INSTITUTE OF CURRENT WORLD AFFAIRS

CHGO-16
Science in Israel, II:
Some comparisons with Hong Kong

27 Lugard Road, 1/floor,
The Peak, Hong Kong.

May 10, 1963.

Mr. R.H. Nolte,
Institute of Current World Affairs,
366 Madison Avenue,
New York 17, N.Y.,
U.S.A..

Dear Mr. Nolte,

It was made abundantly clear at the United Nations UNCSAT* conference in Geneva last February that the problems to do with science and society in newly developing countries are manifold and complex. But among these problems a few stand out as basic and of paramount importance. Wise solutions to these basic problems will contribute in large measure to the whole economic and social development of a country. Each country has its own special conditions and must obviously find its own set of solutions. But countries can be guided in their decisions by a study of what other countries have done in similar stages of development. In this letter I shall pick out a few of these basic problems, show how the Israelis have tackled them, and make some comparisons with Hong Kong.

Science and Education

Perhaps the most basic of all the problems are those to do with education. With limited financial resources, newly developing countries must decide on how many of their children are to receive primary, secondary, and university education. They must decide on whether a distinction should be made between academically orientated and vocationally orientated education, and if so, how many students should have the one and how many the other. They must decide how big a part science should play in the total education program, and they must find the best ways of teaching subjects in order to develop the qualities of inventiveness, creativity, and adaptability. They must also decide how their policies on these matters should change as the economic prosperity of the country grows and its manpower requirements change.

In CHGO-10, I summarised Hong Kong's approach to these problems. The percentages of all children at the different schools and universities are summarised in Figure 1a. Other points to note are that:

- There exists in Hong Kong a tremendous prejudice on the part of parents against vocational schools.
- The secondary grammar education in the sciences follows the British grammar school pattern very closely, with similar curricula and similar types of examinations at the end of the course.
- In the past there has been very little financial support for research at the University.

---

* UNCSAT - United Nations conference on the applications of science and technology for the benefit of the less developed countries.

FIGURE 1a. % OF ALL CHILDREN AT SCHOOL IN HONG KONG, MARCH 1961

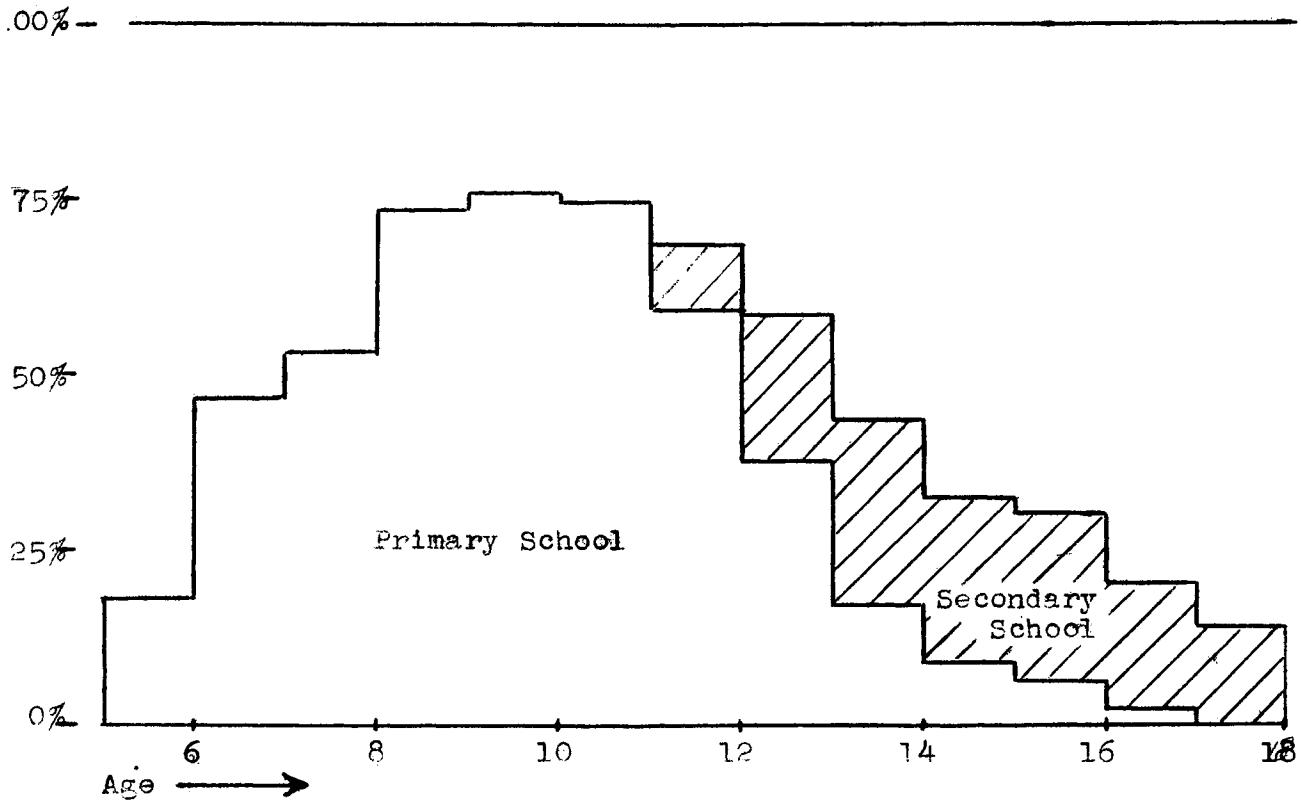
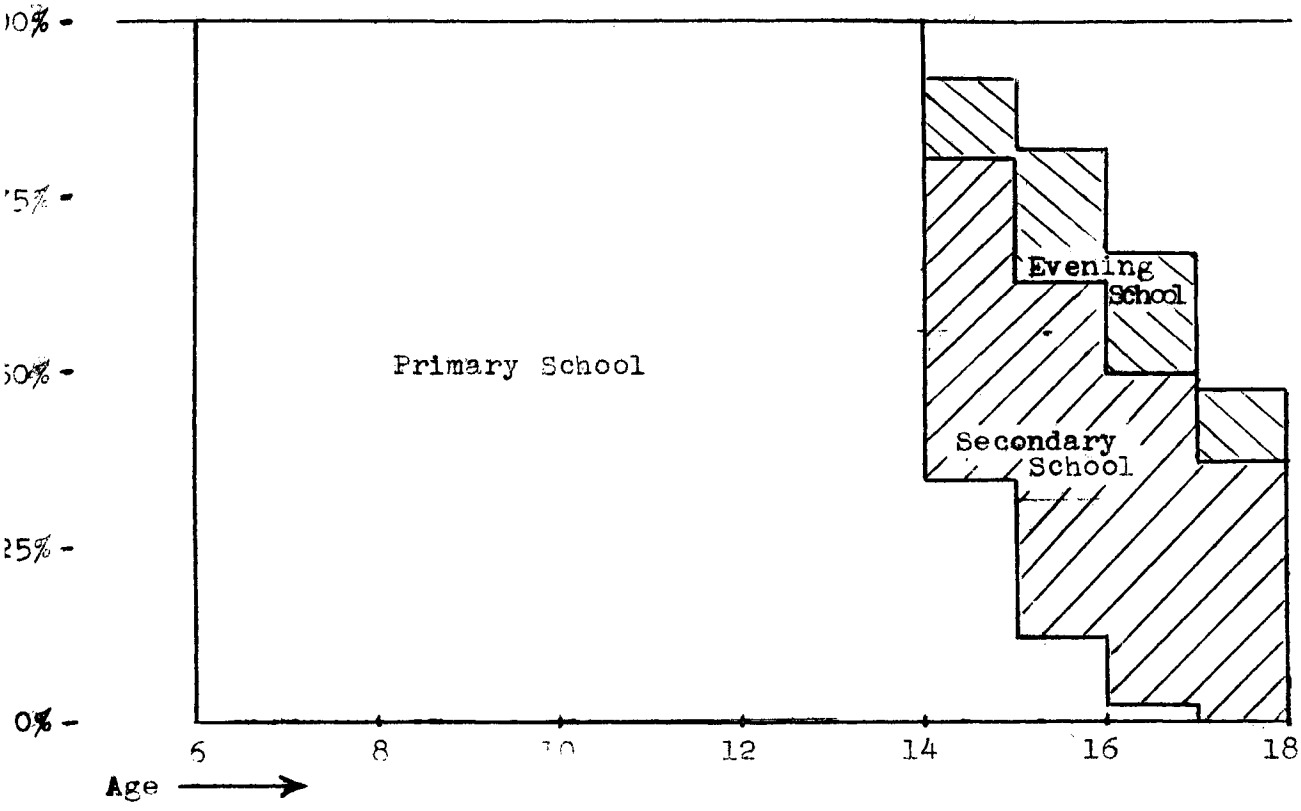


FIGURE 1b. % OF ALL JEWISH CHILDREN AT ISRAELI SCHOOLS, 1962



- In the opinion of most Hong Kong educators (although not all) the students graduating in science from the schools and University are well acquainted with the facts of science but on the whole are lacking in creativity and initiative.

In Israel I had been half expecting to find an education system somewhat similar to that in Hong Kong, since I assumed both places would have been greatly influenced by the British. I discovered that although Britain left her legal system in Israel, she never attempted to interfere with the education system. Dr. Rinot, Director General of Edcuation, talked about this: "During the time of the Mandate," he said, "the British wisely left the organization of education almost entirely to the Jews. Visitors often ask me how it has been possible to build up such an elaborate education system in the short time since Independence. I tell them its not really such a short time, we've been at it for nearly fifty years. The main difference is that we have had free, compulsory education for children up to the age of fourteen since Independence. Although even before Independence, 80% of Jewish children attended school."

Secondary education in Israel is provided for children between 14 and 18 years of age, but it is neither free nor compulsory. Mr. Bentwich of the Ministry of Education gave me the following figures for 1962 which show the variety of secondary education available and the number of students at each type of school.

Number of Israeli children aged 14-18 attending secondary schools

Type of School	Number attending	% of all children aged 14-18
Grammar	45,000	29.5
Vocational	16,000	10.4
Agricultural	7,500	4.9
Kibbutz	8,000	5.2
Rabbinical	3,500	2.3
Evening class	10,000	6.5
Total number at secondary school of some sort	90,000	59.0

If these figures had been broken down into separate totals for each of the four years from 14 to 18 years of age, they would have shown that at the vocational and agricultural schools there are many more students aged 14 than aged 18. The numbers at grammar schools are about the same for each year. This reflects the large number of students who drop out from the vocational and agricultural schools before completing their four year course.

The secondary grammar schools provide academically orientated education which must be taken by those students who intend to be scientists. At these schools all students take six subjects, of which four, Hebrew, Bible, English, and Mathematics, are compulsory. The other two can be sciences, and slightly less than half of the students elect to read science. At the end of the four years an examination is taken at about the level of the British General

Certificate of Education, Advanced Level.

At 18 years of age all children must serve in the army for 2½ years. But after their service about 20% return for higher education, at either one of the five universities, or the Technion (the Israel Institute of Technology) at Haifa, or ultimately do post-graduate research at the Weizmann Institute.

The percentages of all children at school at different educational levels are summarised in Figure 1b.

In addition to the schools already mentioned, there are others which cater for special groups. These include the schools for Arab children; physically and mentally handicapped children; and special classes for newly arrived immigrant children so that they can be quickly assimilated into the regular school system.

By talking to many people in Hong Kong, I was able to form an opinion on the achievements and shortcomings of the education system, particularly as it related to the training of scientists. This was not possible in Israel as I only had time to talk with Government officials. It is noteworthy however, that in Israel the prejudice against vocational and agricultural schools seems to have been overcome. At one time, as in Hong Kong today, all parties wanted their children to attend a grammar school and have an academic education. I was told that as a result of Government propaganda extolling the virtues of vocational and agricultural education, this is no longer the case.

The Language of Science Instruction

A special educational problem is that of the language of science instruction. Whenever modern science is first taught in a country which does not have a recent scientific tradition, a decision has to be made on the language of instruction. Basing my generalization on the only two cases I have studied so far, namely Chinese and Hebrew, it seems that two schools of thought are likely to emerge. One school will be in favour of teaching science in a foreign language. Its adherents may argue that their native language does not lend itself to expressing the concepts of science, they will almost certainly point out that there is no scientific terminology, nor any textbooks in the native language; and they will probably add that since research workers must be able to read papers published in a foreign language, then they may as well begin by learning their science in that language. The members of the other school will advance both nationalistic and pedagogic arguments in favour of science taught in the native language. It is an insult, they will say, to suggest that their language is inferior to other languages -- of course it can be used as a medium for expressing scientific concepts. They will point out that standardized scientific terminologies have been drawn up in other languages, and there is no reason why they should not be similarly created in their language. They will admit textbooks are a problem at first, but even this can be overcome in a short time. Their strongest argument, however, is the pedagogical one: that teaching science in the native language will lead to much greater comprehension by the majority of students.

In Hong Kong all these arguments have recently been heard because of the impending creation of a new university in which Chinese will be the principal language of instruction. I pointed out in CHGO-10 that many people thought that science in the new university should be taught in English. However, the Fulton Commission, in its report published two weeks ago, has recommended in favour of teaching science in Chinese. The Government must decide whether it accepts this recommendation; but if it does, it should bring to a close a debate which began with the introduction of modern science into China in the latter part of the Nineteenth Century. The literature of that time records the arguments -- almost identical to the ones heard last year in Hong Kong -- on whether science should be taught to the Chinese in English or Chinese. The majority opinion seems to have been in favour of teaching in Chinese, although one remark made at a meeting of the Royal Asiatic Society held in Shanghai in May, 1886, really hit home: One member of the Society thought that if the Chinese were to be taught science by foreigners, it was better that they be taught in the foreign language by ..."foreigners who have not had their faculties paralysed by the task of mastering the Chinese language"!

In Israel the controversy on whether science should or could be taught in Hebrew came to a head in 1917 in what has become known as the battle of the languages. At that time the Haifa Technical Institute was nearing completion. The governing body of the Institute was mainly of German origin, and thought that German was the language best suited for teaching science. It was therefore decreed that German would be the language of instruction. The Jewish Teachers' Association violently objected and a series of protest demonstrations were held all over the country. The teachers argued that if Hebrew was to be the national language, it should also be used for teaching science. The Teachers' Association won the day, the German speaking staff at the Institute had to be dismissed and a Hebrew speaking staff appointed in its place.

Now, lectures are given in Hebrew in all schools and universities, except at the post-graduate level, when English is used. Science textbooks are available in Hebrew up to secondary grammar school level, but at the universities, textbooks are in English. "This is not much different from my days at Cambridge," said Mr. Bentwich, "Then we used to have our mathematics lectures in English but the best textbooks were written in French and German."

Science and Government

In CHGO-11 I discussed science and government in Hong Kong. As the basis for that letter I used a list of the scientific activities usually undertaken by governments, published by Alexander King, Scientific Director of OECD. If this list is accepted as representative of the activities with which governments should be concerned, then we must ask what is the most effective way of organizing and co-ordinating these activities. This really boils down to asking what is the most effective way of enabling governments to make wise decisions on matters which concern science.

I showed in CHGO-11 that until very recently there was no

co-ordinating or advisory group of scientists in Hong Kong. Government had relied on consultants for what little scientific advice it felt in need. Last year a Committee for Scientific Co-ordination was founded, but it has very little real power and as far as I know it has not yet been called upon to give any advice to Government. It has, however, performed a useful task by compiling directories of scientific facilities, manpower and libraries in Hong Kong.

I was surprised to find that the situation in Israel had been somewhat similar until only three years ago. Mr. Shimshoni, the Director General of the Research and Development Council, outlined the developments in the relations between science and government since Independence. The first step had been to form a Science Research Council in 1949; but this group had very little influence and no authority. It did not concern itself with assigning priorities. The Council had tried to interest industry in making better use of science, but nothing very effective had been achieved. Mr. Shimshoni went on to explain that this state of affairs had continued until 1959 when Prime Minister Ben Gurion had asked him to report on the status of scientific research and development in Israel. Shimshoni reported that conditions were bad. There was insufficient money for research; there was no effective way for the government to seek or receive scientific advice, and industrial research was almost totally neglected. The outcome of the report was that in February 1960, Ben Gurion, following up Cabinet resolutions, appointed a National Council for Research and Development in the Prime Minister's office, with Shimshoni as its first Director General.

The Council consists of up to 25 members of which up to 15 are scientists and the rest representatives of different government departments. Its terms of reference are broad, and include the advising of Government on all scientific matters. It must recommend the funds to be allotted in the State budget for research and development and has the task of apportioning and utilizing these funds. Mr. Shimshoni summarised the aims of the Council as:-

1. To extend the use of the scientific method and scientific approach in the process of government, and to afford to the government scientific and technological advice.

2. To find ways by which science and technology can best advance economic growth, and in particular industrial development.

3. To plan for the means required -- the organizations, facilities, manpower and services needed to carry out the policies recommended.

In a report* published last November, Mr. Shimshoni reviewed the progress that has been made during the first 2½ years of the Council's existence. This report is a particularly useful document since it not only summarizes what has been done but it also explains the motivating philosophy. It is also refreshingly frank in its discussion of the shortcomings which still exist.

---

* Annual Report 1961-62, National Council for Research and Development, Jerusalem, November 1962.

The following is a brief summary of Shimshoni's statements made either at our interview or in his recent report: Very little progress has been made in introducing science into general government policy decisions. It is still only on rare occasions that scientists will be consulted even on such matters as economic planning. Much more progress has been made in drawing up a policy for science and technology itself. This has been done, not by drawing up a master plan, but by attempting to identify those research directions most important to the State. In addition, the Council has attempted to assess the resources needed for science, in order to develop the country's scientific potential over the next decade. This has mainly been done by a survey of scientific and technological manpower. The Council has also tackled the problem of deciding on the organizations best suited for all aspects of this work.

Science and Industry

It is an indisputable fact that it is the widespread use of science and technology in industry that has contributed in a large measure to the economic growth of the developed countries. But it is a major problem in newly developing democratic countries to know how to encourage industrialists to make more and better use of science. In particular it is a problem to know how far governments should aid the process in a free enterprise society.

In CHGO-12 I pointed out the neglect of science and technology by Hong Kong industry. I mentioned however, that the work of the Federation of Hong Kong Industries was directed towards an increasing application of science. But at the moment there are no government aids to industry, either in the way of information services, industrial research organizations or visiting scientific advisors.

I have already pointed out that Danny Shimshoni's review of science in Israel in 1960 was particularly damning in its discussion of science and industry. Even now, he believes conditions are far from satisfactory. In 1960-61 only 0.2% of industry's turnover was invested in industrial research. The number of scientists and engineers per 100 of all employees in industry was only 0.8, compared with 3.5 in the U.S.A.. In his report of November 1962 Shimshoni writes, "Industrial research is still lacking in scope, quality, and appropriateness to the needs. The greatest problems are the lack of research or of an attitude of innovation within the individual plants; the limited scope and capability of actual development work in proportion to basic science; and, in the lack of emphasis on relevance in selecting basic research directions." Much of what he writes could equally well apply to Hong Kong. It could be particularly useful, therefore, for Hong Kong to study what is being done to remedy the situation in Israel.

The National Council for Research and Development has tackled the problem from several different directions. On the one hand they have helped to introduce legislation which should stimulate industrial research. For example, research contracts given by industry to research institutions can be charged to current expenses, and research costs within the plant itself can be written off in

three years. In addition, Customs duties on scientific equipment have been largely eliminated. Tackling the problem from another direction, the Council set up study groups to study conditions in different industries and make recommendations. On the basis of these recommendations the Council has encouraged co-operative research, and two new research associations have been formed, one for silicates and ceramics, and the other for paint. On those occasions when the Council decided that research was in the national interest, but not within the feasibility of individual industries to carry out, the Government has taken the initiative and set up research organizations itself. An example of this is the Fermentation Research Unit and pilot plant. Also, realizing that basic research is a necessary part of an overall industrial research program, yet at the same time appreciating that many industrial plants are too small to support basic research, the Council has given research grants to universities in support of basic research which the Council believes is closely relevant to the needs of the industry. The Weizmann Institute is also being encouraged to establish an industrial research department parallel to the existing departments in the basic sciences.

All these activities are beginning to bear fruit, not so much in specific research achievements, as in a changing attitude on the part of the industrialists. They are beginning to show some interest in science and technology and to be willing to experiment and innovate.

I visited Israel in the hopes of getting ideas which may be of value to Hong Kong. In education my main suggestion would be for Hong Kong educators to study the Israeli experience in overcoming the prejudice against vocational education. Such a study would be particularly significant at the present time because next December, Hong Kong is to be host for a Commonwealth education conference. One of the topics to be discussed is the type of science education best suited to the needs of developing countries, and the question of vocationally orientated education is certain to be debated.

In science and government, and science and industry, there is an obvious need for a group which will approach the problems of science in Hong Kong with some of the foresight and vigour of the Israeli National Council for Science and Development. I believe this would most easily be brought about by widening the membership and scope of the Committee for Scientific Co-ordination.

Yours sincerely,

C.H.G. Oldham

C.H.G. Oldham.

Received in New York May 15, 1963.