# The Student's Lamp

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A story recently appeared in one of our popular magazines of a minister who made a great discovery. Some of the men in his congregation went to sleep in spite of his best efforts at oratory. The women folks stayed awake. The reverend gentleman searched for a reason for the phenomenon. A little science was brought to bear and the conclusion was that the men were lulled into slumber by a glow of light that had been located above the pulpit. The results of a quiet investigation brought out that the women's hats shaded their eyes, while the bare-headed men were wholly unprotected. As the story goes, the misdirected light was eliminated and the masculine members of the congregation are now wakeful and interested listeners to the minister's sermons.

Without overdrawing conclusions, the above story can be made applicable to may students who are handicapped during study with misdirected light. A student made irritable by headaches from eye-strain produced by a glaring light source during an evening of study cannot start the next day in the proper frame of mind to work at the highest efficiency. Improper illumination is expensive from any angle.

Floor and table fixtures are being used more and more extensively and the many styles and patterns on the market indicate that practically all of them have been designed from a decorative standpoint, with shades of metal, glass, silk, or a combination. As a rule unless specially designed this type furnishes little or no control of the light from the incandescent lamp. The shades must be dense, because the unit is always in the field of vision. With dense glass or metal reflecting surfaces the direct lighting reflector throws most of the light downward. Direct lighting reflectors distribute the illumination well, but often may give glare and disagreeable shadows. With a table lamp the intensity of illumination on the table top is usually too high for comfort if the rest of the room is to receive light from the same source. A table or floor lamp can be designated to be effective by directing downward only enough light to give the proper intensity on the table top, and by directing the remainder of the light to the ceiling where it will be reflected about the room without discomforting brightness. There are floor and desk lamps on the market which fill these requirements by a combination of direct and indirect lighting. The direct light is thrown downward and the lamps are shut out from the direct line of vision by dense shades; the indirect light for the general illumination of the room is furnished by lamps in an indirect reflector at the top of the fixture. As a result the whole effect is very pleasing and the illumination is even and efficient. If a common type of floor or table lamp is used, it should be supplemented by general illumination produced by another lamp, so placed that dark shadows about the room are eliminated. In other words, the function of the local lamp should be merely to intensify the illumination at the work, or to give light in a particular direction, as may be required.

The eye sees brightness, but brightness is merely visual sensation. The sensation of brightness is aroused by a physical phenomenon, namely: the quantity of light emitted by or reflected from a luminous surface. Arrangements of lighting that will introduce normal sensations, or sensations for which the eye is not adapted, are to be avoided. An optically correct and visually efficient lighting arrangement is more a matter of distribution of light than of its quantity. It is not possible to lay down definite rules for lighting to cover all conditions. But certain fundamental principles may be stated, which are found in all good lighting. These are:

Correct Intensity.
Good Diffusion.
Light from Proper Direction.
Absence of Glare (both direct and reflected).

In the normal process of seeing, the eye is called upon to adjust itself for illumination intensities which vary from several thousand foot-candles outdoors on a sunny day, to small fractions of a foot-candle in the same location at night. At the very high values, a blinding effect from the large volume of light reflected to the eye obliterates detail, while at the low rates, the quantity of light is so small as to render accurate discrimination impossible. Between these limits there is a wide range of intensities at which good vision is possible; consideration of economy naturally limits the intensities employed in artificial lighting to the lower values of this range. Light for the student, to be correct, should be of such intensity that work can be carried on without straining the eyes, and yet not be of such high intrinsic brilliancy that the pupil of the eye contracts to such an extent that it cannot see properly. Desirable light intensities for the class of work under consideration range from 8 to 12 foot-candles; intensities up to 50 foot-candles would do no harm if proper diffusion is obtained. An illumination of at least one foot-candle over the entire room should be provided where desk or local fixtures are used. In order to provide sufficient intensity it is not necesary that the largest lamp possible should be used; a lamp

large enough to give the amount of illumination necessary for the desired effect is all that is required. The medium-sized lamp, frosted or opal bulb, is best adapted for the study-room. For close work, such as reading, or writing, a high intensity of illumination is necessary if eye strain and discomfort are to be avoided.

By diffusion of light is meant the ability of the illuminant to distribute light in all necessary directions, thus tending to produce an even illumination. Daylight on a cloudy day is perfectly diffused. The beam of a searchlight has no diffusion. Diffused light is distinctly agreeable and easy to the eyes. It is a common mistake in weak or overstrained eyes to reduce the intensity rather than increasing the diffusion. "Paper work" calls for very little shadow since all the objects requiring distinctions are in one plane.

The importance of light from the proper direction is obvious to all. One of the fundamental rules for proper lighting of study tables is to have the preponderance of light come from the left side.

Among the most frequent and serious causes of bad lighting are those due to glare in its various forms. Glare has been described as "light out of place." The most common cases of glare are those which are due to unshaded or inadequately shaded lamps located within the field of vision. The bare local lamp is a constant sourcme of glare which is extremely injurious to the user's eyes. It is contended that the glare from even a small 15-watt lamp filament decreases the seeing efficiency of the eye 25 per cent. Glossy surfaces of paper, desktops and woodwork are likely to be sources of glare because of specular or mirror-like reflection of images of poorly designed light sources. This form of glare is particularly harmful because of the fact that the eye is often held to such surfaces for long periods of time, and while the glare may not be sufficiently annoying to be recognized as of a serious nature, it may nevertheless in time produce eye fatigue or even permanent injury. Specular reflection can frequently be prevented from striking the eye by locating the light source in such a position with respect to the work that specularly reflected light will be thrown away rather than towards the worker. The use of lighting units of large area, reducing the brightness of the light source, moving the light out of the field of vision and using a good diffusing medium glare, both direct and indirect, can be reduced to a minimum. Too much emphasis cannot be given to the harmful effects due to glare. The proposed industrial lighting code of this state reads: Glare results in decreasing ability to see; it may cause temporary discomfort, and if the condition is long continued may result in permanent injury to the eyesight. The decreased ability to see results in lower quality and decreased quantity of output; consequently, aside from discomfort and danger to the eyes, glare is economically bad. Within the past few years an important work has been undertaken by scientists in behalf of good lighting. Prominent among these is Dr. C. E. Ferree, of Philadelphia, a brother of Dr. Ferree of the University Faculty. He has made a series of tests to find out how light affected the human eye. He found that after three hours work under diffused daylight the eye lost practically nothing in efficiency, whereas, after the same length of time working within range of the rays of an exposed light the same eye depreciated 86 per cent in seeing efficiency. Glare can and does do more harm than any other part of a poorly designed system of lighting.

The problem of student room lighting, from the standpoint of utility, can be very simply stated. Fundamentally it is to provide the best illumination for sustained vision of flat surfaces in horizontal or slightly oblique planes in which papers, pictures, and books are usually examined.

To summarize, the eyesight must be catered to by a uniform horizontal illumination, minus glare and objectionable shadows. There should be no extreme contrast in the brightness of objects within the field of vision. The providing of light well diffused and of ample intensities will eliminate discomfort and the eye will not become excessively fatigued even with application for long periods of time. The severe requirements imposed on student's eyes by modern educational methods create need for the best of working conditions.