METHODS

OBSERVATORY SCIENCE AND TECHNOLOGY APPLIED SCIENCE AND TECHNOLOGY

Teacher's Guide B First Year of Secondary Cycle Two

The programs of Science and Technology (ST) and Applied Science and Technology (AST) offer different methods for problem solving in the context of a learning and evaluation situation (LES) and elsewhere. This section presents each method in the form of a schematic flowchart to assist the student as needed in completing activities in the *Observatory* series. Double arrows placed between stages of the methods reflect their non-linear nature; moving back-and-forth between stages at times may be necessary to successfully implement a method.

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DESCRIPTION OF METHODS AND PROGRAM OF STUDY

	Method		be ped in	Description	
		ST	AST		
Exp	Experimental method		1	Involves the study of reaction and interaction of variables during an experiment.	
Ob	Observation method		1	Aims toward better understanding of a phenomenon by its observation according to set criteria.	
Е	Empirical method		1	Aims toward better understanding of a phenomenon by gathering and compiling data on it.	
	Modelling		1	Aims toward better understanding of an abstract phenomenon by constructing a concrete representation of it.	
Form	nation of an opinion	1		Permits the taking of a position on a controversy by developing an argument based on scientific and technological concepts.	
Tec	Technological analysis		1	Aims toward better understanding of an object or a system by studying its design and operation principles.	
SS	Conception	1	1	Aims toward conceptualizing a technical object or system that satisifes one or more identified needs.	
Industrial process	Design		1	Aims toward designing a conceptualized technical object or system for optimal performance, paying close attention especially to form, style and type of materials.	
snpul	Production		1	Aims toward manufacturing a conceptualized and designed technical object or system or one or more of its components.	

1.1

EXPERIMENTAL METHOD

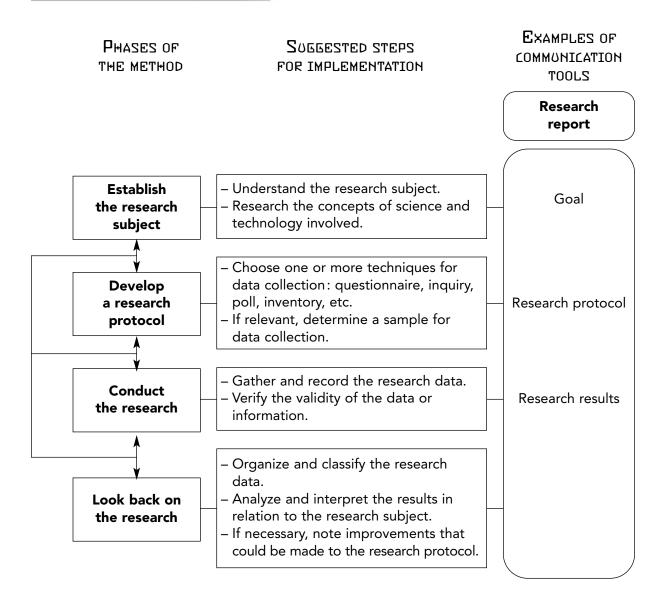
EXAMPLES OF PHASES OF SUBBESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS Lab report - Understand the problem. Goal - Formulate a goal for the experiment. **Define** - Research the concepts of science and Independent technology involved. the problem variable to be solved If relevant, determine the variables Dependent (dependent and independent) to be variable observed and measured. Propose a reasonable explanation— Hypothesis Formulate a a hypothesis related to the target. (I believe that . . . hypothesis Justify the hypothesis. because . . . etc.) Make a list of the materials needed. List of materials - Describe in order all the steps necessary to perform the experiment. Develop an Experimental If necessary, draw a schematic diagram experimental protocol of the layout needed to perform the protocol experiment. Prepare a table of results for recording Table of results the data. - Bring to mind the safety rules that apply to the experiment. Perform the Perform the experiment according experiment to the protocol described. Table of results Gather and record the data observed and measured. - Organize and classify the data Calculations collected. and diagrams - Analyze and interpret the data Data analysis Analyze results collected. and draw – Reflect on the hypothesis: is it conclusions confirmed or not? Show that the goal has been reached Conclusion with the support of the scientific evidence.

OBSERVATION METHOD

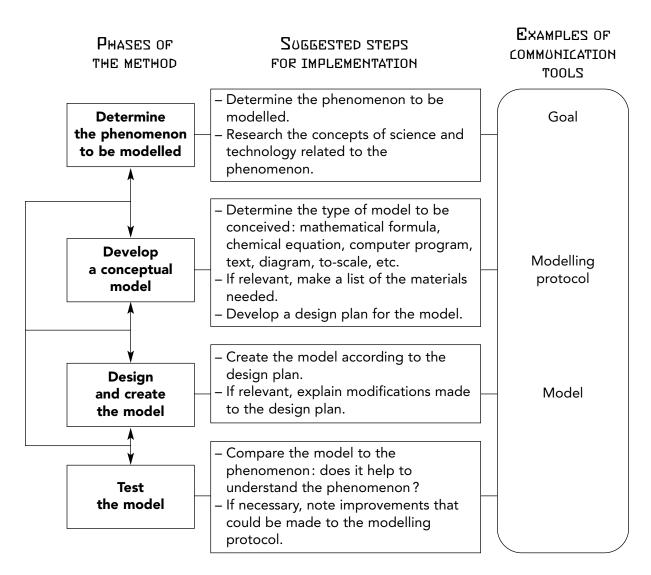
EXAMPLES OF PHASES OF SUBBESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS **Observation** report - Understand the problem or phenomenon to be observed. Goal **Establish** - Research the concepts of science and the observation technology involved. criteria List the elements to observe: colour, Observation structure, shape, mass, volume, etc. criteria Determine the type of observation to be applied: sporadic, continual, fixed time, etc. Develop Identify the senses (sight, hearing, etc.) an observation Observation and the tools (magnifying glass, protocol protocol microscope, etc.) to be used. Describe the procedure to be followed to conduct the observations. Observe and note what is seen (heard, etc.)—not what seems to be seen (heard, etc.). **Implement** Table of - Gather and record the data observed. the observation observations - Organize and classify the data protocol collected; if necessary, draw a schematic diagram. Analyze and interpret the observations collected. - If possible, compare observations with Look back on Reflection on the observation the protocol If necessary, note improvements that protocol could be made to the observation protocol.

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EMPIRICAL METHOD



MODELLING



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FORMATION OF AN OPINION

EXAMPLES OF PHASES OF SUBSESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS - Understand the subject of the controversy. - Identify factors contributing to the Goal controversy: economic, social, **Identify** scientific, etc. the controversy - Express an initial personal viewpoint and express a personal on the controversy. - Explain a personal involvement in viewpoint or associated values the controversy: direct, indirect, - Recognize the beliefs and values that may influence an opinion. Books, resource Consult different sources of persons, websites, information. television and radio Gather - Gather and write down information shows, newspapers, on the elements of the controversy. information etc. - Evaluate the credibility of the Rubric for credibility information collected. of information - Analyze the information collected in relation to the controversy. - Form an opinion on the controversy based on the information collected, Text of opinion **Form** taking into consideration personal or debate an opinion beliefs and values. - Justify the opinion and develop a solid argument with the information collected. - If necessary, specify the supplementary information needed to better form an opinion. Look back - Acknowledge the expertise of those on the opinionwho have contributed to the forming protocol formation of the opinion. - Indicate if the opinion has evolved. If yes, specify why.

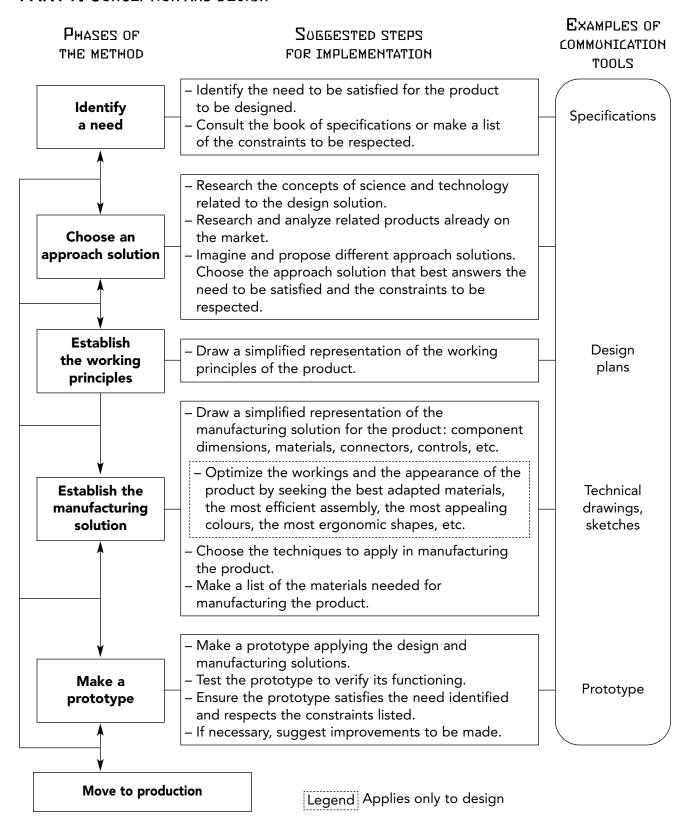
TECHNOLOGICAL ANALYSIS

EXAMPLES OF PHASES OF SUBBESTED STEPS COMMUNICATION THE METHOD FOR IMPLEMENTATION TOOLS Observe and handle the object without disassembling it. **Determine** - Understand the overall function of the purpose of the object: its purposes; the needs it **Specifications** the technological satisfies. object or system Make a list of constraints realized with the object since its conception. Observe and handle the object to understand its operation. If necessary, disassemble it. Draw a simplified representation of **Determine** the workings of the object: key Design how the object components, forces and movements, plans works - Determine the scientific and technological principles that apply to the workings of the object. Draw a simplified representation of the design characteristics of the object: component dimensions, shapes, materials, relationships, controls, etc. Explain the design principles applied in **Determine** the making of the object. Technical how the object - Note the techniques and the materials drawings is made used to make the object. If relevant, suggest modifications that would improve the design of the object: longevity, recycling, maintenance, etc. - If necessary, reassemble the object.

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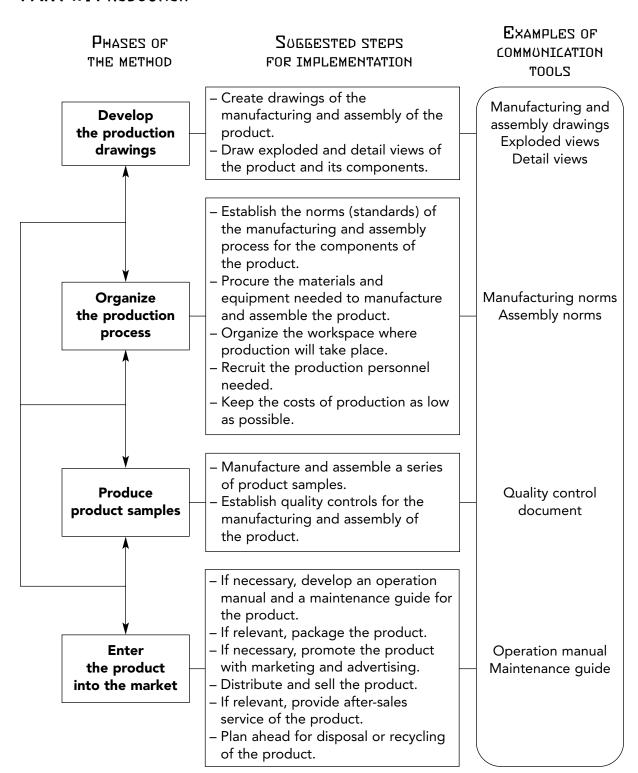
INDUSTRIAL PROCESS

PART I: CONCEPTION AND DESIGN



INDUSTRIAL PROCESS

PART II: PRODUCTION



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