MINIMUM HEALTH AND SANITATION STANDARDS IN SCHOOLS

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INTRODUCTION

IN the month of January, 1921, the Teachers Union of the City of New York began a survey of the public elementary and high schools of the municipality. An application to the Board of Superintendents for a leave of absence without pay for the President of the Union has been made as a preliminary to undertaking the survey. But the application was refused on the stated grounds that there was no need of a survey of the schools and that the person applying for the leave of absence was not qualified to undertake a survey.

Inasmuch as the union movement among teachers is characterized by a growing desire on the part of teachers to improve the conditions under which the work of teaching is carried on, the Teachers Union decided to go ahead with its plans. Accordingly, it was decided by the Union that the President should resign his position as teacher in a high school. The resignation was accepted January 3, 1921.

The letter of resignation dated December 14, 1920, contains this statement quoted here to indicate the scope of the inquiry proposed: "Among the conditions inquired into should be the following: The physical conditions, the conditions relative to administration, the conditions relating to teaching. In addition, I believe it is important that studies be made of the quality of our ideals in relation to the prevailing schools of educational thought. In this connection, we should know the source of the moral, the social, the civic and the professional inspiration of our teachers. The study of these conditions in relation to the product as shown in the output of our schools and in the quality of our citizenship should give us important leads for fundamental changes."

Those who are familiar with conditions in the field of public education know that the teachers themselves have developed few standards of a professional nature. Whatever standards there are have been set up by those who control. They are modified scarcely at all by those who do the work of teaching. In general this state of affairs has tended to establish among teachers a feeling of indifference to conditions of work. In the City of New York many teachers seem to believe that certain unfavorable conditions under which they endeavor to do their work are unavoidable, and make no effort to have them corrected. Doubtless a large number of teachers do not even desire better conditions, because of ignorance of higher standards than now prevail.

The Teachers Union since its organization in March, 1916, has been associated with the union movement in industry, and has become convinced that the development of standards in education must take a path similar to that followed by the workers. If conditions are to be improved, the effort in that direction must be made by the persons who are in direct contact with the conditions. Democracy in education, as in industry, cannot exist without the organized and democratically controlled effort of the workers.

Improvement in the conditions under which work is done leads logically to improvement in the product of work. The Teachers Union has striven to make clear to the teachers the need of professional standards that will aid all those who teach in producing work that has marks of high educational and social value. The Union believes that the first step in the direction of educating the members of our profession to think in terms of standards is to set before teachers such health and sanitation standards as those offered in this publication. The author of the article printed herewith was for several years Director of the Division of Industrial Hygiene of the New York City Department of Health. In that position, and as teacher of Industrial Hygiene in Bellevue Medical School, as well as in his present position in the Department of Health, Dr. Harris has been able to speak with authority on the subject of standards of health.

The distribution of this pamphlet among the members of the Teachers Union will be followed by a study of the physical conditions prevailing in the schools covered by our membership. The facts thus collected will be prepared as a publication of this School Survey series, and will be used for the purpose of arousing the public to the realization of the actual physical environment in which children spend their days in school. A serious effort will be made to carry out a study of the health of teachers along the lines suggested by Dr. Harris. Preliminary inquiries made of our members indicate that it will be possible to obtain the consent of at least one thousand teachers to agree to having exact studies made of their personal health in relation to their work as teachers.

The Teachers Union expects that the establishment of improved standards of a physical nature in the schools will not be attained until the teachers themselves have increased their interest in the matter of needed changes. Similarly, in the administration and in the teaching standards, which have already been given some attention by our organization, hard work and constant agitation will be necessary to the attainment of our aims.

This pamphlet is offered to the public as a social contribution by teachers to the work of preparing children for life. Other contributions made with the same end in view will follow as rapidly as means and time make possible.

THE TEACHERS UNION OF THE CITY OF NEW YORK.
HENRY R. LINVILLE, *President.*

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IN this address it is aimed to present an outline of minimum sanitation standards for the protection of school children and teachers. The contributions made by various observers to our knowledge of the sanitary and working conditions in schools and their effects upon the health of the pupils and teachers are very meagre. Much valuable information is available with reference to the health of school children as a result of school medical examinations and special studies. Aside from Terman's "The Teacher's Health," there have been no very substantial, scientific or comprehensive contributions on the subject of the health of teachers. The health of the teacher determines not only the quality of his services to the individual and to the community as a whole, but is also of grave concern to every parent as an index of sanitary conditions in the school environment.

A note of caution should be sounded with respect to certain fallacies that ers, particularly those dealing with the mortality rate from various diseases among underlie the statistical studies which have been made of the health of school teachthose so employed as contrasted with other occupational groups. The reports of the Schlockow Committee and of Dr. L. I. Dublin on this subject do not present typical cross-sections which give a fair basis for judgment as to the degree to which the teaching profession is a hazardous one. These studies present but a fragmentary picture covering a limited period of time, and in the main, a record of those illnesses and diseases exclusively, for which the regulations provide compensation or, which, for other special reasons, come under official notice.

Those who venture to offer definite conclusions with reference to the presence or absence of hazards in the school environment and the number and causes of illness and deaths are prone to make the same serious error that frequently is noted with respect to military statistics. The cases of illness and of disease which are published in military statistics are, by and large, those which cause a relatively marked disability. At the close of the recent war, morbidity and mortality statistics were published showing the incidence of disease and of deaths, and their causes, in the army. Since then, however, through various sources—official and unofficial—much additional information has come to light about the many cases of so-called "irritable heart," of mental disease, as well as of thousands who since the close of the war have come to official notice as the subjects of tuberculosis, or as suffering from the sequelæ of poison gases, under-nutrition, severe physical labor, and exposure. These as well as other conditions have been responsible for much illness or disability which did not appear in official records. Those who continued in the trenches despite certain more or less significant illness were also never reported. Likewise, with respect to the statistical studies of teachers.

The Kind of Study That is Needed

What is now required is a study that will reveal not only the cases of illness in teachers which come to official notice, but also a large number not officially

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noticed, which have a serious effect upon the physical and mental well-being of teachers, affecting their capacity to teach and the quality of their work. We should know how many of these teachers persist in remaining on active duty in the trenches, so to speak, despite ailments and illnesses which affect them, and who thus really "malinger" or pretend to the possession of health which they do not have. Such studies should cover an adequate span of years and should subdivide the teachers who form the subject of such studies, not only according to sex, but into the various age-groups, so that we may record whether they are subject to a variety of diseases which are directly or indirectly caused by their vocation, and particularly whether such diseases appear in a relatively early age or group. In other words, whether they suffer prematurely from the effects of fatigue, from any specific disease, or from the result of exposure to unsanitary conditions. The cases of illness should be studied and referred back, if possible, so as to learn whether there is an association between a particular type of illness or disease or cause of death, and the conditions obtaining in respective schools.

Such studies should aim to determine how much of the "labor turnover" or the desertions from the ranks of the profession are due to discomfort or ill health induced by the nature of the work. As the result of their experience, industrial hygienists invariably ascribe a certain amount of labor turnover to conditions in industry which have a relation to health and comfort. In such studies, emphasis should not be laid merely upon *the number of deaths,* or even upon the number of cases of illness from various causes, but special consideration should be given to the question whether the work in a given group or type of teachers is compatible with "keeping fit" so as to enable the teachers to enjoy normal and healthful life. Furthermore, such studies should not be rated as complete unless they are based on the most careful clinical observation of a large number of teachers over a considerable period of time, so as to measure more accurately the effect of the work that they are doing upon the general powers of resistance and general well-being, as well as upon the nervous system, the heart, the digestive system, the lungs, and the other parts of the body. Due consideration should of course be given to any personal habits, unusual home conditions, or to a physical condition antecedent to entering the profession, which may have exerted an influence in causing certain clinical conditions that may be observed in the course of such studies.

In the slow evolution of things, the necessity for the medical examination and supervision of school children has become recognized by civilized nations and by the more progressive communities. We must be sure that school children who are being medically examined for the discovery and correction of physical defects are not in the meanwhile subject to environmental conditions within the school which may in greater or less measure be responsible for the development of such physical defects and disease. Therefore, the sanitary conditions of the school environment and the health of the school teacher who comes in immediate contact with school children are interlocked, and must be most carefully considered together.

The school teacher who suffers from a communicable disease, such as pulmonary tuberculosis, is a grave menace because of the intimate contact with relatively large numbers of children, who, as medical men well know, are most subject to tuberculous infection. Therefore, the sanitary conditions prevailing in schools which may favor the development of tuberculosis or other communicable diseases are of very great significance from the standpoint of their influence upon

pupil and teacher. Moreover, ill health may have a very serious effect upon the disposition and temperament of school teachers, and may seriously influence their work in molding the character of the pupils under their care.

Fatigue

With our gradual advance in medical knowledge has come a better understanding of the particular significance of fatigue, not only as the cause of mental strain, of so-called "neurasthenia," but also as the cause of a direct or indirect reaction through nervous channels upon various organs and glands in the body, the complex actions of which are delicately balanced and correlated. A disturbance of one such organ or gland may radiate to many others, and cause perversions of circulation, and of many of the vital processes of life. We have also come to appreciate the fact that the powers of resistance of the body, which determine how susceptible an individual may be to any one of the communicable diseases, are very seriously affected and undermined by fatigue. Fatigue, therefore, aside from causing certain nervous or mental disorders may play a serious role in influencing the development of a variety of organic diseases, or in predisposing individuals to communicable diseases.

Fatigue is not only determined by the number of hours of work, or by the number of days of work each week, but depends to a great degree upon the character of such work. It is especially induced by the necessity of concentrating, and taxing the attention, the memory, and general alertness. For example, everyone who has had experience in studying fatigue in industry has given attention to the strain upon the girls engaged in the process of weaving who may have to take care of twelve or even more looms at a time, or upon girls doing similar types of work which require them to attend to from twelve to thirty or forty units of machinery at one time. In like fashion each pupil may justly be regarded as comparable to a unit of machinery, insofar as it taxes and strains the mental and visual faculties of the teacher, and causes a physical effort on the part of the teacher in the course of teaching, disciplining and speaking to a large group. No one, except those who have done public speaking or teaching continuously for prolonged periods, can appreciate the physical as well as the mental strain which constant loud speaking may cause. Fatigue is greatly aggravated by any insanitary condition which may obtain in the school or classroom. Excessive heat, poor ventilation, inadequate lighting, dust in the air—all of these, and many other environmental factors tend to aggravate as well as to induce fatigue.

In industry it has frequently been possible for experts who study fatigue, to recognize its presence and to estimate its degree by the amount of spoiled work which is produced by those who are suffering from this condition. Unfortunately, this test cannot be applied in dealing with that intangible product of the teachers' labors—namely, knowledge and character development. It would be of inestimable value if the "spoiled work" of teachers, as the result of the fatigue from which they may be suffering, could be even approximately estimated. It would be most valuable to know how many children were unfavorably influenced with respect to the acquirements of character and knowledge, or were "spoiled" or marred in the process of their making as the result of fatigue in the teacher. Unfortunately, it has been found that workers themselves are not always conscious of fatigue, nor are their sensations a reliable guide as to its presence. For these

reasons too much stress cannot be laid upon the importance of having proper and sanitary environment, so that children who spend a considerable part of their growing years in the school environment shall not be unfavorably affected by insanitary conditions—and teachers likewise—and so that conditions of work shall not be productive of fatigue which may cause a marked susceptibility to disease in both pupil and teacher, or be reflected ultimately in the character of the children who come out of our schools.

Occupational Diseases of Teachers

While tuberculosis is not a conspicuous hazard in the teaching profession, it must nevertheless be reckoned with as a most important disease, to which teachers are in a fair measure exposed and subject. No adequate scientific work has yet been done under proper medical direction to ascertain to what extent the physical condition of teachers before they enter upon their profession, or the home conditions, the school environment, or the exposure to conditions which may favor the development of bronchitis or respiratory infections, as well as personal habits, may each contribute to call into activity a latent tuberculous infection which most adults harbor, and cause an active process to be lighted up. In the study made by Dublin of morbidity and mortality statistics which were available through official sources, he pointed out that only thirty-eight teachers had pulmonary tuberculosis during 1915. It is reasonable to suppose that the thorough and systematic physical examination of our school teachers would have revealed a very considerable amount of tuberculosis that had not previously been recognized or disclosed. Pulmonary tuberculosis, even if there be but thirty-eight cases of it among school teachers, is a much more grave condition in members of this profession who come in such direct and intimate contact with great masses of children than is indicated by its numerical prevalence. Especially because, as already mentioned, childhood is the age of greatest susceptibility to tuberculosis, the tuberculous teacher is potentially a distributor of such infection to all of his or her pupils.

Other Occupational Diseases

While there is much that is indefinite with reference to the prevalence of specific occupational hazards or diseases among teachers, because of the fallacious methods of inquiry upon which we have heretofore had to depend for our statistical knowledge, one may, however, state quite definitely on the basis of statistical evidence that tuberculosis, chronic laryngitis, or "speaker's voice," nervous disorders which assume a variety of forms, especially so-called "neurasthenia," digestive disorders, respiratory infections (notably acute bronchitis, influenza, pneumonia and follicular tonsilitis), as well as defective eyesight, may be properly regarded as occupational diseases incident to teaching.

Neurasthenia and other nervous disorders have already been referred to as being very frequent among school teachers;—it is fair to assume this prevalence, not only on a statistical basis but also because they have been found to be most markedly prevalent among skilled workers in various other professions and trades. As already briefly indicated, the nervous manifestations may cause reflex disturbances as of the digestive organs, or the generative organs in females. Such nervous disorders may be temporary in character, or they may be firmly and per-

manently established. Acute infectious diseases would no doubt be found to be relatively frequent, if the health of teachers was studied, not merely by means of the compilation of inadequate statistics, but by continuous medical supervision, and by follow-up to ascertain the causes of absence. The intimate contact of teachers with children, who, as is well known, are especially susceptible to a variety of acute infectious diseases, makes them likely to contract such diseases.

Chronic laryngitis has been very frequently found among teachers, as indeed among others who are compelled to use their voice a good deal. This results in hoarseness and very considerable discomfort, and may be followed by a secondary bronchitis, resulting from extension of the inflammatory conditions affecting the larynx and the pharynx. Laryngitis, and acute or chronic bronchitis, are in a measure capable of being caused as the result of exposure to chalk dust. Dr. George M. Kober in his latest work (Kober & Hanson's Occupational Diseases) has particularly emphasized the hazard from chalk dust not only with relation to bronchitis, but with reference to the development of pulmonary tuberculosis. In reviewing the prevalence of tuberculosis in teachers which some writers have reported as being comparatively low, he says: "Higher rates for tuberculosis have been reported by Schmidt of Dusseldorf (than death rate of 1.3 males and 1.55 per 1000 females in Bavaria), and our American statistics also indicate that school teachers are slightly more liable to tuberculosis than members of the other learned professions.

"This is doubtless due to indoor life, confinement in badly ventilated school rooms and the presence of dust. Diseases of the nervous system and uterine organs are also quite common, and teachers will do well to insist upon proper seats, absolute cleanliness of the school room, fresh air schools, or at least copious ventilation, and susbstitution of wet for dry methods of removing chalk markings."

Defective eyesight is very commonly found among school teachers, and while no doubt it is in a measure due to the strain upon the eyes in the course of preparation for their profession, it may also, however, be produced in a very considerable number of cases by the strain to which sight is subjected in the course of routine work, and particularly by defects of lighting. While there is insufficient evidence to warrant many of the statements which have been made with reference to the prevalence of certain diseases among teachers, one may nevertheless venture to assert that thorough and frequent medical examination of many teachers over an extended period of time, with a scientific method of health-bookkeeping, would show the existence of numbers of organic defects which have not thus far been recognized or justly appraised. Surely, the glib dismissal of diseases said to be associated with teaching which has sometimes marked the reports of certain studies based on manifestly inadequate statistical evidence, is not scientific and has tended, unintentionally no doubt, to treat these moot points as if they had been settled conclusively and for all time.

In marshalling statistics one must be cautious in their use and in their selection that they may not consciously or otherwise be pressed into service to bolster up fixed preconceptions. As illustration one might balance against some statistics which have been published to discount the existence of occupational hazards in the teaching profession, the report contained in Bulletin No. 106 of the U. S. Bureau of Census for 1909 in which it is shown that in certain age-periods the

mortality of female teachers from certain infectious diseases is higher than for the general mass of females in industry; and from organic heart diseases the mortality is higher for the ages 25 to 44 years than among the general workers of the same age-groups; also the mortality is higher for a kidney disease in the age-group 35 to 44 years for female teachers than it is for general workers.

DEATHS OF PERSONS IN OCCUPATIONS

Teachers, Professors in Colleges (Females)	Deaths All Causes	Per Cent. of All Cases at Specified Ages					
		TUBERCULOUS LUNGS			APOPLEXY AND PARALYSIS		
		Teachers	General Workers	Female Workers	Teachers	General Workers	Female Workers
25 to 34 years	269	38.7	31.0	35.7	1.5	1.2	1.3
35 " 44 "	194	19.1	23.6	21.3	4.1	2.7	4.0
45 " 54 "	167	7.8	14.4	10.2	7.8	5.9	8.4
55 " 64 "	130	7.7	7.5	5.6	6.9	10.1	12.3
	760						

	HEART DISEASE			PNEUMONIA (All Forms)			BRIGHT'S DISEASE		
	Teachers	General Workers	Female Workers	Teachers	General Workers	Female Workers	Teachers	General Workers	Female Workers
25 to 34 years	5.2	4.8	6.4	5.2	7.4	5.7	2.6	4.0	4.6
35 " 44 "	9.3	7.7	10.5	11.9	9.5	6.4	7.2	6.6	7.7
45 " 54 "	8.4	11.3	12.7	7.2	9.0	8.0	9.0	9.7	10.0
55 " 64 "	10.0	15.4	15.4	11.5	8.3	9.0	10.0	11.7	11.5

These tables, although significant, show how inadequate available statistics are.

Ventilation

It may be stated without fear of contradiction that ventilation is the most important factor in relation to the health of workers. Defects of ventilation are the most important single cause of disease in industry. A statement of all that the term "ventilation" comprises when it is used by an industrial hygienist will make clear why it is of great significance. This holds equally true with reference to the school, because it is proper to consider the school as the industrial establishment in which are engaged thousands who are acquiring knowledge and submitting to character development; it is the business environment in which a considerable fraction of the lives of pupils and teachers is spent each year. It is commonly understood that ventilation implies the furnishing of an adequate supply of fresh air to a given room, factory, or other space. The industrial hygienist, however, is not concerned merely that the air which is furnished should be adequate in quantity, but also endeavors to have it free from contamination both before and after it enters a room. He desires also that dust, bacteria or the exhalations and emanations of the human body and the gases generated by the burning of gaslights be effectively withdrawn; that the air be of suitable temperature and humidity; that it be kept in motion so as not to stagnate, and that it should not be delivered in such manner as to drive it through a given space or room at a great velocity, thus creating a draft. The air supplied must be distributed to all parts of the room. (This is especially important when mechanical ventilation is depended upon.) Natural ventilation through windows or skylights is by far the best. If ventilation is obtained through natural means, that is, by

an adequate supply of windows, or skylights, it obviously implies that lighting will at the same time also be improved. When, because weather conditions are unfavorable, or structural arrangements are old or defective, or when for a variety of other reasons it is inadvisable to depend upon natural ventilation, one must re-enforce or replace it by resort to artificial methods of ventilation which depend upon fans to propel air into a room as well as to exhaust or remove contaminated air. Frequently, artificial ventilation devices, even though they may have been installed at very great expense and at considerable trouble, have been found to be defective and impracticable in operation. Even when a mechanical system of ventilation is found necessary, it does not justify failure to open windows *at all times when the weather conditions permit.*

The latter statement is in direct conflict with the views which have been held and enforced with reference to this subject, and as the result of which no one has been permitted to open windows while ventilating devices were in operation. Authority for this new view is, however, to be found in the special report made by the Divisional Committee on Heating and Ventilation of the Committee on Welfare of the Advisory Commission, Council of National Defense. This most important report was prepared by some of the foremost engineering authorities in the country. For the sake of emphasis and to overcome the harmful effects of wrong teaching which have been in force hitherto, it is desirable to repeat that the installation of a mechanical system of ventilation in rooms where the natural agencies for ventilation fail or are found insufficient, does not justify the old theory that the opening of windows in such rooms destroys the effectiveness of mechanical ventilation when the latter is in operation. From a hygienist's point of view, quoting the exact words of the report above referred to, "a room cannot possibly have too many windows, nor can they be opened too often or too much when the external weather conditions permit."

The report of the Divisional Committee on Heating and Ventilation of the Council of National Defense, which has already been referred to as an authoritative guide, unfortunately does not make adequate provision for the amount of space to be furnished each occupant of a working place. A minimum of 400 cubic feet of air space per person should be insisted upon; 600 cubic feet per person is the optimum. While it is our business to urge and compel children who cough or sneeze to cover up their mouths and noses with their handkerchiefs, we must nevertheless provide an adequate amount of space for each child in a classroom, so that it will be out of range of the discharges from a sneezing or coughing neighbor; this is a necessary measure of protection against contact infection. For this purpose a minimum of 20 square feet of floor space is necessary for each child in a classroom. In apportioning the above amount of space, it is not intended that one should include in such computation those areas of a room which are not used for seating purposes; the aisles, however, may be included in such computation.

For the purpose of adequate ventilation, rooms should be required to have a sufficient amount of window space so as to allow 21 square feet of window area for every occupant of the room; such windows, however, should open directly to outdoors. When the area of the window space for each occupant averages less than 21 square feet in a given room, it calls for the installation of a mechanical method of ventilation to supplement natural ventilation. When a mechanical

method of ventilation is necessary, the minimum amount of air space should be not less than 600 cubic feet of air per person per hour. If, for example, you have a classroom in which there are forty children, and you have only 700 square feet of window area instead of the optimum 840 square feet, then you have a deficiency of 140 square feet of window area in such room. For each square foot of window area that is lacking 100 cubic feet of air ought to be supplied for each occupant per hour. In other words, the mechanical ventilating device must compensate for the deficiency of window area in the room by supplying 140 times 100 cubic feet of air for each of the 40 pupils. While the essentials of this calculation concern only the engineer, they are offered in this connection to show that it is not sufficient merely to have an elaborate ventilating device in the room, but that the amount of air which is delivered must be accurately regulated. To be satisfied merely with the placing of a flag in front of each ventilator and to accept its fluttering as an indication that all is well, as has been the custom in many schools, is to place reliance on a very poor index of efficiency. Moreover, all locker rooms or wardrobe spaces should be adequately ventilated.

In this connection, it should be pointed out that the ordinary method of storing clothes is one which is not conducive to safety or good health, unless a proper amount of space exists between the clothing of each individual child, so that there may be no point of contact, and unless the space in which clothing is stored is well ventilated and well lighted. The sterilizing effect of sunlight not only upon the air of rooms which must be breathed by persons, but also upon the air of locker spaces must not be overlooked.

The air must not be discharged with velocity at some point in a room to the inconvenience of some of its occupants but should be properly distributed throughout such room. Children who are seated near the windows in a room where natural ventilation is depended upon, should be guarded by a deflector—an inclined glass or wooden shield placed across the lower end of such windows, to deflect upward air currents entering the room so that they will not directly strike the children. In a similar fashion children who are seated near radiators or other heating devices may suffer from the effects of excessive heat. Such radiators should be properly insulated by non-conducting material (asbestos), and the heated air should be deflected upward, or, better still, the radiators or heating units should be so distributed as to be at a distance from children's seats.

In a study made by Dr. S. J. Baker, the Director of the Bureau of Child Hygiene of the New York Department of Health, it was shown that in the closed-window room which was ventilated mechanically and kept at a temperature of about 58 degrees F., the rate of absences as the result of respiratory disease was 32 per cent. greater than in the open-window rooms which were naturally ventilated and kept at the same temperature. The best condition of health with respect to the prevalence of respiratory diseases is found to obtain in the open-window classes. At comparatively frequent intervals, as at the end of each period, all windows should be opened, preferably while the children are for the time being out of the room, or, if they must be kept in the room, while the children are exercising. Frequent changes of air are not only conducive to better health and comfort, but make for increased efficiency.

Where mechanical methods of ventilation are depended upon, a "wet and dry bulb thermometer" should be supplied in each such room, and the teachers

should be made familiar with the reading of such thermometers so that they may estimate the relative humidity which should be at least 20 per cent. for any given temperature. A special chart or table is furnished with each such thermometer which enables the teacher after a very brief experience to make the necessary computation. For the average room, a temperature of 68 degrees F. is most desirable from the standpoint of health.

Lighting

While proper lighting has not the importance of ventilation in relation to health, it is nevertheless of considerable significance among pupils and teachers because it prevents eye strain. The latter condition may be responsible for serious suffering or discomfort which may be manifested by headache, irritability, lack of attention, fatigue, and be the cause of distant or so-called "reflex" disturbances which may be referred to the stomach or to other parts of the body. Dr. Ralph E. Wager of the Department of Biology, Northern Illinois State Normal School, in his study of the health of teachers calls attention to the marked prevalence of defects of eyesight among them. There can be little doubt that a defective system of lighting may not only react to make teachers and pupils irritable, restless and fatigued, but that it may be responsible for the backwardness of many pupils. It is not sufficient to depend on visual tests to discover such defects of eyesight; it is infinitely better to correct improper lighting.

Seating arrangements should be of such character that the light falls over the left shoulder, and the arrangements of seats as well as the location of blackboards should be ordered so that they may not be placed at an angle which interferes with vision and produces a glare. It can be stated definitely that where natural or artificial lighting is used, the writing surfaces, whether blackboards or desks, should be neither too brilliantly lighted so as to reflect glares nor should there be marked shadows upon them. When artificial lights are employed, care must be taken that they should not flicker. Those who are in the habit of reading newspapers or books in the subways can testify to the blinding effects of flickering lights, and they will readily understand how this condition may cause serious eyestrain.

In connection with adequate lighting, it is well to bear in mind the three requirements which are always insisted upon by leading engineers; namely, *sufficiency, continuity* of light, and *diffusion*. The sufficiency of light depends upon having an adequate window area. In order that there may be continuity, it is not only necessary to have a large enough window area for use on comparatively dark days, but there must be provided also one or two things—first a way of reducing light when it is excessively bright, and second, a way of increasing or supplementing it when the days are dark as at the close of day in the winter season or on cloudy days. Lighting engineers emphasize the necessity of having rooms painted in light color, especially the ceilings and the upper portions of wall so that light will not be absorbed by dark surfaces, but be reflected and diffused throughout a room. The lower parts of walls should be painted dark to give relief to the eye. The diffusion of light calls also for the proper placing or distribution of widows.

If the requirements which were specified with reference to the area of window space per person under the head of ventilation are complied with, the light-

ing requirements will at the same time be well met. Adequate natural lighting like natural ventilation is the best. However, we must be careful to prevent the glare of sunshine. In such cases, window shades, especially those which can be raised from below upward, are essential. Windows that have a northern exposure are best for the purpose of lighting. Those that have a southern exposure permit an excessive amount of sunshine to enter during the middle of the day in particular, so that a heavy shade may have to be pulled down to cover the entire window area, thus necessitating the use of artificial lighting during the early part of the day.

When sunlight enters through the upper part of the window, it may be modified and made agreeable by having translucent window glass put into the upper sash, or by using light, translucent shades. The light entering through the upper part of the window diffuses over the widest area in the room. For this reason it is desirable, to have windows reach to as near the ceiling as possible. The opaque or dark window shade is undesirable. Windows must be kept clean or they will prevent the entrance of an adequate amount of light even though the total area of window space is sufficient.

If the windows look out upon a more or less confined space, and the light is intercepted or reduced by neighboring buildings much can be done to improve the lighting of such rooms by using what is known as prismatic glass. Prismatic glass is supplied in the form of corrugated glass, or has little prism-like projections which catch the light from any patch of sky which such window may face, and reflect or bend the light, and direct it into the room. While clean windows are always a most important essential for adequate lighting, they are of the greatest importance where prismatic or translucent glass is employed, because in these the light is already to a certain degree modified.

When artificial lights are employed, they must be properly distributed so as to give light to all parts of the room; they must be of adequate candle power, and the glare from such light which may fall upon polished desk-tops or other polished surfaces must be eliminated so far as possible by the use of dull paints and by the proper shielding or shading of the light. The lamps that are supplied must be kept clean or a great deal of the lighting power is lost. The use of ground glass electric bulbs or of ground glass globes has found great favor and is very desirable because it prevents glare. Reflectors are extremely valuable in improving and distributing the light thrown by lamps, but they are utterly useless if they are permitted to become unclean. It should also be remembered that a lamp which may give adequate candle power at the beginning becomes worn out with use, and the light therefore grows dimmer.

If artificial light must be employed in a class room, it is advisable not to depend on a single light or a cluster of lights placed in the center of the ceiling, but if possible such lights or clusters should be distributed about the walls or ceiling so as to light up equally well all parts of the room. Any system of artificial lighting which permits marked shadows to be thrown upon any part of the working space or particularly upon the desk, is objectionable and indicates that an improper system is employed. When artificial lighting is employed in class rooms, the optimum amount of light for ordinary use should be four foot-candles. A foot-candle is the common unit of illumination, equal approximately to one watt, and is the amount of lighting effect produced upon an object by a standard candle held

at a distance of one foot; roughly, one can estimate whether the four foot-candles which ought ordinarily to be supplied for office work have been furnished, by the following very simple mathematical test: The candle-power furnished by a lamp or cluster of lamps is made the numerator; the denominator is the square of the distance of such lamp or cluster of lamps, from the writing surface. For example, if a single lamp, or if a cluster of lamps in the center of the room, gives a light of 200 candle-power, then 200 is the numerator; if the distance from the writing surface of a pupils' desk is the source of light is 10 feet then the square of the distance is 100 feet, and the denominator is therefor 100. We then have a lighting power of 200/100 which equals 2 candle power; in other words, we have only half the optimum illumination. The minimum which should be allowed for close application is 3 foot candles; therefore, in the problem cited, the boy who sits 10 feet from a 200 foot candle light is receiving only one half of the optimum or two-thirds of the minimum lighting required.

Drinking Water and Drinking Fountains

All the standards that have been previously outlined have been in agreement with those which are laid down by authorities in the field of industrial hygiene for offices and similar work places. Continuing to apply such standards, it ought to be emphasized that drinking water ought to be readily accessible on the various floors of school buildings so that pupils and teachers may not have to lose time in going a considerable distance to slake their thirst. It is the general experience that where drinking water is not readily accessible, there is a tendency to repress the desire for water. The importance of drinking water in adequate amount from the health standpoint, as well as for the sake of comfort, need not be argued at this date. Nor need one dwell upon the dangers which lurk in the use of common drinking cups.

The placing of drinking fountains in sufficient number so as to be readily accessible, is the best means of eliminating the use of the common cup. The latter is always to be found where the ordinary faucet is used to control the flow of water. The drinking fountain must, however, conform to a modern design, or it may give a false sense of security with respect to the transmission of disease. Such fountain must deliver a column of water that rises to a height of several inches. It should be furnished with a metal ring which prevents bringing the lips in close contact with the spout of the fountain. The column of water should not, however, be a vertical one, because it has been found by experience, that disease germs which may be on the lips of a person who uses the fountain, may remain supported at the top of the column of water for a very considerable period of time without being discharged into the drain. For this reason, the only proper type of drinking fountain is one which delivers an inclined column of water rising to a height of several inches, the inclination being about 15 degrees, so that any germs which may be caught in such a column of water are not kept dancing at the top, as is the case with the vertical water spout, but fall over into the drain promptly.

Sanitation of the Toilet

Toilets should be readily accessible. A great deal of unnecessary loss of time results when toilets are housed in a single unit at a considerable distance from the classrooms or offices. Moreover, constipation which is of such frequent occur-

ence among pupils, and among teachers whose life is a sedentary one, is encouraged when the toilets are at a considerable distance. This is the common experience with large groups of people in industry and undoubtedly applies to the school population.

It is needless to say that the sanitary standards in the construction and equipment of toilets should conform to those laid down for industry, that is, there should be a sufficient number of toilets for the school population; they should be so constructed that the ventilation, lighting and heating conform to the standards already laid down; they should insure privacy, for it has generally been found that where there is no privacy, there is a tendency towards demoralization through the force of bad example and through the operation of "crowd" psychology. The material entering into the construction of the toilets should be impervious, and non-corrosive, and the construction should allow for proper drainage so that there may be no stagnation or accumulation and exposure of excrement. The windows and doors of the toilets should be particularly shielded during the spring and summer time by the use of screens to prevent the entrance of flies.

It should be remembered that while one hundred and eleven typhoid carriers are known in the City of New York, it has been estimated that from 1 to 5 per cent. of those who have had typhoid fever remain typhoid carriers, discharging typhoid bacilli in their excrement for many years or for the rest of their lives. In the City of New York, we have had over twenty thousand recognized cases of typhoid fever which were reported to the Department of Health in the last ten years. It will be seen at a glance that there must be many more typhoid carriers, even if we limit ourselves to the cases which occurred in the last ten years, than are known to the Health Department. This may include many school teachers or pupils who recover or who may be healthy carriers. The entrance of flies which have access to excrement that is not promptly and effectively washed away or drained, is therefore a possible source of danger. The trough urinal or receptacle in toilets, or the so-called school sinks are a source of danger. Water-flushed and properly sewer-connected drainage for all toilet fixtures, together with screens at windows and doors, are very essential to prevent the possible spread of typhoid fever, and of other intestinal diseases through the medium of flies.

Washing Facilities in Toilets

The washing facilities in toilets should be adequate. Typhoid carriers are safe to others only to the degree in which they exercise care promptly and thoroughly to wash their hands. Therefore, washing facilities should be available in toilets or near toilets, and also in other parts of the building so as to be readily accessible. A variety of communicable diseases are no doubt transmitted as the result of infection of the hands through contact with the nose and mouth, as well as through possible soiling with human excrement.

The supply of washing facilities, and the installation of hot water regulated so as to be of proper temperature, is extremely important from the standpoint of health to the individual pupil or teacher, and to those with whom they may come in contact. The supply of soap and towels in suitable quantity is also extremely important. Measures have been devised which permit one to provide these upon an economical and practical basis. Special paper towels, as well as properly

secured cloth towels, are available on the market. It is more economical to prevent disease by supplying proper washing facilities as well as to inculcate proper personal habits in pupils, than it is to save money by omitting such facilities and fixtures.

General Cleanliness

Reference has already been made to the economy which results from keeping windows and lighting fixtures clean. The general cleanliness of floors and all furniture hardly needs to be alluded to in the light of modern knowledge. It is important that dry dusting and dry sweeping be eliminated from all schools, no matter at what hour performed, but especially before the opening of school or at any time during the school day. Dry dusting and sweeping tends only to scatter dust, and is not effective for its collection and disposal. Mopping of the floors with oil cloths or with damp cloths or so-called "settlers," like oil particles or wet sawdust, is essential, and this should be done when the school has been completely emptied of pupils and teachers. In this connection, reference should be made to the chalk dust which is set free in class rooms or which results from the cleaning of erasers. This should be prevented so far as possible by the use of moist cloths for erasing chalk marks. While this may involve loss of time, it is, however, profitable in the long run. Pupils should never be asked to clean blackboard erasers.

Rest Room and Lunch Room

In modern industry, it has been found not only desirable but necessary and economical, to provide a lunch room where those who are unable for a variety of reasons to secure luncheon at their homes or in restaurants, may find suitable and sanitary quarters to be used as lunch rooms. While this is not so important in the school as it is in certain branches of industry, nevertheless, in the interest of good housekeeping and comfort, it is desirable so far as possible to have places which are available for use as lunch rooms for pupils and teachers. While a properly fitted up lunch room which has come to be recognized as an essential in welfare work for those employed in industry, may be difficult to obtain in the schools, there can be no question whatever that a rest room suitably fitted up to permit pupils and teachers, who may be temporarily indisposed or ill, to rest, is necessary as well as desirable. Many absences which formerly occurred in industry because adequate facilities for rest or for emergency medical and nursing relief were lacking, have now been eliminated in industrial establishments which have regard for the health of employees. This has been done by the installation of rest rooms where nursing care or quiet can be obtained and where indispositions are promptly ministered to with the least degree of suffering to those so affected and with the ultimate prevention of more serious developments. To use the vernacular, rest rooms have been found to be a "paying proposition."

Unfortunately, it is not possible in the brief compass of an address of this character, to dwell upon the necessity for maintaining proper health in pupils and teachers by the observation of rules of personal hygiene which are extremely important, and which, if violated, tend to weaken resistance or favor the development of disease. Much could be said about the value of an adequate and proper diet, faulty habits of eating, as well as the use and abuse of exercise, the need for rest periods, the value of adequate sleep, the avoidance of exposure to excessive heat and

cold at various seasons of the year, and the relation of proper methods of dressing to such conditions. Attention to these details is required in the school, as well as outside of the school. The health aspects of recreation and many other topics which are directly related to personal health, might be profitably dwelt upon, but this address was not intended to emphasize these things.

By way of conclusion, it is desirable to refer again to the necessity for adequate medical supervision and study of teachers, with a view to ascertaining their physical condition and fitness at the time of their entrance into the profession, and the casualties, and damages to health which may be recorded at various stages of their career in the profession, with a view to determining more accurately than has been done in the admittedly limited studies which have been made heretofore. There can be no doubt of the scientific value of studies which concern themselves not only with the results of medical examinations made at the time of entrance into the profession and periodically repeated examinations thereafter, but also with careful sickness reports and follow-up, and medical examinations to record the character, duration and the ultimate effects of all illnesses whether deemed trivial or important, conducted over a considerable period of time. In this way alone, will it be possible to obtain knowledge of scientific value and importance in safeguarding the health of teachers, and protecting pupils from the physical and mental effects of sickness, to which teachers may be subject.

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