

CHAPTER D

Organizational Structure

Organizational Structure

One of the complaints that the committee heard from professionals involved in developing new curricula for science and technology is that there is no mechanism for assimilating these innovations, and the result is that they can take many, many years. There is no one standing ready to introduce the new subject into the school. For this reason, it is the committee's contention that today we must place the position of the supervisor as an instructor at the top of our priority list. At the same time, we must establish mechanisms for guidance, back up and support, designed to help all parts of the education system assimilate curricula and innovations. It is clear to the members of the committee that their proposals call for making a great number of changes to the education system in the fields of mathematics, science, technology and computers, which will take place over the next five years. This process requires that appropriate organizational measures be instituted at all levels.

At the level of the school, the committee recommends instituting a system of coordinators within the institution. The coordinators will maintain contact with the regional back-up and support centers to receive advice, direction and guidance. Expanding the role of the organizational supervisor and enlarging the guidance system are additional steps in the process of implementing the program and providing aid to the schools. All these will be integrated into the network of teacher training and in-service training which will help teachers to enter the new fields.

A special administration, established expressly for this purpose, will direct the project. The administration will work to implement the changes on all levels. We must bear in mind that "Tomorrow 98" is not confined to adding disciplines and subject matter; the project reflects a fundamental change in the overall organization of teaching science and technology in the education system. The crux of the change is in a new perception of the relationship between science and technology and in making science and technology part of the basic education of all students. Both of these are new concepts to the education system, and will require the following organizational changes: a unification of educational frameworks, parallel to the unification of discipline and subject matter; an integration of science and technology; a complete integration of laboratory work and theoretical studies; and an integration of the computer into the learning

process. Together, all of these will create a new framework of mathematics, science and technology instruction in the State of Israel.

This overall change will require close cooperation on the part of all the parties at the Ministry of Education and Culture whose work relates to scientific and technological education - especially the organizational supervisors for mathematics, science and technology. This will dovetail with measures already implemented by the Ministry during its most recent restructuring project, when the Science and Technology Department was created. These measures properly recognized the general nature of the subject. Beyond all these, we need to conduct a wide-ranging informational campaign among students at different age-levels to inform them about the possibilities that the different scientific technological fields offer, and to encourage students to have more self-confidence, enabling a greater proportion of them to elect scientific- technological studies.

The committee believes that there is only way to finance "Tomorrow 98" - through cooperation. It seems to us that the changes proposed here - which, in our humble opinion, are vital to the education of the generation living in the modern competitive society - can be funded only by having all the involved parties work together. The funding must come from the Ministry of Finance, the Ministry of Education and Culture, local authorities, and parents.

The committee hopes that we can successfully carry out this important mission by jointly adopting all of these measures. This would require all the institutions involved in educational administration in Israel to cooperate in devoting essential resources to curricula, educational materials and the instructional network. It would also require receiving the same genuine cooperation enjoyed by the members of this committee from all the different parties at the Ministry of Education.



Recommendation D/1:

"Tomorrow 98" Administration

The committee recommends establishing a "Tomorrow 98" administration, which will be responsible for implementing the recommendations of this report and conducting follow-up.

The committee advocates that the "Tomorrow 98" administration be established at the Ministry of Education and Culture. The administration will be the operational headquarters for implementing this report's conclusions, and will be directly accountable to the Director-General of the Ministry. The function of the administration will be to ensure that the committee's recommendations are enacted, by coordinating all the involved parties within the Ministry and outside of it. The administration will receive overall responsibility and complete authority for the areas of its jurisdiction. A senior staff-member with an appropriate background will head the administration; s/he will be assisted by people responsible for each field in which the administration operates.

The recommendation to establish a special project administration reflects the committee's position that it requires a special structure to implement a special project, and not a mere organizational change. The primary roles of the administration will be to direct the different bodies at the Ministry of Education and elsewhere in enacting the committee's recommendations, and to coordinate between these groups.

Recommendation D/2:

Budget

The committee recommends the setting up of a special financial structure to apply the conclusions of this report.

When the committee devised the "Tomorrow 98" budget, its guiding principle was that the recommendations should be implemented as inexpensively as possible without compromising the declared aims. The following are the committee's recommendations:

A. Instructional hours

The Ministry of Education will have to calculate the general balance resulting from applying the conclusions of this report. There is no doubt that this will be expensive; quite a few sections, however, call for cuts in hours, due to changes in programs and aims. In general, the committee is of the opinion that some of the additional instructional hours can be funded by reworking goals within the education system.

B. Building

As much as possible, existing spaces should be renovated to suit new needs. Nonetheless, it is clear that significant resources will be required for building laboratories and science rooms. The committee suggests that this process take place over a period of five years. *Mifal Hapayis* should be involved as much as possible in supporting this endeavor. Similarly, the committee recommends that every effort be made to attract foreign donors, by publishing literature on the project.

C. Equipment

The committee proposes that funds to purchase equipment should come from at least four sources: the Ministry of Education and Culture, parents, local authorities, and the proprietors. *Mifal Hapayis* should take as active a role as possible in funding the purchase of equipment. The Ministry's allocations will be on a sliding socioeconomic scale, covering 30% of the overall cost on average.

D. Costs and financing

The budget for "Tomorrow 98" was designed for a five-year period. The annual cost of the project is approximately NIS 300 million. In the committee's view this sum should come from three sources. The Ministry should make NIS 100 million available from its present budget to the project on an annual basis, by changing its priorities and reassigning resources. This sum is about 1.5% of the Ministry's budget. In addition, the government should make an annual contribution of NIS 100 million, as an acknowledgement of the project's importance to the nation and its contribution to all facets of life, including defense, industry and all the other components of the nation's economic strength. Another NIS 100 million annually, earmarked primarily for the purchase costs of computers, will come as a partial donation from other bodies, including local authorities, donors, parents and different funds connected to educational institutions.

Recommendation D/3:

Project Steering Board

The committee recommends establishing a "Tomorrow 98" board.

The board will preside over "Tomorrow 98," responsible for supervising and directing the project. The Minister of Education and Culture will appoint the board. It will be composed of a number of senior representatives of the Ministry of Education and Culture, including its Director-General. A representative of the Center for Science Instruction and representatives of industry and the universities will also sit on the project steering board. The board will have between ten and fifteen members, and will be chaired by one of Israel's senior scientists.

The board will convene once every three to four months.

The board will direct the implementation of the project and will report on its progress to the Minister of Education and Culture.

Recommendation D/4:

Professionals From Science and Technology Holding Administrative Positions in the Education System

The committee recommends that the education system issue directives stating that every educational institution should appoint a principal or assistant principal whose background is in mathematics, science or technology. This would be dependent on the pool of candidates responding to the tenders and on the candidates' suitability in other ways. In a similar vein, the committee proposes that when the Ministry of Education and Culture appoints candidates to administrative positions at different levels, it should give preference to individuals who come from these fields.

This recommendation is based on the fact that the vast majority of administrative positions in the education system are staffed by people whose basic education is in the social sciences and humanities. The committee believes that the proper balance in every educational institution is achieved when the principal or vice principal is trained in either mathematics, science or technology. It is only natural that people with a basic education in these fields can contribute more to advancing mathematics, science and technology in their schools and can better direct what is happening in these fields within the schools. It is clear to the committee that this will be a long, drawn-out process, and it suggests that the Ministry of Education and Culture issue directives to begin these procedures.

The same holds true for the staff of the Ministry of Education. At the administrative level of the Ministry, there is a shortage of people whose area of specialization is science and technology. This influences the Ministry's ability to direct and guide different echelons in the education system, and the committee recommends that the Ministry issue appropriate directives in this regard. This would entail appointing people with scientific and technological backgrounds to senior positions in the education system, including the head office, the districts, and the educational institutions.

Recommendation D/5:

Curriculum Development

The committee recommends devoting more energy and funding to curriculum development in mathematics, science, technology and computers. The committee also suggests that the curriculum development framework be reorganized.

In different sections of this report, the committee proposes measures that are predicated on writing new curricula or updating and improving existing curricula. The committee did not thoroughly explore the subject of curriculum per se, as it did not perceive this as part of its role. A lack of expertise and limited time were also relevant factors in this decision. Nonetheless, the committee is convinced that the success of each recommendation is largely dependent on the quality of the curricula that will be produced.

Israel has a number of centers which have - in the past, as now - undertaken excellent work in curriculum development in the fields of mathematics, science, technology and computers. A number of these centers joined forces to form the Center for Science Instruction (CSI). This institution, in coordination with the Curriculum Department, has done a great deal to further science instruction in Israel. Some curriculum-writing centers are not part of CSI, and the committee recommends that all institutions involved in developing curricula for mathematics, science, technology and teleprocessing - assuming that the quality of their curriculum development meets certain criteria - should become associated with CSI, both for organizational and budgetary purposes. For this purpose the CSI should be reorganized; the new structure should ensure that assignments will be distributed to the teams in a manner that will guarantee that all the work will be accomplished and duplication of efforts be avoided. The reorganization of CSI will involve drafting a new budget, based on real needs and ensuring that these needs will be met. The committee also recommends that the work groups at CSI be funded in accordance with a precise definition of their output, and that capital be dispensed on the basis of the work the group produces, according to the established timetable.

The committee suggests that CSI work closely with the network of back-up and support centers (see Recommendation D/6) and the organizational supervisors (the parties who will be responsible for enacting and testing the curricula in the field), in conjunction with the Manpower Administration for Instruction, Training and In-service Training.

In the committee's view, a program should be adapted to develop curricula in mathematics, science, technology and teleprocessing. This program will last several years and will be based on development centers, each of which will specialize in a certain area. The development centers will also be responsible for follow-up and supervision of the implementation of their curricula in the schools.

Recommendation D/6:

Regional Support Centers

The committee recommends operating regional centers to provide support in mathematics, science, technology and computers. The centers will have departments organized by subject and will be divided into age-groups.

Israel already has a number of frameworks providing instructional support to the schools, namely the network of pedagogic centers, the network of computer applications support centers, and support centers for teaching the natural sciences in elementary and junior high schools.

A number of people testified before the committee that difficulties in implementing the new curricula arose because of a lack of a mechanism to direct the changes, i.e. all the activities required for the new curricula. This includes in-service training and guidance for teachers; conducting follow-up of curriculum implementation and making changes to the curriculum as demanded; and providing suggestions and directions, as well as logistical assistance with equipment, accessories and literature. It is important that the support centers maintain constant contact with the people working in developing new curricula and the equipment suppliers. For computers, this also involves operational aspects and maintenance.

Technically, it would be possible to run the support centers by using the existing infrastructure of already operating centers, such as the regional learning centers established by the technological education system, pedagogic centers and computer back-up centers that operate in many places. The Ministry of Education should develop a nationwide network of support institutions and make suitable arrangements with the local authorities for their operation. The Ministry should be involved in the task of establishing appropriate frameworks and suitable concentrations of activities. The network of support centers will also take part in the in-service training that will result from this report. They will provide didactic, logistical and information services in everything relating to existing curricula and future curricula. The centers will also have an extensive library of professional literature as well as software and communications systems that will expose visitors to all aspects of the educational environment required in their subject areas. The centers will work together with the institutions involved in developing educational materials and curricula, to answer

the needs that may arise. They will be equipped with all the communications equipment necessary to provide assistance by telephone or through computerized communications.

The committee suggests that the structure be flexible and in accordance with needs. Some fields, like teleprocessing, will require more centers than will other fields. Similarly, not all centers will offer the same activities, because of the specific conditions in different areas. The operational methods employed in the centers can also be varied, and include running mobile support centers where needed. The Ministry of Education should make preparations to operate the back-up and support centers, establish standards for operation, decide on the structure of the centers, and determine criteria for budgetary allocations. The Ministry should also establish a special body which will be responsible for operating the network of back-up and support centers. This body will work as a national administration and will be the one to establish precise standards for running every center, based on local data. It will also make the proper operational arrangements with proprietors and the local authorities for running the centers. The committee proposes that the Ministry of Education cover 50% of the costs and that the remainder come from the proprietors, the local government and other sources.

Recommendation D/7:

Organizational Supervisors for Mathematics, Science and Technology

The committee recommends that the Ministry of Education and Culture increase the role of the organizational supervisor for science and technology, and that the instructional aspects of the organizational supervisor's work be expanded.

The function of the organizational supervisor in the education system in Israel has two main components:

Role of supervisor - primarily, monitoring the level and functioning of the school.

Role of instructor - primarily, providing guidance to teachers, principals and coordinators in the proper implementation of curricula.

The committee recommends that now, as part of "Tomorrow 98," we should emphasize the role of supervisors and organizational supervisors as instructors and educators for mathematics, science and technology programs in the schools. The committee believes that the supervisor's status in the education system should be elevated, the functional ability of the organizational supervisor for science should be enhanced, and the role should concentrate more on guidance and instruction. The instructional supervisor is responsible for everything taking place in his/her field, and therefore s/he should be allocated means which exceed those generally allotted today. At present, some organizational supervisors are holding part-time positions, which prevents them from doing their work properly. Most do not receive any help from the education system.

The committee recommends that every position of organizational supervisor, in every principal technological or scientific discipline as well as in computer be filled by a person with proper qualifications in the discipline and in education, including relevant experience in the field. This person must be given a full-time position. When needed, s/he should receive assistance from a professional staff, and appropriate office arrangements. The Ministry of Education must now establish guidelines for positions in this area. The job of organizational supervisor should emphasize instructional aspects over every other facet of the work. The committee believes that this is the most important element at this time, and that the organizational supervisor should be

given sufficient instructional resources to use in accordance with the needs of the schools. The Ministry of Education should establish guidelines in this matter.

The committee proposes that all organizational supervisors for science, technology and computers should work in close cooperation with the "Tomorrow 98" administration.

Recommendation D/8:

Preparations for Building Laboratories

The committee recommends that the Ministry of Education make special preparations to build laboratories and science rooms. The Ministry should conduct a comprehensive and detailed survey of laboratories and laboratory equipment at all levels of the education system. A full picture of the different types of laboratories and the required equipment should be compiled; instructions should be issued to all parties of the education system on building, renovating and equipping the laboratories. We must embark on a five-year comprehensive program for building science and technology laboratories.

The program of building and equipping laboratories, as detailed in the committee's recommendations, relies on information that is largely out-of-date. At this point, we lack a clear picture of the detailed needs for laboratories and equipment in all the educational institutions. The information is dependent on sample inspections and the evaluations of experts and central supervisors. It is clear to the committee that in many cases it will be possible to renovate existing rooms for new objectives, as set down in this report, and sometimes the facilities will not be appropriate for laboratories.

The educational institutions will have to present the Ministry of Education with their proposals, together with specific descriptions of the existing situations in the schools. The Ministry will be responsible for establishing criteria and priorities for the allocation of resources for building/renovating/equipping the laboratories, and a five-year program will be formulated accordingly. This program will take into account the inventory of existing rooms and the options for flexibility. It will be based on a thorough survey conducted in all educational institutions for this purpose.

The committee recommends conducting a survey of laboratories and laboratory equipment at all levels of the education system. This survey should include the fields of science, technology and computers and should draw a clear picture of the physical conditions in the education system. It should begin immediately and will be the basis for allocating resources for laboratories. It is expected that the survey and project-design will be completed within one year.

Recommendation D/9:

Incentives for Teachers in Development Areas and Disadvantaged Neighborhoods

The committee recommends that the Ministry of Education, together with teachers organizations and the Ministry of Finance, appoint a committee to establish incentives for mathematics, science and technology teachers in development areas and disadvantaged neighborhoods.

During the committee meetings, it became apparent that there is no overall shortage of science teachers today. This view is supported by teacher training and retraining programs for immigrants and Israel's past experience which demonstrates that in periods when work in general is scarce, there is no shortage of science and technology teachers. At the same time, however, it is difficult to find gifted teachers who are willing to devote a number of years to directing science and technology instruction in their schools. There is evidence that this is a localized problem - the difficulty lies in finding appropriate teachers in remote areas. The committee, therefore, believes that we need incentives to encourage young teachers, who have a few years of experience, to move to peripheral areas and build their futures there. The committee contends that these incentives should be temporary - in keeping with the actual situation in the area - and that they should be substantial enough to be effective.

The committee suggests that the Ministry of Education, in conjunction with teachers organizations and the Ministry of Finance, establish a clear-cut series of priorities for development areas and disadvantaged neighborhoods, that will enable these areas to attract high-quality educators.

Recommendation D/10:

Information for Students Before They Choose Their Area of Specialization

The committee recommends that all parties who play a role in directing students, particularly teachers and guidance counselors, work towards correcting the distorted image of mathematics, science and technology commonly held by boys and especially girls.

One of the most serious problems that arises in the process of students choosing to specialize in technology or the sciences is the distorted image students create about these fields among themselves. This picture is comprised of a self-evaluation, which is not always accurate, and the student's view of the possibilities these fields hold for him/her, which is not always in line with reality. It is a product of contacts with friends, parents and teachers (who do not have an adequate background in these areas) and conversations with one or more guidance counselors (who do not necessarily have all the information about the various options and requirements, and cannot always evaluate whether the student is well-suited to studying in a scientific technological track).

The committee believes that it is extremely important to provide students with reliable information about science and technology, fields on which the scientific-industrial development of the country depends. The past few years have seen a certain improvement in this area, principally an increase in the number of students who choose to take a series of science courses. This development, however, is not sufficient, and it has not occurred at the same rate in all places. Providing information is especially important in peripheral areas, where the low self-esteem of the students prevents them from choosing an extensive program of scientific-technological studies. This issue is extremely important in building the social and economic infrastructure of these areas. Providing correct information and proper encouragement will eventually cause an increase in the number of students from peripheral areas who choose an extensive program of science and technology.

In the committee's view, therefore, a number of steps must be taken to rectify this situation. We need to bring correct and authorized information to the student's home, i.e. an informational campaign directed towards the parents. This is predicated on the reasonable assumption that parents have a major say, significant authority and great influence in directing their children, both in their studies and in choosing a future occupation. This course of action must be coordinated fully

with different involved parties and carried out in conjunction with the school administration. Guidance counselors should be involved in presenting students with an up-to-date picture about possible programs of study and options for future training and post-secondary education. It is particularly important to raise the percentage of girls who choose to enter scientific- technological tracks. Emphasis should be placed on the integrated approach to science and technology, as expressed by the work of this committee, and on the demands of the contemporary economy. Past experience has shown that when a determined effort is made in this direction, it brings results. The committee wholeheartedly endorses initiating an information campaign of this type.

Recommendation D/11:

Junior High Schools and Elementary Schools in the Former Configuration

The committee recommends devoting equivalent resources in mathematics, science and technology to grades seven and eight in junior high schools and elementary schools.

The committee understands the reasoning behind the decision that institutions that have been structured as junior high schools should receive priority from the school system. It believes, however, that today, although progress has been achieved in converting schools to a junior high school structure, the process is likely to take several more years. And, although the main thrust in building schools is directed towards immigrant absorption, we must not hinder the progress of students who live in an area that has not yet instituted junior high schools, in a subject so vital to the individual and the society, namely advancement in mathematics, science and technology. Seventh and eighth grade students in an eight-year elementary school should receive the same number of hours as their contemporaries in a junior high school, and should be given the same exposure to laboratory experimentation.

This recommendation involves providing certain resources, particularly in allocating hours (including an additional hour of mathematics), renovating laboratories and laboratory equipment, training teachers and appointing coordinators. The committee recommends that in certain areas where the transition to a junior high school structure is almost completed, and the students will soon be moving to the junior high schools, new laboratories will not be built, and temporary solutions be found instead.

The committee would like to note that this is a system-wide process, not one specific to science and technology. Nonetheless, because of gaps existing in the education system in the areas of the committee's concern, and because the committee is cognizant of the fact that these gaps are liable to widen, the committee decided to recommend equalizing the resources for science and technology. Although the subject of the implementation rate of the structural reform is beyond the committee's scope, we believe that the gaps that exist today between the two types of institutions are a growing threat. This recommendation will not appear in the committee's budgeting framework because it applies to general aspects of the education system.

Budgetary Appendix

Cost of "Tomorrow 98" in 1992 prices

BY CHAPTER

(millions of NIS)

Chapter	1992-93	1993-94	1994-95	1995-96	1996-97	1997
Ch. A	48.9	69.6	87.6	103.5	116.0	76.1
Ch. B	24.2	37.8	39.9	41.7	45.2	28.6
Ch. C	63.7	91.2	114.9	112.8	131.6	117.2
Ch. D	8.8	8.3	10.7	9.6	9.6	9.6
TOTAL	145.6	206.9	253.1	267.6	302.4	231.5

BY SUBJECT

(millions of NIS)

	1992-93	1993-94	1994-95	1995-96	1996-97	1997
Teachers	10.2	23.3	30.7	17.5	20.8	9.6
Positions	24.5	62.9	96.9	129.8	162.5	163.2
Building	43.4	47.3	47.3	47.3	47.2	
Equipment	51.6	57.9	59.2	55.0	53.0	40.7
Misc.	15.9	15.5	19.0	18.0	18.9	18.0
TOTAL	145.6	206.9	253.1	267.6	302.4	231.5

* See explanation of tables on following page.

Explanation of tables

Teachers - Includes training, in-service training, substitutes and retraining.

Positions - Includes position hours, guidance, instruction, supervision and laboratory technicians.

Building - Includes renovating, depreciation and maintenance.

Equipment - Includes equipment and amortization.

Miscellaneous - Includes curricula, experiments, research and organizational follow-up.

The figures cited here are the costs to the government budget and not the overall costs. The figures for equipment and computer hardware assume that government participation will cover a third of the overall cost, which will be divided between the government, the local authorities and the parents.

A detailed budget which presents all the calculations and computation indexes will be submitted separately.

Provisos

Two members of the committee wished to express their reservations about the recommendations endorsed by the committee.

Below are their provisos.

A. Dr. Eliezer Marcus

Recommendation A/1:

The words "preferably, starting in the third grade" should be crossed out.

Recommendation A/8:

Matriculation examinations should not be required for the new discipline.

Recommendation D/7:

The organizational supervisors for science, technology and computers should be accountable to the pedagogic secretariat, and should work in close cooperation with the "Tomorrow 98" administration.

Recommendation D/11:

Dr. Marcus does not support the recommendation which does not allow the education reform to be fully implemented.

B. Mr. Menahem Argov:

Mr. Argov opposes unifying science and technology at the junior high school level and proposes that technology should remain a separate subject, both because of the characteristic professional content and because of the process of training and preparing the student for the work world. He opposes dropping industrial arts from the junior high school curriculum. He proposes accelerating the implementation of the technological education reform and recommends that the student be able to choose from the entire high school system - both academic and technological tracks - while making the institutions responsible for preventing drop-outs. Mr. Argov opposes the "academic" trends expressed by this report, which come at the expense of technological education, and is concerned about a negative impact from the spirit of this report, especially regarding the achievements of the education system in preventing drop-outs and in absorbing students from lower socio-economic backgrounds.