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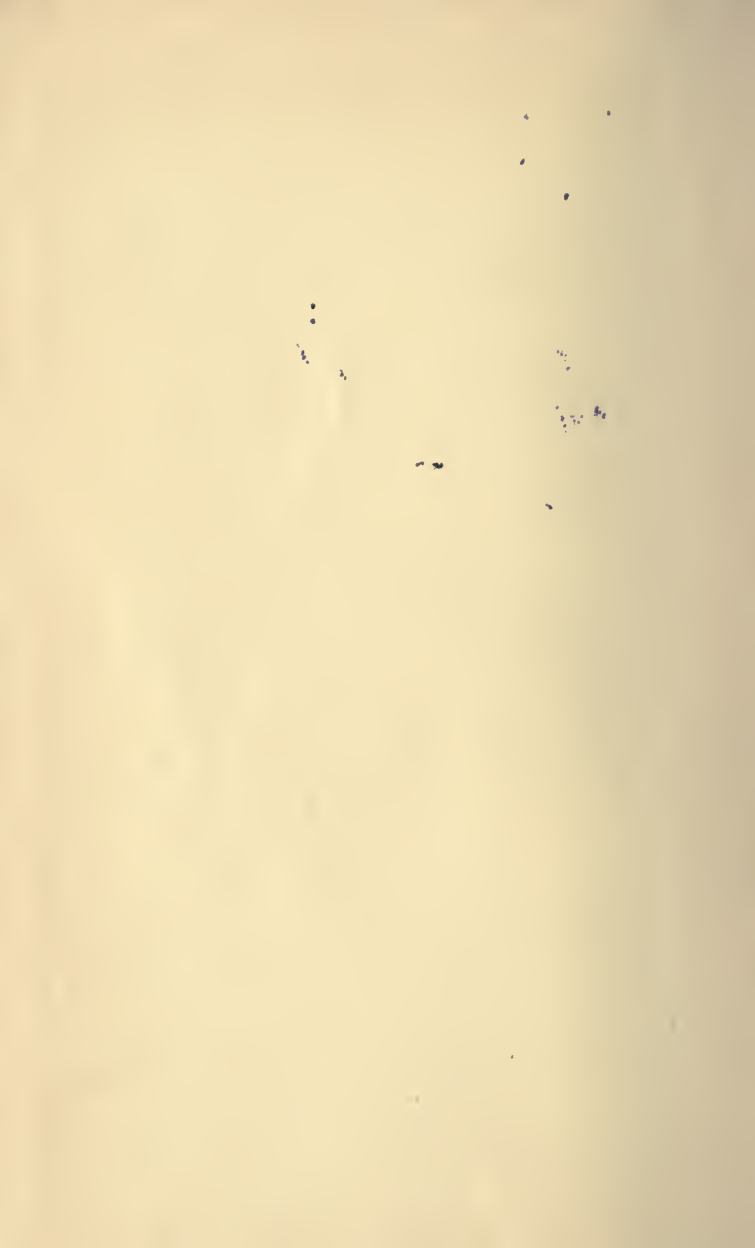
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**THE TENDENCY TO THE
CONCRETE AND PRACTICAL
IN MODERN EDUCATION**

BY

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INTRODUCTION

It is evident to students of our educational system that the conflict so long waged between formal book training and the newer, more practical forms of education, centering in the social and industrial needs of children, has at last become a winning fight in favor of the newer education. No longer does the educational leader hesitate to recognize, in theory, at least, the widespread demand for a curriculum which will better fit pupils for their various vocations; moreover, substantial progress has been made in introducing handwork, eyework, and sense-training into our schools, urban and rural.

The argument that has been chiefly instrumental in winning support for a closer adjustment of our schools to the changing social and industrial demands has been predicated on the unfortunate effect of the old régime upon the individual pupil. He dropped out of the school at too early an age, because of inability to do the bookish kind of

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work demanded almost exclusively by the schools; or, if he survived the system of training imposed upon him by the school machine, he found himself ill-prepared for the work confronting him.

In the study of the effects of the different forms of education, however, we have often lost sight of the equally important relation of school-training to national progress. China, Japan, India, and other Oriental countries furnish significant lessons of the unprogressive effects upon national life of the formal memoriter study, towards which much of our own school training has tended in the past. In this monograph Dr. Eliot interprets the social conditions which he found to exist in his travels in the East, and shows the relation of these conditions to the kinds of training that have prevailed in these Oriental countries. It is the hope of the editor and the publishers that this monograph will give even greater impetus to the movement for more practical training in our schools,—a movement which to no inconsiderable extent has been the result of Dr. Eliot's own educational leadership.

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I¹

The relation of education to national progress

I HAVE just been looking for two months and a half at an immense nation, in whose method of education there has been nothing of either the concrete or the practical. The peculiar quality of Chinese education has had a prodigious effect on the career of the nation, and explains, in fact, its present backward condition. As you know, in China education has been purely literary, philosophical, and ethical, and the educated men have had control of the national life to an extraordinary degree. Official life in China was only to be entered through the gate of education, —

¹ An address delivered before the Massachusetts State Teachers' Association.

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through a careful, prolonged study of the Chinese classics, through the acquiring not only of the classics themselves, but of skill in interpreting them and in reproducing similar compositions. The education had not one particle of the concrete in it. A Chinese scholar, young or old, was not expected to use his hands for any purpose except for writing and, if he were very poor, for cooking his own food. It had something of the practical, because it was only through education that public office could be attained, — public office and the teacher's calling being the only suitable occupations for a scholar. If we add cleric to teacher, how much the Chinese educational situation resembles that of Europe for two centuries after the revival of Greek!

Now, what has been the result in China? Their education was highly creditable as a literary, philosophical, and ethical training. A young man who had learned innumerable passages from the Chinese classics, could write Chinese characters by the thousand, could himself write both prose and verse acceptably, and had passed the severe examinations for entrance to the public

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service, had undergone a very serious intellectual training. The national results are not to be attributed to any defects in the particular kind of education which China has so highly respected and exclusively used; for that education provided an extraordinary mental training, — particularly of the memory, — and produced men who could tackle with great facility any job which did not involve acquaintance with the concrete and the practical, or knowledge of the experimental method and the inductive reasoning.

For example, we had at Cambridge a few years ago a young Chinese scholar who had come to Harvard College with high recommendations from his Chinese teachers, — teachers who had given him the best that Chinese education had to offer. He was a very brilliant scholar all through college, easily surpassing most of the American contemporaries beside whom he worked. He then went into the Harvard Law School, and there again distinguished himself among the very best men of that strenuous school. He was subsequently employed by the best university in China to teach Western subjects, and particu-

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larly economics and commercial law. The Chinese governors of the university employed him with reluctance; because they could not believe that a young Chinese studying Western subjects, even if he studied them seven years, could have reached the attainments that a Western youth — an American or European — would have made in the same time. The very intelligent and discriminating president of the university — the Pei-yang University at Tientsin — would not appoint this young man to a professorship in his university until President Lowell had assured him in a special letter that Mr. Chao was the equal in law studies of any American with whom he had come into competition. I later talked with Professor Chao at the Pei-yang University (and I had often talked with him at Harvard), and he confirmed in Tientsin what he had said to me in Cambridge — namely, that a young Chinese who had been through a large selection of the Chinese classics, learned to write in the Chinese characters, and acquired the art of composition, would find easy any study in the western literature, philosophy, or ethics, or indeed any

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study which called chiefly for a strong memory. His own case amply illustrated this doctrine. Countless young men in Europe, the staple of whose education was the Greek and Latin classics, have illustrated the same doctrine, *mutatis mutandis*.

Therefore, the Chinese education in literature, philosophy, and ethics has been a sound, valuable education of its kind, and thousands upon thousands of Chinese youth went through it, passed the state examinations successfully, entered upon public office, and served their generations, some of them with distinction, all of them with sufficient capacity to maintain the system of education in public respect for more than two thousand years.

Why, then, is China in its present backward condition? Why has it made no progress, until within fifteen or twenty years, in the arts of modern life, and in the modern sciences, pure or applied? Why is life in China almost what it was two thousand years ago? It is because the Chinese have never known anything about the inductive philosophy. The inductive philosophy is only four

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hundred years old; in Europe and America it has had much less than four hundred years of active, pervasive life. It is not much more than a hundred years since the inductive philosophy became an active working force in the general mind of Europe and America; and most of Occidental progress in the arts and sciences, in morality, and in manufactures, transportation, finance, commerce, and trade has been accomplished within that period by the use of the inductive method of accurate observation, exact record, and limited inference. China has not had a bit of this wonderful experience; it has not to-day, except in the few thousand young men who have been trained within the last twenty years in Europe, America, or Japan. We have witnessed a revolution in China within a little over a year, a revolution prodigious in its political and social effects, and in its immediate accomplishments most remarkable. Where did that revolution come from? Straight from the few thousands of Chinese young men who have learned about the inductive philosophy and its fruits in Europe, America, or Japan within the passing generation. I

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came in contact with many of the revolutionary officials who were striving to reorganize Chinese society, and to unite in one effective whole the immense country and the multitudinous people, now much divided. They were almost all of them men young in years, who had learned something about the inductive philosophy in Europe, America, or Japan within the last twenty years.

Characteristics of inductive philosophy

What are the characteristics of the inductive philosophy? Why has it proved to have such a tremendous transforming power on the habits, manners, customs, government, religion, and whole life of any people that accepts it and puts it in practice? It proceeds from the observation of the concrete and the practical; it seeks the fact, it thinks little of the abstract or the speculative; it does not rely on any kind of revelation. It studies the fact, the concrete object, vegetable or mineral, solid, liquid, gaseous, or ethereal; the thing or being that can be seen, heard, or touched; the movement or process that can be weighed or measured. It goes for the truth, the facts; and

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having observed the facts by eye or ear or touch, or any other sense-process, it compares fact with fact, group of facts with group, and from that comparison and the resulting classification, it draws some very limited inference, the next step in advance, not a far-reaching speculation away out among the stars or the atoms, not a full-fledged theory, but the very next step beyond the facts observed. And then it makes a careful record of all these observations, the groupings, the leadings, and the inferences. The reasoning of the method is as keen as the observation, and as accurate as the record. Out of that inductive process have come, we may say without exaggeration, all the new ways of doing things in this world, all modern industries, and all the new freedoms, collective potencies, and social equalizations. Modern economics afford one of the best instances of the successful use of the inductive method.

Do you say that this is a material or mechanical view of human progress? By no means; because throughout all this process of observation, record, and inference there flows the inventive

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and prophetic power of the human imagination. Do you suppose that Mr. Edison's work in life has been the product of his eyes or his fingers chiefly, or of a reasoning process which has never leaped beyond the visible or tangible fact? Far from it. The highest capacity of Mr. Edison, his finest practical quality, is his inventive and creative imagination; and the same is true of every man who accomplishes in either pure or applied science anything in the way of advance or progress. Plenty of people can do the routine or verifying work in pure and applied science; but to do the real progressive work one must have a vivid, free, and excursive imagination, as well as capacity for exact logical and consecutive thinking, and for intense application. When, therefore, we admire the fruits of the inductive philosophy, when we wonder at the extraordinary achievements of the inductive method in the material world, we must not suppose ourselves to be abandoning the realm of the intellectual and spiritual. Far from it. We are looking through the gateway of the largest and most fruitful field for the human reason and imagination.

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The inductive method in education

But am I not straying from the announced subject of this discourse, — the concrete and practical in education? I think not. We all recognize that within the last twenty years there has been an extraordinary development of interest in the concrete and practical sides of education. I am sometimes inclined to believe that America has had more to do with that development both at home and abroad than we Americans suppose; because I think that public attention was very early directed here to the value of the concrete and practical in education by the greatest of American philosophers, — not by an American scientist, but by a philosopher, a seer, a man who had deep, pervasive thoughts and put them into sentences that live. I refer, of course, to Ralph Waldo Emerson. It was he who first in this country declared that the possession of some manual skill, some power to do work with his body, with his eyes, his ears, his hands, was essential to the right quality of a cultivated man. Herbert Spencer in England much later taught that

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natural science was the thing best worth knowing; but he was nearly a generation after Emerson. Now, neither Emerson nor Spencer could do much with his hands. They did not illustrate their doctrine in their own persons; but they taught with great clearness that through the training of the senses and through careful reasoning on the testimony of the senses one may perfect the thinking process in either child or adult. That is what American systematic education has lately come to believe in, and to develop as a working method. I remember saying in some previous address, that it is through practice with eye, ear, nose, and touch, and the same nerves and ganglia that transmit and record our sensations, and set going our movements, that we all get our minds at work in childhood, and acquire not only skill with eye and hand, but also skill in thinking.

I have been much disposed of late years to dwell upon the absense of sense-training from our systematic education. I believe that to have been the greatest defect in the kind of education which has come down to us from the Middle Ages,

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from the curriculum of the Jesuit colleges, and from the early universities, — the omission of systematic training of the senses. Here, we come directly to the subject of this afternoon — the value of the concrete and practical in education. That value first declares itself in the improvement of the observing senses, and then in the skill of hand and eye which results from such training.

A corporation established in Massachusetts is carrying on a medical school in Shanghai, China, and seven or eight young American physicians with the aid of two or three European physicians are now instructing Chinese young men in the medical art. I was lately in one of their laboratories. Twelve students were at work on histology — the study of the microscopic structure of the muscles, nerves, and organ-tissues of the body. These young men had had very little previous training in natural science; but what were they doing? Each man was looking through a microscope at a section of some organ on the slide, determining with the eye just what was to be seen under the microscope, and then drawing on

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paper what he had seen, making a representation in black and white of what he saw under the microscope. Then he colored that sketch with different colors to bring out more clearly the differences of structure in the different parts of the object he was studying. Now, that was accurate eyework and nice handwork; and these young men had had no previous training in the use of the microscope or in drawing such objects. One has to learn how to see through a microscope.

The results obtained in that laboratory were remarkable. I have seen many American students in the first year of medical study, doing just that kind of work. I never saw in any American school so good work done with eye and hand by beginners as those twelve Chinese young men were doing. How did they acquire that capacity? The Chinese characters count by thousands; they are little groups of short lines; and with a few lines an indefinite number of groups can be made. The characters differ but slightly from one another. The reader must look sharply at these Chinese characters to determine by the eye only what each character is, and the writer has to re-

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produce these characters in great variety by free-hand drawing with a fine brush dipped frequently into India ink. Those young men had received during their literary education that sort of training of the eye and the hand. Their practice was confined to the Chinese characters; but it came right into play in the study of medicine, and will give them rapid progress in many of the medical arts, and facilitate their acquisition of the medical and surgical skills. They had received a valuable training of the senses, which was applicable in many directions.

We Americans, like the Chinese, have dwelt in our schools too much on two faculties — discrimination between the shades of meaning of different words and phrases, and memory for words, phrases, narrative, description, and even argument. Memory training has predominated over training in observation and the acquisition of skills. I remember attending a debate in a college not far away, two sides apparently arguing a burning question; but when the debate was finished it was apparent that there had been no real collision of minds on the spot, only recitals of

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memorized arguments prepared beforehand. Mind had not met mind in the actual performance. The contestants had only repeated from memory arguments they had either written themselves, or been helped to write, beforehand.

The new interest in the concrete and practical which has come into our schools within the last twenty years has created some new varieties of school, and is beginning to reconstruct the programs of long-established schools, both public and private. Is this change to result in a degradation of education? Does it mean that education is to be less efficient for the training of the mind, the imagination, and the will, more utilitarian, and less ethical and inspirational? That is a grave question which deserves the most careful consideration.

We all agree that the present generation is characterized by two strong desires. One is the desire for sound knowledge, not knowledge of the myth, the fable, or the dream, but knowledge of the fact, the truth; and the second is the intense desire to be of service to mankind. Efficient education is that education which enables the child

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to satisfy its curiosity joyously, and multiply its contacts with the world, and the young man or young woman first to gratify the passion for truth, and then to gratify the passion for service. I believe that every introduction into the scheme or program of a grammar school, high school, academy, college, or university of teaching from the concrete and the practical is a gain towards this kind of efficiency. I believe that every skill acquired by a child at school or a student in college brings with it an increase of mental power, and that the true value of any prolonged education may be correctly estimated by the number of skills the educated person has acquired, and by the strength of the mental grip upon the subjects and objects through which the educated man is enabled to earn his livelihood, and to exercise his various powers of enjoyment. Accordingly, I have for some years been eager to advocate increased attention to the training of the senses, beginning young and keeping on through all grades of school life and through college life.

It is astonishing to see how intelligent girls can go through a long systematic training, up to the

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eighteenth or nineteenth year, or even to the twenty-second or twenty-third, without acquiring any skill. One of the most intelligent women I know informed me the other day that she possessed only one skill, that she could not sew, cook, play, sing, or draw ; that her only skill was picking berries, and that one skill she did not learn at school, but by accompanying her father on his walks during the blueberry and blackberry seasons. Yet this woman had thoroughly enjoyed a prolonged education at a good school and a good college. Very few persons, men or women, can give a correct account of a transaction or event they have witnessed. Accordingly, the courts constantly have to deal with contradictory accounts of one and the same event, and in critical cases every bit of human evidence needs corroboration and verification. Few persons can use their eyes, ears, and hands with accuracy ; so that the artist and the skilled artisan are distinguished among men for the precision with which they both see and touch. Many professional men are quite unable to use any tool or implement except a pen, and nowadays not even

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a pen, because of the typewriter. Indeed, if it were not for music and the sports, most educated men would possess no skills at all.

The school subjects that contribute largely to sense-training

What are the subjects which are obviously serviceable in training the senses? First, drawing, an admirable training for both eye and hand, — but how pitifully neglected throughout the whole American school system! Then music, which trains not only the ear, but the nervous system of the whole body, when carefully and persistently practiced. Did you ever watch an organist playing an organ with several banks of keys and many pedals? That process, particularly when the organist plays from memory, is one of the most extraordinary exhibitions of the simultaneous action of many parts of the nervous system of which the human being is capable. The hands and the feet move rapidly and rhythmically, each hand and each foot being separate from the other in its motions; each finger works separately; the ear takes instant note of the time and the har-

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mony and of many details in the volume of sound; and then the memory is at work in reproducing the composition from a record which exists at the moment only in the brain of the player. For an effective training of that complex nervous system which serves what is called the mind, playing upon a musical instrument, or singing, excels every other training of the nervous system to coördinated action, simultaneous within a fraction of a second, the coördination of all the nerves and senses in action being often intense and intensely enjoyable.

Drawing really provides us with another language, another means of communicating with our fellow-men, which is often clearer and more easily and accurately apprehended than language. The traveler among strange people speaking a strange language can always get the vessel or implement he needs if he can make a drawing of it, for drawing is a universal language. The thinking process in drawing, playing an instrument, or any manual work of an accurate sort, is keen; and the moral lessons involved are admirable. The accuracy of language has many de-

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grees, and accuracy of speech as a moral quality is often hard for a child to appreciate; but any child knows when he has planed a small piece of board so level, so plane, that a straight-edge will show no light under it when turned about on the plane. That is something that can be done just right, and if it is not done right, the child itself can see that it is not right. How many of our school books, on which we so much rely in education, not only do not state things just as they are, but make actual misstatements! I watched a little child examining its illustrated spelling-book. At the head of the page was a little diagram of a cow, about an inch long, and against the diagram was printed this sentence, "This is a cow." That untruth is a type of many statements in our readers, geographies, and histories. Our books are full of such misrepresentations. We need to bring children in contact on every possible occasion with the real objects, and not with pictures or drawings of the objects. We need to set their minds at work on the concrete things, and not on verbal descriptions of the things. That is the way to train the child's

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senses. The training of the memory should be closely connected with the training of the senses. Let the child look for a moment at an object or group of objects, and then be asked to describe what he has seen. Let him hear a musical air, or a bird's song, and be asked to reproduce it. Let him practice the use of tools as soon as he has strength enough to guide them. Let the youth have practice in the use of machines as soon as he can safely manage them. Let the country children be taken into the fields and woods to study growing things both vegetable and animal. Let the city children be taken by the teacher into shops, parks, gardens, and museums to train eyes to see and memory to hold. Let laboratory work in zoölogy, chemistry, and physics be made a much larger part of school and college training than it now is. In the country the brooks, the plains, and the hills will give the best lessons in geography, and in the city the shop windows, the street traffic, and the railroad stations or the wharves will supply the best sense and memory training for commerce and trade. Most American children have heretofore grown up in com-

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plete ignorance of the heavenly bodies and their motions, notwithstanding the fact that every child who lives by the sea, or on a prairie, or a hillside, has exhibited before him every night the stupendous spectacle of the spangled heavens. We have wasted this nightly opportunity to train the eyes of the children and to develop both memory and imagination.

Contrast between Japanese and Mohammedan education

The Japanese are an extraordinarily alert, nimble-minded people; and within forty years they have established throughout the Empire a complete school system, copied from European and American types. In all their schools and colleges they have attained a higher average attendance than any other nation in the world, and they have secured a perfect registration of the entire school and college population. For years they have been doing, and are still doing, a great deal more than we are to teach through the concrete and the practical. It was delightful to meet, when walking in country places in Japan, the

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schools going out with all their teachers to walk, because on those walks every possible opportunity was taken to teach the children to observe closely and accurately, and to study the actual natural objects, and not pictures only, or descriptions of them. I met one day two hundred children, accompanied by five teachers, on a walk for the purpose of seeing what was going on by the wayside and on the more distant fields and hills; and not one of those children was over ten years of age. Those children took a walk of three miles that morning, and it was raining part of the time. Such work on the part of the teacher is as highly valued as any book-work he does; and when the authorities are selecting teachers, they select persons who can do that kind of thing, and will not employ persons who cannot. Twenty-five years ago, I passed through North Africa from Cape Spartel on the west to Tunis on the east, and thence by sea to Alexandria and Cairo. On that line of travel I took frequent opportunities to step inside schools, that I might witness the Mohammedan process of education. That process is a great exaggeration of any Christian

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book process, because from bottom to top of Mohammedan education the instruction consists of dictating phrases or passages from the Koran, or from commentaries on the Koran. It is all book-work, and it is the study of a single book of supreme authority. At Tangier I went into a little school for young children. A white-bearded man in white clothes sat in the center of a half-circle of children. He was armed with a long, flexible fishing-rod, and he could reach every child with the rod. He recited three or four words from the Koran, and all the children shouted those words back to him. If any child were silent, he got touched up. They all repeated simultaneously the teacher's words, phrase by phrase; and that was literally the only thing done in that school. Later in the same winter I arrived at Cairo, and visited the University of Cairo, the largest university in the world; and there I found the students grouped in circles round their teachers, and the circles around teachers were very numerous. Teachers and students sat on straw piled on the stone floor; and every teacher was doing exactly the same thing I had seen in the

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infants' school at Tangier, only more of it; and he did not carry a fishing-pole. He repeated long passages from the Koran, or from some commentary on the Koran, generally using both the original and the commentary, I was told. The students took notes of what he dictated, and were called upon later to repeat what he had said. Still there was a single source of ideas, still a single book, a book in the highest degree authoritative; and the teacher was dictating to the student what he should know, what he should believe, and how he should live. In this process there was abundant training of the memory and of the power to absorb the thought of another, and to hold in the memory philosophy, religion, and law thirteen centuries old.

That method in education accounts for the lack of progress in civilization of the Mohammedan peoples. It relied on memory applied to revelation, and on submissive interpretation of revelation. In consequence, there has been no advance in natural science made in any Mohammedan country for several centuries. To be sure, there were Arabs in the tenth century who de-

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served to be called scholars. The Arabs at that period possessed skilled handicrafts, an architecture of their own, some skill in surgery, and a practical knowledge of irrigation. When the Moors invaded Spain, they were in some respects in advance of the Spaniards in the arts of both war and peace. These advances in arts and sciences were lost in the triumph of the Berbers over the Arabs in the eleventh century — the barbarous Berbers being Mohammedan strict constructionists. Our numbers and arithmetic to-day are largely Arabic; but that is only a strange survival of one bit of an arrested development in civilization. Moreover, as we all know, arithmetical reasoning is absolutely peculiar, and has very little application in common life. Of all the subjects taught in modern schools arithmetic, beyond the simplest applications of the simplest rules, is the least practical, because its reasoning is demonstrative; whereas the reasoning we have to depend on in the natural sciences and in the daily conduct of life is almost all probable, and not demonstrative, reasoning. In the educational history of Islam, you may find the reason for the

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kind of life the Moslem peoples have lived for the last nine hundred years, just as you may see in the history and present condition of the Chinese people the legitimate results of their kind of education.

Through training in the concrete and the practical all our schools should impart knowledge of the inductive method and of its fruits. Every child ought to get a glimpse of the real mode of ascertaining truth in this world; ought to know how the truth has, as a matter of fact, been come at in all the modern sciences, pure and applied. Not that the child itself can be expected to practice the inductive method, except so far as it may do so in learning to observe and to make an accurate record; but every child ought to learn what the scientific process of study and inquiry is, so that in after life, when he is adult, he shall know how to apply, or how to get applied, in his own sphere or province that invaluable method.

Inductive training through out-of-door occupations

You may now be asking, how is it that with so little comprehension of the desirable processes of

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education, the generations have got on as well as they have? If they have been following a method in education which relies chiefly on memory, neglecting the training of the senses and the inculcation of the inductive philosophy, how have they attained the partial success of the last four hundred years, and the more rapid success of the last sixty years? There was no diffused systematic training in the modern sciences till within a hundred years. How has the civilized world got on as well as it has? Because the training of the successive generations in Europe and America since the sixteenth century has not depended solely on the methods used in systematic education. The occupations of mankind have contributed much to the training of the senses and to developing the germs of the inductive method. Agriculture, for example, the commonest occupation of mankind, is closely dependent, and more and more so in recent times, on accurate observation of natural phenomena and natural laws. All through the Middle Ages, and indeed at the present moment, war and preparations for war have provided for millions of men a harsh but effective training in

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the quick use of the senses at the peril of life, in remembering the thing to be done on the instant, in enduring the hardships of war, and resisting its intense temptations. War and preparations for war have been, not only for the officer but for the private, a widespread, though not universal, training of the senses and of such moral qualities as obedience, order, promptness, and fidelity; and since firearms and other instruments of precision and high explosives have been so generally used in warfare, this training has acquired more and more of intellectual merit. Hunting and fishing have given certain classes of the population in Europe and America a sound training in quick and accurate observation, and in the economical use of human faculties to procure a precarious livelihood by outwitting animals. In the United States to-day how completely have these conditions changed! Here in Massachusetts, for example, only a small proportion of the children can secure the training which a farm is capable of giving. Hunting for a living is pursued by only a very small fraction of the population. Wars are infrequent, and there be-

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ing only a small standing army, whole generations grow up without any experience of war. Hence the school system is under obligations to provide as many substitutes as possible for the training lost when agriculture ceased to be the main occupation of all the civilized peoples, machines replaced men in many of the principal industries, men, women, and children by the million have become almost automatic tenders and feeders of machines, and the majority of the population crowds into cities and large towns.

When we consider the extreme lack of concrete and practical teaching for children in countries which, like the United States and Great Britain, have become intensely industrial on the factory system, we realize that another potent influence in Anglo-Saxon schools and colleges has had strong effect in reducing the losses and injuries caused by inadequate development of concrete teaching and the laboratory method in the school systems of those countries. That influence has come from sports, both out-of-door and indoor. These generally give children and youth some rather strenuous training in quick observa-

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tion and prompt and accurate use of arms and legs in active motion. Most out-of-door sports require some form of quick decision, so that those who excel in them are found to possess a short time-reaction. Many indoor sports, as, for instance, games of cards, afford a good training of the memory. Others, like picture-puzzles, require an intent observation of form, and particularly of outline. Others, like chess, require the visualizing of future possible combinations of many objects, each of which has its own rules of movement. Others, like charades, "Throwing Light," "Dumb Crambo," and "Twenty Questions," need much mental alertness, some knowledge of real and fictitious characters, and a quick interpretation of the motions, gestures, and inflections of the leading actors in these sports. Even such simple sports as young girls and boys use, like tag, marbles, and hop-scotch, have in them considerable training value.

We shall better appreciate what sports have done for Anglo-Saxon children and youth if we compare English and American experience in this respect with Chinese. The Chinese have

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had no sports, neither out-of-door athletic sports nor indoor games. The popular amusements are gambling in very simple forms and attending open-air theaters. Neither the laboring class nor the scholar class has received any of the training which English and American young people get from their sports. There seem to be no guessing games in China, and no coöperative sports like baseball, football, and rowing in crews. The Chinese have also lacked the training which universal military service gives a people. The consequences of these centuries-long deprivations are plainly to be seen in the present political and industrial condition of China. The ruling class, the scholars, are men of sedentary life, with no taste for bodily exercises, no manual skill, and no muscular vigor. Under such stress as the revolutionary leaders have lately been subjected to they give out in body and mind, being quite unfit to bear the strain of intense mental labor with anxiety and sense of present danger. Since the deficiencies of Chinese education have not been compensated by any training like that which the Anglo-Saxon games and sports supply, the total

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results of the national system of education have been distinctly inferior to those of a somewhat similar education in Anglo-Saxon countries. The Japanese have had a much more fortunate experience than the Chinese in this respect. Their ruling class were skillful swordsmen, as their retainers, the Samurai, were; and the whole people enjoyed the active and skillful sport of wrestling, which is not too dangerous or too rough a sport if practiced under the Japanese rule of quick surrender.

The increasing need of training in schools

These compensations for the lack of concrete, practical methods of instruction in school and college account in some measure for the fact that the civilized world has not suffered so much as it might have from this defect in systematic public instruction. The children and youth have themselves found and developed in their sports and games some first - rate educational forces. But now, owing to the concentration of population in cities, the opportunities for out-of-door sports are very scanty for the larger part of the popula-

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tion. Have the children of Boston a good chance for out-of-door sports? Have the people of Boston as a community opportunity for the training of their senses, such as hunting and fishing supply to the savage or semicivilized man, and to some small fraction of a civilized people? The absolute inadequacy of the present provision of opportunities for sport among city children is good reason for giving prompt and vigorous support to the present playground movement. Progress, however, toward the better development of sports and games should not be allowed to check the evolution of the training of the senses and of concrete and practical instruction throughout the common - school system. It is in the schools that the strongest influence can be brought to bear in favor of the new education.

*Practical training a valuable means of moral
and intellectual development*

The desired change in the theory and practice of education gets valuable support from the new view of what constitutes cultivation, of what produces the cultivated man or woman. The con-

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ception of the cultivated man or woman has undergone a profound change during the last forty years. We used to think that the cultivated man or woman must be a professional person or a person of leisure, well read in literature, or in literature and history, or possessed of some fine accomplishment or some personal skill in the arts. Now we expect to find cultivated men in all walks of life. We find them in all the professions — and the number of professions has greatly increased within two generations. We find them in business and trade. We define a cultivated man or woman to be a person who has a liberal mind and generous heart, who has comprehensive interests and sympathies, and a wide range of vision, and who finds the great satisfactions of life in pursuing truth and rendering service. In my boyhood I never heard business recognized as an intellectual pursuit. It was supposed to depend on some fortunate faculty in buying and selling. There was in it a peculiar gift for money-making; but it was not an intellectual pursuit. Opinion on this subject is entirely different to-day. Manufacturing, banking, finance, insurance, and transportation

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are all recognized as intellectual pursuits, requiring a competent education in youth. It used to be the practice to bring up foremen in the manufacturing industries of the country through the factory by the training which the factory itself afforded. I lately passed a few days with a group of highly intelligent managers and directors of electrical manufactories. They agreed that it was now impossible to train foremen in the factory itself; that foremen could no longer rise from the ranks, but must start in the works with the advantage of a good high-school or technical-school education. The superintendent must be started with the advantage of a college or polytechnic-school education. It is quite impossible to bring up a superintendent in a complicated industry, unless he has a thorough education before he enters the mill or factory. These facts obviously emphasize strongly the need of introducing into American schools and colleges more training of the senses, more concrete and practical instruction, and more opportunity to acquire skill.

We must not be discouraged in the least be-

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cause there are so many new industries and occupations for which boys and girls are to be in some measure prepared while at school. The various industries and occupations may fairly claim that the schools ought to serve them, ought to begin to train children in both manual and mental methods for the different kinds of work in which later they will severally earn their livelihoods. We must not imagine that this better preparation of children to earn their livelihood is going to diminish the intellectual value of the school training. On the contrary, if what I have put before you this afternoon has the force of reasonableness and truth, the modifications needed in the schools of the country in order to adapt their human product to the varied industries and occupations of to-day, far from degrading the schools, will decidedly improve them as institutions for moral and intellectual training. It is for the teachers, superintendents, and school committees to make sure that in making school instruction as concrete and practical as possible, as contributory as possible to the later earning of the livelihood, the schools shall not be harmed as training-places

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for moral conduct, mental capacity, and joy in living. Teachers, superintendents, and committees have a deal of studying and planning to do in order to put into execution the reform so urgently needed. Not only are programs to be reconstructed, but methods of training the individual child's senses, memory, and power of concentration all together are to be invented. Time must be found for imparting various sorts of skill to the pupils; and the apparatus which the pupils will need for acquiring these various skills must be liberally provided. Fortunately many admirable methods and much well-devised apparatus can be copied and adapted from French and German types, and much of the apparatus can be copied from types which such schools as the Pratt Institute, the Franklin Union, and the Wentworth Institute have invented or copied from abroad. The college and university laboratories in chemistry, physics, and zoölogy have many suggestions to make about the best way to teach the elements of these sciences in the secondary schools.

The friends of American high schools and acad-

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emies dread the reduction of time long allotted to book-study and the training of the memory, and the enlargement of the time to be allotted to observational study and to the acquisition of various skills of eye, ear, and hand. I venture to think that the new work in schools and colleges will do more for the training of the memory and the imagination, in proportion to the time allotted it, than the old work has ever done; and that the way to prolong the serviceable life of the high school and the academy, now threatened by their competitors the mechanic arts high schools, the manual-training schools, the commercial high schools, the arts and crafts schools, and the schools for apprentices, is to introduce into them a liberal amount of concrete and practical instruction.

The leadership of higher institutions of learning in this reform

Encouraging beginnings in the reform I have been urging this afternoon have already been made in some public school systems, and much support may be found in the experience of the

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new competitors of the high schools. The endowed and private schools have not been as enterprising in this respect as the public schools; partly because they cling closer to educational tradition, and partly because they feel compelled to give a large amount of time and attention to athletic sports. It is the higher education, however, that, as usual, supplies the best leading. The case system in teaching law and medicine, the new way of teaching history less as a memory study and more as an exercise in tracing sequences, causes, and effects, the comparative method in teaching government from large accumulations of carefully recorded facts, the diagram and map method of presenting to the eye groups of related facts, and the museum method of teaching social ethics from photographs, plans, and models all illustrate applications of the inductive method to new ways of teaching old subjects. The widespread introduction of the lantern into schoolrooms and college lecture-rooms is evidence of a wholesome tendency towards a serious training of the eye and the memory together.

II¹

Why Oriental education has failed

AN American educator gets many shocks when he is traveling in the Orient. He sees in India and China some tremendous failures in education, failures in the education of both men and women; and when he comes to Japan he finds a wonderful recovery from similar failures accomplished in the short space of forty-five years; since what they call the Restoration of 1868 they never use the word Revolution to describe their extraordinary changes in governmental and social structure.

One of the first observations I made in regard to education in the East was on the clear failure of an elaborate education based almost entirely on literature and the training of the memory. In what sense do I use the word failure? No nation in the world has a greater regard for education

¹ An address delivered before the Schoolmistress's Association, Cambridge, Massachusetts.

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than the Chinese. For many centuries it has been only through education that official position could be reached; and, on the other hand, official station could be attained by the child of parents of any sort, if he could compass an education in the Chinese classics. In that respect the Chinese have been extremely democratic, because their official class was open to persons of any parentage, who won that dignity by a remarkable education based on literature, a little metaphysics, a little mathematics, and a strenuous training of the memory. That kind of education, though severe and highly valued, produced a civilization which did not get beyond that of Europe in the Middle Ages. In that sense Chinese education has been a failure.

In Japan one learns that out of their age-long despotic government and their feudal system came a good deal of what we should call sound literature, much admirable art, and a general practice of the noble virtue called loyalty. Nevertheless, the Japanese down to 1868 lacked the inductive method of seeking and finding truth, that all-powerful method which has made the Europe

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of the nineteenth century utterly different from the Europe of the fourteenth.

In these three countries — India, China, and Japan — the status of women is very different from that of women in any Christian country. In Christian countries one sees an ideal of woman higher than any that exists in non-Christian countries; but also there exist in some Christian countries thousands of women of a type lower, or more degraded, than any found in large numbers among non-Christian peoples that have risen above downright savagery. The high Christian ideal of woman combined with the feudal-system ideal of chivalry produced together a status of women superior to any seen in Oriental countries. The traditional Japanese type of wife and mother involved only a limited education for women; but it had so many excellences that it still persists in Japan, in spite of the fact that Japanese opinion in regard to the education of women has been so liberal since the Restoration, and so well carried into effect, that a new status for women is beginning to develop in Japan. For instance, I visited in Japan two

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Superior Normal Schools for women. These two schools were graduating scores of young women every year, and sending them as teachers into the elementary and secondary schools of the country, and into Japanese social life well fitted to become the interesting and helpful comrades of educated men. They were better equipped with laboratories, kitchens, and apparatus than any normal schools I ever saw in the United States. They were furnished with the best means of teaching elementary chemistry, physics, botany, zoölogy, and the domestic and industrial arts; and their programs allotted to these subjects much more time than it is customary to give them in the United States. What the Japanese have done is to seize upon, use, and master the inductive method. They have put that method into all their institutions of education, and its results into all their industrial, educational, and governmental operations.

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The lesson to be learned from the failure of Oriental education

When I saw how completely helpless the multitudinous Chinese nation is in face of the European nations which have long possessed the inductive method in the search for knowledge and the application of sciences, I understood the lesson which that fact should convey not only to the Chinese officials of the new government, but also to all educational statesmen and administrators in America and Europe. The experience of the Orient teaches that the educators of America and Europe have given altogether too small a place in the education of both boys and girls to the mastering of the inductive method, that is, to training the senses, to illustrating every rule by concrete examples, and to teaching the pupils to do things with eyes, ears, hands, and voice. All children from the primary school up should be taught to observe with precision, to make an accurate record of things observed, to group and compare the facts recorded, and to draw thence the just, limited inference. So will they learn to

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think with precision. The training of the senses gives at the same time the best training of the thinking power. The masters of the inductive method during the last hundred years have been the best thinkers the race has produced. They are the men who have trained their senses, their thinking powers, and their imaginations all at once, and so have been enabled to reconstruct all industries, all governments, and society itself. The best test to be applied to any long-continued education for girls is, what can the girl that has received that education do with eyes, ears, fingers, and thinking process? What use can she make of her knowledge and her skill? How many skills has she acquired?

The great result of the inductive method is that men have thereby learned to think to advantage, to such advantage that they can think beyond the present limits of knowledge and acquire some new knowledge. Every bit of new knowledge must fit into the knowledge already acquired, just as the next bit of a picture-puzzle must fit into those bits already arranged. The investigator in history, economics, or comparative re-

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ligion as well as in chemistry, physics, or biology must see clearly what the complicated outlines of present knowledge are. Otherwise he would not find the new bit that fits. No bit that does not fit the achieved outline will add to the development of the picture.

What does this imply in the investigator? It implies that he must be able to hold in his own mind an accurate picture of that portion of the total puzzle which has been already arranged. He must be able to see and understand what has been already done in the subject to which he is devoted. His reading must be broad and accurate. He must also be able to see accurately with his own eyes, and touch accurately, and hear accurately. He must have the fullest use of these senses by which we get all our knowledge of the external world, and all our enjoyment of it. His memory also must be highly trained to quickness of grasp and long retention, and all his knowledge must be as it were at his fingers' ends, ready for instant use.

But how does all this apply to your problem? How does it apply to the education of girls?

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I suppose I gave more time and study to medical education than to any other branch of education while I was President of Harvard University; and the development of medical education in the last forty-five years has been far greater and more fruitful than that of education for any other profession. Through this development, accomplished in several advanced nations, and through the creation of many strong medical institutions for education and research, it has come about that the medical profession during the last forty-five years had made more contributions to human welfare and to the defense of mankind against pestilences, contagious diseases, wounds, accidents, and degrading vices than any other profession. What better test of the merits of a method of education on a large scale can we have than this demonstrated capacity for serving mankind on the part of many thousands of individuals through a generation and a half? There has been hardly any change in the capacity of the legal profession to serve civilization during the last forty-five years. The greatest change in legal education has occurred in the United States, and

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has been due to the discovery by Professor C. C. Langdell of a new method of teaching law, namely, the method of teaching it from actual cases by the inductive method. Compare again the achievements of the medical profession during the last fifty years with the achievements of the clerical profession. The clerical profession has made no such gains as the medical profession has made. No new powers have come into their hands. On the contrary, one would say that the clerical profession was contributing no more to the progress of mankind since 1860 than it did before.

Again, how does all this apply to your work in schools for girls, or to the work in boys' schools? I think it indicates that a smaller proportion of the average school time should be given to memory studies like language and history, and a larger proportion to scientific studies, to the domestic arts, to music and drawing, and in general to the acquisition of skills.

An interesting experiment and its lesson

A very interesting experiment made about a year ago at the Union Club in Boston illustrates

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what I have been saying. Mr. George G. Crocker, Chairman of the Rapid Transit Commission, and for many years interested in testimony given from time to time about happenings during the construction of the Boston subways, invited twenty members of the Union Club, men in middle life or older, to witness the acting of a short scene by four persons, each of the twenty witnesses undertaking to write out immediately a description of what he had seen and heard. The scene lasted a minute and a half, and was acted at a moderate rate of speed and with entire distinctness. When the twenty onlookers sat down to write out each his own description of what he had seen, three of the number protested at once that they could not do it; so that only seventeen undertook the job. In that little scene there were two things specially intended to be noted by every witness. One of these things was what one actor said at a given stage of the performance, and the other was what became of a pocketbook. Not a single man out of the seventeen noted and reported both those points, although they projected conspicuously. Hardly

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any one gave an accurate description of even one of these points; and in the whole seventeen there were only two persons who described the scene at all alike. These witnesses were all well-educated men, — judges, lawyers, manufacturers, and merchants, — and they were all what are called successful men.

The result of this experiment is a perfectly legitimate outcome of the methods of education which have obtained not only in this country but in Europe for the past five centuries. That education has been largely memory training; it has not been the kind of training which enables the educated person to see and hear correctly, and then to hold firmly in the memory for even a few moments what has been seen and heard. Mr. Crocker, the lawyer who devised this experiment, wanted to bring out the fact that it is not reasonable to suppose that half a dozen witnesses of the same transaction can give anything like the same account of it. He wished to demonstrate that testimony given in court cannot be depended on unless corroborated, and that contradictory or discordant testimony must not always be at-

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tributed to falseness in the witnesses, because it may be due wholly to incapacity in observing or remembering. The late Judge John Lowell was concerned with admiralty, and therefore cases of collision at sea often came before him. He said one day in my presence, "In a case of collision I expect the two parties interested to give me entirely different accounts of what happened. In a collision between sailing-vessels the two parties seldom agree, for instance, on which way the wind was blowing."

Again, what has this to do with the program of a girls' or boys' school? Much. I think it shows that we ought to give a great deal more time than we now do in schools to training the children to see straight, to hear correctly, to touch dexterously, to write a just account of an object, an event, or a person, and to hold in the memory things seen, heard, touched, and recorded. All children ought to learn not only to absorb quickly, but to give out or express quickly and truly. Even in the study of language and literature the children should not only store their memories with fine selections in prose and verse, but should them-

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selves make use of their acquisitions in their own writing, speaking, and reciting. In short, the teaching of language and literature should be made as concrete as possible, and incessant applications should be required in the work of the individual pupil. Drawing from memory is a most useful exercise of this very sort; but to use it in schools to advantage the time now allotted to drawing would have to be multiplied by three or four.

These methods of instruction are already being developed in this country with remarkable results; but they are not much used in schools for the children of well-to-do parents, either girls or boys. They are to be seen in afternoon schools and night schools, in the short courses at the agricultural colleges, in the classes of the Young Men's Christian Associations, and in the demonstration work for farmers carried on by the Department of Agriculture and the General Education Board in the Southern States, and now just starting under Government control in the Northern and Western. This most desirable kind of instruction is addressed, therefore, for the most part

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to adults and to persons still young whose systematic education has been stopped too early, because the earnings of the parents were not sufficient to enable the family to spare the earnings of the children. Thus the method used for forty years past in medical education has penetrated a variety of irregular institutions of education, which are supplementing the work of the regular schools and colleges. All the trade and technical schools and all the vocational classes in the high schools are using this method; and it is surprising to see, in such institutions as the Pratt Institute in Brooklyn and the Wentworth Institute and the Franklin Union in Boston, how little direction is needed by the pupils, how they use successfully refined and powerful tools and machinery, work each experiment out for themselves, and give a good account of what they have seen and done. Medical education has been characterized for thirty years past by elaborate training of the senses, and insistence on practice and skill, and on cautious accuracy in reasoning. The results in prodigious services from the medical profession to the community may well commend the methods

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of medical education to teachers of every kind, and to the trustees or managers of every sort of educational institution.

The inductive method as applied by Professor Agassiz

Many years ago I received a vivid account from the late Henry J. Bigelow, for forty years one of the most eminent surgeons of Boston, of the kind of instruction his son got in Professor Louis Agassiz's laboratory in Cambridge. When young Bigelow arrived for the first time at the laboratory, Professor Agassiz gave him a trilobite, a notebook, and a piece of drawing-paper, and said, "Examine this object all day, describe in this notebook what you see, and make a drawing of the trilobite as you see it." Young Bigelow worked over the trilobite all the morning, and thought he had described and drawn everything he could possibly see in it; but during the afternoon he discovered a few points which he had not recorded. The next morning Professor Agassiz looked at Bigelow's drawing and remarked, "You have not seen half of it. Go right on." That

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process lasted three days. Young Bigelow found it interesting though difficult. He went home to spend Sunday, and his father asked him what he had done at the laboratory. Young Bigelow having described the process, his father said, "What! no lecture, no sketch from Mr. Agassiz, no instructions as to what you were to see?" "None," the son said; "no book, no guidance, nothing to go by. I had to see it myself. I had to describe it all myself." "Well," said the father, "that is exactly the way a puppy has to learn." The comparison was a just one; but Dr. Bigelow omitted to say that what a puppy learns he learns admirably well, and that it is a matter of life and death to him to put it immediately into practice. The son has later demonstrated in many ways that Professor Agassiz's method with him was a good one.

A hopeful outlook for education

I am fully persuaded that we have just begun to develop the right kind of education. The new experiments in education are in the highest degree hopeful, including Madame Montessori's

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application to normal children of the methods which were developed forty years ago in this neighborhood by Dr. Edward Seguin for the benefit of defective children, and have been admirably used by Dr. Fernald for the past twenty-five years at the Massachusetts School for the Feebleminded at Waverley. The main result of all the new experiments is that they succeed in making both children and adults think, and think to advantage, and follow up their thinking in action. For the individual the result is acquired power to produce, to imagine, and to enjoy; — and this is the end of all true education.

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