National Center for Education Research and Development

National Textbook

New Curricula

Republic of Lebanon

Ministry of National Education, Youth and Sports

TECHNOLOGY

Secondary Education

Second Year

Sciences Section

National Center for Educational Research and Development

National Textbook

New Curricula

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National Center for Educational Research and Development
Secondary Publications Co. s.a.r.l.

Technical Preparation: Technical Team ■ NCERD
Artistic and Technical Preparation: ■ S.P.C.
Production and Distribution: Secondary Publications Co. s.a.r.l.
Tel: 01-488775
Printing: Joseph D. Raïdy Printing Press

First Published 1999

The National Textbook Project

This is the second installment of textbooks completed by the Center as part of a three-stage effort to produce the books called for by the New Curricula. We are placing these books in the hands of students with the great hope that we are moving, step by step, toward the goal of acquiring sound and modern learning, using sophisticated educational means and up-to-date methodology that encourage and reinforce individual thinking and research, the acquisition of skills, the development of ethical and national attitudes, the feeling of national belonging as well as the feeling of belonging to humanity at large.

The on-going revolution in information, communication and educational technology has undoubtedly limited the role of the textbook and lowered the rank it used so recently to occupy. However, in our society and in many other societies, the textbook remains the basic means of education, and it is our duty to exert our utmost effort and care to come up with the best product as to form and content. Yet we should not lose sight of the fact that the textbook is not sufficient by itself but should rather be used as a stepping stone to access other sources of information. What is important is to keep a clear vision and maintain the right course toward our objective. The means should not turn into the end and the student should always remain the focus of the learning/teaching process.

No one ignores or denies the fact that textbook writing requires very high academic and educational qualifications and very wide field experience. The authors committees undeniably possess such qualifications and qualities, yet last year's textbooks did contain some faults and gaps which were duly pointed out by researchers in many articles, and, indeed, we have benefited from some of them. Such is the nature of human work, no matter how good the intentions or how great the effort exerted.

Constructive criticism is a real contribution to raising the standard of authorship, minimizing errors and filling gaps. We only hope that criticism will always be objective and motivated by a desire to enhance educational reform in order to achieve better products.

A favorite adage handed down from our old scholars: "He who criticizes you is as helpful as a co-author". Let all criticism directed at the Center be of this caliber.

In closing, we hope that we all will have benefited from our experience and that the textbooks of the third and final stage be closer to realizing our hopes and more beneficial to our students. We are now preparing ourselves to assess the parts so far achieved of the new curricula and to assure that our educational movement is proceeding on the right track for achieving the best results.

June 2, 1999

President, National Center for Educational Research and Development

Nemer FRAYHA

Preface

The present book conforms with the new curriculum concerning the Secondary Cycle.

As part of the New Curriculum, decree No 41/M/98, Technology, as a discipline, is the first attempt to exploit knowledge into concrete application. All along this course, students are exposed to the latest technical improvements that will guide them in choosing the right profession.

The suggested projects integrate the knowledge and the know-how of many disciplines.
The book consists of Worksheets prepared for individual or group use.

The suggested technical devices are familiar and common to students.

Each project consists of a set of activities which aim towards assembling innovated or ready made elements.

These projects will gain more meaning through field trips to specific sites and exposure to lectures and demonstrations conducted by specialists in the field.

I. GENERAL OBJECTIVES

In technology education and by reason of their influence on the technical, economic and social evolution certain domains were given the privilage of selection on others; thus forming a step in technology towards a technical culture. Learning about such domains will, as time goes on, enable as to tackle technical problems resulting from the rapid progress in technology and means of production.

The objective of technology education is to establish a symbiotic relationship between conceptual understanding and practical realization of concepts

II. SPECIFIC OBJECTIVES

At this level, Technology Education aims at achieving objectives which enable the learner to:

- acquire an approach based on systems and their functions
- adopt an analytical attitude
- develop a sense of production
- realize models
- enhance critical thinking

III. TECHNICAL DOMAINS / FIELDS

The aim of this course is to link study at school with the future production needs in society. All topics have socio-economic implications and involve the following fields:

1- Norms of technical design

The included projects allow students to distinguish the different formats and the significance of the types of design (perspective, pattern, proportion, section, balance), as well as, representation.

2- Electronics

The technical objects, realized according to given schematic diagrams, conform with the cost rate and fabrication standards. Such objects allow the realization of specific functions of elements currently used in devices.

3- Acoustics

The projects studied in this domain familiarize the students with ultrasonic techniques, particularly echography and sound-proofing.

4- Economy

The realized projects relate to the business line of work and finance, production of a technical object, making contracts and identifying and using the different means of payment (cheques, bank transfers, drafts...)

5- Automobile technology

The material provides information relevant to any possible breakdown in the car's body or engine, as well as procedures for diagnosis. It allows us to maintain a checkup routine on the mechanical and electrical car systems.

6- Chemical Industry

It aims at enabling students to acquire the technical skills of producing plastic materials (PVC, nylon, synthetics, ...) and the extraction of oil (saturated and non-saturated). It also highlights waterproofing techniques.

7- Diverse Technologies

Two aspects are targeted at the same time domain: research and realization. They aim at exploiting the potential and current use of devices: Camscope (CD), microwave ovens, photographic devices (printing, enlarging, developing, protection of transparencies), solar furnace and radar.

IV. EDUCATIONAL OBJECTIVES

1. Methodology

The details of the manual work are presented in the work-sheets. Worksheets consists of the following processes:

- Comparing information
- Choosing the appropriate methods
- Taking proper decisions
- Making the object

2. Procedure

- Gathering information on the project
- Sorting out the information
- Choosing the object
- Applying prerequisite knowledge to make the object.

3. Exploration

- Each construction follows a set of given instructions
- Efficient use of time and space is maintained
- Safety measures to be followed
- Estimate cost to be calculated

4. Communication

Students will be asked to:
- Share information
- Enhance their knowledge, know-how, and projection into the future
- Find out ways to improve production.

V. INTEGEATION

Applied technology is not restricted to manual work but is related to various disciplines:
- Studying needs
- Following operational steps
- Studying the market
- Estimating the cost of production

Making an object also contributes to:

1. Vocabulary

- Written expression
- Correct language

2. Apply and become aware of scientific issues and their implications to the environment

3. Develop mathematical logic through:

- reasoning
- numerical presentation.

4. Enhance civic education through:

- Critical thinking
- Group work
- Assuming full responsability of the work done.

VI. SPACE AND EQUIPMENT ALLOCATED TO THE TEACHING OF TECHNOLOGY

Technology sessions can take place in a classroom provided that it can accommodated such activities. An average area of 2.7 m^2 per student is necessary (for a class of 18 students). Closets (at least two) are required for storage.

The ideal situation would be to have a 100m^2 workshop to accommodate 2 x 18 students with appropriate furniture and equipment (refer to the norms and standards of architectural program. General teaching, Lebanon 1997, and to the lists of furniture and equipment).

VII. SAFETY MEASURES

Safety measures are set to minimize the risk of accidents.
The working conditions must conform with the norms and the standards of safety measures.
The risk of electrocution is discussed in a seperate worksheet.
All other worksheets include a set of safety measures to be adopted.

VIII. EVALUATION

The evaluation of the activities is based on knowledge, and know-how. The acquired skills are measurable, and can be evaluated as follows:

Criteria	Indicators	Note %
- Scientific approach	-Clear, comprehensible, with correct application.	10%
-Functioning (Feasability)	-Correct shape, easy rotation no friction at the joints.	50%
-Presentation	-Neat, attractive, good finishing	20%
-Commercialisation	-Well studied in a given economical context.	10%
-Innovation	-Personal work	10%
		100%

A feedback is undertaken at the end of each cylce, since a desired behavior is targeted at a progressive rate.

Table n°1:

Scope and sequence of the contents
(Secondary Cycle - Classes 1 and 2)

Themes:	Content		
	Class 1	**Class 2 (Sciences)**	**Class 2 (Humanities)**
Systems and Techniques	-Systems .structure,environment:,control, verification,feed-back,interface entry/exit. .representation by sketch .formalization .application: technical, ecological. physical, automated and computerized system .sensor -Optics: .astronomical telescope .optical fibre: endoscopy. -Techniques of reprinting: .printing techniques .printing. .photostats. **15 periods**	-Photo techniques .equipment and production -Acoustics: .ultrasonics: fields of use. .acoustics of an auditorium **4 periods**	-Photo techniques .equipment and production -Acoustics: .ultrasonics: fields of use. .acoustics of an auditorium **4 périodes**
Electronics	-Electronics: .use and familiarization with passive and active component: R,C, diodes, transistors, thyristor, remote control. .experimental approach **7 periods**	-Electronics: .oscilloscope: use , application .functions of communication .logical circuits .bascules, coding and decoding **8 periods**	
Energy		-Motor technology : .mechanics: engine. .electricity: production and distribution. -Micro-waves -Furnace, radar. **6 periods**	-Motor technology : .mechanics: engine. .electricity: production and distribution. -Micro-waves -Furnace, radar. **6 periods**
Chemical industry	-Chemical industry: .paper industry. .essence extraction (orange blossom, sage...). .enemal work. -work and use of resin. **5 periods**	-Chemical industry: .plastic production. .water proofing .oil (saturated and nonsaturated) **4 periods**	-Chemical industry:. .petroleum and derivatives. .perfumes .pigment, dye **4 periods**
Communication and Media		-Norms of technical drawing: .perspectives. .forms of rotation. .projections / cuttings / sections. .valuation of drawings. -Stocking the information. **4 periods**	-Stocking information. -Cinema. -Advertising media . -Television (broadcast and reception) **8 periods**
Economics and Management		-Contract. -Means of payment. **4 periods**	-Contract. -Means of payment. **4 periods**
Security and Protection	-Staff members, individuals -Materials -Environment **3 periods**		
Total:	**30 periods**	**30 periods**	**30 periods**

Table n°1

Scope and sequence of the contents
(Secondary Cycle - Classes 3)

Themes:	Contents			
	Class 3 (GeneralSciences)	**Class 3 (Life Science)**	**Class 3 (Litterature and Humanities)**	**Class 3 (Sociology and Economics)**
System and Technics	-Medecine and technology: .techniques and equipment. -Cartography: .techniques and means of detection. **5 periods**	-Medecine and technology: .techniques and equipment. -Cartography: .techniques and means of detection. **5 periods**	-Medecine and technology: .techniques and equipment. -Cartography: .techniques and means of detection. -Meteorology: forecast card. **9 periods**	-Medecine and technology: .techniques and equipment. -Cartography: .techniques and means of detection. -Meteorology: forecast card. **9 periods**
Electronics	-Electronics: .functions: feeding, filteing, oscillation, feedback, modulation. -Automatics: .open,closedball (feedback). .linear servo-control. **10 periods**	-Electronics: .functions: feeding, filteing, oscillation, feedback, modulation. -Automatics: .open,closedball (feedback). .linear servo-control. **10 periods**		
Energy	-Energy: .solar energy and setting-up. .conserving energy in a fluid. -Laser: fields of use. **5 periods**	-Energy: .solar energy and setting-up. .conserving energy in a fluid. -Laser: fields of use. **5 periods**	-Energy: .solar energy and setting-up. .conserving energy in a fluid. -Laser: fields of use. **5 periods**	-Energy: .solar energy and setting-up. .conserving energy in a fluid. -Laser: fields of use. **5 periods**
Industry	-Chemical industry: .petroleum derivatives. .perfumes. .pigment, dye. **4 periods**	-Chemical industry: .petroleum derivatives. .perfumes. .pigment, dye. **4 periods**	-Chemical industry: .petroleum derivatives. .perfumes. -Food processing industry: .origin, conservation sterilization **8 periods**	-Chemical industry: .petroleum derivatives. .perfumes. -Food processing industry: .origin, conservation sterilization **8 periods**
Communication and Media	-Numerical rotation: .numerical telephone, television, cable TV, high definition TV. **2 periods**	-Numerical rotation: .numerical telephone, television, cable TV, high definition TV. **2 periods**	-Numerical rotation: .numerical telephone, television, cable TV, high definition TV. **2 periods**	-Numerical rotation: .numerical telephone, television, cable TV, high definition TV. **2 periods**
Economics and Managment	-Monetary system. -Documents of purchase and sale **4 periods**	-Monetary system. -Documents of purchase and sale **4 periods**	-Monetary system. -Documents of purchase and sale **4 periods**	-Monetary system. -Documents of purchase and sale **4 periods**
Total:	**30 periods**	**30 periods**	**30 periods**	**30 periods**

Table 2

Competencies
(Secondary Education - 2nd. Year, Science)

Theme	Skill	Competency
Technical Design	Identify	- Distinguish the format and significance of the types of design
	Apply	- Carry on the design of different objects
Electronics	Inform	- Use the oscilloscope as a measuring device
	Use	- Realize electronic mountings (symbolic and numerical)
Acoustics	Set up	- Set up a sound proof room
	Familiarize	- Familiarize with Ultrasonic Techniques
Economy	Identify	- Write a contract - Interpret the clauses of a contract of payment
	Realise	- Use the different forms of payment
Automobile Technology	Inform	- Identify the functions of the different parts involved in the automobile operation
	Apply	- Follow a car maintenance routine - Carry out simple repairs
Chemical Industry	Realize Inform	- Extract oil - Identify the production methods of plastic materials - Initiate waterproofing techniques
Diverse Technologies	Exploit	- Exploit the potential current use of photo-graphic devices
	Realize	- Construct a solar furnace

List of tools and equipments

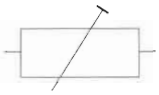
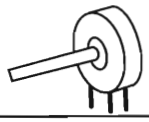
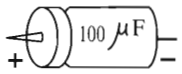
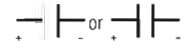
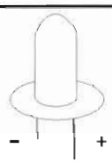
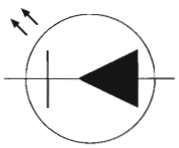
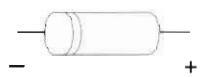
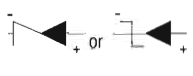
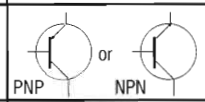
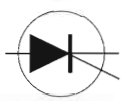
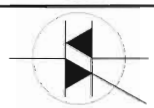
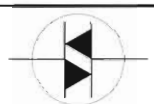
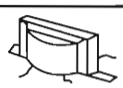
(Technology Workshop)

Level: Secondary / Local: Techynology workshop / capacity: 15 students

Ref	Name	Type/ Caracteristics	Quantity
E01	Crocodile vernier caliper	Set 1/10, 1/20, stainless steel.	03
E02	Pliers	Set: black, red, yellow.	01
E03	Paper cutter (guillotine)	Paper, plastic, transparent sheet, 2mm - 300mm.	01
E04	Toolbox	Metallic or plastic with drawers containing: 1 x cutting pliers with stripping edge. 1 x universal pliers with stripping edge. 1 x set of 5 screwdrivers, OBC 5. 1 x professional multi purpose scissors. 1 x iron solder, 30 watts Max,support 1 x protractor 1 x compass 1 x metallic ruler, 300mm 1 x center punch 1 x set of 3 limes for wood work 1 x set of 3 limes for metal work 1 x cutter with retractable blade, 6.5 mm 1 x carpenter saw 1 x hammer 250g with aclaw 1 x stripping pliers for wire ends 1 x metallic meter, tape 2 - 3m 1 x screwdriver test, long nose 1 x mechanic saw with 5 blades	06
E05	Diamond (cutter)	Ordinary type	01
E06	Blade cutter	Retractable, 18mm	02
E07	Square	200 x 300 mm	02
E08	Square set		01
E09	Working bench	Rotatable base	06
E10	Suction vice		02
E11	Set of 6 screwdrivers	OBC 6	01
E12	Set of 6 clamps		02
E13	Hammer	300g with claw	01
E14	Plastic sheet		02
E15	Sander	200W, 220W	01
E16	Multimeter	VOM	02
E17	Drill	13mm with support, 220V	01
E18	Punch	Made of steel	01
E19	Forceps		01
E20	Glue gun		02
E21	Hacksaw		02
E22	Garden sheers	To cut branches	01
E23	Hot plate	220V, 1000 watts approx.	01
E24	Ribbon saw	Section:30 x 100mm, Power 600W Source 220V.	01
E25	Air compressor	50 liters, 220V	01
E26	Grinding machine	∅ 150mm, 220V	01
E27	Parallel sides vise	125mm, turnable base	06
E28	Termocling-film machine	300mm 3mm thickness	01
E29	Jigsaw	6 blades to cut wood, plastic or metal	01
E30	Stabilizer	24V - 30V, 5A	02
E31	Frequency generator	Waves: sinusoidal, square, triangular Frequency: 10HZ, 100 KHZ Output voltage: 0-10 V, 50 ohms Out TTL: 0 -5V. Output power: 2 - 5W. Input: 220V	02

Ref	Name	Type/ Caracteristics	Quantity
E32	Oscilloscope	2 input terminals, power supply: 220V.	02
E33	Multimeter	Analogic	01
E34	Chronometer	Manual, 1/10	01
C01	Electrical accessories	Set of; 6 x plugs 6 x battery holders 6 x crocodile clips 6 x sockets 24 x bulbs, 3V 12 x bulb holders 10 x electric motor (toy)	02
C02	Paper clips	Box (100 pieces.)	02
C03	Solder	100g 10/10e	02
C04	Cables (wires)	3 coulors	03
C05	Cardboard	Porous and normal 400g	-
C06	Pins	Box	01
C07	PVC glue	225ml tube with a piston	06
C08	Plexiglass glue	100g tube	02
C09	Capillary film	200 x 300mm (package)	01
C10	Drill	Set: O 0.8 -1-1.2 -1.5 -2mm	02
C11	HSS drill	Set of 9 drills	01
C12	Cutting blades	Set: 6.5 and 18mm	02
C13	Sawing blades	Set of 10 and a saw	02
C14	Degraving liquid	1 L bottle	01
C15	Moulding material	1 Kg plastic bag	12
C16	Colored polystyrene	330 x 290, 2mm thickness, set of 4 colors	04
C17	Adhesive ribbon	Roll with support	02
C18	Solvent	1 L bottle	01
C19	Integrated circuit	Industrial size	06
C20	Commutator	1 set	06
C21	Condensor	1 set	06
C22	Diode	1 set	06
C23	Speaker	1 set	06
C24	ON-OFF switch	1 set	06
C25	LED	1 set (different colors)	06
C26	Microphone	Ohms	06
C27	Photoresistance	1 set	06
C28	Potentiometer	1 set	06
C29	Relay	1 set	06
C30	Resistor	1 set	06
C31	Thermistance	1 set	06
C32	Transformer	220 / 110 - 6, 9, 12 volts	06
C33	Transistor	1 set	06
C34	Switch	1 set of different types	06
M01	Kit	Saw and ribbon, drill, grinder 1400 x 800mm, solid wood	01
M02	Closet	To accomodate tools, bits and pieces	01
M03	Trolley	Boards and maps	02
M04	Working area	Wooden board, 110 x 550mm	07
M05	Shelves	To hold tools and drawers	03
M06	Stool	Wooden	12

IDENTIFICATION OF COMPONENTS
TECHNOLOGY SERVICES
THEME: ELECTRONICS

Designation	Aspect	Symbole	Utilisation
Resistance			Determine: - potential difference - intensity
Adjustable resistance			Adjust: - potential difference - intensity
Potentiometer			Help vary: - potential difference - intensity
Capacitor			- Store energy - Absorb parasites at oscillations
Elecytrolytic capacitor			Filtering
Diode			Rectify AC currents of low frequency
Light Emitting Diode (LED)			Pilot lamp
Diode Zener			Stabilise Adjust } a potential difference
Transistor			Amplify intensity Commutator
Thyristor			Controled rectifier
Triac			Controled power switch
Diac			Automatic shutter (trigger) according to voltage applied
Transformer			Lower / raise alternating voltage
Integrated circuit			Regulation Amplification Bascule Counting } logic circuit

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