A REPORT TO THE MINISTRY OF INDUSTRIES OF THE SYRIAN ARAB REPUBLIC ON THE STATUS OF VOCATIONAL TRAINING WITH RELATED RECOMMENDATIONS.

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C O N T E N T S

	PAGE
INTRODUCTION	1
TRAINING PROGRAMS	3
Current Programs	3
Industrial Apprenticeship	3
Accelerated Training	7
Special Training	12
Future Programs	14
New Programs at Aleppo and Damascus	14
New Programs at Homs and Deir El Zor	15
REVIEW OF VOCATIONAL TRAINING	17
Organization	17
Planning	19
Programs Implementation	20
Facilities and Equipment	24
Damascus and Aleppo Complexes	24
Institutes and Training Schools	26
Facility and Equipment Planning	28
Major Problems	32
Organizational Fragmentation	32
Comprehensive Planning	32
Curriculum Development and Training Aids	32
Personnel Development	33
Facilities and Equipment	33
RECOMMENDATIONS	34
Terminal Goals	35
Comprehensive Planning	35
Curriculum Laboratory	36
Information Resource Base	36
Teacher Training	37
Facilities and Equipment	38
Enabling Goals	39
Immediate Needs	39
Future Options	43
APPENDIXES	44
A. Principal Duties	44
B. Key Individual Contacts	45
C. General Recommendations for Shops	47
D. List of Supplemental Documents Provided	63

INTRODUCTION

This report is a partial response to the request of the Ministry of Industries of the Syrian Arab Republic for technical consultation from the United States through the Agency for International Development (US/AID). It was accomplished by an Auxiliary Member of the United States Department of Labor International Technical Assistance Corps (DOLITAC) through a service agreement with US/AID. The principal duties of the consultant, as communicated through a series of telegrams, are listed in Appendix A. The consultation is limited to the Ministry of Industries, although vocational training is supported by other ministries, and to the public sector (national industries).

The report is addressed to two audiences. The primary audience is the Ministry of Industries of the Syrian Arab Republic. The purpose is to describe the state-of-the-art as it relates to the principal duties of the consultant and to make recommendations to overcome obstacles to the further development of vocational training in Syria. The secondary audience is to the US/AID and DOLITAC. Consequently, the report includes some background material that is well known to the Ministry of Industries.

The report consists of three major sections--(1) a description of the current and future training programs, (2) a review of vocational training within the Ministry of Industries as it relates to the principal duties of the consultant, and (3) recommendations in the form of terminal goals and enabling goals.

A preliminary draft of the report was reviewed by officials within the

Ministry of Industries who were invited to correct any errors of fact and misperceptions of the consultant, and provide any further comment they desired to make. This review was very helpful and appreciated by the consultant. Nevertheless, the responsibility for the report and its contents rests entirely with the consultant.

Other aspects of the technical assistance took the form of discussions of the substantive aspects of the principal duties and the providing of supplemental resource documents.

TRAINING PROGRAMS

When the Ministry of Industries was established in 1958 it was charged with the development of centers of vocational training. The purpose of the centers was to provide skilled and semi-skilled workers of both sexes for industries in the public sector of Syrian industry.

CURRENT PROGRAMS

Three forms of vocational training are currently in existence. They are known as (1) industrial apprenticeship, (2) accelerated training, and (3) special training. Each is briefly described below.

Industrial Apprenticeship

The purpose of industrial apprenticeship is to prepare skilled workers for industries in the public sector. Students must have completed the preparatory stage (grade 9), be physically able to perform the anticipated occupation and 15 to 18 years of age. The student must agree to work for a public employer for a period twice as long as his training. The student, employer and the Directorate of Professional Training and Qualification (third party) participate in the indenture contract. For this the employer pays the student 150 pounds per month the first year and 240 pounds the second year.

The industrial apprenticeship is composed of the following five major components:

1.	Elimination of industrial illiteracy	12 weeks
2.	Basic training	24 weeks
3.	Primary production training	12 weeks

4. Production training 40 weeks

5. Final preparation 8 weeks

The industrial illiteracy component consists of orienting the student to the world of work. Basic training develops the essential knowledge and skills related to the occupational area. Primary production training relates basic training to simulated production products and environments. Practical training consists of on-the-job training conducted in a factory under the supervision of industrial personnel. During final preparation the student returns to the vocational complex to eliminate any observed limitations in the factory setting and performs a "graduation" project.

During the first three components, which are administered at the vocational training complex, both practical training and theory (related instruction) are provided. A schedule of the overall industrial apprenticeship is provided in Figure 1. A schedule of the theoretical lessons by subject area is provided in Figure 2.

F I G U R E 1

SCHEDULE OF INDUSTRIAL APPRENTICESHIP BY COMPONENTS AND ACTIVITIES

Components	Elimination of Industrial Illiteracy		Basic Training		Primary Production Training		Production Training		Final Preparation	
Activities	Weeks	Hours	Weeks	Hours	Weeks	Hours	Weeks	Hours	Weeks	Hours
Practical training	10	240	22	528	9	216	35	1190	-	-
Practical tests	1	24	2	48	1	36	2	72	4	144
Theoretical lessons	10	120	22	264	9	108	35	70	2	72
Theoretical tests	1	12	2	24	1	36	1	36	1	36
Holiday	1	36	-	-	1	36	2	72	1	36
Total	12	432	24	864	12	432	40	1440	8	288

FIGURE 2

SCHEDULE OF THEORETICAL LESSONS FOR THE APPRENTICESHIP SYSTEM BY SUBJECT AREA

nponent	Eliminating Illiteracy	Industrial	Basic Training		Primary Production Training		Total Hours
›jects	Hours per week	Hours per component	Hours per week	Hours per component	Hours per week	Hours per component	per course
lustrial ıwing	3	30	2	44	2	18	92
lustrial :hematics	2	20	1	22	1	9	51
ecial :hnology	-	-	2	44	2	11	62
ısurement	1	10	1	22	-	-	32
evention of :idents	1	10	1	22	-	-	32
:hnology of :erials	1	10	1	22	-	-	32
:ional & Social ıcation	1	10	1	22	1	9	41
:mistry	-	-	1*	24	-	-	24
hanics & Parts Machines	-	-	1	22	4	36	58
:ctricity	-	-	1	22	1	9	31
eign Language	2	20	1	22	1	9	51
of Labour	1	10	1	22	-	-	32
						Total	538

*Only for foundry and heat treatment sections

During 1975-1976 there were 264 trainees enrolled in the apprenticeship program in the following courses:

Course	Number of Trainees
Textile	34
Electricity	52
Metals	
Turning	18
Milling or Grinding	25
General Fitting	23
Tool & Die Making	6
Sheet Metal	21
Welding & Blacksmithing	72
Foundry	7
Pattern Making	7
Total	264

Accelerated Training

The purpose of accelerated training is to provide adults with entry-level production skills within the shortest period of time. The trainee must be literate, 16 to 35 years of age and physically capable of performing the occupational objective. The trainee recruited from public industry is paid 150 pounds per month from an employer but must agree to remain with the employer at least twice as long as the period of training. Trainees who do not come from public industries do not receive payment.

Accelerated training consists of two types--the normal course and the special course. The normal course provides some occupational specialization but the special course provides only basic skills. The normal course lasts 36 weeks and breaks down as follows:

1.	Practical training	792 hours
2.	Practical tests	72 hours
3.	Theoretical lessons	396 hours
4.	Theoretical tests	36 hours

The schedule for theoretical lessons is displayed in Figure 3.

The special course lasts 24 weeks and breaks down as follows:

1.	Practical training	528 hours
2.	Practical tests	48 hours
3.	Theoretical lessons	264 hours
4.	Theoretical tests	24 hours

The schedule for theoretical lessons is displayed in Figure 4.

The number of trainees completing both accelerated and apprenticeship programs at Damascus and Aleppo complexes are displayed in Figure 5. In Syria a facility for teaching a program area (e.g., metals, automotive, electricity, etc.) are known as "centers," and the facility for a group of centers is known as a "complex." Hence, there are several centers within both the Damascus and Aleppo complexes.

FIGURE 3

SCHEDULE OF THEORETICAL LESSONS FOR THE NORMAL COURSE OF ACCELERATED TRAINING

Components	Eliminating Industrial Illiteracy		Basic Training		Total Hours per Subject
Subjects	Hours per Week	Hours per Component	Hours per Week	Hours per Component	
Industrial Drawing	3	33	2	44	77
Arithmetic	3	33	2	44	77
Special Technology	2	22	2	44	66
Measurement	2	22	1	22	44
Prevention of Accidents	1	11	2	44	55
Technology of Materials	-	-	2	44	44
National & Social Education	1	11	1	22	33
				TOTAL	396

FIGURE 4

SCHEDULE OF THEORETICAL LESSONS FOR THE SPECIAL COURSE OF ACCELERATED TRAINING

Components / Subjects	Eliminating Industrial Illiteracy		Basic Training		Total Hours per Subject
	Hours per Week	Hours per Component	Hours per Week	Hours per Component	
Industrial Drawing	3	24	3	42	66
Arithmetic	3	24	2	28	52
Special Technology	2	16	2	28	44
Measurement	1	16	1	14	30
Prevention of Accidents	1	8	1	14	22
Technology of Materials	-	-	2	28	28
National & Social Education	1	8	1	14	22
				TOTAL	264

FIGURE 5

NUMBER OF TRAINEES COMPLETING ACCELERATED AND APPRENTICESHIP PROGRAMS AT THE DAMASCUS AND ALEPPO COMPLEXES BETWEEN 1970-1976

Years	Programs Within Training Complexes*															
	Metal Trade Training Center		Electric Training Center		Building Training Center	Drawing Training Center		Secretary Training Center	Spinning & Weaving Training Center	Automo-tive Training Center	Total	
	D	A	D	A	D	D	A	D	A	A	D	A
1970-71	90	126	24	-	20	-	-	-	35	55	134	216
1971-72	71	116	74	-	20	-	-	-	50	115	165	281
1972-73	130	104	90	-	25	-	-	-	70	66	245	240
1973-74	74	72	42	-	23	-	-	-	59	65	139	196
1974-75	178	75	61	-	24	23	21	-	52	91	286	218
1975-76	368	375	147	48	87	44	24	35	126	80	681	653

* A - Aleppo
D - Damascus

Special Training

A third kind of vocational training is provided by the Ministry of Industry to its own constituency and sometimes to the constituents of other ministries. Special training takes place in the centers within the two vocational education complexes at Damascus and Aleppo, intermediate institutes, and schools of qualification and training. In most cases they are located near to the productive capacity (e.g. factory) they serve. The length and content of the programs vary considerably. Student selection also differs by type of training and organizational sponsorship.

The following programs are offered in the vocational training complexes of Damascus and Aleppo for the Ministry of Industry.

Programs	Locations	
1. Metal trades	Damascus	Aleppo
2. Electricity/electronics	Damascus	Aleppo
3. Carpentry	Damascus	
4. Textiles		Aleppo
5. Automotive		Aleppo
6. Drawing	Damascus	Aleppo

In addition, there is a center for secretary training and an English language laboratory that is not limited to the Ministry of Industries.

The intermediate institutes provide two years of training to graduates of secondary schools. The students must agree to serve three times as long as their training period for which they receive 150 pounds per month. The intermediate institutes have only recently been established and are currently expanding their capacity, but recent information concerning their capacity and opening dates is provided in Figure 6.

FIGURE 6

AVERAGE CAPACITY AND OPENING DATES OF INTERMEDIATE INSTITUTES

Names	Date of Opening	Number of Students at 1974-75	Number of Students at 1975-76
Intermediate Institute for Engineering & Metallurgic Industries in Damascus	1/25/75	85	125
Intermediate Institute for Chemical Industries in Damascus	1/25/75	62	125
Intermediate Institute for Food Industries in Damascus	2/22/75	72	125
Intermediate Institute for Chemical Industries in Homs	2/15/75	90	125
Intermediate Institute for Agricultral Machinery in Aleppo	2/15/75	50	125
Preparing Institute for Spinning & Weaving in Damascus	4/25/70	108	125

In 1975 and 1976 fifteen schools for qualification and training were introduced and named after the firms that introduced them and where they are located. They are a special response to the development of skilled manpower to attain the goals of Syria's fourth 5-year plan. The conditions of admission and duration are similar to the industrial apprentice program. The schools are as follows:

Schools	Locations
1. Cables	Damascus
2. Metal Industries	Damascus
3. Metal Structures	Damascus
4. Matches and Pencils	Damascus
5. Tanning	Damascus
6. Electronics	Damascus
7. Glass and Porcelain	Damascus
8. Asbestos	Aleppo
9. Glass and Glass Lamps	Aleppo
10. Porcelain	Hama
11. Iron and Steel	Hama
12. Batteries	Aleppo
13. Cement	Damascus
14. Chemical Fertilizers	Homs
15. Electric Motors and Aluminum	Lattakia

FUTURE PROGRAMS

The need for increasing the quantity and quality of trained manpower to attain the industrial development goals of the fourth 5-year plan has accentuated the need for vocational training. Consequently, existing programs will be expanded in scope and new progrmas will be started at the existing vocational training complexes at Aleppo and Damascus. Two new vocational training complexes at Homs and Deir El Zor will be constructed and equipped by 1979. Improvements in the existing programs of the intermediate institutes and the schools of qualification and training will also be forthcoming. New institutes and training schools will also be established.

New Programs at Aleppo and Damascus

In addition to the upgrading and expansion of existing progrmas at the Aleppo and Damascus complexes a number of new programs will be initiated. The Aleppo complex will add programs for the training of secretaries and chemical assistants. The Damascus complex will add programs to train workers

for the textile, automobile repairs, and chemical industries. The budget allocations proposed in the fourth 5-year plan for the development of these complexes is 7.0 million Syrian pounds.

New Programs at Homs and Deir El Zor

If current plans materialize the development of skilled manpower by the existing and new complexes at Homs and Deir El Zor will more than double by 1979. As indicated in Figure 7 the two new complexes could add another 2,046 trainees if used to capacity. Each of the new trainee complexes will have the following programs:

1. Metal Trades
2. Building Trades
3. Electricity and Electronics
4. Textiles
5. Automotive Repairs
6. Agricultural Mechanics
7. Chemicals

The budget allocation proposed in the fourth 5-year plan for the development of complexes at Homs, Deir El Zor and intermediate institutes is 60.0 million Syrian pounds.

FIGURE 7

PLANNED TRAINEE CAPACITY OF HOMS AND DEIR EL ZOR COMPLEXES

Metal Trades		Electricity and Electronics		Building Trades		Spinning and Weaving		Automotive		Agricultural Mechanics		Chemical		Total Trainees	
H	D	H	D	H	D	H	D	H	D	H	D	H	D	H	D
212	212	180	156	276	240	137	117	112	112	114	114	32	32	1063	983

TOTAL 2046

H--Homs

D--Deir El Zor

REVIEW OF VOCATIONAL TRAINING

The principal duties of the American consultant for the review of vocational training in the Syrian Arab Republic were indicated in various communications to the American Government. They are identified by duty numbers in Appendix A. For the purpose of this report they have been organized in the following categories:

Categories	Duty Number
Organization	2
Planning	1 & 3
Program Implementation	5 & 6
Facilities and Equipment	1, 5, 6 & 7
Major Difficulties	4
Recommendations	9

The first five categories are incorporated in this section--Review of Vocational Training. The recommendations are included in the final section of the report.

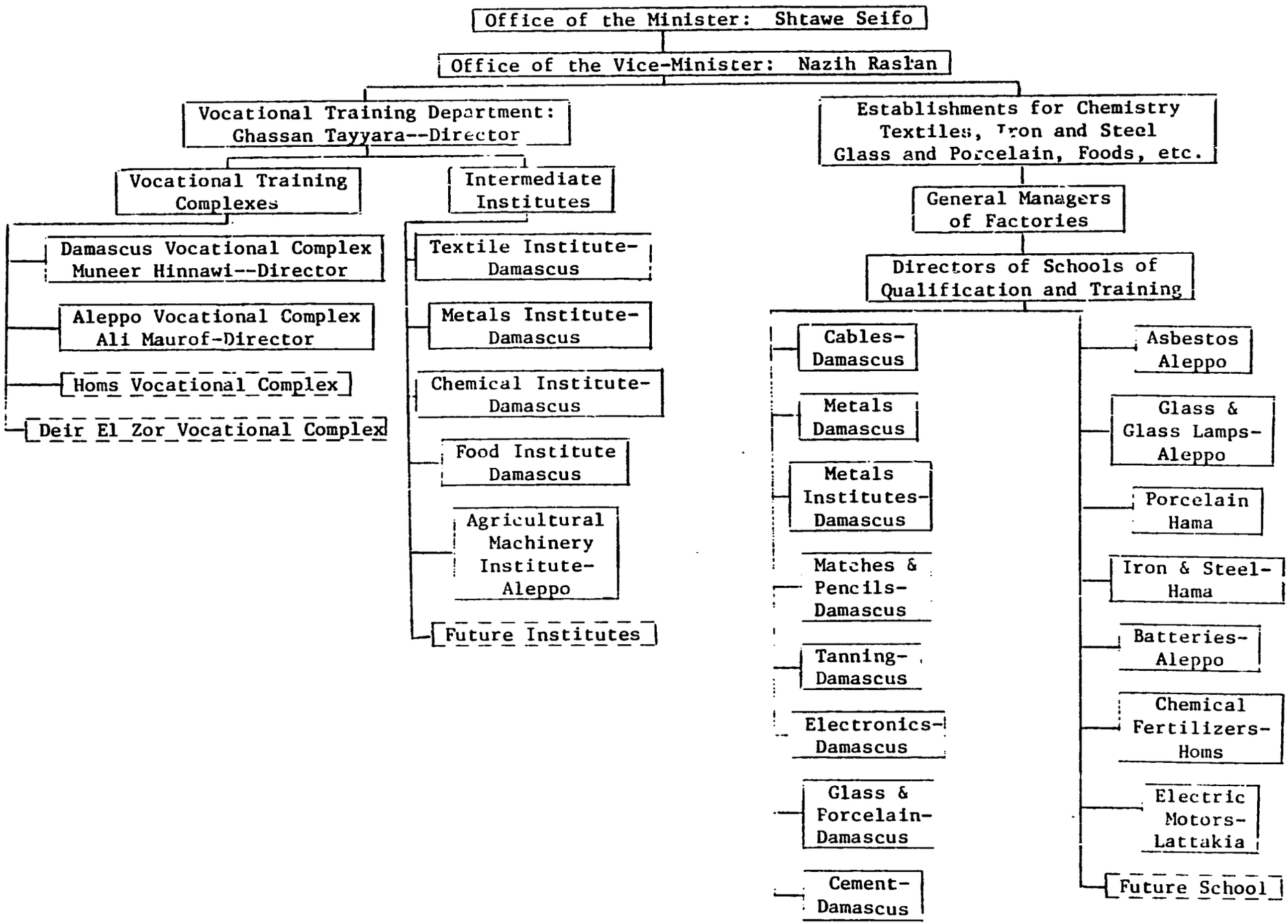
ORGANIZATION

The vocational training of skilled and semi-skilled industrial workers in Syria is carried out under a number of ministries (education, public works, labor, etc.) but the Ministry of Industries carries a major responsibility. In some instances, such as the training of secretaries, the Ministry of Industries assumes some of the responsibility for other ministries. However this is the exception rather than the rule.

A simplified organization of vocational training in the Ministry of Industries is displayed in Figure 8. The Ministry is organized under

FIGURE 8

ORGANIZATION OF VOCATIONAL EDUCATION IN THE MINISTRY OF INDUSTRIES



directorates and establishments. The Vocational Training Department has responsibility for the vocational training complexes and the intermediate institutes. The establishments (unions of industrial specialties) have responsibility for the industrial production in the factories and the newly established schools of qualification and training.

Limited informal relationships exist between the vocational training institutions of the Directorate and the factory schools of the establishments. Although the necessity of relating vocational instruction to the productive applications of the factories and the dependency upon the institutions of the Directorate for a trained supply of labor is widely acknowledged, there is no formal authority that links the two together. Current interaction is dependent upon friendship ties and the spirit of cooperation between members of the ruling political party from which the current leadership is provided. This tenuous and fluid situation will undoubtedly give way to a more formal authority structure within the Ministry in the near future.

PLANNING

Although significant decisions have been made by the Syrian Arab Republic in regard to the future of vocational training, there is an obvious deficiency of systematic planning expertise to implement the general vocational training goals of the government. This is not only apparent in the underdevelopment of planning agencies to carry out this function, but in the absence of planning processes and products and the dependence upon external assistance. For instance, this is evident in the lack of any comprehensive planning documents, programmatic goals and objectives, management information systems, needs assessments, evaluations, organized curriculum development processes and the systematic development of the new vocational complexes and the specification

of equipment. There is an obvious need for the development of expertise in the substantive areas of planning for vocational training and in planning technology (e.g., Program Evaluation and Review Technique (PERT)).

This is not to overlook the beginning of work in this area. For instance, the Planning Commission has a Directorate or Population and Manpower Planning with a small effort underway in the Department of Manpower Planning. Surveys have been conducted by this Department of manpower supply and demand in the public sector. Although the level of detail for vocational planning leaves much to be desired it is a significant beginning.

Within the Vocational Training Department of the Ministry of Industries there is another significant unit known as the Study Office. However, the Office is only staffed by one full-time and five part-time engineers who have full-time assignments elsewhere in the Department. It is charged with implementing the 5-year plan, planning new complexes and conducting community surveys. This is a large order for such a small office. Not only is the staff too small but the essential expertise is not developed.

PROGRAM IMPLEMENTATION

For an American observer the most obvious deficiencies in the vocational training system of the Syrian Arab Republic fall in the broad area of program implementation. Included within this area are instructional plannind and curriculum development, instructional execution, instructional management, coordination and instructional evaluation.

It is apparent that the recruitment and education of educators in Syria does not provide for the development of educational technology--only technical

expertise in subject area specializations. In this system the lead teacher is commonly an engineer with five years of engineering preparation at the university level. Some of the engineers have studied abroad although many come from the Syrian Univeristies in Damascus, Aleppo and Lattakia. Instructors have a technical secondary education. Sometimes trainees are also used as instructors because of the shortage.

The deficiency in program implementation could be alleviated by developing the capacity of their administrators and teacher educators to provide personnel development for all educators including on-the-job supervisors of trainees in the factories with the types of educational technology with which they can profit. Some examples of types of educational technology that could be considered are listed here.

Instructional Planning & Curriculum Development

How to conduct a community survey

How to organize and maintain an advisory committee

How to develop program goals and objectives

How to conduct an occupational analysis

How to develop a course of study

How to determine the needs and interests of students

How to develop student performance objectives

How to plan a unit of instruction

How to write a lesson plan

How to select and obtain student instructional materials

How to prepare teacher-made instructional materials

How to modularize curriculum

Instructional Execution.

How to direct student laboratory experiences

How to employ simulation techniques

How to direct student study

How to direct students in applying problem-solving techniques

How to direct the project method

How to introduce a lesson

How to summarize a lesson

How to direct small group discussions

How to employ oral questioning techniques

How to employ reinforcement techniques

How to provide instruction for slower and more capable students

How to present information through an illustrated talk

How to demonstrate a manipulative skill

How to demonstrate a concept or principal

How to conduct team teaching

How to direct individualized instruction

How to present information using subject matter experts

How to illustrate with bulletin boards and exhibits

How to illustrate with models, real objects and flannel boards

How to present information with an overhead projector

How to present information with filmstrips and slides

How to present information with films

How to present information with audio recordings

How to present information with televised and video-taped materials

How to direct program instruction

How to present information with a chalk board and flip chart

Instructional Evaluation

How to establish criteria for student performance

How to assess student cognitive performance

How to assess student affective performance

How to assess student psychomotor performance

How to determine student grades

How to evaluate instructional effectiveness

Instructional Management

How to project instructional resource needs

How to prepare budgets and reports

How to arrange for expanding facilities and/or for purchasing supplies

How to maintain a filing system

How to provide for the safety needs of students

How to provide for the first aid needs of students

How to assist students in developing self-discipline

How to organize a vocational laboratory

How to manage and maintain a vocational laboratory

Coordination

How to develop cooperative programs with factories

How to identify and secure prospective training stations

How to place students on the job

How to develop the training ability of on-the-job instructors

How to coordinate and supervise on-the-job instructors

How to evaluate students on-the-job

How to plan and conduct theory (related) instruction

Although some of the examples in the above list might not be useful for Syrian educators, a competency-based (performance-based) approach should be used in determining which are useful and which are not. In other words, a study should be conducted to determine specifically what Syrian educators must know and do to execute their responsibilities effectively. In fact, this is the same approach that should be used in curriculum development for vocational trainees.

FACILITIES AND EQUIPMENT

In many areas of facility and equipment review it is difficult for an American observer to critique Syrian vocational training establishments. For example, some of the philosophies and the organization of vocational training differ, the area of educational technology is undeveloped in Syria, program objectives are not precisely specified, and many regulations such as construction of buildings and provisions for safety differ. It would be unfair to use the criteria for facilities and equipment in the United States to evaluate Syrian institutions. Nevertheless, there are some mutual standards and areas for comment.

Damascus and Aleppo Complexes

The best facilities currently available for vocational training are the vocational complexes at Damascus and Aleppo. They are large masonry structures with high ceilings and relatively few supporting partitions and obstructing pillars. Consequently, they allow for fexibility and change as new programs, philosophies, technologies and instructional strategies emerge. There also appears to be relatively good fenestration and lighting, ample wall space, good provisions for ventilation, and ample provisions for power. Auxiliary

space for material storage, tool storage, and office space is also available. An instructor has good visibility for oversight of the workshop areas and there appears to be ample room for traffic.

Some other aspects of these compelexs are not as desirable. There appears to be little consideration of accoustical problems. The noise level in some workshops is a significant problem, especially for the theory classrooms that are adjacent to the workshops. Many aspects of shop layout are not functional. For example, machinery is often arranged in rows without concern for their function and relationship to other kinds of machinery. Neither can one observe the desirable flow of materials and process in the natural order of storage, processing, fabrication and finishing. There are also material storage problems. Although ample space is available the management and storage within the allocated rooms can often be improved. More serious, however, is the poor location of some storage rooms. In a few situations, heavy, long, and bulky material must pass through a small external access, down a narrow hall and through a narrow door into storage. When the material moves from storage to the workshop some of the same problems exist. Finally, there appears to be little provision for audio-visual media and teaching aids storage and control, but this, or course, relates to the undeveloped state-of-the-art in instructional technology.

Although there are many impressive pieces of machinery in the two complexes, many of them are out of date and do not provide the type of training that is needed in the factories. Some needed equipment does not exist. This is a constant complaint of the engineers and instructors and is legitimate in many instances. It is readily accepted that if agricultural

and industrial output is to be increased contemporary machinery is needed, but it is not always recognized that increasing the quantity and quality of human productive capacity also requires contemporary equipment. This is one reason why vocational training will always be more expensive than academic education and need extra funds.

The Institutes and Training Schools

In view of Syria's goal to develop its labor force through vocational training and the decision to expand its vocational training capacity, the lack of indigenous planning expertise is undoubtedly a serious deficiency. Syrians must master the substantive aspects of facility and equipment planning, the process, and the techniques. Anything short of this will result in costly and unfortunate mistakes.

A number of years ago a school workshop planning committee suggested ten steps that should be followed to plan California's vocational facilities. They are generally applicable for Syria although many details of implementation would differ.

1. The first step in planning a school shop is to describe in some detail the educational activities to take place in the shop. The instructor, the administrator, the advisory committee and the group of participants concerned with the educational program should participate in the planning.
2. The second step is to determine the shop load, the number of students to be accomodated, the time available for instruction, the age and grade level of the students, and the size and number of classes.
3. The third step is to become acquainted with current codes and

standards for the construction of school shops, and from this study to develop a reference check list applicable to the shop being planned.

4. The fourth step is to hold a preliminary conference with the architect, discussing educational activities, shop load, standards, building design, space considerations, and cost limitations for guidance and further planning. Visits, with the architect to well-planned schools and industrial shops is recommended.
5. The fifth step is to make a list of the equipment, tools, and supplies to be used in the shop.
6. The sixth step is to decide what principal areas, facilities, and auxiliary rooms are needed.
7. The seventh step is to draw, in consultation with the architect, a preliminary shop floor layout to scale, showing locations of principal areas, facilities, auxiliary rooms, and equipment.
8. The eighth step is to prepare, for the architect, a description of the shop and set of "instructor specifications" to explain and supplement the floor plan.
9. The ninth step is to assist the architect in the revision of the preliminary plan, answering additional planning problems posed by the architect. Detailed sketches of built-in equipment should be provided at this time.
10. The tenth step is to assist the architect by providing answers to questions of detail as they appear during the final planning and construction.

Inherent in these ten steps are several important assumptions. First, a good vocational facility must be designed and built to accomodate the program that will be conducted in it. Buildings and equipment should facilitate the program goals and objectives--not constrain them. Consequently, what is going to be taught and how it is going to be taught should be determined first.

Second, those who are involved in the instructional process (e.g. engineers, instructors, administrators etc.) and those most concerned with the outcomes (e.g. factory personnel, members of professional associations, etc.) should participate in the planning process. Such people can provide expert advice. They can be members of planning committees.

Third, there should be a close working relationship between the architect and the people who will use the facilities. Without it the architect will undoubtly develop facilities that are less useful for the implementation of the programs.

Finally, the specifications of facilities and equipment is the most important activity. A detailed document of educational specifications should be built. In the United States a comprehensive document of educational specifications (EDSPECS) is developed when any vocational facility is built or modified. It is an analytical description of the purpose, method, and organization of the educational program prepared as a guide to the planning of educational facilities. A typical outline of the contents is as follows:

1. GENERAL CONSIDERATIONS

Description of Educational Plan

Program Considerations

Philosophy of education for each type of program

Community characteristics

Student body composition

Curriculum variations

Relationship of school or department to school system or school

Administrative Considerations

Attendance area to be served

Field of vocational and practical arts education to be provided

Types of programs in each field

Time requirements for each type of program in each field

Expected enrollments by school division program, type of program, and course

Local economic conditions

Safety provisions

Description of Physical Plant

* General Character of the building

General atmosphere to be created by the building

General type of construction

Major sections or units of the building

Preferred number of stories

General Facilities required in the building: instructional, auxiliary, and community use areas

---

*These vocational facilities may be within a building which accommodates other areas of education.

Essential Special Characteristics of the site location

2. DESIRED SPACES AND EDUCATIONAL PROGRAM

Instructional Spaces

Required number and kinds of rooms

Describe for each room:

Program and functions

Number of students and types of groups to be accomodated

Location in relation to other facilities

Required special physical arrangements and/or features

Each item of required equipment and furniture

Desirable built-in features

Devices, arrangements, and unusual physical features essential to safety

Special lighting, power, ventilating, or other services peculiar to the room

Space required for equipment, furniture and instructional activities

Auxiliary Spaces

Required number and kinds of rooms

Describe for each room:

Functions, facilities and location relationships

Sizes and kinds of groups to be accommodated or size and kind of material to be stored

Types of activities for which provisions must be made

Essential special physical relationships and features

Each item of required equipment, furniture, and built-in features

Special lighting, power, ventilating or other service peculiar to room

3. SPECIAL SITE ARRANGEMENT FEATURES

Orientation requirements, if any

Service drive requirements

Car and truck parking requirements

Outdoor storage requirements

School or public transportation requirements

Loading and unloading docks

A paved patio in a protective enclosure

4. SPECIAL PHYSICAL ASPECTS OF BUILDING

In terms of special performance, if required

Structural: Lighting, accoustics, hardware and lock systems, window, floor, and wall surfaces

Mechanical: Ventilation, plumbing and heating, and air conditioning

Utilities: Electrical power systems, fire alarm systems, gas service, sewage systems, communication systems, clock and program systems, and water supply

5. FINANCIAL REQUIREMENTS FOR THE PROJECT

Architect's cost estimates

Cost of equipment and furniture for each listed instructional or auxiliary space

Plan for financing the project

Plan for fund allocation

Some general unabridged recommendations for workshops used in the state of Ohio are included in Appendix D for consideration and adaptation. Of

course, specific recommendations for program areas are also available and have been provided in supplemental material.

MAJOR PROBLEMS

The Syrian Arab Republic is a rapidly developing nation that has made some necessary decisions in the area of vocational training to support its economic development and has made a good start. It has some capable leadership, a varied approach to manpower training problems and some important facilities and equipment. As expected, Syria also has some significant problems. Some of the major problems related to the scope of this review and report are briefly stated below so as not to be overly redundant.

Organizational Fragmentation

The organization of vocational training within the Ministry of Industries and between the Ministries appears to be separate and fragmented. Authority is decentralized and sometimes without clear lines of responsibility within the Ministry of Industries.

Comprehensive Planning

There is no comprehensive planning although there is a beginning towards this goal in the Planning Commission and the Study Office of the Department. Planning is needed for policy and management decision-making, program development, facilities, and equipment.

Curriculum Development and Training Aids

There is no systematic and standardized curriculum development and few available resources for it. Engineers and instructors must rely upon their

own resources even though few have any training for it. Relatively few training aids are available and in use.

Personnel Development

The personnel who provide leadership (administrators, engineers, and instructors) have been trained in the scientific and mechanical areas of expertise. Few have any formal training in educational technology--the field in which they are responsible as professionals.

Facilities and Equipment

Some very significant accomplishments have been made with facilities and equipment, and planned new complexes will improve this area considerably. Nevertheless, much new equipment will have to be obtained for the new and current facilities. Indigenous personnel are not being fully utilized as resources and there is a lack of knowledge about how to proceed.

RECOMMENDATIONS

The recommendations that are represented in this report grow out of the strong conviction that the most significant problems in vocational training in the Syrian Arab Republic have their roots in the apparent lack of professional educators. The current and emerging leaders in vocational education have acquired considerable expertise in their respective subject area specialties, but they have not been trained to solve educational problems. Without the indigenous capacity to recognize and deal with educational problems themselves, they tend to rely on resources that have been designed for other situations and external, short-term, experts. Until indigenous leadership with educational expertise emerge, Syrian vocational educators will be forced to rely on stop-gap measures and be vulnerable to innumerable misjudgements by well-intended, external consultants and the commercial interests of those who have something to sell.

This is not to overlook the current preoccupation with facilities and equipment as a real and urgent concern. Adequate facilities and equipment are necessary to the development of a skilled labor force as it is in the production of products and the rendering of services. Obviously, the Syrian Arab Republic needs assistants in the acquisition of necessary facilities and equipment. But even in the planning and acquisition of facilities and equipment, deficencies of educational expertise are evident.

Consequently, the recommendations that follow are weighted towards personnel developments in educational expertise.

Two different discussions follow, the first is concerned with terminal goals and the second is concerned with enabling goals. The enabling goals are designed to help achieve the terminal goals. They do not represent a long-term plan for that would be premature. Other enabling objectives should be formulated after some experience with those presented here.

TERMINAL GOALS

Five areas of development are specified for urgent consideration. How they should be organized and incorporated within the Ministry of Industries is not specified.

COMPREHENSIVE PLANNING

The capacity to conduct comprehensive planning of vocational training should be developed and established. The planners should be able to perform the following:

1. Conduct short, intermediate and long-term planning
2. Plan and conduct community surveys of training needs and resources
3. Collect management information data and process it for administrative purposes.
4. Evaluate programs and make follow-up studies
5. Organize, conduct and maintain advisory committees
6. Conduct policy studies
7. Develop work break-down structures and flow charts for comprehensive planning projects

8. Coordinate planning activities within the Ministry of Industries, the Planning Commission and other related governmental agencies.
9. Provide consulting services throughout the Ministry of Industries.
10. Continue his/her professional development.

CURRICULUM LABORATORY

A curriculum laboratory to systematically develop uniform curriculum with a competency-based (performance-based) approach should be established and maintained. The personnel of the laboratory should be able to perform and supervise other participants in the following:

1. Conduct occupational analysis
2. Develop program goals and objectives
3. Develop student performance objectives
4. Develop courses of study
5. Develop units of study
6. Develop lesson plans
7. Develop instructional materials
8. Develop teaching aids
9. Develop modularized curriculum
10. Project instructional resource needs
11. Continue his/her professional development

INFORMATION RESOURCE BASE

An organized information resource base should be established and maintained to provide the requisite resources. The personnel supporting this effort should be able to perform the following:

1. Establish and maintain a library of printed documents
2. Establish and maintain microfiche library
3. Select and obtain all resource materials in cooperation with other educational personnel
4. Utilize acquisition resources such as Abstracts of Instructional And Research Material (AIM/ARM) from the Center for Vocational Education at Ohio State University
5. Select, obtain and manage an inventory of occupational analyses
6. Select and obtain teaching aids
7. Operate and maintain microfiche reader/printers
8. Continue his/her professional development

TEACHER TRAINING

A vocational teacher education program should be established and maintained with minimal levels of competency specified for teachers within the Ministry of Industries. The teacher educators should be able to perform the following:

1. Utilize a competency-based approach in all teacher education activities
2. Plan and evaluate vocational teacher training programs systematically
3. Execute instruction effectively
4. Manage instruction effectively
5. Coordinate instruction with participating individuals and organizations
6. Continue his/her professional development

FACILITIES AND EQUIPMENT

Establish and maintain facilities and equipment planning office for the development and improvement vocational training facilities and equipment should be established and maintained. The personnel of the office should be able to perform and supervise participants in the following:

1. Select and direct the activities of general and program area advisory committees
2. Plan and conduct a community survey
3. Direct the development of educational specifications with all participating individuals and organizations
4. Read and interpret blueprints
5. Monitor building construction
6. Select and obtain all facility planning documents
7. Maintain filing system for all pertinent facility and equipment documents
8. Evaluate vocational training facilities with established principals and standards
9. Evaluate site surveys with established principals and standards
10. Coordinate training plans and building development with architects and comprehensive planners
11. Develop work breakdown structures and flow charts of facility and equipment planning tasks.
12. Provide consulting services throughout the Ministry of Industries
13. Continue his/her professional development

Obviously the terminal goals specified in each of the five categories

are not presumed to be conclusive or even entirely realistic. They do, however, clarify the perceived need and provide initial basis for dialogue and decision making.

ENABLING GOALS

Five enabling goals are recommended for immediate implementation. The magnitude of the need and the plans for the development of vocational training programs and facilities accents their urgency.

IMMEDIATE NEEDS

A short-term(3 to 4 weeks) awareness and decision-making tour of vocational training in the United States should be planned and conducted for high-level leaders of vocational training in Syria. The general purpose is to become aware and oriented to the role and capacity of vocational training practices and institutions in the United States to address and meet the needs of vocational training institutions in Syria. Specifically, the tour should provide for the following:

1. Develop an awareness and orientation to the contribution of educational technology and personnel development to the development of vocational training in America.
2. Develop an awareness and orientation to the potential contribution of educational technology and personnel development to the development of vocational training in Syria.
3. Study the planning process for vocational training at the federal, state and local levels in the United States.
4. Study the administration and management of vocational training in the United States.

5. Study the planning and establishment of vocational training facilities and equipment.
6. Study the development of vocational training personnel, especially teachers, in the United States.
7. Study the role and contributions of the National Center for Vocational Education at the Ohio State University to vocational, technical and career education in the United States.
8. Study the role and contributions of one or more curriculum laboratories to vocational training in the United States.
9. Study a variety of training programs within American industrial enterprises.
10. Formulate a plan for the development of Syrian vocational training leaders that utilizes the available institutions in the United States.

A team of four American experts in vocational training should be sent to Syria to work with designated counterparts to establish and maintain within the Ministry of Industries (1) a planning office, (2) a curriculum laboratory, (3) a teacher training center, (4) an information and resource center, and (5) one or more exemplary demonstration programs (discussed below). It should be a two-year effort with the option to extend the effort depending upon need and circumstances. It is based upon the assumptions that a minimum of eight counterparts will be identified by the Ministry of Industries to work full-time as counterparts with the Americans, and that it is infinitely better to train Syrian counterparts in Syria that attempt to do it in a foreign environment such as the United States. Specifically, the personnel development program should provide the counterparts with the following:

1. The substantive knowledge and technical skills to conduct compre-

hensive planning for vocational training in Syria.

2. The substantive knowledge and technical skills for planning establishing, and maintaining vocational training facilities and equipment in Syria.
3. The substantive knowledge and technical skills for establishing and maintaining a curriculum development laboratory for vocational training in Syria.
4. The substantive knowledge and technical skills for establishing and maintaining teacher education programs in Syria including related on-the-job trainers in the factories.
5. The substantive knowledge and technical skills to establish and maintain an information and resource center for vocational training in Syria.

This is considered to be the most important of all recommendations because it is the principal means to the attainment of the indigenous capacity to solve educational and training problems in Syria.

The development of the information resource base should be implemented on a small scale immediately and expanded as useful information resources can be identified, their circulation managed, and Syrian personnel trained to profit from them. The need and capacity to profit from certain available documents and training aids currently exists and will be expanded as personnel development expands. The capacity to access, manage, control and retrieve documents and other information materials must also develop. Storage and dissemination equipment is also necessary. Specifically, the following should be provided:

1. Immediate identification and acquisition of curricula and related resources (e.g., occupational analysis, courses of study, etc.)
2. Immediate identification and acquisition of facility and equipment documents for current and emerging programs.
3. Immediate identification and acquisition of needed training aids.
4. Immediate subscription to selected vocational training document identification resources.
5. Provisions for computer-assisted searches of fugitive documents and materials.
6. Immediate purchase of microfiche reader/printers.
7. Immediate purchase of a limited amount of document storage equipment and the continued acquisition as future need materializes
8. Continued identification and acquisition of documents and training aids as personnel development progresses and document utilization is demonstrated.

One or more exemplary demonstration vocational training centers (e.g., automotive, building trades, metal work, etc.) should be established in Syria under the direction and sponsorship of an American team of experts. The purpose of this recommendation is to develop exemplary model programs and facilities that will provide positive examples for emulation and replication. It is assumed that American experts with assistance from Syrian counterparts would provide the following:

1. Develop the courses of study and curriculum materials.
2. Specify and acquire the equipment, tools, and teaching aids.
3. Layout an ideal workshop for the instruction.
4. Train the teachers in instructional methodology.

5. Train the teachers in the designated subject areas in the United States by providing fellowships for those who are qualified as discussed below.
6. Evaluate student outcomes and teacher performance to improve and assure the quality of the programs in the center(s).
7. Utilize the demonstration center(s) for teacher training purposes.

Technical subject-area training of potential vocational teachers should be provided in the United States for all qualified Syrian candidates approved by the Ministry of Industries for which there is a demonstrated need in the existing and future vocational training institutions. The future teachers should be trained in the United States for a minimum of nine months unless it can be demonstrated that the candidate has already had significant training in the subject area. This technical training program should include the teachers selected for the exemplary demonstration centers.

FUTURE OPTIONS

These terminal and enabling goals are only expected to address the immediate and urgent needs of vocational training in the Ministry of Industries. Continued dialogue should take place between the Syrian Arab Republic and the United States Government. Additional decision making and planning could occur as early as the conclusion of the recommended short-term tour of high level Syrian leaders in vocational training. Additional short-term awareness and study tours for specific purposes could prove beneficial. Periodic reviews of progress, diagnosis of problems and remedies, and other technical assistance from the United States should also be provided for a long-term dialogue and working relationship between the two governments would undoubtedly advance vocational training in Syria significantly.

APPENDIXES

APPENDIX A

PRINCIPAL DUTIES

1. Review the vocational training centers in Damascus and Aleppo and plans for centers in Deir El Zor and Homs.
2. Study the organization of vocational training in Syria.
3. Review the Syrian Arab Republic's vocational development plans including organizational structures and vocational education.
4. Study difficulties faced by vocational training in Syria.
5. Study the organization of training workshops and equipment.
6. Discuss school layout or general arrangements and training centers themselves, for most efficient training operations.
7. Review shop organization, particularly sizes of equipment.
8. Discuss with Syrian Arab Republic's officials vocational training curriculum organization, including time scheduling, course outlines and lesson plans.
9. Make recommendations concerning development of higher levels of training than at present, and possible technical assistance in the above areas.

APPENDIX B

KEY INDIVIDUAL CONTACTS IN THE SYRIAN ARAB REPUBLIC

Farouk Al Zouabi	General Manager of Cable Factory
Zouhair Al Sahen	General Manager of Iron and Steel Products
Mohamad Bareesh	Director of Tractor Factory School
Hassan Edelbi	General Manager of Electric Motor Factory
Georges Ghadban	Vice Director of Damascus Complex and Director of the Study Office
Riad Ghazi	Director of Chemical Institute
Samir Hariri	Electrical Engineer, Aleppo Vocational Training Complex
Muneer Hinnawi	Director of Damascus Vocational Training Complex
Akram Kari	Chief of Spinning Section, Textile Institute
Ramex Khusrof	Mechanical Engineer Institute for Chemical Industries
Ali Maurof	Director of Aleppo Vocational Training Complex
Jalal Mourad	Director of Manpower Department, Planning Commission
B. L. Daghertani	Dean Higher Institute of Chemical Engineering
Abdallah Sabbagh	General Manager of Porcelain and Glass Factory

APPENDIX B (cont.)

Ali Silo	Assistant Director of Aleppo Vocational Training Complex
Ghassan Tayyara	Director of Vocational Training Department
Abdull Latif Zannaji	Director of Electrical/Electronic Institute

US/AID--Syria

Gordon B. Ramey	Director, US/AID
Dennis M. Chandler	Official
Thomas Ball	Official
Herbert C. Roberts	Official

American Embassy--Damascus, Syria

Patrick Theros	Economist

Department of Labor, Bureau of International Labor Affairs

Daniel C. Lazenchick	Director of Program Operations
Carleton H. Falen	Chief, Division of Overseas Cooperation and DOLITAC
Samuel M. Justice	Regional Projects Coordinator, Near Eastern and African Area
Glenn E. Hahm	Regional Projects Coordinator for Asia Bureau of International Labor Affairs

State Department

Kurt Tiel	Syrian Desk Officer

US/AID--Washington

Marvin E. Hurley	Program Operations Officer, NE/TECH/SPHRRD
James F. Watson	Engineering Equipment Coordinator

APPENDIX C

GENERAL RECOMMENDATIONS FOR SHOPS*

These suggestions are believed to be generally applicable to most school shops:

LOCATION:

1. It is well to locate shops in the wing of the main or in a separate building
2. Avoid having shop uints located on alleys with entrances adjacent to cafeteria disposal units.
3. When there is more than one shop, it is desirable to have them grouped to provide for inter-departmental relationships.
4. If at all possible, shops should be located on the ground floor. This provides more adequate support for heavy machines and for the delivery of supplies and equipment. The ground floor also provides maximum light, safety, and health conditions. Shops located below ground level encounter many problems. Excessive moisture causes materials to swell and warp, and oxide to form on tools and equipment.
5. Plan the entire shop on one floor. This is essential where one teacher is in charge.

* These recommendations are unabridged. There has been no attempt to adapt them to the Syrian vocational training environment.

SIZE AND SHAPE OF A SHOP:

1. The size of the shop will depend on the activities to be taught. A shop used for bench woodworking will not need to be as large as one for auto mechanics. The best method to determine optimum size is to make a layout of the equipment in place.
2. Experience suggests that there not be less than fifty square feet per student in shops where light work is done; one hundred square feet in heavy shops, such as machine shop; one hundred twenty-five square feet where assembly areas are needed. This is exclusive of storage space.
3. A rectangular area which approximates a width to length ratio of one to two, is recommended over other shapes.
4. If at all possible, pillars and vents that obstruct the teacher's view as he supervises and presents instruction should be avoided.
5. Eliminate all nooks, ledges, and compartments where scrap material may accumulate.

FLOOR CONSTRUCTION:

1. The type of floor materials should be appropriate for the work to be done in the shop. Where concrete is used it must be pointed out that it produces undo strain on individuals who are required to work on it for any period of time.
2. All shop floors should be specified and finished so that they will provide firm footing at all times.
3. The floor should present a pleasing appearance, require a minimum of repair, and be easy to clean.

4. A concrete floor should be used where there is an excess of oil and grease.

WALL CONSTRUCTION:

1. Walls should be constructed of material that may be easily cleaned. A light glazed tile serves this purpose; when it is used, it is recommended that it extend five or six feet from the floor with the remaining top area built of acoustical material.
2. Acoustical wall material should be coarse enough so as not to lose too much of the sound proofing quality when it is refinished. (Special paints are avialable for acoustical services.)
3. Partitions around the finishing room, shop library, teacher's office, and planning or drafting room should be constructed so that they are sound proof. The upper portion should be transparent, since the teacher needs to be able to supervise activities in these areas from the main shop. It is recommended by some state departments of public instruction that all partitions be the movable type.

CONSTRUCTION OF CEILINGS:

1. Ceilings should be at least twelve feet high.
2. Ceilings that are treated with acoustical material provide better teaching and learning conditions.
3. Ceilings of classrooms under shops with power euqipment need to be soundproof, and for the same reason, ceilings of shops need to be acoustically treated to prevent sound from disturbing learning conditions in classrooms located on the floor above.
4. Avoid open beam ceilings because they are dust catchers and become unsightly.

DOORS:

1. All shop doors should open outward.
2. To avoid traffic congestion, it is suggested that there be two large doors from the room, one for students to enter and another for them to leave. This is not always feasible, and where it is not, double doors will serve the same purpose. Doors leading from the shop should not be secured or locked from the inside while the class is in session. The locking mechanism should open when a student pushes on the opening handle.
3. Some shops such as auto-mechanics and farm mechanics require a large surface door.
4. An outside door may be highly desirable for receiving materials. It may be used also to a good advantage where the shop is used for evening classes or hobby work when other parts of the school building are not accessible.

LIGHTING:

1. The room should be equipped with sufficient windows for as much natural light as possible.
2. Windows should begin at bench height and extent to the ceiling.
3. Glass block areas are not recommended as a substitute for regular windows, since they give individuals the feeling of being confined.
4. Equipment should be arranged so shadow-free and glare-free light from window falls on work services.
5. When possible windows should face the north.
6. Lighting utility companies and lighting equipment companies usually provide consulting service that will insure maximum lighting conditions.

7. Since artificial light is used more than natural light, the objective should be to provide adequate foot candles at each work station.
8. Another objective should be to provide a sufficient number of lights properly placed in banks, to supplement natural light so that shadows and glare are kept at the minimum.
9. Switches need to be planned for banks and individual lights so that only those which are needed may be turned on. Often lights are along an inside wall while there is sufficient natural light at work stations near the windows.
10. Light fixtures must be easily cleaned to maintain a high degree of efficiency. In shops, the light fixture's mounting should be flexible so the fixture will not be damaged if accidentally bumped.
11. Consult an architect regarding the most efficient window shades. Maximum natural light comes from the upper part of the window; too often this area is partially or completely covered with roll-type shades which are attached at the top of the window.

VENTILATION AND HEATING:

1. The heating system should be so regulated as to maintain a suitable temperature. Sixty-eight degrees is recommended in a shop where students are working. Drafting rooms need to be maintained at the usual temperature for the classrooms.
2. Heating and ventilating should be planned to use a minimum space.
3. Exhaust systems should be installed where smoke, gases, paint fumes, or excessive dust are present.
4. In most states hoods with exhausts must be specified over forges, melting pots, and other open-flame equipment.

5. A vacuum exhaust system is needed to remove shavings.

EQUIPMENT:

1. Arrange equipment for free use of aisles.
2. Machines commonly used in sequential order for production should be placed in order of their operation.
3. All machines should be arranged to provide maximum safety for an operator and for students moving about in the surrounding areas.
4. Machines such as grinders should not be secured to columns or pipes which may transmit sound to other rooms.
5. A master switch that may be locked should be provided to control all machines.
6. Each power machine should be equipped with a safety switch which will automatically turn the machine off if it should be in operation when the master switch is pulled. In addition, remote control safety switches should be installed at strategic locations on the wall of the shop so that all power may be shut off in event of an accident. Where it is not possible to have such an electrical system, each machine should be equipped with an individual switch that can be locked.
7. When necessary, specify dust exhaust systems for each machine.
8. Equipment should be placed so that it will not interfere with the opening of doors.
9. The equipment that is used most should be placed in the central area of supervision.
10. Machines should be located to process maximum sizes of material. A circular saw backed up against the wall would be of little value.

11. Lighting efficiency is provided by mounting individual lights on or above machines.
12. All power equipment must be grounded.
13. In electrical shops metal benches should be insulated.
14. It is imperative that power machines be adequately guarded.
15. Locate equipment to secure the best possible lighting conditions. This is usually accomplished by placing precision machines, such as lathes, jig-saws, mills and grinders near the windows.
16. Except for portable machines, equipment should be securely fastened to the floor.
17. It is easier to clean under soldering furnaces when they are mounted on brackets that extend out from the back and over a wall bench.
18. When possible, all machines should have individual stands rather be mounted on benches.

ELECTRICAL OUTLETS AND WIRING OF MACHINES:

1. All electrical outlets should be indicated on the architect's drawing and installed as a shop is constructed or remodeled.
2. The wiring for machines may be either brought up from the floor or down from the ceiling.
3. Wires that come up out of the floor should be put in place before the floor is laid or poured. It is recommended that additional outlets be installed at sixth-foot intervals so that they would be available in the event that new machines are added or moved. Outlets not in use are easily covered with brass plates.
4. In some newer installations for industrial arts using machines of home workshop type, school systems are installing ceiling tracks

which contain movable trolley drop cords with electrical outlets.

5. Extension cords from the machines and portable equipment are then plugged into these drop cords. With each machine equipped with a stop-and-go switch and the main power supply equipped with emergency stop switches, this is an economical and flexible installation.

TOOLS:

1. When planning a shop, provisions need to be made for racking, dispensing, and checking tools. Cabinets are also needed for extra tools and equipment.
2. Metal tool cabinets lined with wood are functional since the wood linings may be replaced when they become worn.
3. Tools for servicing a machine should be located on a nearby panel.

BENCHES:

1. Benches for a shop may be obtained with one, two, or four work stations. The teaching situation, space available, and what may be already on hand are factors to consider.
2. When there are single-type workbenches on hand, they may be placed singly; in twos with benches back to back; in threes with two benches placed back to back and a third on the end; and in fours with the right back end of each against the left end of a bench. This last method conserves floor space but leaves an opening about eighteen inches square in the center of the four benches. This area may be filled in with the plywood or a composition board to facilitate janitorial work. If there is ample floor space, the four benches may be set apart slightly to provide for sweeping and cutting stock.

3. The four-station bench with a hardwood top and metal compartment lockers in the base has become a popular all-purpose bench.
4. Individual benches equipped with drawing boards, replaceable pressed-wood tops, and individual seats may be specified where floor space is so limited that work stations must also be used for planning.
5. Wall benches should be standard height with a solid, flat, work surface. The under part of these benches may be enclosed to provide storage compartments.
6. The distance between ends of benches should never be less that twenty-four inches. There needs to be at least thirty-six inches between the working sides of benches with vises staggered.
7. Benches on which heating euqipment is mounted need to be covered with a protective material. For good protection, ease of maintenance and good appearance, sixteen-gauge stainless steel laid over asbestos is recommended.
8. The work stations for any major activity should be grouped together.

TRAFFIC:

1. Aisles should be provided for ample flow of traffic. They should take the natural and shortest course to doors, lockers, and instructional or work areas.
2. The width of an aisle is dependent on the number of students in the room at any one time. The width should never be less than thirty-six inches.

STUDENT STORAGE:

1. Most shops provide a small area for student's personal belongings

and space for storing items under construction.

2. Individual compartments may be provided in banks of lockers placed along the wall. In new shops, these banks may be recessed in the wall.

3. Provisions should be made for storing planning books or planning sheets. When a drawer or compartment is specified they may be stored flat. It is recommended that space be provided so that each foreman may file the planning books for the students under his direction.

STORING MATERIALS:

1. Few shops and laboratories have been built with sufficient space for storage of materials and supplies. Architects and school administrators have been too willing to reduce the amount of space needed for the storage of materials when there is a need to cut planned facilities for financial reasons.

2. Provision should be made for: small items such as hardware to be stored on and bulky items such as lumber, plywood, sheet metal, and steel; supplies for wood and metal finishing; balconies and small rooms provide facilities for such storage.

3. Teaching aids not in use may be stored by having them mounted on panels and placed in drawers.

INSTRUCTIONAL AREA:

1. The area for group instruction should be large enough so that all members of the largest class will have a place to sit and write.

2. By placing each row of seats on a elevated platform five or six inches above the row in front all students can see what takes

place at a demonstration bench.

3. The distance on the platform between rows should be at least thirty-nine inches so that a student may pass freely in front of someone sitting down.
4. Where room is available, it is well to have two aisles for students to enter and leave their seats. When this is impossible one down through the middle will suffice.
5. Individual desks are recommended.
6. The chalkboard should be hung so that it is accessible to the teacher and readily seen by the students.
7. A demonstration bench and machines on which demonstrations are given should be located so students may view demonstrations from their seats in an instructional area. When the demonstration bench is movable it may be shifted into the best position for students to see.
8. When a large mirror is mounted above the demonstration bench, students may then see from two directions.

PLANNING AREA:

1. Where floor space is limited it may be necessary to use the same area both for group instruction and as a planning area. When possible, however, a room with a glass partition should be equipped so students may do reference work, make and duplicate drawings, and plan individual jobs.
2. The size of such a planning room depends on the activities that will be scheduled in it. Generally such a room needs to be large enough to house six or seven students while they are making drawings, developing plans, reading references, or answering questions.

4. Planning rooms need to be equipped with drafting equipment, tables, and chairs or stools.
5. Some city and state supervisors recommend that facilities for instructional lessons and planning be in the same room.

TEACHER'S OFFICE:

1. A teacher needs a place away from the activities of a shop or laboratory where he may be by himself when he is not teaching. This small room should include a desk, table, chairs, filing cabinet for teaching plans, shelves for the teacher's professional library and a closet for his clothes.
2. It should be located near the instructional area of the planning room.
3. The desk in a teacher's office need not be located to provide a view of the shop. Teachers need to be discouraged from using their offices while the classes are in session.
4. To economize, the teacher's office equipment could be placed in the planning room.

DISPLAY CASE:

1. A display case should be included for students' work and instructional material. If possible, it should be built into the shop-corridor wall so that it may be seen from both the corridor and the shop; it should open into the shop. The size of a display case depends upon the articles to be displayed. It should be well lighted and equipped with glass shelves.
2. A bulletin board should be provided for displaying safety posters

and related or guidance information.

3. Considerable wall space should be provided for displaying teaching aids, tool panels, pictures, and murals.

COMFORT FACILITIES:

1. Wash basins are needed in shops and drafting rooms. The round or semi-round industrial type with foot-pedal controls have proven to be satisfactory and easy to clean. The number, size and kind of wash basins will depend on the kind of shop. One semi-round is usually sufficient for most shops.
2. A drinking fountain cuts down on the need for leaving the room. These should be located near the washing facilities.
3. Many shops and drafting rooms are now being built with small adjacent toilet rooms.

SAFETY FACTORS:

1. Safety metal containers are needed for rags and waste used to wipe oil or paint.
2. Steel cabinets should be specified for storing flammable liquids and paint.
3. Two types of fire extinguishers should be located in the room--carbon dioxide for fires caused by electricity and flammable liquids, and a water solution for ordinary combustible materials.
4. A metal first aid cabinet should be placed on the wall near washing facilities.
5. All machines should be equipped with individual switches that are handy to the operator.

6. The main power should be controlled with a magnetic switch. There should be stop switches located throughout the room.
7. A fire blanket should be hung in a container near open flame equipment.
8. Operator's zones should be located around machines. There should be sufficient space designated to protect the operator from passing students when the machine is in operation.

EQUIPMENT FOR VISUALS:

1. A pull-down screen should be placed in front of the instruction seats.
2. A cabinet for projectors, slide films, slides and movies should be located in the rear of the instructional area. The top of such a cabinet may be used to hold the projectors while they are being used. Some instructional areas are now being equipped so that the teacher may control the projectors from in front of the class.
3. Sound amplifiers may be installed in the wall near the screen.
4. The windows in an instructional area need to be equipped with opaque curtains so the room may be darkened. Such curtains may be electrically controlled.

WRITING SPECIFICATIONS FOR MACHINES AND EQUIPMENT

If the teacher is going to get the equipment that he wants, he must submit clearly written specifications. The objective should be to write detailed specifications to prevent the possibility of having the board of education purchase an inferior product through competative bids. An example of specifications for a circular saw:

1. A ten-inch tilting arbor saw (5/8" arbor).
2. Positive lock fence (fore and aft) moves to right 25", to left 15".
3. Maximum depth of cut 3 1/8 inches.
4. Graduated quadrant tilting worm.
5. Positive lock on raising or lowering the blades.
6. Double grooves for miter gage.
7. Safety blade guard and splitter which may be easily removed without wrenches.
8. Equipped with one and one-half horsepower, three-phase, 220 volt motor
9. Motor to have sealed ball or Timken bearings.
10. Chip remover
11. Table dimension 20" x 27", with wings 36" x 27".
12. Distance from front of table to center of blade 17".
13. Table height 34".
14. Sawdust catcher in the base.

When there is a certain make of machine which is believed to be more desirable than others available, specifications can be written against the superior qualities of such equipment. This eliminates the necessity of recommending the purchase of a particular make. When arranging for equipment,

it is well to specify just how a machine should be mounted on the floor. Specifications for the circular saw might be:

1. Twenty-foot clearance in front of table.
2. Twenty-foot clearance from back edge of table.
3. Four-foot clearance on both right and left sides of table.
4. Obstructions should never be placed in clearance areas specified in points 1, 2 and 3.
5. No obstruction above the tables for a distance of seven feet and for a radius of ten.
6. Direction of feed should parallel the feed of adjacent machines, and should follow the natural flow of work.
7. An area around the machine, four feet in front and back and three on each side should be encompassed with a red line two inches wide to designate an operator's zone. Nonskid material should be placed on the floor.
8. Electrical connections are to be made from the floor.
9. The saw is to be fastened securely to the floor.

APPENDIX D

LIST OF SUPPLEMENTAL DOCUMENTS PROVIDED

This list of materials is being provided by the U.S. Government to fulfill observed needs in the planning of vocational training in Syria and will follow the submission of this report. However, the items marked with an asterisk (*) have been left in Syria as a gift of the American consultant.

Information Resources

- Abstracts of Instructional and Research Materials in Vocational Education (AIM/ARM), Vols 9 and 10
- Abstracts of Instructional Materials in Vocational Education (AIM), Vols 1-6 (as available)
- Abstracts of Research Materials in Vocational Education (ARM), Vols 1-6 (as available)
- Directory of Task Inventories, Vols 1-3
- Vocational-Technical Learning Materials: Books and Manuals for Schools and Colleges

Curriculum Materials

- Basic Course Outlines
  - Auto Body and Fender Repair*
  - Auto Body Repair
  - Automechanics
  - Bricklaying
  - Building Trades
  - Carpentry*

Communication Electronics*

Construction Electricity*

Diesel

Electronics

General Drafting

Industrial Electronics*

Machine Shop

Machine Trades*

Refrigeration and Air Conditioning

Plumbing

Radio and Television

Sheet Metal

Welding

Basic Electronics I

Instructor's Manual

Learner's Manual

Experimental Manual

Basic Electronics II

Instructor's Manual

Learner's Manual

Experimental Manual

Basic Electricity

Learner's Manual

Experiment Manual

Basic Instructional Units for Machine Trades

Bricklaying I

Learner's Manual

Answers

Bricklaying II

Learner's Manual

Answers

Electric Lineman Training

Series 100--Learner's Manual

Series 200--Learner's Manual

Series 300--Learner's Manual

Series 400--Learner's Manual

Series 100--Answer Book

Series 200--Answer Book

Series 300--Answer Book

Series 400--Answer Book

Jigs and Fixtures for Machine Trades

Machine Trades I

Learner's Manual

Answers

Machine Trades II

Learner's Manual

Instructor's Manual

Facilities and Equipment

A General Guide for Planning Facilities for Occupational Programs

A Guide to Systematic Planning for Vocational and Technical Schools

Educational Facilities and Equipment: Ideas and Planning Guide*

Modern School Shop Planning*

Suggested Guidelines for Developing High School Trade, Industrial and Health Organization Programs

Occupational Analyses

Air Conditioning and Heating

Auto Mechanics

Carpentry

Drafting

Industrial Mechanic

Machine Trades

Plumbing

Radio and TV Repair

Residential Electrician

Miscellaneous

A System of Statewide Evaluation of Vocational Education

Manpower Demand: Information Guidelines for Educational Vocational Education, and Manpower Planning