y	y	B.Sc.Optom.

Table 2: Country Profile for the Pan America Region

Country	Institution	Prereq Yrs	Class #	Study Yrs	Clock-Hrs	Curriculum Not Included	DPAs	TPAs	Clinic	Exter nship	Award
Canada	University of Waterloo	13	60	4	x	none	y	y	y	y	O.D.
Columbia	University De La Salle	12	180	5	5040	none	y	y	y	y	Optometrist
Mexico	Inst. Politecnico Nacional(C.I.C.S.)	12	35	5	x	11, 19, 20	n	n	n	n	Lic.Optom.
	Natl. Polytech. Institute (I.P.N.)	12	80	5	8000	none	y	y	y	y	B.S.Optom.
	Univers. Autonoma De Agusal.	13	50	4.5	4416	11, 20	y	y	y	y	Lic.Optom.
Peru	Escuela Sup. de Optom. y Optika	12	70	4	5200	6, 7, 9, 10, 16-21	n	n	y	n	Optometrist
Puerto Rico	Inter-America University	12	40	4	4000+	none	y	y	y	y	O.D.
U.S.A.	University of Alabama	16	40	4	5263	none	y	y	y	y	O.D.
	University of California Berkeley	15	60	4	x	none	y	y	y	y	O.D.
	Ferris State	15	32	4	x	none	y	y	y	y	O.D.
	Univeristy of Houston	15	100	4	x	none	y	y	y	y	O.D.
	Illinois College of Optometry	16	168	4	x	none	y	y	y	y	O.D.
	Indiana University	15+	70	4	x	none	y	y	y	y	O.D.
	University of Missouri-St. Louis	16	44	4	x	none	y	y	y	y	O.D.
	New England College of Optometry	15	100	4	4500	none	y	y	y	y	O.D.
	Northeastern State University	15	26	4	5200	none	y	y	y	y	O.D.
	Nova-Southeastern University	15	100	4	5440	none	y	y	y	y	O.D.
	Ohio State University	16	64	4	2500+	none	y	y	y	y	O.D.
	Pacific University	15	85	4	5000+	none	y	y	y	y	O.D.
	Southern Calif. College Optometry	16	96	4	4361	none	y	y	y	y	O.D.
Southern College of Optometry	15	120	4	470	none	y	y	y	y	O.D.	

(Table 6, continued)

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Table 7: Countries without optometric education: number of vision care providers (trained locally and outside the country)

REGION/ Country	Self- taught local	Self- taught outside	Appren- tice local	Appren- tice outside	Tech- nical local	Tech- nical outside	University/ College local	University/ College outside	Ophthalmolo- gists local	Ophthalmolo- gists outside	Oth- er local	Oth- er outsi- de
AFRICA												
Botswana	0	0	0	0	0	0	15	15	0	6	2	8
Guyana	0	0	0	0	2	0	3	0	4	0	0	0
Kenya	0	0	10	0	0	0	0	30	0	15	0	0
Namibia	0	0	0	0	0	3	0	19	0	3	0	0
Mauritius	0	0	0	0	0	10	0	15	0	15	0	0
Zambia	0	0	0	0	0	0	0	0	0	2	0	0
PAN AMERICA												
Brazil	0	0	0	0	300	0	0	0	7000	0	0	0
Trinidad and Tobago	4	0	0	0	0	21	0	48	0	22	0	0
Uruguay	0	0	0	0	0	0	0	0	200	0	0	0
EUROPE												
Iceland	6	0	10	0	18	0	0	0	28	0	0	0
Latvia	25	0	0	0	25	15	13	2	175	25	0	0
Luxembourg	0	1	0	1	37	1	0	5	0	40	0	1
Slovenia	0	0	0	200	0	30	0	0	0	100	0	0
E. MEDITER.												
Kuwait	0	10	10	10	0	55	0	90	16	10	0	0
ASIA-PACIFIC												
Fiji	0	0	0	0	0	3	0	4	0	12	0	0
Nepal	0	0	0	0	0	0	0	0	75	10	200	0
Thailand	800	1000	500	500	700	0	30	0	900	0	0	0

Discussion

From the country profiles presented, great variation may be seen both between countries and between institutions within a country (Tables 1 through 7, Results). It should be noted that care should be taken not to use comparative analysis as a basis for judgement of one country's "superiority" in educational standards over another, or even between institutions in many cases. Since vision care needs of countries may vary due to a multitude of factors (socio-economic, population, geography, disease prevalence, etc.), the requisite optometric programs may in and of themselves vary to fill the unique needs. However, from general observation of the country profiles, several trends are prevalent:

- 1) Minimal prerequisite education is rarely below 12 years. This underscores the requirement of each country to have individuals entering who have completed full primary/secondary-level education; often this education is difficult to obtain in many developing countries.
- 2) The number of study years for each program is usually 3 or more. Again, this indicates a distinction in the requirements of optometric institutions to establish a full and comprehensive academic base.
- 3) While binocular function and strabismus/amblyopia assessment are taught at many institutions, instruction on treatment in these areas is missing.

Although assesment of binocular functioning (for example in areas of pediatrics and rehabilitation) may be readily attainable, treatment may involve time, equipment and effort that is not endorsed by the profession. In addition, certain countries may simply not be aware of the various techniques available to treat various binocular and perceptual disorders in the population. Effort is needed to expand curriculum in this crucial area.

4) Areas in disease treatment and therapeutic pharmaceutical useage are lacking in the curriculum of many institutions.

An extremely important component, particularly in countries with a high prevalence of ocular and systemic disease, this is an area that may require expansion for many countries. Reasons for this lack may be economic, political restriction by government or special interest groups, or a deficit of experienced instructors in the subject matter. A lack of desire by the optometric profession in general to expand training into this area may also be a reason.

5) Clinical rotations (supervised practical experience with patients in an academic in-house clinic) are more common than externships (practical patient experience at an external location from the school) in most countries.

This is an expected result, and may be due to economic, geographic or other restrictions within the country itself.

6) Awards conferred vary greatly from country to country.

Several situations exist where a program of greater clock-hours, years and curriculum base confer a title that is not as substantially recognized in the professional community as that conferred by a program with fewer academic demands.

7) Many countries without an optometric institution have vision care providers trained in other countries along with those trained within.

Several factors may have led to inaccuracies within this study. The data required may have simply not been available by the respondents. Likewise, in many cases the total number of schools and contacts for each country may not have responded, possibly affecting the true optometric education profile of that particular country. Language barrier may also have contributed, with all surveys and responses in English. Misunderstandings or misinterpretations of the questions might have altered results. Occasionally a range or estimate of values was given; in

these cases an average or the estimate was used in the data. There may have also been no recognized definition of optometry in many places (Greece is one example). It is possible that some countries and institutions may have erroneous data either by design or unknowingly. However, it was the impression of the researcher that this situation did not happen very often. Human error in data entry may also have played a role. Finally, changes in educational curricula are continuous, resulting in new or altered information to when the surveys were sent.

Past studies on optometric education place optometry into three main categories - that of a "craftsman", an allied health profession, and an independent health care profession^{11,12}. With continued international cooperation and governmental recognition of optometry as a distinct and required profession, work has already begun in developing established programs and educating optometry students to graduate as an independent professional^{13-18,34}.

Despite the continued international bonds that are forming within the profession of optometry, disparity still exists for graduating practitioners from different schools within a region. Examples are Africa (Table 1), the People's Republic of China (Table 2) and India (Table 5), where variation in curricula and awards conferred still persists, in an area where the need for vision care is extremely high¹⁹⁻²¹. Another example concerns Europe's situation, with great variation between countries and schools in optometric education (Table 3). Efforts to develop a Pan-European Diploma in Optometry have been slow, but governmental recognition of migratory practitioners has increased since the unification process has been underway^{22,23}. In another perspective, the development of promising programs, such as those formed in Puerto Rico and Mexico's Universidad Autonoma De La Guna^{24,25} appear to be a step in the right direction for the health needs of each country.

To conclude, the data gathered is hoped to provide an overall perspective of optometric education worldwide. The data may potentially be used by

institutions and countries interested in initiating, enhancing, or expanding their curriculum. Comparative evaluation of optometric education between countries may permit easier credentialing of international licences²⁶. A good example of this is the enhancement of optometry's status in the Philippines of recent³⁴. Governments may gain greater understanding of the training required for optometrists. International cooperation may be enhanced by prior knowledge of an institution or country's need for assistance or exchange^{1,7,28-33,35-37}. The computer database allows easy annual updates for established programs, and the flexibility to expand further information. It is hoped that data from this study will be used for the World Council of Optometry and others interested as an initial database.

The importance of cooperation and exchange among optometric colleagues throughout the world cannot proceed without first a knowledge and understanding of the educational base between countries and schools³⁸⁻⁴³. Growth of the profession must first be had by growth in the training, independent of political or economic pressures within a region⁴⁴⁻⁵⁰. It is hoped that this study has helped to describe the current standards of optometric education internationally.

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Footnotes

- a. Where independent sources were noted, the specific contact is listed in the raw database, available by the authors.

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Appendix 1
Detailed Survey Responses



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1996

WORLD-WIDE INTERNATIONAL OPTOMETRIC EDUCATION STUDY
 (Please use additional sheets if needed)

COUNTRY _____
 EDUCATIONAL INSTITUTION _____

I. ENTRANCE INFORMATION:

How many years of school education is necessary for admission? years

Is there an entrance test required for optometric admission? yes / no
 (if "yes", please give details below):

What specific courses or training are required for admission?
 (please state below or attach to this form):

What is the size of the typical entering class? number of students entering each year

From how many applicants is the entering class usually chosen? number who apply for for entrance each year

In the typical entering class, how many are men? number of men
 Women? number of women

(please see other side of page)

II. INSTITUTION INFORMATION

Is there a formal program of optometric studies? yes / no

If "yes", is the formal program a (circle one): university/college school
vocational/technical school
correspondence/mail training
other _____

If "no", please describe the optometric training involved:

What is the current tuition charge per student (U.S. dollars) for each year of study?

Please state percentage of monetary funding of optometric institution by:

	Government	<input type="text"/>	%
+	Company/corporation	<input type="text"/>	%
+	Private sources	<input type="text"/>	%
		<hr/>	
		=	100%

How many full-time instructors teach in the program? number of instructors

How many part-time instructors teach in the program? number of instructors

How long has the optometric educational institution been present? years

Are graduates of the optometric institution recognized and approved for optometric work in other countries? yes / no If "yes", please list countries:

III. CURRICULUM DETAILS

What is the duration of the program? years

What is the length of an academic year in months? months

How many days each week do the students attend classes? days

How many clock hours of instruction are required to finish the program? hours

What is the name of the award or qualification given?
(ie: certificate, degree)

Which of the following testing procedures are taught in a practical manner (ie: the tests are performed on fellow students or patients)?
(please check):

Refraction (subjective)	_____	Direct Ophthalmoscopy	_____
Retinoscopy/Skiaskopy	_____	Binocular Indirect Ophthalmoscopy	_____
Biomicroscopy	_____	Gonioscopy	_____
Keratometry	_____	Phorometry	_____
Tonometry	_____	Strabismus/Amblyopia Testing	_____
Visual Fields	_____	Non-Strabismus/Amblyopia	_____
Colour Vision Testing	_____	Binocular Disorder Testing	_____

Which of the following treatment procedures are taught in a practical manner?
(please check):

Spectacles	_____	Anterior Segment Ocular Disease	_____
Contact Lenses	_____	Posterior Segment Ocular Disease	_____
Low Vision/Magnifiers	_____	Ocular Surgical Co-management	_____
Strabismus/Amblyopia Treatment/Therapy	_____	Non-Strabismus/Amblyopia	_____
		Binocular Disorder Treatment/Therapy	_____

Is there practical instruction in diagnostic ocular pharmaceuticals? yes / no
(if "yes" please give details):

Is there practical instruction in therapeutic ocular pharmaceuticals? yes / no
(if "yes" please give details):

(please see other side of page)

What is the nature of the clinical training?

Is there an externship program? yes / no
(if "yes" please give details):

Describe the testing methods used to assess student knowledge and proficiency:

Written -

Practical -

Please include a list of courses - use of the attached charts would be helpful.

Describe any international collaborative programs with optometric educational institutions in other countries.

Please state any new or future changes expected for the optometric educational program.

IV. OTHER PROFESSIONS

In your country, what is the terminal degree for the profession of:

Medicine _____

Total years of education years
(elementary, secondary, post-secondary)

Dentistry _____

Total years of education years
(elementary, secondary, post-secondary)

Pharmacy _____

Total years of education years
(elementary, secondary, post-secondary)

Please complete a separate sheet for each year of study

CURRICULUM DETAILS

Optometric Institution: _____

Programme Title: _____

Year of Study: _____
 (ie: 1st year, 2nd year, etc.)

Department	C/O	Subject Name	Lecture Clock Hours	Laboratory Clock Hours	Tutorial/Seminar Clock Hours	Clinic Clock Hours	Total Hours

C = Compulsory course requirement
 O = Optional course requirement

Please complete a separate sheet for each year of study

CURRICULUM DETAILS

Optometric Institution: _____

Programme Title: _____

Year of Study: _____
(ie: 1st year, 2nd year, etc.)

Department	C/O	Subject Name	Lecture Clock Hours	Laboratory Clock Hours	Tutorial/Seminar Clock Hours	Clinic Clock Hours	Total Hours

C = Compulsory course requirement
O = Optional course requirement

(please see other side of page)

Please complete a separate sheet for each year of study

CURRICULUM DETAILS

Optometric Institution: _____

Programme Title: _____

Year of Study: _____
(ie: 1st year, 2nd year, etc.)

Department	C/O	Subject Name	Lecture Clock Hours	Laboratory Clock Hours	Tutorial/Seminar Clock Hours	Clinic Clock Hours	Total Hours

C = Compulsary course requirement
O = Optional course requirement

Please complete a separate sheet for each year of study

CURRICULUM DETAILS

Optometric Institution: _____

Programme Title: _____

Year of Study: _____
(ie: 1st year, 2nd year, etc.)

Department	C/O	Subject Name	Lecture Clock Hours	Laboratory Clock Hours	Tutorial/Seminar Clock Hours	Clinic Clock Hours	Total Hours

C = Compulsary course requirement
O = Optional course requirement

(please see other side of page)

Appendix 2
General Survey Responses



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WORLD-WIDE INTERNATIONAL OPTOMETRIC EDUCATION STUDY
 (Please use additional sheets if needed)

COUNTRY _____

Who performs sight testing and prescribes spectacles in your country?
 (circle those that apply):

- self-taught opticians
- apprentice opticians
- technically-schooled opticians/optometrists
- university/college-schooled optometrists
- ophthalmologists
- other _____

Please give an estimate of the total number of individuals who test sight and prescribe eyeglasses in your country, in the chart below:

EYEVISION CARE PRACTITIONERS	TOTAL NUMBER	NUMBER TRAINED IN OTHER COUNTRIES
Self-Taught(Opticians)		
Apprentice(Opticians)		
Technically-Schooled(Opticians/Optometrists)		
University/College-Schooled(Optometrists)		
Ophthalmologists		
Other		

Are there future plans for optometric education in your country?(circle one) yes / no

If "yes", please describe:

In your country, what is the terminal degree for the profession of:

Medicine _____	Total years of education <input type="text"/> years (elementary, secondary, post-secondary)
Dentistry _____	Total years of education <input type="text"/> years (elementary, secondary, post-secondary)
Pharmacy _____	Total years of education <input type="text"/> years (elementary, secondary, post-secondary)