VISUAL IMPAIRMENT IN THE SCHOOLS

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PREFACE

This book is designed to provide a foundation for a better understanding of the structure and function of the eye and common eye disorders in children, and approaches to assess and enable students with low vision to maximize their visual learning in educational programs. The book is primarily designed for students who are preparing to be teachers of children with visual impairments and practicing teachers who want to update their knowledge concerning children with low vision. It is also intended for use by orientation and mobility instructors, special education and regular classroom teachers, support personnel, and parents who desire to know more about the special needs of children with visual impairments. A basic fundamental understanding of the eye and visual learning should be helpful in working with ophthalmologists, optometrists, psychologists, and other specialists who are concerned with assisting the child with visual impairment to function more efficiently. The book is also designed to provide a broad enough foundation to meet the diverse backgrounds of the personnel who work with children with low vision in educational settings, but simple enough so that the reader is not overpowered by the medical or psychological complexities.

Chapter 1 describes the children with visual impairments who are the subjects of this book. Background information about demographics, terminology, and structure and function of the eye is explained so that the causes of visual impairments can be understood.

Chapter 2 provides a description of the eye's early embryonic development. Protective measures for the eye and visual perceptual development from birth to age seven are delineated as a foundation for an understanding of the assessment of functional vision and its educational implications for children with impaired vision.

Chapter 3 shows how the visual system is evaluated by an eye specialist. The information in this chapter is designed to help the vision teacher or other professional to a better understanding of the report of the eye specialist's examination in planning educational approaches with children with low vision.

In Chapter 4, information is presented regarding the basic optics of the eye and lens systems, optical defects and corrective lenses and ocular motil-

ity problems. Many children with visual impairments have refractive errors causing nearsightedness, or alignment errors causing loss of binocular vision.

Chapter 5 is an overview of the most common diseases that affect the areas adjacent to the eye or the surface layers of the eye itself. Orbital disease and abnormalities of the eyeballs, the structures that secrete tears and the outer layers of the eye are discussed.

In Chapter 6, diseases of the internal parts of the eye are examined. Internal diseases are those affecting the structure and function of the enclosed area of the eye and its central nervous system connections.

Chapter 7 considers vision screening to identify children with vision problems. Vision screening has proved reliable in detecting many types of vision problems among preschool and school age children. Children who fail vision screening tests are referred to eye specialists for diagnostic exams.

Chapter 8 deals with the control of environmental factors such as brightness, contrast, and size of image so that the most efficient and comfortable seeing can take place.

Chapter 9 describes how children with impaired vision can be enabled to function more efficiently with the proper use of appropriate optical and nonoptical devices. Training procedures are outlined for both near and distance optical devices. Chapter 9 was written by Anna Bradfield, Stephen F. Austin University, and Randall T. Jose, University of Houston School of Optometry.

Teachers should find Chapter 10 to be most helpful in providing guidelines and specific procedures for the functional vision and media assessment of students. A framework for assessing the functional vision of both students who are cognitively delayed and students who are academically age appropriate is provided.

The content of this book is based upon many years of experience in the classroom and in the preparation of teachers of children with visual impairments. It is hoped that this foundation will help teachers and other concerned persons to better assist their students with low vision to function more efficiently in the classroom.

The authors wish to express their appreciation to several people who contributed in the preparation of this text. Special recognition is extended to Jayne Harley and Marvin Sanford for their contributions in communication, typing, and photography, and to Karen White for her work in critiquing the manuscript.

Rebecca Burnett
Randall Harley
G. Allen Lawrence
LaRhea Sanford

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Chapter 1

INTRODUCTION AND STRUCTURE AND FUNCTION OF THE EYE

This chapter first describes demographics for the population of persons with visual impairments and then introduces and defines important general terminology. Functional problems related to visual impairments are presented and defined. Information about the structure and function of the eye is discussed so that the causes of visual impairments and the different problems associated with ocular abnormalities can be understood.

Although a wealth of general information concerning the eye, visual functions, and the abnormalities which can occur to this sense organ is readily available, many misconceptions exist among persons who are visually impaired, their parents, their teachers, and the general public. Agencies such as the American Foundation for the Blind and Prevent Blindness America (see Appendix A, Resources: Agencies, Organizations and Companies) disseminate brochures in an effort to enlighten people regarding myths about the eye. Common myths or misconceptions about the eye and clarification regarding the myths are presented in Appendix B, Common Myths About Vision.

Myth: All Visually Impaired Persons Should Wear Glasses

Joe was a seventh grader who had transferred from a private school to a middle school in the district. He was referred for vision services by his math teacher. The assessment revealed that Joe had a form of macular degeneration with a distant and near acuity of 20/400. Joe was able to travel independently in and around the school building. Most people did not realize that Joe was visually impaired, until he picked up a book to read. One day a teacher approached the vision teacher and inquired as to why glasses had not been provided for Joe. The vision teacher explained that glasses are prescribed to correct refractive problems. Joe has a damaged retina that sends faulty or incomplete images to the brain for interpretation and glasses would not clarify the image.

DEMOGRAPHICS

Demographic information on persons who are visually impaired is limited due to inconsistent use of standardized definitions to describe the population, the variety of purposes for collection of data, the variety of age ranges of concern, and the fact that no central registry exists. The American Printing House for the Blind, Prevent Blindness America, the U.S. Department of Education, and the National Center for Health Statistics are examples of sources of information on demographics.

Nelson and Dimitrova (1993) calculated estimates of age specific rates and numbers of severely visually impaired persons in the United States using population data from the 1990 census, the 1977 Health Interview Survey, and the 1984 Supplement on Aging to the 1984 Health Interview Survey. According to these estimates, there are 4,293,360 persons who are severely visually impaired, or 17.3 persons per 1,000. Age specific rates per 1,000 persons were estimated as follows: 0 - 17 years = 1.5; 18 - 44 years = 3.2; 45 - 54 years = 13.5; 55 - 64 years = 28.4; 65 - 74 years = 59.0; 75 - 84 years = 118.4; and 85 years and over = 210.6.

An annual registration of school aged children who are identified as "legally blind" is conducted by The American Printing House for the Blind (APH). According to the 1999 APH Annual Report, 48,382 students under college level in the United States were registered as of January 5, 1998. To be registered with APH, students must be *legally blind* (a visual acuity of 20/200 or less in best eye after correction or a field of vision of 20 degrees or less) and be enrolled in educational programs.

TERMINOLOGY

In the education of children with visual impairments, definitions may vary across agencies and programs. Some definitions focus on measures of acuity, while others focus on more functional descriptions. State departments of special education have developed definitions to help local school systems identify and serve students who are visually impaired. Federal and state governments have adopted a definition of legal blindness which helps determine eligibility for such services as Vocational Rehabilitation and Supplemental Security Income (SSI). The American Printing House for the Blind also uses the definition of legal blindness as a criteria in determining eligibility for funding and materials. *Legal blindness* is defined as having a "central visual acuity of 20/200 or less in the better eye with corrective glasses or central visual acuity of more than 20/200 if there is a visual field defect in which the peripheral field is contracted to such an extent that the widest diameter of the visual field subtends an angular distance no greater than 20 degrees in the better eye" (Koestler, 1976, p. 45). This definition was developed by the American Medical Association in the 1930s and has been used as criteria for services provided by the federal government and other agencies.

Teachers of students who are visually impaired use state definitions in recommending eligibility for services; however, more functional terms are used when writing reports and talking with classroom teachers. *Visual impairment*, according to Jose (1983, p.62), is "the actual damage to the eye that results in an acuity or field loss. This impairment can be mild (20/40), moderate (20/200), or severe (20/800)." *Visually limited and partially sighted* are terms which have been used to describe students who have a visual loss ranging from approximately 20/70 to 20/200. These persons are generally able to read printed materials. *Low vision* is a more current term used to describe persons who are partially sighted or visually limited. According to Corn and Koenig (1996), a person with low vision is one "who has difficulty accomplishing visual tasks, even with prescribed corrective lenses, but who can enhance his or her ability to accomplish these tasks with the use of compensatory visual strategies, low vision and other devices, and environmental modifications" (p. 4). *Blindness* is a term most people associate with having absolutely no sight. Generally, individuals who are referred to as "blind" may have perception of movement of objects or perception of light. *Functional blindness* is a term used to describe individuals who have little or no usable vision. Generally these persons are taught using tactile materials and braille.

Visual acuity is the ability to see or distinguish small separations between portions of the visual fields and is a measure of central vision. Visual acuity