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CHANGES NEEDED IN AMERICAN SECONDARY EDUCATION

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CHANGES NEEDED IN AMERICAN SECONDARY EDUCATION

BY

CHARLES W. ELIOT

THE prevailing programmes in American secondary schools contain many valuable features. It is the purpose of this essay to set forth certain much-needed amendments of these programmes.

The best part of all human knowledge has come by exact and studied observation made through the senses of sight, hearing, taste, smell, and touch. The most important part of education has always been the training of the senses through which that best part of knowledge comes. This training has two precious results in the individual besides the faculty of accurate observation—one the acquisition of some sort of skill, the other the habit of careful reflection and measured reasoning which results in precise statement and record.

A baby spends all its waking time in learning to use its senses, and to reason correctly from the evidence of its senses. At first, it reaches after objects near by and far off alike, but gradually learns to judge by the eye whether or not it can reach the object seen. It tries to put everything into its mouth, perhaps in an effort to estimate size and shape correctly—which at first it cannot accomplish by the eye alone as the adult does, nor satisfactorily to itself even by the hand—or else to renew some of the agreeable sensations as to flavor or texture which it has already experienced,

or possibly to rub its gums against something which feels cool and smooth. The baby's assiduity in observation and experimentation, and the rapidity of its progress in sense-training are probably never matched in after life. Its mind is also trained fast; because it is constantly practising the mental interpretation of the phenomena which its senses present to it.

The boy on a farm has admirable opportunities to train eye, ear, and hand; because he can always be looking at the sky and the soils, the woods, the crops, and the forests, having familiar intercourse with many domestic animals, using various tools, listening to the innumerable sweet sounds which wind, water, birds, and insects make on the countryside, and in his holidays hunting, fishing, and roaming.

Increasing skill in the use of the hands and fingers has undoubtedly had much to do with the development of the human mind ever since man first stood erect, and set free from foot work his fingers and their opposing thumb. One of the best methods of developing the minds of children is practice in the coördinated activities of the brain and the hand. If brain, eye, and hand are coöperating, the developing mental effect is increased; and the mental action and reaction is stronger still when eyes, ears, and hands, and the whole nervous system, the memory, and the discriminating judgment are at work together.

The fundamental trades—such as those of the carpenter, mason, blacksmith, wheelwright, painter, hand leather-worker, and shoemaker, have provided immensely valuable education for the human race, and have, indeed, been the chief means of raising barbarous peoples to a condition of approximate civilization. To-day the teaching of those trades, without much use of machinery, is the best mode of developing the natural powers of a backward people—like the North American Indians and the negroes. When a Hindu father transmits to his son not only his caste with all its privileges and its restrictions, but also his hand-trade—such, for example, as that of a goldsmith or a potter, he imparts to his son under a religious sanction some of the most important elements in a sound education. East Indian civilization has been in great part transmitted in this way. The European guilds with their elaborate rules about apprenticeship contributed strongly for centuries to the education of the people through trades, before public schools

and education for the masses through books and reading had been thought of.

There have of course been civilizations which had but slight foundations, apart from military force, except a strong development of linguistic, philosophical, or theological studies; but even these civilizations have generally developed also to a high degree some fine art, like architecture, sculpture, or ceramic art, which requires keen observation and no little skill. Moreover, none of these civilizations were so firmly founded as our own; for they had not attained to the scientific conception of truth, or to the inductive method of arriving at truth. It should be the great advantage of modern education that it has learnt to combine the training of the powers of observation with an accurate use of language and the best kind of memory work.

In noble and rich families some training of the senses was obtained all through feudal times; because the men were brought up to war and the chase, and the women not only shared in some degree the sports of the men, but acquired the manual skill which sewing, knitting, hand-weaving, and embroidering demand. Even before the invention of gunpowder, success in war demanded the skilful use of trained senses in accurate and quick observation. Hunting and fishing have from the earliest times provided all sorts and conditions of men with admirable training of alert senses.

In respect to the training of their senses the children of well-to-do parents nowadays are often worse off than the children of the poor; because they are not called upon to perform services in the household or on the farm which give practice in accurate observation and manual dexterity.

The advent of mechanical power and machinery has greatly impaired the educational value of many trades; and this impairment has become so common that it may almost be called universal. The accurate joints a carpenter used to make by the careful use of his own eyes and hands are now made by machines almost without human intervention. The horseshoes which a blacksmith used to turn by hand on his anvil, and temper in his own little fire with an accurate appreciation of the changing tints of the hot metal, are now turned out by machinery by the hundred thousand, almost without touch of human hand or glance of human eye. Tending machinery is, as a rule, less instructive for the workman than hand-

work of the old-fashioned sort, unless, indeed, the machine is complex, and the product liable to imperfections. In that case the working of the machine must be closely watched by trained human senses. The ordinary uniformity of a machine product is due to invariability in the action of the machine; and this invariability is a main object from the point of view of the inventor or the proprietor; but that same invariability makes the tending of the machine of little use in the education of the human being that tends it—child, woman, or man. In certain industries a young man may learn in two or three days to make the few almost automatic movements which the right tending of his machine demands; and then may go on for years tending that same machine. Any ambitious or even prudent young man will try to escape as soon as possible from that sort of work. There is in it no training of the senses, no progress, and no joy in work.

The difference between a good workman and a poor one in farming, mining, or manufacturing is the difference between the man who possesses well-trained senses and good judgment in using them, and the man who does not. The valuable farm-hand is the man that can drive a straight furrow with a plough and a pair of mules, or can follow accurately in parallel curves the contours of the land while ploughing. The good hand-fisherman is the man who can feel correctly what is going on at the fishhook out of sight, and can make his motor nerves react quickly to what he feels there. The successful hunter is the man who can not only organize a well-devised drive, but can shoot surely the instant the game comes in sight. It is the blacksmith who has the sure touch with his hammer and the quick sight of the right tint on the heated drills who can sharpen three sets of quarryman's drills, while another man sharpens one.

It follows from these considerations that the training of the senses should always have been a prime object in human education at every stage from primary to professional. That prime object it has never been, and is not to-day. The kind of education the modern world has inherited from ancient times was based chiefly on literature. Its principal materials, besides some elementary mathematics, were sacred and profane writings, both prose and poetry, including descriptive narration, history, philosophy, and

religion; but accompanying this tradition of language and literature was another highly useful transmission from ancient times—the study of the Fine Arts, with the many kinds of skill that are indispensable to artistic creation. Wherever in Europe the cultivation of the Fine Arts has survived in vigor, there the varied skill of the artist in music, painting, sculpture, and architecture has been a saving element in national education, although it affected strongly only a limited number of persons. The English nation was less influenced by artistic culture than the nations of the continent. American secondary and higher education copied English models, and were also injuriously affected by the Puritan, Genevan, Scotch-Presbyterian, and Quaker disdain for the Fine Arts. As a result the programmes of secondary schools in the United States allotted only an insignificant portion of school time to the cultivation of the perceptive power through music and drawing; and, until lately, boys and girls in secondary schools did not have their attention directed to the Fine Arts by any outside or voluntary organizations. As a rule, the young men admitted to American colleges can neither draw nor sing; and they possess no other skill of eye, ear, or hand. A high degree of skill in athletic sports is acquired only by exceptional persons; and the skill itself is of a coarser kind than that needed by the artist and the skilled workman.

Since the middle of the eighteenth century a new element in the education of the white race has been developing, slowly for a hundred years but rapidly during the past fifty. This new element is physical, chemical, and biological science. Through the study of these subjects the medical profession has been revolutionized and several new professions of high value have been created—such as that of the chemist, of the engineer—civil, mechanical, electrical, or metallurgical—and of the forester. Through the radical work of great inventors and discoverers and of these new professions, all the large industries and transportation methods of the world, and therefore the commerce of the world, have been so changed that the producers and traders of times preceding 1850 would find, if they should revisit the scenes of their labors, that the processes by which they made their livings or their fortunes had completely disappeared. This prodigious change should have instructed the makers of programmes for schools and colleges maintained by

nations which were undergoing this great revolution in regard to their means of livelihood; but for the most part professional educators have been, and still are, blind to the necessity of a corresponding reformation or revision of the processes of education.

There is one profession, however, in which the educational processes have been adequately changed, but only within recent years, namely—the profession of medicine. The reason for the comparatively early improvement of medical education is that the medical art has always depended for such measure of success as it attained on the physician's power of accurate observation, and his faculty of reasoning cautiously and soundly on the testimony which his senses gave him. From remotest times the successful physician has been by nature a naturalist. He saw and heard straight, and his touch gave him trustworthy information. He has still, and must always have, the naturalist's temperament, and he must possess the naturalist's trained senses. The reason that medicine and surgery have within twenty-five years made such astonishing progress is that the practitioner, possessing the senses and mental habits of the naturalist, has been supplied through the progress of biological, chemical, and physical science with wonderful new means of accurate diagnosis. The training the medical student now receives is largely individual training in the use of his senses; and this training is given by experts in the use of their own eyes, ears, and hands in diagnosis and treatment. The just reasoning follows on the trustworthy observation. What has already been done in medical education needs to be done in all other forms of education, whether for trades or for professions, whether for occupations chiefly manual or for those chiefly mental.

The great increase of urban population at the expense of rural which has taken place during the past sixty years, with the accompanying growth of factories and the crowding together of the working people and their families, has resulted, so far as schools and colleges are concerned, in placing more children and youths than formerly under the influence of systematic education and keeping them there for a longer period; but this improvement has been accompanied by a decline in the amount and quality of the sense-training which children and adolescents have received. An increasing proportion of children goes to the high schools, academies, and colleges; but the farm now teaches but a small proportion

of the children born to the nation, and the urban family cannot train the children's senses in so effective and wholesome ways as the rural family could. In cities and large towns the trade which a boy chooses, or is assigned to, no longer demands for admission a prolonged apprenticeship. Machinery turns out an ample product without the need of much skilled labor. The general result is an inadequate training of the senses of the rising generation for accurate and quick observation. Unfortunately, the schools, which might have come to the rescue of the children, have for the most part clung to the traditional programmes which rely chiefly on studies that train the memory and the powers of discrimination and analysis, but do not drill children in seeing and hearing correctly, in touching deftly and rapidly, and in drawing the right inferences from the testimony of their senses.

In recent years, on account of the complexities, urgencies, and numerous accidents of urban life, there has been a striking revelation of the untrustworthiness of human testimony, not because witnesses intended to deceive, but because they were unable to see, hear, or describe accurately what really happened in their presence. This is probably an old difficulty; but it has been freshly brought to public attention by the numerous cases of conflicting testimony developed in courts, and before commissions of inquiry, medical examiners, and police authorities. Indeed, in such investigations it is well-nigh the rule that the testimony of the different witnesses not only presents many variations of detail, but is often discordant and even contradictory. The investigators have to rely chiefly, not on what the witnesses testify occurred at the moment, but on what careful observers can subsequently learn from the actual state of the wreck, and the condition of the dead, the wounded, and the more or less injured survivors. This inability to see, hear, and describe correctly is not at all confined to uneducated people. On the contrary, it is often found in men and women whose education has been prolonged and thorough, but never contained any significant element of sense-training. Many highly educated American ministers, lawyers, and teachers have never received any scientific training, have never used any instrument of precision, possess no manual skill whatever, and cannot draw, sing, or play on a musical instrument. Their entire education has dwelt in the region of language, literature, philosophy, and history, with limited

excursions into the field of mathematics. Many an elderly professional man, looking back on his education and examining his own habits of thought and of expression, perceives that his senses were never trained to act with precision, that his habits of thought permit vagueness, obscurity, and inaccuracy, and that his spoken or written statement lacks that measured, cautious, candid, simple quality which the scientific spirit fosters and inculcates. Such a deplorable result ought not to have been possible; but it has been unavoidable by the individual, whether child or parent, because the programmes of secondary schools still cling almost exclusively to the memory subjects and the elements of mathematics, and college students are apt to adhere in college to the mental habits they acquired at school. The ordinary student does not venture into untried fields, because he feels more secure in the familiar.

If any one should ask—why has modern society got on as well as it has, if the great majority of its members have had an inadequate training in the use of their senses or no systematic training of that sort, the answer is that some voluntary agencies and some influences which take strong effect on sections of the community have been at work to mitigate the evil. Such are, for example, athletic sports, travel, the use by city people of public parks and gardens, the practice of that alert watchfulness which the risks of crowded thoroughfares and of the dangerous industries compel, and the training of the senses which any man who practises well a manual trade obtains on the way. Many of the household arts also give a good training in the careful seeing and handling which lead to accurate perception. The problem is now how to make systematic secondary education support and better these incidental influences, and how to coördinate sense-training with accurate reasoning and retentive memorizing.

In urging the training of the senses, the educator must never lose sight of the fact that mental vigor does not necessarily result from bodily work alone, whether handwork or work in directing machines. Many persons work all their lives with a moderate amount of manual skill, who never develop any considerable faculty of discrimination or of sound judgment. Whole tribes and nations have done fine handwork for generations, and yet never developed intellectual superiority. If one had to choose

between training the senses and training the memory and the language powers, one would choose the latter; but both are indispensable to the best results in education. Neither depends for its educational value on imparting information; each supplies an indispensable discipline for the human intelligence.

A survey of the programmes of the existing American secondary schools—public, private, and endowed—would show that as a rule they pay little attention to the training of the senses, and provide small opportunities for acquiring any skill of eye, ear, or hand, or any acquaintance with the accurate recording and cautious reasoning which modern science prescribes. To make, or read, a complete survey of these programmes would be a dull and heavy task; but the demonstration needed for the purpose of the present essay can be readily given by analyzing the programmes of a few typical schools and academies. Such an analysis of the programmes and regulations of twelve different schools and one group of kindred schools is given in the Appendix, the general result being that the secondary schools are giving not more than from one tenth to one sixth of their force to observational, sense-training subjects. Any school superintendent, teacher, or committeeman can verify the results of this analysis in any secondary schools with which he is acquainted.

The changes which ought to be made immediately in the programmes of American secondary schools, in order to correct the glaring deficiencies of the present programmes, are chiefly: the introduction of more hand, ear, and eye work—such as drawing, carpentry, turning, music, sewing, and cooking, and the giving of much more time to the sciences of observation—chemistry, physics, biology, and geography—not political, but geological and ethnographical geography. These sciences should be taught in the most concrete manner possible—that is in laboratories with ample experimenting done by the individual pupil with his own eyes and hands, and in the field through the pupil's own observation guided by expert leaders. In secondary schools situated in the country the elements of agriculture should have an important place in the programme, and the pupils should all work in the school gardens and experimental plots, both individually and in coöperation with

others. In city schools a manual training should be given which would prepare a boy for any one of many different trades, not by familiarizing him with the details of actual work in any trade, but by giving him an all-round bodily vigor, a nervous system capable of multiform coördinated efforts, a liking for doing his best in competition with mates, and a widely applicable skill of eye and hand. Again, music should be given a substantial place in the programme of every secondary school, in order that all the pupils may learn musical notation, and may get much practice in reading music and in singing. Drawing, both freehand and mechanical, should be given ample time in every secondary school programme; because it is an admirable mode of expression which supplements language and is often to be preferred to it, lies at the foundation of excellence in many arts and trades, affords simultaneously good training for both eye and hand, and gives much enjoyment throughout life to the possessor of even a moderate amount of skill.

Drawing and music, like other Fine Art studies, were regarded by the Puritan settlers of New England and by all their social and religious kindred as superfluities, which, if not positively evil, were still of wasteful or harmful tendency, and were, therefore, to be kept out of every course of education. By many teachers and educational administrators music and drawing are still regarded as fads or trivial accomplishments not worthy to rank as substantial educational material; whereas, they are important features in the outfit of every human being who means to be cultivated, efficient, and rationally happy. In consequence, many native Americans have grown up without musical faculty and without any power to draw or sketch, and so without the high capacity for enjoyment, and for giving joy, which even a moderate acquaintance with these arts imparts. This is a disaster which has much diminished the happiness of the native American stock. It is high time that the American school—urban or rural, mechanical, commercial, or classical, public, private, or endowed—set earnestly to work to repair this great loss and damage. Although considerable improvements have been recently made in the programmes of American secondary schools, especially within the past ten years or since vocational training has been much discussed, multitudes of Americans continue to regard the sense-training subjects as fads and superfluities. They say: the public elementary schools should teach thoroughly

reading, writing, spelling, and arithmetic, and let natural science, drawing, music, domestic arts and crafts, and manual training severely alone. Let the secondary schools teach thoroughly English, Latin, American history, and mathematics, with a dash of economics and civics, and cease to encumber their programmes with bits of the new sciences and the new sociology. This doctrine is dangerously conservative; for it would restrict the rising generations to memory studies, and give them no real acquaintance with the sciences and arts which within a hundred years have revolutionized all the industries of the white race, modified profoundly all the political and ethical conceptions of the freedom-loving peoples, and added wonderfully to the productive capacity of Europe and America.

If any one asks how it can be possible that these new subjects, all time-consuming, should be introduced into the existing secondary schools of the United States, the answer—adequate, though not easy to put into practice—is, first, that the memory subjects and the mathematics should be somewhat reduced as regards number of assigned periods in the week; secondly, that afternoon hours should be utilized, or, in other words, that the school day should be lengthened; and thirdly, that the long summer vacation should be reduced. It is worse than absurd to turn city children into the streets for more than two months every summer. Since the new subjects all require bodily as well as mental exertion, they can be added to the memory subjects without any risk to the health of the children, provided that the shops, laboratories, and exercising rooms be kept cool and well ventilated. In rural schools a good part of the new work in sowing, planting, cultivating the ground, and harvesting must be done out of doors. The observational, manual, and scientific subjects often awaken in a boy or young man for the first time an intellectual interest and zeal in work which memory studies have never stirred. Hand and eye work often develops a power of concentrated attention which book work had failed to produce, but which can be transferred to book work when once created. All the new subjects require vigorous and constant use of the memory, and give much practice in exact recording, and in drawing only the limited and legitimate inference from the recorded facts.

If the educational material and the method of instruction were right, the training given in the grades would be just as good for the

children who leave school at fourteen as for those who go on till eighteen, and the training in the high school would be equally appropriate for pupils who do not go to college and for those who do. The progressive sense-training from beginning to end of systematic education is desirable for all pupils, whatever their destinations in after life, and should prepare every pupil for his best entrance on earning a livelihood, at whatever age that necessity is to come upon him. It should be the same with the language and history studies in every public school programme. At every stage, or in every grade, they should be suitable for every pupil no matter what his destination. Flexibility and adaptation to individual needs would still be necessary in the programmes, first, in order to enable the individual pupil to concentrate on the studies he prefers and excels in, and, secondly, to enable pupils of different capacity to advance at different rates. The adoption of these principles would solve justly problems in the American tax-supported system of public education which have been in debate for generations.

Every school plant, whether in city or country, should be used, not only by the regular pupils between the hours of eight or half-past eight and four or half-past four, but by older youths and adults at hours outside the working time in the prevailing industries of the town or city where the school is situated. Many efforts are now being made to introduce continuation schools and to develop evening schools; but these efforts should become universal, and should result speedily in a large extension of the American public school system. Moreover, the fundamental object of the proposed changes in the programmes should be distinctly recognized—the better training of the senses.

The suggested changes in American school programmes will not make public school life harder or more fatiguing for the pupils. On the contrary, observational study and concrete teaching are more interesting to both children and adults than memory study of any sort; and whenever the interest of pupils is aroused it brings out more concentrated attention and harder work, but causes less fatigue. The obvious utility of mental labor directed to a practical end increases the interest the pupils take in their work, and stimulates them to effective effort. To use a good tool or machine, and get the results it is competent to produce when in skilful hands, is vastly more interesting than reading or hearing about the uses of

such a tool or machine. Whenever by the use of observational and concrete methods the pupils' power of attention and of concentrated effort is developed, that power of attention once acquired can be exercised in other subjects. This principle holds true not only of manual or bodily labor, but also of games and sports, and of coöperation in rhythmical movements like dancing. The power of concentrated attention won in carpentry, turning, forging, or farm work is easily transferred to work in reading, writing, and ciphering, or at a later stage in history, literature, and civics; so that the reduction in the so-called academic studies made to allow the introduction of observational studies need not result in less attainment in the academic studies themselves.

These changes will all add to the annual cost of the schools, because much of the new instruction must be given to the individual pupil, treated by himself, and not as a member of a numerous class. In short, the example of the modern medical school, which needs to be imitated in all schools, teaches that good training of the senses is more costly than the ancient classwork with books and lectures. The cost of town and city school systems will be also increased by the necessity of employing a larger number of teachers, if the schools are to be kept at work evenings, as well as daytimes, and during forty-six weeks of the year instead of forty-one. Indeed, the chief item in the increased cost in city schools, consequent on the introduction of sense-training and observational studies, would be in the salary list. More teachers would be required and a larger proportion of them would be men. The new teachers would be good mechanics, well-trained laboratory assistants, and naturalists competent to teach botany, zoölogy, and geology on walks and excursions with the pupils. To provide these teachers in sufficient numbers, the programmes of normal schools would need to be considerably modified; so that it would probably be necessary to wait for the production of an adequate number of teachers competent to give the new kinds of instruction. The prime object being to give all pupils a correct conception of the modern scientific method, and sound practice in using it, the teachers themselves must understand that method, and be bred to its constant use. It is possible to deaden any subject as a means of mental training, and science and the Fine Arts just as easily as the classics, history, geography, or arithmetic. It is quite possible to teach observa-

tional subjects in a memoriter, unreasoning way, and without imparting the essential moralities of freedom and brotherhood. Such teaching would defeat the object of the proposed reform. On the other hand, some of the traditional subjects may be taught in a concrete way, which really enlarges the field of observational study, when once the pupil has mastered the observational method in regions within sight and touch; just as printed cases in medical practice which give all the symptoms and facts in each case may be used to supplement bedside study of actual patients. The printed cases would be of no use to students who had never seen an actual case, or had never themselves made up the record of an actual case for the use of the visiting physician. So when pupils in a secondary school have once mastered a portion of the history of their own country by the study of personages, places, pictures, speeches, charts, and diagrams, they can safely use their imaginations to clothe and vivify the history of other times and peoples, and particularly the biographies of famous men. This is a legitimate enlargement of a true observational method. By mixing geometry with arithmetic and with algebra the teaching of elementary mathematics may be much enlivened, the concrete illustrations apprehended by sight or touch vivifying the abstract numbers or quantities.

For this great improvement in the conduct of American secondary schools a good deal of preparation has already been made. The new schools of Mechanic Arts, the Trade Schools, the various endowed Institutes for giving a sound training in applied science, and such institutions as Hampton Institute and Tuskegee Institute are showing how to learn by actual seeing, hearing, touching, and doing, instead of by reading and committing to memory. They have proved that the mental powers, as well as the bodily powers, are strongly developed by the kind of instruction they give; so that nobody need apprehend that reduced attention to memory subjects, with increased attention to the training of the senses, the muscles, and the nerves will result in a smaller capacity for sound thinking and for the exercise of an animating good-will.

There has not infrequently been much disappointment as to the effect on the mental powers of the pupils of the new courses in scientific subjects and the new instruction in drawing, carpentry, forging,

moulding, and so forth, which have already been introduced into American secondary schools. The reason for these disappointments is the imperfect manner in which the new instruction has been given. It is indispensable to success with the new subjects that the pupils should use their own eyes, ears, and hands, and themselves describe and coördinate their own observations. In the study of their own results they must apply their own powers of discrimination, memory, and expression. It is the combined action of senses, reasoning, and memory, which alone gives the true result in the pupil. The real educational use of any concrete experience requires reflection on its significance, and finally the firm holding in the memory of the results of both observation and reflection.

It is not the secondary school alone which needs to be reformed —the elementary school needs to set a different standard of attainment, not lower or easier, but rather higher and harder—a standard in which the training of the senses shall be an important element. If the new secondary schools are to accomplish their rational objects, they must rest on new elementary schools which utilize the spontaneous aptitudes of childhood—for the acquisition of modern languages, for example. As to the American college, it may be said to have already abandoned the traditional four years' programme of linguistic, literary, and mathematical studies with a dash of history and philosophy; and many colleges now require for admission the elements of some scientific subject. As a whole, the colleges have already begun to attend to the training of the senses by introducing a considerable variety of elective courses in science; but the changes already introduced do not afford the mass of the students adequate opportunities to remedy the deficiencies in the training they received in their schools. Moreover, to begin that systematic training of the senses at the college age is not the most advantageous arrangement.

If the elementary and secondary schools served well boys and girls from six to eighteen years of age, the main reform would in time be accomplished. It is but a small percentage of the youth of the country that go to the colleges and the higher technical schools; and the parents of this small percentage are often able to provide their children with opportunities for securing, outside of their systematic education, a well-coördinated use of all their senses and nerves—such as a violinist, organist, pilot, locomotive engineer,

or sharpshooter requires. The educational publicist must keep in mind the interests of the 95 per cent. of the children, rather than those of the 5 per cent.; for it is on the wise treatment of the mass of the population during youth that a modern democracy must rely for assuring the public health, prosperity, and happiness.

It must not be imagined that any advocate of more sense-training in education expects to see diminished the exercise of the reasoning powers or of the motive powers which distinguish Man from the other animals, or to see impaired Man's faith in the spiritual unity of the world, or his sense of duty toward fellowmen, or his active sympathy with them. The devotees of natural and physical science during the last hundred and fifty years have not shown themselves inferior to any other class of men in their power to reason and to will, and have shown themselves superior to any other class of men in respect to the value or worth to society of the product of those powers. The men who, since the nineteenth century began, have done most for the human race through the right use of their reasons, imaginations, and wills are the men of science, the artists, and the skilled craftsmen, not the metaphysicians, the orators, the historians, or the rulers. In modern times the most beneficent of the rulers have been men who shared in some degree the new scientific spirit; and the same is true of the metaphysicians. As to the real poets, teachers of religion, and other men of genius, their best work has the scientific quality of precision and truthfulness; and their rhetorical or oratorical work is only their second best. The best poetry of the last three centuries perfectly illustrates this general truth. Shakespeare wrote:

"I know a bank whereon the wild thyme grows."

The florists now tell us that thyme will not thrive except on a bank. George Herbert wrote:

"Sweet day, so cool, so calm, so bright;
The bridal of the earth and sky.
The dews shall weep thy fall to-night,
For thou must die."

Precision of statement could not go further; thought and word are perfectly accurate. Emerson said to the rhodora:

"The self-same power that brought me here, brought you."

A more accurate description of the universal Providence could not be given. Even martial poetry often possesses the same absolute accuracy:

"Oh! Tiber, Father Tiber,
To whom the Romans pray,
A Roman's life, a Roman's arms,
Take thou in charge this day!"

"Cannon to right of them,
Cannon to left of them,
Volleyed and thundered,
Into the jaws of Death
Rode the six hundred."

When human emotions are to be stirred, and human wills inspired, it is the simple, convincing statement which moves most, and lasts longest:

"Greater love hath no man than this: that
a man lay down his life for his friends."

The most exact, complete, satisfying, and influential description of true neighborliness in all literature is the parable of the Good Samaritan:

"Which of these three, thinkest thou, proved neighbor
unto him that fell among the robbers? And he said,
He that showed mercy on him. And Jesus said unto him,
Go, and do thou likewise."

It is an important lesson to be drawn from the Great War that under the passionate excitements and tremendous strains of the wide-spread disaster, the medical profession and the nurses of all countries are holding firmly to that exact definition of the neighbor, and are obeying strictly the command, "Do thou likewise." These are men and women who have received thorough training of the senses without suffering any loss of quick sympathy or of humane devotion.

Rhetorical exaggeration, paradox, hyperbole, and rhapsody doubtless have their uses in moving to immediate action masses of ordinary men and women; but they are not the finest weapons of the teacher and moralist:

"Speaks for itself the fact,
As unrelenting Nature leaves
Her every act!"

APPENDIX

The proportion of attention given to observational and scientific subjects in secondary schools in comparison with that given to linguistic, literary, mathematical, and historical subjects, may be illustrated by analysis of the programmes of a few typical schools.

In a New York high school which maintains the traditional four years' high school course, and a course intended to prepare for commercial work, the number of recitation periods offered in the four years are respectively 21, 25, 25, and 35—a total of 106; and out of these 106 periods each pupil is required to attend 72 periods, being 18 periods per week throughout the four years. The number of options is small during the first three years, but large in the fourth year. Out of these 106 periods, 24 had some possible element of observational work; but these could all be avoided by any pupil who wished to do so, unless, indeed, the pupil was hoping to enter a college which demanded the elements of some one science for admission. There were in the school no laboratories for physics, chemistry, or biology. The commercial course contained only $77\frac{1}{2}$ periods, of which 72 were required. Of the $77\frac{1}{2}$ periods, 10 had possibly, but not necessarily, some element of observational work. This school has lately come into possession of a new building which contains well-equipped laboratories for physics, chemistry, and biology, and is this year (1915–16) offering for the first time a noteworthy course in agriculture which includes 13 periods of English, 10 of history, and 10 of mathematics, but also 10 for science and 30 for agriculture, including laboratory and shop work, field trips, project work at home, and classroom work. The instructor for agriculture is engaged for the entire year, and will spend his summer with the boys who pursue the Agricultural Course.

In an excellent high school in an important western city there were in 1914–15 34 teachers who gave full time on the weekly programme of the school, of whom

1 taught physics with the laboratory method
1 chemistry with the laboratory method
1 zoölogy and physiology with the laboratory method
2 mechanical drawing and manual arts, and
1 free-hand drawing.

Thus, about one sixth of the actual teaching force was teaching subjects which might fairly be called observational. This school maintains a "Normal Course" which requires a good two years' course in free-hand drawing, given five days in the week, for forty minutes a day. There being no prescribed outline of work in music, the different high schools in this city make out each its own course in music. One of them maintains an excellent course in music covering the first two years out of the four; but the high school, the composition of whose staff is partially analyzed above, gave no course in music because of lack of accommodations. In general, a course in music is required of pupils in this city only if they select that high school course which is called the "Normal Course." Free-hand drawing is not required except in the "Normal Course." Since the city provides in its high schools more instruction than any one pupil can take, it is possible for pupils to graduate creditably from a high school without having devoted even one sixth of their time to observational studies.

In another large western city the high schools provide seven different courses, among which each pupil chooses one. In three of these courses memory studies have the usual preponderance; but in the other four, called Art, Manual Training, Domestic Art and Science, and Commercial, there is an unusual proportion of observational or vocational studies. The city spends money liberally in its high schools for instruction in drawing—both free-hand and mechanical—manual training including joinery, turning, pattern-making, moulding, forging, and the domestic arts and sciences, knowledge of which is especially desirable for girls, and in botany, physiology, physics, and chemistry. Botany and physiology are only half-year subjects. All science subjects have five periods each per week, usually divided into three recitations and one double laboratory period. In the Art Course, art drawing is required during the four years, and is given in double periods each second day.

In the course called Classical, the proportion of observational studies accessible to the pupil is very small; but in the courses called Art, Manual Training, and Domestic Art and Science it is fairly large, while in the courses called General and Scientific the proportion of observational studies is identical, and approaches one sixth of the total time demanded from the pupils by either of

these courses. In the course called Scientific of the 20 units required for graduation, 4, or one fifth of the whole, must be in science. In the General Course, 18 units being required for graduation, 2 must be in science; and these 2 may be increased to 3 or 4 —that is, one ninth of the total number is required for science; and this proportion may be increased by election to one sixth or even to two ninths.

Music in these schools consists of chorus singing taught for two periods a week for four years; but music is not enumerated among the studies of the schools, being regarded as extra or outside the regular programme. The word music does not occur in the printed programmes of the seven courses. Art Drawing, Mechanical Drawing, Manual Training, and Domestic Art and Science require but little preparatory study in connection with the work done in the periods assigned to these subjects on the programmes. Physics, physiology, chemistry, and physiography require preparatory study, but not so much as the language studies and the mathematical. It has been proved in the high schools of this city that girls devote more time than boys do to study in preparation for the recitation periods of the high school programmes.

In an old secondary school maintained wholly at public expense, and devoted for many years to classical learning, the present Course of Study includes the following observational studies: In the first year 2 periods a week in elementary science and 2 in physical training—these two subjects together having 4 out of 25 periods per week, and being represented in the second and third years in the same proportion. In the fourth and fifth years there is no scientific study whatever. In the sixth and last year of the course physics has 5 periods out of the 25, with lecture demonstrations and laboratory work throughout the year. In the last four years of the course the physical training consists exclusively of military drill—that is, the setting-up drill, the manual of arms, marching, and company and battalion movements. In all the physical training given at this school there is hardly any training of the powers of observation. Neither music nor drawing is a subject of instruction. Laboratory work in the elementary science of the first year and in sixth-year physics occupies about half of the time allotted to those subjects in the programme; but many pupils who

are proposing to go to college give additional time to the laboratory study of physics.

A public school situated in a New England city combines a well-developed English High School Course with an equally well-developed Classical Course intended to prepare boys and girls for admission to colleges of high standing. This school teaches physiology, chemistry, and physics partly by the laboratory method, and is well equipped for such work. It also gives much instruction in penmanship, stenography, and typewriting, but chiefly for pupils who take the Commercial Course. Drawing is an elective study open to all pupils, ordinarily for two periods (of forty-five minutes each) a week. Physical training is an elective subject open to all girls for two periods a week, but not to boys. The school maintains two large chorus classes, and an orchestra of about fifty pieces, each meeting once a week. There is a class in Harmony which meets twice a week. The Boys' Glee Club and the Girls' Glee Club meet outside of the school. All music work is elective, but is under the personal supervision of the Director of Music employed by the School Committee. The school does not provide any form of manual training; perhaps because it has an alliance with a Technical School close by.

On account of the many kinds of pupil in this school, and of the large volume of instruction needed to meet their various wants, the best way to estimate the proportion of the school's energy which goes into the teaching of observational and scientific subjects is to compare the number of teachers employed in the school for those subjects with the number employed for the languages and literatures, and for history, civics, and mathematics.

There are 79 teachers, of whom 13 are men. Out of these 79, 12 teach subjects which may be said to include a considerable proportion of training of the senses—namely, drawing, physiology, chemistry, physics, and physical culture. Of these 12, 2 are men giving full-time, and 1 is the Musical Director, who gives 5 hours a week. One female teacher gives only part of her time to a subject belonging in this category—physiology. Another, a teacher of physiology, gives part of her time to a commercial subject. It appears, therefore, that $15\frac{1}{5}$ per cent. of the School's energy goes into the teaching of subjects of an observational and scientific

quality, and 84⅘ per cent. into instruction in languages, literature, mathematics, history, and civics. The individual pupil may devote either somewhat more or somewhat less than 15 per cent. of his attention to observational and scientific subjects.

In an old New England academy the prescribed studies are exclusively linguistic and mathematical with the following exceptions —a course in physical training which requires four hours a week throughout the Academy Course, and courses in physics, chemistry, and drawing, which are optional studies open to the two upper classes only. Languages—ancient and modern—and elementary mathematics occupy the great majority of the teachers, and almost all the time of the ordinary pupil. Regular instruction in music is, however, provided for members of the glee club and the chapel choir and of the mandolin club and the orchestra. The study of music, however, is completely voluntary and outside of the regular course of the academy. In 1914–15, 32 teachers were employed in this academy, three of whom were devoted to the teaching of physics and chemistry, and two to the instruction in physical training. This academy maintains laboratories for physics, chemistry, and mechanical drawing, and allows the pupils in these subjects to devote two hours twice a week to laboratory work in these subjects. The voluntary instruction in music—both vocal and instrumental—is given one evening a week for about seven months; but much more time is given to music by individual pupils. An examination is required for admission to any one of the musical clubs. Membership in these clubs is considered an honor, and regularity of attendance at their rehearsals is strictly enforced.

Another endowed academy in New England maintains two courses of study—one called the Classical, the other the Scientific. In the Classical Course no observational subject whatever finds place, except optional physics and chemistry, each four periods a week in the senior year, and optional mechanical drawing for two periods a week in the senior year. The Scientific Course makes chemistry and physics elective one year earlier than the Classical, and therefore perhaps permits the pupils who elect it to advance farther in these two subjects. This academy possesses labora-

tories for physics and chemistry, and teaches both these subjects by the laboratory method. Opportunity is offered for the study of piano, organ, and harmony; but this instruction does not make part of any Course of Study maintained by the academy. The subject of drawing other than mechanical drawing is not mentioned either in the Course of Study or in the elaborate Constitution of this academy. Memory subjects have an overwhelming preponderance over observational.

In a good, partially endowed, New England school which is intended for sons of well-to-do people, the total number of recitation hours contained in the six years' programme of studies is 185, of which only 28 contain an element of observational work; and to arrive at this figure 28, there must be included in it all the hours given to physical training, namely, 12, and one hour a week given in the two earliest years to singing. Of the other 14 hours, 5 are devoted to manual training, 5 to physics, and 4 to chemistry, physics being a required study and chemistry an alternative for Greek. In this school nearly the whole weight of instruction is applied to languages, mathematics, and to a moderate proportion of historical teaching in which is included the history of English literature.

In another similar, preparatory school, also partially endowed, four distinct courses are maintained in each of the four years. One of these is called the Scientific Course, because it is intended to prepare candidates for admission to a Scientific School rather than to a College. This course prescribes a little more science in the lower middle (second) and senior years than any one of the other three courses, but out of its 79 periods of recitation in the four years, only 7 are devoted to science of any sort. All the rest are given to languages, history, and elementary mathematics. No drawing is taught in the school, and no music except during one hour a week for those pupils who desire it—about one fifth of the whole number.

In an excellent private school for boys, situated in New England, the five years' Course of Study shows a small proportion of expenditure for instruction in observational and scientific subjects. In-

struction is provided for 139 periods a week of 40 minutes each. Out of these only 16 periods are devoted to observational and scientific subjects all put together, being $11\frac{1}{2}$ per cent. of the total instruction offered. Out of 11 teachers, 2 or $18\frac{1}{2}$ per cent. give their whole attention to manual training, sloyd, drawing, physics, and chemistry; and these teachers are provided with facilities for teaching carpentry, wood-carving, basketry, metal-work, and clay-modelling, and with well-equipped laboratories for teaching physics and chemistry. The school also pays unusual attention to systematic athletic sports and exercises under careful supervision. It should be mentioned also that the spirit of the teaching in such subjects as languages and geometry is unusually observational, and the methods as far as possible inductive and concrete. It is one of the very few schools in the country which provides in its Junior Department of two preliminary years (not included in this statement) a teacher who takes the younger boys on observational walks in the country, and older boys on trips to commercial plants where the practical applications of physics and chemistry in the industrial arts may be seen. The school building contains a gymnasium; but the school puts its emphasis on out-of-door exercises in winter as well as in spring and fall, and to carry out this policy has a good Field and a well-equipped Field-house. In its Course of Study and its announcement for 1914–15 the word music does not occur except as one subject among many for ten-minute morning talks. Like some other schools mentioned in this Appendix, this school has made significant improvements in its programme for 1915–16.

In a good private secondary school for the sons of well-to-do families, recently organized and partially endowed in a New England town, there are 6 classes or years which exhibit varying percentages of observational studies. For the youngest, or Class VI, science has 3 periods out of 25 provided. In Class V political geography is the only subject that could be called scientific; and this subject has 2 periods out of 25. In Class IV science, which is physiology and hygiene, is assigned 2 periods out of 19. In the three classes already mentioned manual training is provided for 2 periods a week, and music is taught for 1 period; but for these periods no previous preparation by study or practice is required of

the pupils. In Class III forestry replaces the manual training; and no other science appears in the work of the year. In Class II physics, with 4 periods and 2 hours of laboratory work, is offered as an alternative for Latin with 5 periods; and elective science is offered for 2 periods more. Manual training for 2 periods reappears in the programme of this year; and the 1 period for music is continued. For Class II the school offers instruction covering 37 periods, of which chemistry and physics have each 4 periods with 2 hours of laboratory work in each. There is an option between these two subjects. Two periods are given to manual training and 1 to music, as before. One period a week is given to music in every one of the 6 years of this school. The boys are taught first to read music, and then are trained in part singing. Incidentally they learn a little about harmony, and about the technique and the various forms of musical composition. In the first class (last year) appreciation of music is taught in connection with the study of famous works. The school also provides teaching for two glee clubs and the school chorus, which are voluntary pupil organizations. In the final year (Class I) each pupil selects from the 37 periods of instruction, with the advice and approval of the headmaster, a course of study suited to his own needs, the amount of instruction provided by the school being at least twice as much as any single pupil can advantageously take.

In an excellent secondary school for girls, situated in New England, the whole course is divided into 8 classes, each of which has some instruction in sight-singing, the use of the voice in reading and speaking, and gymnastics. In the first year, or Class I, of the school, and out of a total of 19 periods in the week, one period is devoted to elementary science, without the use of any text-book; and 2 periods are devoted to drawing, color work, and writing. In the next year of the school, Class II, out of 21 periods, one period is devoted to botany, and 2 periods for half the year to physical geography; and the time devoted to drawing, color work, and writing is the same as in the first year. In the third year, Class III, out of 21 periods, one is given to the elements of zoölogy, no text-book being used; and 3 periods are devoted to sewing, stencilling, and color work. In the fourth year, Class IV, instruction is given in the elements of domestic economy, cooking, leather work, and color

work, and 4 periods are used for these subjects; but leather work and color work are elective subjects. In the fifth year, Class V, color work, copying at the Boston Museum of Fine Arts, carving and drawing are taught as elective subjects each for one period; but the copying at the Art Museum is done in the afternoon, outside of school hours. This special opportunity at the Museum may be used once a week in the afternoon in each of four years of the programme. In the sixth year, Class VI, 3 periods out of 29 are used for general science, and of the 29 periods, 5 are assigned to elective Greek. In the seventh year, Class VII, out of $37\frac{1}{2}$ periods, 2 periods are assigned to physiology and 3 to chemistry as elective studies; and Greek is again elective for 5 periods. The pupil may not take 5 hours of science in Class VII. In the eighth and last year of the regular programme, Class VIII, out of 54 periods of instruction provided by the school, a large majority of which are elective, the pupil may, if she wish, devote 3 hours to physiology, 7 to chemistry, 2 to drawing, and 3 to music, thus giving a large part of her time to observational studies. Such a course would not, however, lead to a diploma, since with 15 hours given to observational work most pupils would find it impossible to meet the requirements of the school in regard to history and language. The number of recitation periods for members of the older classes averages 18 a week.

This school employs 8 room teachers, all of whom teach subjects not observational, and 31 department teachers, not all of whom give full time. Of the department teachers, 2 teach science, properly so-called, 2 teach musical subjects, 3 artistic subjects, and 7 teach various forms of household economics, games, or sports, and gymnastics. Approximately, one third of the teaching force is employed on observational, scientific, or skill subjects.

The excellent building of this school contains, besides the ordinary classrooms and recitation-rooms, six music-rooms, three laboratories, two play-rooms, a gymnasium with a stage suitable for concerts, tableaux, and plays, a swimming-pool, drawing- and wood-carving-rooms, a studio, and a domestic-science kitchen. This fact, as well as the varied instruction provided, shows that the school pays unusual attention to observational studies and to the acquisition by nearly every pupil of some sort of bodily skill.

The manual training or technical schools of the country, in the

secondary grade, generally retain in their courses a considerable amount of what is called academic work—that is, instruction in languages, history, and mathematics—but their programmes contain a large proportion of studies which may properly be called observational, such as carpentry, printing, music—both vocal and instrumental—drawing—both mechanical and free-hand—pattern-making, forging, chemistry, and physics. These schools offer a course in elementary science which gives a general view of science, and is provided for the purpose of arousing the interest of the pupils in the scientific method and its fruits. They usually offer a variety of industrial courses—such as courses in which printing, free-hand drawing, mechanical drawing, electricity, wood-working, or iron-working is the leading subject; and these courses naturally vary considerably in regard to the observational studies selected for each course. In all such courses the proportion of elective subjects is larger than in the ordinary high schools and academies; and the observational studies are apt to appear in the list of electives, although some of them frequently appear in the list of required studies. On the whole, the usual predominance of memory subjects disappears in the programmes of these schools, doubtless for the reason that they really attempt to prepare boys for specified industrial careers. For decided success in any good, modern trade or industry, a reasonable amount of sense-training is almost indispensable. In all such schools chemistry and physics are taught with some use of the laboratory method. Drawing—both mechanical and free-hand—has its proper place in the appropriate programmes of technical schools, and through it an invaluable training of both eye and hand can be acquired. Some of these schools pay more attention to music than the average high school; although the work in music is generally elective. In order to give time for working in the shops and laboratories, these schools usually extend the school day at least two hours into the afternoon without objection on the part of the pupils, because the value of the shop and laboratory work is as plain to them as it is to the teachers.

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