

## EDUCATION AND SCIENTIFIC RESEARCH

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**I**N discussing the present status of education in China it may be well not to limit attention to the organized intricacies of the educational system as such. Education is but one phase of the highly significant and complex movement of China's adjustment to the modern world. How has its aim been formulated in view of national needs? What are the difficulties that hamper educational endeavor? And what new tendencies are discernible in the problems of education for the populace and of education for a new leadership?

It is well known that China before the nineteenth century was a country that had a culture comparable to the culture of any nation in the world before the coming of the modern scientific and industrial era. Beginning with the second quarter of the nineteenth century, the modern world by means of improved weapons of war came to China with a threatening gesture. We shall not retrace all the unfortunate and regrettable happenings of the impact. By the beginning of the twentieth century the Chinese, especially the intellectual leaders among them, realized that, in order to exist as an independent people in the modern world, they must take cognizance of the achievements of modern industrial civilization, learn from abroad methods of scientific mastery, and adopt new institutions for the purpose of China's modernization.

Stimulated by the success of Japan's efforts at modernization through the establishment of a modern school system, the Chinese government appointed in 1904 a commission to draft a plan for a system of national public schools. This plan was accepted and promulgated by decree in 1905. The old civil service examinations—a practice for the selection of public officials inaugurated about two thousand years ago—were abolished. A public school system of the modern type with its provisions for different grades of education, primary, secondary, and university, was put in force.

In the impatience of seeing China modernized, those responsible for the change did not take time for a careful evaluation of the imported formula. This hurried importation left many problems for

the decades that followed. Nevertheless, laboring under great difficulties, a modern school system has been in existence for the last twenty-eight years, and thousands of schools and hundreds of thousands of students show evidence of its operation.

## I

A brief review of the different formulations of the aim of education, as announced by the successive governments, will show us the progressive steps in the realization as to how China was to be modernized.

When the new school system was first introduced, the government was under the old imperial régime. The aim of education was stated as being fivefold: loyalty to the emperor, respect to Confucius, public spirit, military bravery, and practicality. The first two were traditional, and the last three showed conscious effort toward modernization. Public spirit was to be encouraged especially in forms of patriotism in the modern nationalistic sense. Military bravery was needed for the defence of the country. And practicality implied the introduction of the sciences in the schools and the adoption of modern industrial methods.

With the coming of the Republic after the revolution of 1911, the educational aim was restated. The first formulation in 1912 emphasizing moral education, technical education, education for a military citizenry, and esthetic education was soon felt to be not specifically appropriate for a republic. In 1918, at the National Education Conference, a resolution was passed and adopted by the government, to include in the educational aim the cultivation of the spirit of democracy.

In 1922, after the influence of the American school system became more explicitly felt, a reorganization was announced by presidential order. The number of years in the different grades of institutions was rearranged: from primary school seven years, middle school five years, higher preparatory three years, and university three to five years, to primary school six years, junior middle school three years, senior middle school three years, and university four to six years. Seven controlling principles were enunciated: adjustment to evolutionary changes in society, promotion of democratic spirit in education, provision for the growth of individuality, development of people's productive ability, emphasis on life-situation in education, to

make education accessible to all people, and to allow elasticity for the meeting of local needs. Those who are familiar with educational thought in America a decade ago can easily and clearly discern American influences in this reorganization.

After the establishment of the National Government in Nanking in 1927, the principles of the Kuo-min-tang began to be applied to education. In 1928, the Central Executive Committee of the party recommended as the educational aim of the country the following: Education of the Republic of China is to be based on the "Three People's Principles"—to promote the spirit of nationalism, to hasten the realization of political democracy, and to effect the betterment of people's livelihood. These principles were formally announced by the government in 1929.

Through the various formulations of the aim of education in the past twenty-eight years, we can detect a general trend making China into a modern nation. But transforming a nation of the size of China with as old traditions is by no means a simple task. What are some of the difficulties that disturb the smooth working of the educational system?

## II

Let us inquire a little into the social setting that conditions educational effort. The more obvious factors in the social setting would include threatening foreign invasions, disorder in the political machinery, changes in social institutions, and the breaking down of the old economic structure. But for an appreciation of the essential difficulties in educational work I should lay stress on the psychological factor in the social setting.

By the psychological factor I mean the traditional conception of education deeply rooted in the mind of the people. To be brief, it is the conception of education as the specific preparation for the "scholar." The place of the scholar in Chinese society of the past was unique. According to the time-honored classification, people were supposed to belong to four vocational groups—the scholar, the farmer, the artisan, and the merchant. Although this classification was at no time strictly applicable and although there were always other vocational occupations beside the four mentioned, the scholar was respected by all and enjoyed the privileges and prestige of official employment. Education for hundreds of years was considered

to be the exclusive and specific means for the preparation of the scholar. The civil service examinations were instituted for the purpose of selecting candidates for official positions, and the scholars successful in the examinations were the acknowledged leaders in political and social life and enjoyed the privileges of the leisure class.

This traditional conception is still potent in the minds of the people, though often in a veiled form. Some effects of this conception on the new school system may here be mentioned. First, the conception of education as the specific preparation for the scholar has tended to make the common people hesitate in sending their children to the new schools. The farmers and artisans, especially in the rural districts, are still very much of the opinion that sending their children to the new schools for three or four years is somewhat a useless luxury, inasmuch as farmers and artisans, according to their traditional outlook, require no "education."

Second, the traditional conception has left behind an undue respect for and reliance on book-knowledge and literary expression. In the old days, the scholars knew their classics by heart and practised literary compositions of a special style required by the civil service examinations. In the modern schools we find this undue respect for book-learning one of the great impediments in inculcating a realistic attitude of mind towards modern problems.

And third, the old "scholar-ideology" has seriously limited the outlook of the students in the higher schools. In most people's minds, the new school system has come to take the place of the old civil service examinations. Those who attend the universities are somehow expected to enter upon official careers. This explains the fact that more than one-third of the students in the universities, according to the statistics of 1930, are in colleges of law, which according to the Chinese system include departments of political science. And even those who take up other studies are often found upon graduation among the aspirants for positions in government offices. Thus, talent is diverted from other pursuits that the nation urgently requires for its economic reconstruction and social reorganization.

With all the difficulties in the social setting, however, educational efforts in China, far from being discouraged, are pressing forward in new directions in order to fulfill the mission of guiding the extremely complex process of the nation's cultural transformation.

## III

## NEW DIRECTION IN THE EDUCATION FOR THE POPULACE

In the pre-industrial days the skills involved in agriculture and in craftsmanship were traditionally handed down from one generation to the next by the apprenticeship system and by cooperative work within the family. As to social conduct, oral traditions in the form of precepts and personal prestige in natural social groupings contributed to the cultivation of personal integrity and group cohesiveness. "Education," as already mentioned, was considered only as the preparation for the intellectual leaders who served as administrators of public affairs and as upholders of social customs.

When the new school system came in, the general populace, except the city-dwellers, could not appreciate education as given in the primary schools. Even in cases where there are no economic impediments, such as the inability to clothe the children properly and the necessity of setting the children to work to assist in the dire struggle for mere subsistence, the farmers and artisans in the country districts have hesitated to send their children to school. It is not because they are not conscious of the value of education. It is rather because they value "education" too highly as being the specific preparation for the "scholar."

The government has announced a program for carrying out compulsory education in the whole country. The Ministry of Education plans to train 1,400,000 primary school teachers and to provide a million class-rooms within the next twenty years. It is hoped that by 1951 forty million children will be enrolled in the primary schools. These figures may give us an idea of the numbers of people that must be taken into account. The problem is necessarily gigantic.

While provisions are being made for the extension of formal school instruction, far-seeing educational workers have begun to realize that due attention should be given to the psychological factor involved. The traditional conception of education must be frankly faced; otherwise, organizational devices and government requirements such as the age at which children should be sent to school, the number of years to stay there, the consolidation of village schools, will, it is feared, only bring bewilderment to the populace. Based on this realization, new experiments are being carried out in several parts of the country. The chief contention motivating these experi-



ments is that education should be brought to the people, not only in terms of formal school instruction, but also in terms of concrete assistance to improve their livelihood. Effective means are worked out for the relief of poverty of the people and for their enlightenment as to national needs in the face of foreign invasions and of readjustments in political, social, and economic life. This new direction in general education, I am pleased to report, is gradually finding support in public opinion and government action. The Mass Education Experiment in Ting-hien, Hopei, the Provincial Rural Reconstruction Institute at Tso-ping, Shantung, and the rural extension work in parts of Kiangsu, Chekiang, Shansi, Anhui, and Kwangtung, all indicate the new interest in the betterment of the populace. Through such means as the literacy campaign, the spread of information concerning new agricultural methods and implements, and instruction in health and citizenship, the educational workers with the new vision are attacking bravely the tremendous problem of education in rural districts, which contain approximately 85 per cent of the huge population of the country.

#### NEW DIRECTIONS IN THE EDUCATION FOR LEADERSHIP

For the past quarter of a century, more than fifty universities under government and private agencies have been established. This phenomenon is unique in the history of education. It reflects the respect for learning of the Chinese people. While there may be much to criticize concerning the quality of instruction and inadequacy of equipment, it cannot be gainsaid that the people realize the supreme need of supplying the nation with a new educated leadership. Here also, the traditional conception has contributed difficulties that must be faced as realities. When the civil service examinations were discontinued, the newly established universities were supposed to take their place in supplying candidates for official positions. The fact that most students in the universities are still looking forward to entering the much coveted officialdom, as pointed out above, is a problem challenging solution.

Attention is now being directed to the correction of this defect. Public men in various parts of the country are declaring against the unhealthy crowding of applicants for official jobs. And there is a general realization that productive pursuits should be encouraged and that studies and research in engineering and the sciences should,

at the present juncture of China's need for economic reconstruction, be emphatically promoted. The Ministry of Education has recently ordered that no new Law and Liberal Arts Colleges will be recognized by the government. In some of the newly founded provincial universities, as, for instance, in the Provincial University of Kwangsi, all students are encouraged to take engineering, agriculture, or the sciences. They are also required to devote part of their time to actual productive labor. Some secondary schools have also undertaken to try new experiments. For instance, at Nankai School, Tientsin, a group of students is undergoing a new kind of training, devoting half of their time to studies in class-rooms and the other half to productive labor in shops.

We may say, then, that the new direction in leadership-education aims to supply China, not with leaders who know nothing but books, but with leaders who are well equipped in the solution of concrete problems and who can think scientifically and work collectively for the nation's good.

#### IV

We now proceed to a consideration of the new interest in scientific studies and scientific research.

The intellectual reorientation involved in the introduction of modern science is one of the most basic movements in the cultural transformation of China. In regard to the introduction of foreign intellectual products, the Chinese have never taken an attitude of aversion. When the value of these products is clearly demonstrated, they have been willing students and ably adapted the imported ideas to the fertilization of the indigenous culture.

An example from an earlier period may be given here. Some fifteen hundred years ago a foreign intellectual movement came into China with the introduction of Buddhism. That was the most potent intellectual stimulus from the outside world that the homogeneous culture had received up to that time. At first the Chinese intellectuals learned from the Indian teachers who came to China. Later, they went to India for more authentic knowledge. They carried with them the Chinese habit of patient and tenacious application in learning. They studied in India under the best teachers and brought back to China manuscript upon manuscript which upon their return they translated into Chinese. Some of the translations, no-

tably those by the famous Hüan Tsang, were so well done that they are approved by modern scholarship as being both faithful and expressive. Incidentally, with their respect for written records, the Chinese have saved many a Buddhist document from destruction, and much modern knowledge of early Buddhist literature has been made possible on the basis of Sanskrit originals and Chinese translations.

The intellectual stimulus that came from India contributed much to the flourishing culture in the T'ang and Sung dynasties. At present we are in the midst of another movement of intellectual transmission—this time from the modern West. The core of this movement is modern science, which came to China in the latter part of the nineteenth century. The Chinese turned their attention to it because they felt that science made western nations strong in war. The early translators of scientific works were mostly those connected with the Kiangnan Arsenal established in 1865 for the manufacture of modern weapons of war, or with the new army and navy. Translations of Lyell's *Principles of Geology* and Tyndall's *Physics*, for instance, were first published by the Kiangnan Arsenal. The translator of the Darwinian theory into Chinese, Yen Fu, was a student sent to England to study naval science and later became interested in the natural sciences.

The wide-spread promotion of the study of modern sciences came with the new school system inaugurated in 1905. Modern sciences, such as are usually found in the curricula of western schools and universities, have been introduced into all institutions established under the new system. Students sent abroad have returned and carried on scientific research with very promising results.

Societies for the encouragement of scientific research are necessarily of recent date. Prominent are the National Geological Survey, 1913, the Science Society of China, 1914 (its Biological Research Laboratory in Nanking 1916), the Research Institutes of the Academia Sinica, 1927 (nine institutes have so far been organized: Institutes of Physics, Chemistry, Engineering, Geology, Astronomy, Meteorology, History and Philology, Psychology, and Social Sciences), the Fan Memorial Biological Survey, 1928, and the Peiping Research Institute with its departments of physical and biological sciences, 1929.

It is but natural that the first results of research should come



from those studies that are more closely connected with natural phenomena somewhat regional in character, such as geological studies, research of fauna and flora, and studies in palaeontology and archaeology.

Research contributions in geology have already gained recognition in China and abroad. Geological mapping, stratigraphy, seismology, and study of mineral resources have all been undertaken with very significant results. They have been not only of importance to science as a new intellectual discipline, but also of practical value to the nation. For instance, in the study of mineral resources, about one hundred and forty million tons of iron ore, 15 per cent of the grand total of the nation's reserves, were discovered by the investigators of the China Geological Survey. Of general interest is the discovery of the so-called Peking Man (*Sinanthropus pekinensis*), a contribution to the knowledge of earliest man. We shall not mention the scores of technical papers in geology and palaeontology that have been contributed by investigators. Suffice it to say that the results are now acknowledged by more experienced fellow scientists outside of China, and these should be qualified to judge.

In biological studies, contributions from Chinese scientists are coming forth in increasing volume. Fauna and flora that have been unknown to the scientific world are being collected, classified, and described with indefatigable energy and scientific scrupulosity. Researches in agricultural entomology and pharmacology of Chinese drugs have already brought forth much useful knowledge for the eradication of natural pests and for the relief of human suffering. Stimulated by the challenging opportunities in a still virgin field, the workers in biological research are all filled with enthusiasm, and are pressing forward to make new discoveries of importance to science.

One of the departments of research that has recently claimed attention is that of archaeology. Archaeological studies were highly developed by the time of the Sung dynasty in the eleventh and twelfth centuries. On account of their reverence for the past it is natural that the Chinese should have always paid great attention to ancient records and ancient objects. But systematic study with the help of modern equipment was started only in recent years. It is sponsored by the Research Institute of History and Philology in Academia Sinica. The work undertaken in An-yang, Honan, has re-

vealed results that are of great significance to historians of China's early age. The An-yang site was known to be the capital city of the Shang dynasty, about 1500 B.C. The investigation has yielded much information not to be found in written records. By means of careful stratigraphical study the investigators have been able to find, to mention one instance, that the people of the Shang dynasty had already mastered the casting of bronze to an advanced degree and made weapons, ceremonial vessels, and other ornaments. While some of the interpretations may be still contended by experts, the fact that the Chinese are making use of modern scientific methods to ascertain facts concerning the life and culture of their early history is a very significant development. And it is bound to promote thought to a great extent.

It would be too much to expect that, with less than a generation's effort, a great deal could have been produced. But there is no question whatsoever that Chinese intellectuals have definitely taken a new direction and have joined their fellow-workers in other parts of the world in the advancement of scientific knowledge for the discovery of truth and the mastery of nature.