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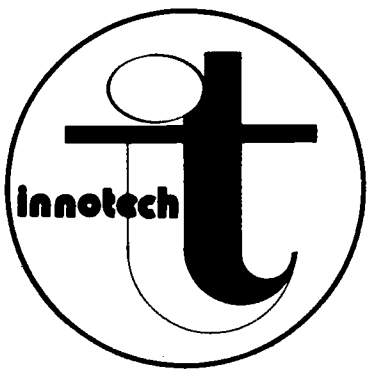
ABSTRACT

This publication is intended to aid educational planners in developing nations in translating national goals and aspirations into educational objectives and in establishing and quantifying priorities among educational objectives. Much of the content is based on a model for setting educational objectives that was developed in Indonesia in 1972. The booklet consists of three separate chapters prepared by different authors. Chapter 1 presents a simplified self-instructional module for setting educational priorities based on the Indonesian model. Chapter 2 describes the Indonesian model in detail. Chapter 3 reviews various techniques of priority-setting and examines a number of basic constructs leading to the value contribution method on which the Indonesian model and self-instructional module are both based. The appendix presents the prioritized educational objectives developed in Indonesia in 1972. (JG)

INNOTECH/SP-FR/74

REGIONAL CENTER
FOR EDUCATIONAL
INNOVATION AND TECHNOLOGY

SETTING PRIORITIES AMONG EDUCATIONAL OBJECTIVES



APRIL, 1973

INNOTECH/SP-FR/74

SETTING PRIORITIES AMONG EDUCATIONAL OBJECTIVES

BY

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WITH CHAPTERS CONTRIBUTED BY

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SEAMEO Regional Center
for
Educational Innovation and Technology

Saigon

April, 1974

CONTENTS

FOREWARD

In June 1972, the Office of Educational Development (BPP) in Indonesia completed a precedent-setting development programme on educational objectives. This programme was unique in that it developed successful techniques for (1) translating national goals and aspirations into educational objectives and (2) establishing and quantifying priorities among educational objectives. The Indonesian government is currently building upon the results of this programme in revising its school curriculum.

The Regional INNOTECH Center was so impressed with the potential breakthroughs represented by these techniques, that it invited the authors of this report as visiting scholars to the Center to prepare a model which could be adapted by other SEAMEO member countries. We are grateful to the Government of Indonesia for releasing Drs. Sudijarto and Drs. Sutjipto for the two months it required to prepare this report. Although they have described the model with unusual clarity, it is not a report that can be read quickly. The reader is cautioned to understand each step before going on to the next. Such careful reading will have its rewards because we believe that the priority-setting techniques described herein can be adapted to the needs of any country whether it be "developing" or "developed".

INNOTECH has invited two additional persons to contribute to this report. Michael B. Nathenson has simplified the Indonesian model and developed it as a self-instructional module for use in INNOTECH's training programme on educational planning. Because the module does simplify the approach, it appears here as Chapter I. We suggest that the reader go through this self-instructional chapter much as a student would do so that the basic concepts and procedures of the technique can become clear. Chapter II presents the Indonesian model.

Vincent N. Campbell, who played a major advisory role in the development of the Indonesian model, has consented to our presentation of a paper which he has prepared for publication elsewhere. His scholarly and practical approach to setting priorities is given as Chapter III.

Although the three approaches differ in many respects, the value-contribution method is the core concept of all three. The Center hopes that educational planners in the SEAMEO countries and elsewhere will seriously consider the potential of value-contribution in establishing priorities among objectives in their own nations. The Regional INNOTECH Center stands ready to provide consultative help to member countries.

Pham Van Cung
Director

ACKNOWLEDGEMENTS

More than 300 persons throughout Indonesia contributed to the development and tryout of the priority-setting techniques described herein. They are acknowledged by name in three reports* prepared by the Office of Educational Development (BPP) of the Indonesian Ministry of Education and Culture.

In addition to the authors, there were eight project staff members who devoted ten months to developing and trying out the techniques:

Anwar Jasin
Soeradjiman
Wardojo
Thamrin Gunardi
Maman Suherman
Tonny Hartono
I.B. Arnawa
Sukarno Sindhuputro

A panel of three eminent authorities in education and planning spent two weeks with the staff conducting objectives workshops and providing guidelines for our later work. The three were John C. Flanagan, Chairman of the Board of the American Institutes for Research; Guy J. Pauker, RAND Corporation; and Ralph W. Tyler, Director Emeritus of the Center for Advanced Study in the Behavioral Sciences.

Frank B. Womer, Professor of Education at the University of Michigan and former Staff Director of the National Assessment of Educational Progress provided valuable and insightful guidance during his four-month stay in Indonesia.

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* Identification of goals, objectives and targets:
Volume I: Development of educational objectives
Volume II: Determination of educational priorities
Volume III: Setting priorities among educational objectives, Office of Educational Development, Ministry of Education and Culture, Indonesia. Jakarta, June 1972.

Vincent N. Campbell (author of Chapter III in this present report) conducted a careful review of potential priority-setting methods before spending two weeks in Indonesia. It was during this two weeks that the basic "value-contribution" method was developed.

We would also like to express our sincere appreciation for the encouragement and guidance of Daryl G. Nichols, American Institutes for Research, and of the senior staff of the Office of Educational Development. Their support throughout the project period was important to its success.

We are most grateful to UNESCO for providing the majority of funding for the project in Indonesia.

Finally, we would like to express our appreciation to the SEAMEO Regional INNOTECH Center and to its former Director, Ly Chanh Duc, for the opportunity provided us to disseminate the priority-setting technique to other countries.

Sudijarto
Sutjipto

INTRODUCTION

Educational priorities are continuously being established and revised by every community and nation. Whenever new educational budgets are made, whenever a curriculum is revised or a textbook written or a teacher replaced -- priorities are made. The question being asked is "How to allocate educational resources?"

Educational resources are limited in all countries: there is no way to attain all the desirable educational achievements (objectives). Reading is a desirable objective, but so is music, technical skill, home economics, etc. All educational objectives, by definition, are desirable achievements. But some are undoubtedly of greater value to the individuals in a given society than others. Priorities among educational objectives, must be established in one way or another.

It is probably the most usual practice to make these judgments in relation to known deficiencies and to some implicit concept about the kind of education of most value to a society and its citizens. The Indonesian model upon which this report is based attempts to make such judgments explicit by relating educational objectives to national goals, whether they be an "improvement in banking services" or the "insurance of equal treatment of citizens under the law." The first step in setting priorities, therefore, must be the establishment of explicit national goals and targets. This topic is treated in Chapter II.

Education is not (or should not be) self-serving; education exists to serve the needs of a society and its citizens, collectively and individually. The preservation of a society's knowledge, culture and traditions and the provision for societal change and development provide the purposes of education. It was this rationale which provided the basis not only for relating educational goals to national goals, but also for the derivation of educational objectives themselves. The method by which Indonesia developed educational objectives from national/societal goals also is treated in Chapter II.

Given the existence of comprehensive and explicit national goals and educational objectives, priority setting becomes a process of judging the relative value of national goals of judging the relative contribution of educational objectives to the achievement of national goals. Hence, the name "value-contribution" has been given to the methods described herein.

The word "relative" above also has special significance to the value-contribution method. A ratio-scale is used throughout so that the results can indicate not only that a given goal or objective has more value than another, or that it makes a greater contribution, or that it has a higher priority -- but also how many times more valuable, or greater in its contribution or higher in its priority. The use of the concept of "relative", therefore, provides a much more powerful decision-making tool than would otherwise be possible.

No effort has been made to calculate the relative costs for the achievement of educational objectives, but it is a logical extension of the work reported herein. Resource allocation could thus encompass both relative priority and relative cost.

Chapter I, beginning on the next page, is a self-instructional module which contains all the elements of the value-contribution method. Although it assumes that national goals and educational objectives have already been established, and although it is relatively simplistic, we strongly suggested that it be understood fully before proceeding to later chapters.

CHAPTER I: A SELF-INSTRUCTIONAL MODULE FOR SETTING PRIORITIES

by Michael B. Nathenson

INNOTECH conducts a series of three-month courses on educational planning for key educators in the SEAMEO Region. The Center considered the Indonesian model of sufficient importance to educational planners that it has been included as one of the twenty-seven instructional modules in the course. As with the majority of course instruction, this module is self-instructional, allowing persons of different experience and language proficiency to proceed at their own pace. Although the format may be new to a number of readers, the essential components of the self-instructional module are:

Preview, Rationale and Objectives -- giving the background, the purpose and value of the content and the objectives which one should achieve on completing the module.

Pretest -- determining whether a student already has the knowledge or skills to be learned in the module. (Students who already can achieve the objectives need not take the module.)

Prerequisites -- determining whether a person has the necessary entry skills to benefit from the module. (Students lacking some prerequisite skills are given individual remedial instruction.)

Instructional Frames -- including instructional content, practice, self-evaluation study questions and feedback.

Post-test -- insuring that all achieve the stated objectives.

FRAME 1:

PREVIEW, RATIONALE, OBJECTIVES

How often have educational plan ers insisted upon making education more "relevant" to the needs of individuals and society?

and

How often have educational planners spoken about the need to set "priorities" on the use of limited educational resources?

We often have used words such as "relevance" and "priority", but our ability to implement then in any systematic way has been lacking. This Module, therefore, is designed to introduce you to one representative technique for systematically setting educational priorities - the "Value-Contribution (VC) Method."

Before beginning, one point must be clarified: The VC Method only provides a tool for making judgments about educational priorities; the vailidity of its results must rely upon the validity of human judgment. Decisions will always be made on how to improve education; whether or not a formal priority-setting technique exists. It is hoped, however, that techniques like the VC Method will provide the needed systematic linkage between societal needs and educational priorities.

OBJECTIVES

After completing the self-instructional learning programme for this module, you should be able to apply one priority-setting technique - the Value Contribution (VC) Method - to a hypothetical set of objectives.

FRAME 1A: PRETEST

Perhaps you already know how to set educational priorities among objectives using the VC Method. If so, there is no need for you to complete this programme.

Apply the VC Method to set educational priorities for the following targets and objectives:

National Target $_1$	Increase economic development
National Target $_2$	Improve the social and cultural environment
National Target $_3$	Stabilize the political system

Educational Objective $_{(A)}$	Children should demonstrate their knowledge and skills in arithmetic
Educational Objective $_{(B)}$	Children should be able to read and understand written material in their national language
Educational Objective $_{(C)}$	Children should be able to apply principles of science to their daily lives
Educational Objective $_{(D)}$	Children should demonstrate their understanding of economic development, social justice, basic human rights, and democratic government.
Educational Objective $_{(E)}$	Children should appreciate the arts, music, and literature.

TAKE YOUR COMPLETED PRE-TEST TO A MEMBER OF THE TRAINING STAFF FOR EVALUATION. DO NOT GO ON TO FRAME 2 UNTIL INSTRUCTED.

FRAME 1B: PREREQUISITES

To master the objectives of this programme, you must be able to perform simple mathematical calculations.

(1) Add the following numbers:

30
25
60
40
15
20
5
95

Sum = _____

(2) 85% is an example of

_____ High percentage

_____ Medium percentage

_____ Low percentage

(3) Subtract:

(a) 65% - 15% = _____

(b) 90% - 60% = _____

(4) Multiply:

(a) 35 x 10 = _____

(b) 65 x 100 = _____

(c) 20 x 15% = _____

(d) 60 x 40% = _____

(e) 40 x .25 = _____

(f) 20 x .30 = _____

(g) 400 x 0 = _____

(5) Divide:

(a) 600 ÷ 25 = _____

(b) 260 ÷ 20 = _____

(6) Convert:

25% to its decimal equivalent _____

Distribute (i.e., apportion) 100 points among the 6 objectives below. Give the highest number of points to objective which, in your opinion, makes the most valuable contribution to the welfare and needs of your country. Give lower number of points to the objectives you judge to be of lesser value. The total of the Value Contributions must be 100.

	ESTIMATED VALUE CONTRIBUTION
Objective 1: Increase heavy and light manufacturing	
Objective 2: Increase production of raw materials	
Objective 3: Increase production of food and clothing	
Objective 4: Reduce rate of population growth from 2.5% to 1.5%	
Objective 5: Improve hygiene, sanitation, nutrition and medical services	
Objective 6: Improve management, planning, efficiency and productivity	
TOTAL	100

FEEDBACK TO PRE-REQUISITE TEST

(1) Sum = 290

(2) High percentage

(3) (a) 50%

(b) 30%

(4) (a) 350

(b) 6500

(c) 3

(d) 24

(e) 10

(f) 6

(g) 0

(5) (a) 24

(b) 13

(6) .25

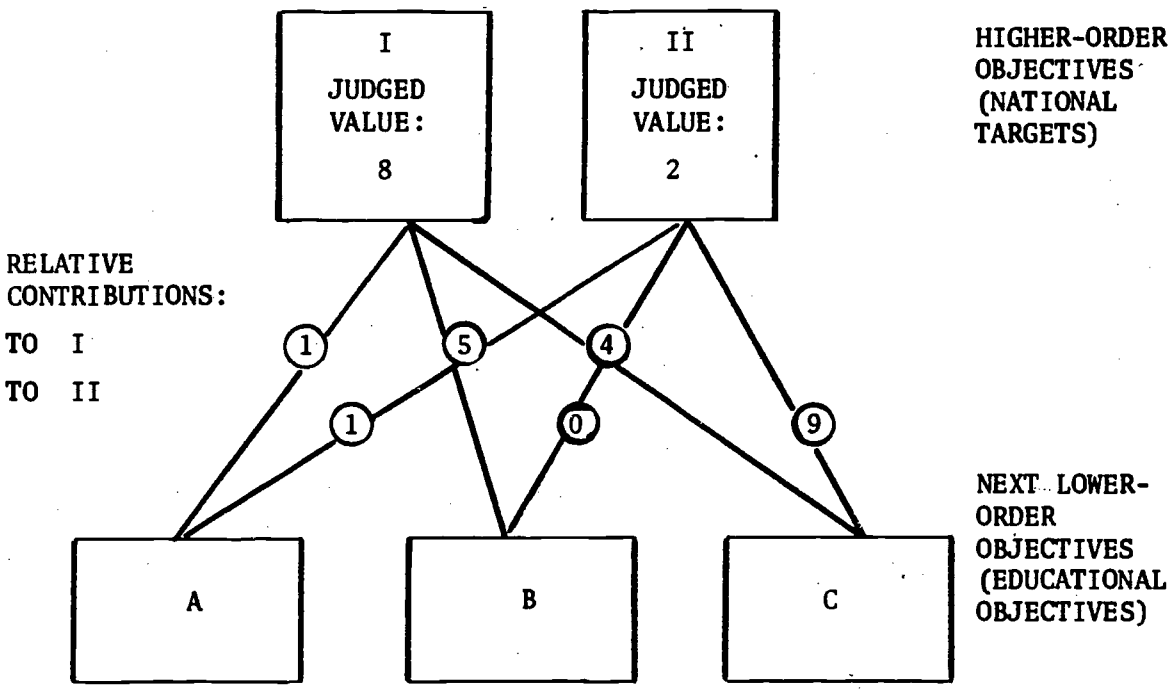
(7) Any answer is acceptable if your six numbers (i.e., points) add-up to 100

(For example:)

Objective	Value Contribution
1	20
2	25
3	10
4	5
5	15
6	25
	100

FRAME 2: Basic Rationale of the VC Method

The relative value of lower-order objectives (educational objectives) depends on the relative value of higher-order objectives (national targets) and on the relative contribution that lower-order objectives make to them. Here is an example of a problem that illustrates the basic process. To understand it, follow the four steps and applied practice given on the pages following the illustration.



V-C to I	8 x 1 = 8	8 x 5 = 40	8 x 4 = 32
V-C to II	2 x 1 = 2	2 x 0 = 0	2 x 9 = 18
VALUE	10	40	50

PROBLEM: To calculate the relative value of Lower-Order Objectives A, B, and C. (Use diagram on page 9.)

Step 1: Higher-order objective I has a judged value of 8

Applied Practice 1: What is the judged value of Higher-order Objective II?

_____ FEEDBACK _____

2 (answer)

Step 2: Judges have estimated that:

A. Lower-Order Objective A contributes one (1) to Higher-Order (H-O) Objective I and one (1) to H-O Objective II

B. Lower-Order Objective B contributes five (5) to H.O. I and zero (0) to H.O. II

Applied Practice 2: C. What contributions does Lower-Order Objective C make to:

(1) _____ Higher-Order Objective I

(2) _____ Higher-Order Objective II

_____ FEEDBACK _____

(1) 4 to H.O. Objective I

(2) 9 to H.O. Objective II

Step 3: To determine the Value Contributions of Lower-Order Objective A: (Refer to page 9.)

(1) Multiply the judged value of H-O Objective I (8 as determined in Step 1) times the Relative Contribution that Lower-Order Objective A makes to it (1 as determined in Step 2).

Thus, 8 x 1 = 8, is the Value Contribution that A makes to I.

(2) Multiply the judged value of H-O Objective II (2 as determined in Step 1) times the Relative Contribution that Lower-Order Objective A makes to it (1 as determined in Step 2)

Thus, 2 x 1 = 2, is the Value Contribution that A makes to II.

Applied Practice 3a

Determine the Value Contributions of Lower-Order Objective B to:

(1) _____ Higher-Order Objective I

(2) _____ Higher-Order Objective II

_____ FEEDBACK _____

(1) 40 to H.O. Objective I

(2) 0 to H.O. Objective II

Applied Practice 3b

Determine the Value Contributions of Lower-Order Objective C

_____ FEEDBACK _____

(1) 32 to Objective I

(2) 18 to Objective II

Step 4:

The VALUE of Lower-Order Objective A is determined by adding its Value Contributions to both Higher-Order Objectives I and II:

Value Contribution to I	8 x 1 = 8
plus	plus
Value Contribution to II	2 x 1 = 2
Value of Objective A	10

Applied Practice 4a

Determine the VALUE of Objective B

Value Contribution to I _____

plus

plus

Value Contribution to II _____

Value of Objective B _____

FEEDBACK

VC to I: 8 x 5 = 40

VC to II: 2 x 0 = 0

Value of Objective B 40

Applied Practice 4b

Determine the VALUE of Objective C

FEEDBACK

VC to I: 8 x 4 = 32

VC to II: 2 x 9 = 18

Value of Objective C 50

Referring again to the diagram on page 9, we can say that the VALUE of Objective B is four-times the VALUE of Objective A or that Objective B is four times as valuable as Objective A.

STUDY QUESTION

By the same logic, we can then say that Objective C is ____ times as valuable as Objective A.

FEEDBACK

five times

Using the VALUES obtained for Objectives A, B, and C, we could then calculate the relative VALUES of objectives at an even lower-order.

FRAME 4

A basic assumption must be met when using the VC Method:

At each level in the hierarchy, the objectives must be comprehensive, i.e., they must include all of the objectives at that level which contribute to all of the objectives at the next higher level.

For example, the three Lower-Order Objectives A, B, and C contain all of the possible contributors to Higher-Order Objectives I and II.

STUDY QUESTION

Why do you think this assumption is so important?

FEEDBACK

With all possible contributions accounted for, it is then possible to say, for example, that Objective B is judged to be four times as valuable as Objective A.

FRAME 5

The VC Method, as illustrated in FRAME 2, is quite adequate to establish values for National Goals, Objectives and Targets. But, once we move from national objectives toward educational objectives, simple value is not sufficient. Other decisions are necessary:

1. What proportion of the achievement of National Targets is due to human ability (H) as opposed to other resources such as finance, government policy, or natural resources? Since education can only have an effect on human ability (H), educational priorities must be addressed solely to this aspect of target achievement.

2. At the educational objective level, what proportion of the achievement of a given objective can or should be the responsibility of the educational system? For example, should (or can) religious instruction or civic achievement be the sole responsibility of the schools, or should much of this responsibility rest with parents, religious institutions, the community, etc. This estimate of educational contribution (EC) of the educational system is needed before we can set priorities among student achievements (objectives) for which the school system is to be responsible.

3. Again, at the educational objective level, what is the difference (D) in the proportion of children (at a given target age) who presently are achieving the objective and the proportion of children who ideally should be able to achieve the objective in the future. If a sufficient proportion are achieving an objective under present conditions, the priority for improvement is low no matter how valuable the achievement of the objective is to society.

STUDY QUESTION

Mark (✓) each of the following that one must consider when determining the educational priority of a given objective.

_____ value of a given national target

_____ human ability component of a given target

_____ contribution of objective to a given target

_____ educational contribution, expressed as a proportion of objective achievement, which can or should be the responsibility of the educational system.

_____ difference between the current proportion of children at a given target age achieving the objective and the desired proportion.

FEEDBACK

all must be considered in determining the educational priority of an objective.

FRAME 6 - NO RESPONSE REQUIRED

During the remainder of this programme (FRAME 7 through FRAME 14), you will use the Value Contribution technique to establish priorities for a hypothetical set of objectives. To be successful, you must accomplish the following tasks:

Task 1: Given six (hypothetical) national targets, judge the relative contribution which each target makes to the need and welfare of your country.

Task 2: Calculate the net value of the Human Ability (H) component of each National Target.

Task 3: Given eight (hypothetical) educational objectives, judge the relative contribution which each objective makes to each of the six National Targets.

Task 4: For each objective, judge the proportion of its achievement which can be or which should be made by the educational system (EC).

Task 5: For each objective, judge the difference between the percentage of children presently achieving it and the percentage of children who should be achieving it in an ideal society twenty-five years hence (D).

Task 6: For each objective determine its educational priority.

FRAME 7

TASK 1: Given the six hypothetical national targets (NT), judge the relative value contribution which each target makes to the needs and welfare of your country.

STEP TO ACCOMPLISH TASK 1: Estimate the relative contribution which each National Target makes to the needs and welfare of your country. To do this, distribute 100 points among the 6 National Targets. Give the highest number of points to the target which, in your judgment, makes the most valuable contribution to your country's needs and welfare. Give lower number of points to the targets you judge to be of lesser value.

Remember: Giving 50 points to one target and 10 points to nother means that the target receiving the 50 points is judged by you to be five-times as valuable to your country's needs and welfare as the target receiving the 10 points.

Enter the estimated value contribution of each National Target in the second column of Form 1 on the next page.

NOTE: The total of the estimated value contributions of the six National Targets must be 100. Check by adding up NT_1, NT_2, NT_3, NT_4, NT_5, and NT_6 and making certain that the total is 100

FRAME 7

FORM 1

"ESTIMATED VALUE CONTRIBUTION OF NATIONAL TARGETS TO NATIONAL NEEDS AND WELFARE"

NATIONAL TARGETS		ESTIMATED VALUE CONTRIBUTION
NT_1	Increase heavy and light manufacturing	
NT_2	Increase production of raw materials	
NT_3	Increase production of food and clothing	
NT_4	Reduce rate of population growth	
NT_5	Improve hygiene, sanitation, nutrition and medical services	
NT_6	Improve management, planning, efficiency and productivity	
	TOTAL	100

FRAME 8

TASK 2: Judge the Human Ability (H) component of each National Target

RECALL FROM FRAME 5: The achievement of National Targets is dependent not only on human capability, but also upon other inputs such as national resources, capital investment, government policy, external support, etc. Education can only assist in the achievement of those national targets which represent human capability.

STEPS TO ACCOMPLISH TASK 2.

(1) Refer to Form 2 on the next page: "Human Ability component of National Targets."

(2) In your judgment, how much does human ability (as opposed to other inputs) contribute to the achievement of each National Target? Your estimate should be in percentage.

For example:

Perhaps you feel that human capability contributes only 25% to NT_1 (Increase manufacturing), but as much as 80% to NT_4 (Reduce population growth).

(3) Enter your judgments of the Human Ability (H) component for each of the six National Targets in the second column of Form 2.

FRAME 8
FORM 2

JUDGMENT OF THE HUMAN ABILITY COMPONENT OF
NATIONAL TARGETS

NATIONAL TARGETS		HUMAN ABILITY COMPONENT (H%)
NT_1	Increase heavy and light manufacturing	
NT_2	Increase production of raw materials	
NT_3	Increase production of food and clothing	
NT_4	Reduce rate of population growth from 2.5% to 1.5%	
NT_5	Improve hygiene, sanitation, nutrition and medical services	
NT_6	Improve management, planning, efficiency and productivity	

FRAME 9: PRIORITY-SETTING AMONG EDUCATIONAL OBJECTIVES

The human ability component of national targets (coupled with target values) provides the focus for educational priority setting. The primary question to be answered concerns the relative contributions of educational objectives to national targets.

TASK 3: Given the following eight hypothetical educational objectives (EO), judge the relative contribution which each objective makes to each of the 6 National Targets:

$EO_{(A)}$ Children of school age should have sufficient skills in listening, speaking, reading and writing their national language.

$EO_{(B)}$ They should have sufficient knowledge and skills in arithmetic and problem-solving.

$EO_{(C)}$ They should know and understand semi-technical facts about their national environment, and have the ability to apply the scientific method in daily life.

$EO_{(D)}$ They should know and understand basic human rights, principles of democratic government, social justice, and economic and social development.

$EO_{(E)}$ They should have skills in one of the following fields: Agriculture, industry, mining, transportation, handicraft, and commerce.

$EO_{(F)}$ They should be able to appreciate art, music, and literature.

$EO_{(G)}$ They should be able to demonstrate their understanding of the importance of good health by practicing habits of cleanliness (both personal and in the home), regular physical exercise, good nutrition, inoculation, and prompt health care when needed.

$EO_{(H)}$ They should have an appreciation for the importance of a planning approach in solving both personal and school problems. They should implement planning and management procedures in daily life.

STEPS TO ACCOMPLISH TASK 3

(1) Refer to Form 3 on pages 23-24: "Relative Contribution of Educational Objectives to National Targets". The 8 Educational Objectives are listed at the left margin while the 6 National Targets (NT) are in columns. A verbal description of each National Target was given on page 20.

(2) To judge the relative contribution which each Educational Objective makes to each of the 6 National Targets, follow the steps in the example below:

Example: National Target NT_1

(a) Estimate the relative contribution which each Educational Objective makes to National Target$_1$. To do this, distribute 100 points among the eight objectives. Give the highest number of points to the objective which, in your judgment, makes the most important contribution to NT_1. Give lower number of points to objectives you judge to be of lesser importance.

Remember: Your giving 30 points to one objective and 10 points to another means that the 30 point objective is judged by you to make three times as much contribution to NT_1 as the 10 point objective.

(b) Enter the estimated contribution of each educational objective in the NT_1 column. The sum of the contributions of the 8 objectives for NT_1 must be 100. Check your work by adding the 8 contributions - the total must be 100.

(c) Repeat Steps (a) and (b) for

NT_2
NT_3
NT_4
NT_5
NT_6

FRAME 9
FORM 3

RELATIVE CONTRIBUTION (RC) OF
EDUCATIONAL OBJECTIVES TO NATIONAL TARGETS

EDUCATIONAL OBJECTIVES / NATIONAL TARGETS		NT_1	NT_2	NT_3	NT_4	NT_5	NT_6
$EO_{(A)}$	Children of school age should have skills in listening, speaking, reading and writing their national language.						
$EO_{(B)}$	They should have sufficient knowledge and skills in arithmetic and problem-solving.						
$EO_{(C)}$	They should know and understand semi-technical facts about their national environment, and have the ability to apply the scientific method in daily life.						
$EO_{(D)}$	They should know and understand basic human rights, principles of democratic government, social justice, and economic and social development.						

FRAME 9
FORM 3 (Continued)

EDUCATIONAL OBJECTIVES \ NATIONAL TARGETS		NT_1	NT_2	NT_3	NT_4	NT_5	NT_6
$EO_{(E)}$	They should have skills in one of the following fields: Agriculture, industry, mining, transportation, handicraft, and commerce						
$EO_{(F)}$	They should be able to appreciate art, music and literature						
$EO_{(G)}$	They should be able to demonstrate their understanding of the importance of good health by practicing habits of cleanliness (both personal and in the home), regular physical exercise, good nutrition, inoculation, and prompt health care when needed.						
$EO_{(H)}$	They should have an appreciation for the importance of a planning approach in solving both personal and school problems. They should implement planning and management procedures in daily life.						
	TOTAL	100	100	100	100	100	100

FRAME 10

TASK 4: For each objective, judge the proportion of its achievement which can or should be made by the educational system.

RECALL FROM FRAME 5: Some objectives can best be taught by the schools, e.g., objectives concerned with mathematics. Some objectives cannot be taught wholly by the school, e.g., objectives concerned with citizenship behavior in the community.

Some objectives should be taught by schools, e.g., grammar in the national language. Some objectives should not be taught wholly by the school, e.g., objectives concerned with religion.

STEPS TO ACCOMPLISH TASK 4

(1) Refer to Form 4 page 26-27: "Estimated Educational Contribution (EC) of the School System to the Achievement of Objectives".

(2) For each objective, estimate what proportion of its achievement can or should be made by the school (educational system). Your estimates should be in percentages.

EXAMPLE - EDUCATIONAL OBJECTIVE A

(a) If you think that educational Objective A "Children should have skills in listening, speaking, reading, and writing their national language" can or should be taught mostly in school, your percentage estimate would be high (perhaps 70% to 90%).

(b) Enter your estimated educational contribution for $EO_{(A)}$ in the second column.

(3) Repeat Steps (a) and (b) for

EO (B)
EO (C)
EO (D)
EO (E)
EO (F)
EO (G)
EO (H)

Until Form 4 is completed for all eight Educational Objectives

FRAME 10
FORM 4

ESTIMATED EDUCATIONAL CONTRIBUTION (EC) OF THE SCHOOL SYSTEM TO THE ACHIEVEMENT OF OBJECTIVES

EDUCATIONAL OBJECTIVES		ESTIMATED EDUCATIONAL CONTRIBUTION
$EO_{(A)}$	Children of school age should have sufficient skills in listening, speaking, reading and writing their national language	
$EO_{(B)}$	They should have sufficient knowledge and skills in arithmetic and problem-solving	
$EO_{(C)}$	They should know and understand semi-technical facts about their national environment and have the ability to apply the scientific method in daily life	
$EO_{(D)}$	They should know and understand basic human rights, principles of democratic government, social justice, and economic and social development	
$EO_{(E)}$	They should have skills in one of the following fields: agriculture, industry, mining, transportation, handicraft, and commerce	
$EO_{(F)}$	They should be able to appreciate art, music and literature	

FRAME 10
FORM 4 (Continued)

EDUCATIONAL OBJECTIVES		ESTIMATED EDUCATIONAL CONTRIBUTION
$EO_{(G)}$	They should be able to demonstrate their understanding of the importance of good health by practicing habits of cleanliness (both personal and in the home), regular physical exercise, good nutrition, inoculation, and prompt health care when needed	
$EO_{(H)}$	They should have an appreciation for the importance of a planning approach in solving both personal and school problems. They should implement planning and management procedures in daily life	

FRAME 11

TASK 5

For each objective, judge the difference between the percentage of children (at a given target age) presently achieving it and the percentage who would be able to achieve it in a future ideal society some twenty-five years hence.

STEPS TO ACCOMPLISH TASK 5

(1) Select one target-age group for your own use from the example below:

Grade 3 : Approximately 9-10 years old
Grade 5 : Approximately 11-12 years old
Grade 8 : Approximately 15-16 years old
Grade 12: Approximately 18-19 years old

(2) Refer to Form 5 on pages 31-32: "Estimated Difference in the Target Population between Current and Desired Achievement of Educational Objectives"

(3) For each objective, estimate the per cent of children in your target-age group who are presently achieving the objective.

EXAMPLE - EDUCATIONAL EXAMPLE A

(a) For $EO_{(A)}$ what per cent of children in your target-age group are presently acquiring sufficient skills in listening, speaking, reading, and writing their national language? If, for example, you think this objective is presently being achieved by a high percentage of children in your target group, then your per cent estimate should be high (e.g., within the 70% - 90% range). If, for example, you think this objective is presently being achieved by about half of the children, then your per cent estimate should be within the 40%-60% range.

(b) Enter your estimate for $EO_{(A)}$ in column (2), "Population Presently Achieving Objective (%)".

(4) Repeat steps (a) and (b) for each of the remaining seven educational objectives.

(A note: If assessment figures of actual student achievements would be available, such "hard facts" would be more appropriate to use.)

FRAME 11 (continued)

(5) For each objective, estimate the percentage of children in your target age group who would be achieving the objective in a future ideal society twenty-five years hence.

EXAMPLE - EDUCATIONAL OBJECTIVE A

(c) For $EO_{(A)}$ what per cent of children in your target group would be able to acquire sufficient national language skills in a future ideal society?

High per cent of children who would achieve objective in future ideal society	=	High Estimate 70%-90%
About half of the children who would achieve objective in future ideal society	=	Middle Estimate 40%-60%
Low per cent of children who would achieve objective in future ideal society	=	Low Estimate 10%-30%

(d) Enter your estimate for $EO_{(A)}$ in column (3), "Population Who Would Achieve Objective in the Future (%)"

(6) Repeat Steps (c) and (d) for each of the remaining seven educational objectives.

(7) To obtain the difference between the percentage of children presently achieving each educational objective and the percentage of children who would be able to achieve it in a future ideal society, simply subtract column (2) from column (3) for each of the 8 Educational Objectives.

(8) Enter the differences in column 4 "Estimated Differences between Current and Desired Achievement."

Note: Differences may possibly be negative if a larger percentage of children are currently achieving a given objective than would be achieving it in a future ideal society.

FRAME 11
FORM 5

ESTIMATED DIFFERENCE IN THE TARGET POPULATION BETWEEN CURRENT AND DESIRED ACHIEVEMENT OF EDUCATIONAL OBJECTIVES

EDUCATIONAL OBJECTIVES	POPULATION PRESENTLY ACHIEVING OBJECTIVE (%)	POPULATION WHO WOULD ACHIEVE OBJECTIVE IN THE FUTURE (%)	ESTIMATED DIFFERENCE BETWEEN CURRENT AND DESIRED ACHIEVEMENTS
$EO_{(A)}$			
$EO_{(B)}$			
$EO_{(C)}$			
$EO_{(D)}$			
$EO_{(E)}$			
$EO_{(F)}$			

FRAME 11
FORM 5 (continued)

EDUCATIONAL OBJECTIVES	POPULATION PRESENTLY ACHIEVING OBJECTIVE (%)	POPULATION WHO WOULD ACHIEVE OBJECTIVE IN THE FUTURE (%)	ESTIMATED DIFFERENCE BETWEEN CURRENT AND DESIRED ACHIEVEMENTS
$EO_{(G)}$			
$EO_{(H)}$			

FRAME 12

TASK 6: To determine educational priorities for the eight objectives:

STEPS TO ACCOMPLISH TASK 6

(1) Briefly review FRAME 2, beginning on page 9: "The Basic Rationale of the VC Method"

(2) Refer to FORM 6, page 37a: "Applying the VC Method in Setting Priorities Among Eight Objectives."

(2) The six National Targets are listed in boxes across the top of the form. To obtain the Net Value (NV) of the Human Ability Component for each National Target, follow the steps in the example below:

EXAMPLE - NATIONAL TARGET$_1$ (See page 37a)

(a) In the box provided enter your previously estimated value (V) for NT_1 - (obtain your estimate from FORM 1 on page 18).

(b) In the box provided, enter your judgment of the Human Ability Component (H) (obtain your judgment from FORM 2 on page 20).

(c) Multiply V x H to obtain net value (NV_1)

V	x	H	=	Net Value (NV_1)

and enter the product in the box provided.

Repeat Steps (a), (b), and (c) for each of the remaining National Targets (NT_2 - NT_6)

(4) 8 circles are drawn under each National Target. To obtain the relative contribution of each educational objective to each National Target, follow the steps in the example below:

EXAMPLE - National Target $_1$

(a) In circle A, enter the Relative Contribution (RC) which $EO_{(A)}$ makes to NT_1 (obtain numbers from FORM 3 on pages 23-24).

FRAME 12 (continued)

(b) In circle B, enter the Relative Contribution (RC) which $EO_{(B)}$ makes to NT_1 (again obtain numbers from FORM 3 on pages 23-24)

(c) In circle C, enter the RC which $EO_{(C)}$ makes to NT_1

(d) Repeat the above process for the remaining five objectives until all RCs are filled-in for NT_1

NOTE: Check to make sure that the total of all contributions to a given target equals 100; if they do not, return to pages 23-24 to check your calculations.

Repeat Steps (a), (b), (c), and (d) for each of the remaining National Targets (NT_2 - NT_6)

(5) Six lines are drawn under each of the eight Educational Objectives. To obtain the total net value contribution of each objective, follow the steps in the example below:

EXAMPLE - EDUCATIONAL OBJECTIVE A, $EO_{(A)}$

(a) Obtain NV_1 for National $Target_1$ (see top row of boxes). Write that number here _____.

(b) Obtain the relative contribution (TC) which Educational Objective A $EO_{(A)}$ makes to National $Target_1$ (see circle A under NT_1). Write that number here _____.

(c) Multiply the number in (a) times that number in (b) and enter the product on the first line under $EO_{(A)}$ (Labeled: 1 NV x RC).

NET VALUE OF NATIONAL TARGET 1	X	RELATIVE CONTRIBUTION WHICH EDUCATIONAL OBJECTIVE A MAKES TO NATIONAL TARGET 1	=	NET VALUE CONTRIBUTION OF EDUCATIONAL OBJECTIVE A TO NT_1

FRAME 12 (continued)

(d) Repeat Steps (a), (b), and (c) for National Targets 2, 3, 4, 5, and 6, entering products on the lines under Educational Objective A.

(e) Add up the six net value contributions for $EO_{(A)}$ and enter the sum in the box under Educational Objective A labeled: "Total Net Value Contribution of Educational Objectives to National Targets"

Repeat Steps (a), (b), (c), (d), and (e) for each of the remaining educational objectives:

$EO_{(B)}$
$EO_{(C)}$
$EO_{(D)}$
$EO_{(E)}$
$EO_{(F)}$
$EO_{(G)}$
$EO_{(H)}$

(6) A row of dotted-lines (i.e., ...) is drawn under each of the eight Educational Objectives labeled "Educational Contribution" (i.e., directly under the row of boxes labeled "Total Net Value Contribution of Educational Objectives to National Targets.").

To obtain the education contribution of each objective, simply copy the percentages from FORM 4 on pages 26-27 onto the blank dotted-lines. For example, the Educational Contribution for $EO_{(A)}$ (obtained from FORM 4) should be entered on the first dotted-line under $EO_{(A)}$. The Educational Contribution for $EO_{(B)}$ should be entered on the next dotted-line under $EO_{(B)}$ etc., for each of the eight Educational Objectives.

(7) A row of broken lines (i.e., ----------) is drawn under each of the eight Educational Objectives labeled "Difference between Current and Desired Achievement of Educational Objectives" (i.e., directly under the "Educational Contribution row of dotted-lines).

To obtain this difference for each objective, simply copy the percentages you calculated from the last column of FORM 5, pages 31-32, onto the blank dotted-lines. For example, the estimated difference between current and desired achievement of Educational Objective A (obtained from FORM 5) should be entered on the first broken-line under $EO_{(A)}$. The difference in achievement of $EO_{(B)}$ should be entered on the next broken-line under $EO_{(B)}$, etc., for each of the eight Educational Objectives.

(8) Refer to the row of boxes labeled "Raw Priority" under each of the eight Educational Objectives (i.e., directly under the two rows of broken-lines). To obtain the raw priority of each objective, follow the steps in the Example below:

EXAMPLE - EDUCATIONAL OBJECTIVE A

(a) Copy the Total Net Value Contribution of Educational Objective A here _____

(b) Copy the Educational Contribution of Educational Objective A here _____. (If it is written as a percentage, convert it to decimal equivalent for easier multiplication.)

(c) Copy the Difference between Current and Desired Achievement of Educational Objective A here _____ (If it is written as a percentage convert it to decimal equivalent).

(d) Multiply the number you copied in (a) times the decimal proportion in (b) times the decimal proportion in (c) and enter the product in the Raw Priority box under $EO_{(A)}$.

TOTAL NET VALUE CONTRIBUTION OF EDUCATIONAL OBJECTIVE A	X	EDUCATIONAL CONTRIBUTION OF EDUCATIONAL OBJECTIVE A	X	DIFFERENCE BETWEEN CURRENT AND DESIRED ACHIEVEMENT OF EDUCATIONAL OBJECTIVE A	=	RAW PRIORITY OF EDUCATIONAL OBJECTIVE A

Repeat Steps (a), (b), (c), and (d) for each of the remaining Educational Objectives.

FRAME 12 (Continued)

(9) To facilitate the setting of priorities, it is helpful to convert the raw priorities obtained in Step 8 to a common base of 100. Refer to the row of boxes labeled "Priority of Educational Objectives (Base 100)".

To convert the raw priorities of each objective to priorities with a common base, follow the steps in the example below:

EXAMPLE - EDUCATIONAL OBJECTIVE A

(a) Add the raw priorities of each of the eight Educational Objectives and enter the Total Raw Priority here _____.

(b) Divide the number obtained in (a) by 100 and enter the number here _____.

100	÷	TOTAL RAW PRIORITY OF ALL EIGHT EDUCATIONAL OBJECTIVES	X	RAW PRIORITY OF EDUCATIONAL OBJECTIVE A	=	PRIORITY OF EDUCATIONAL OBJECTIVE A

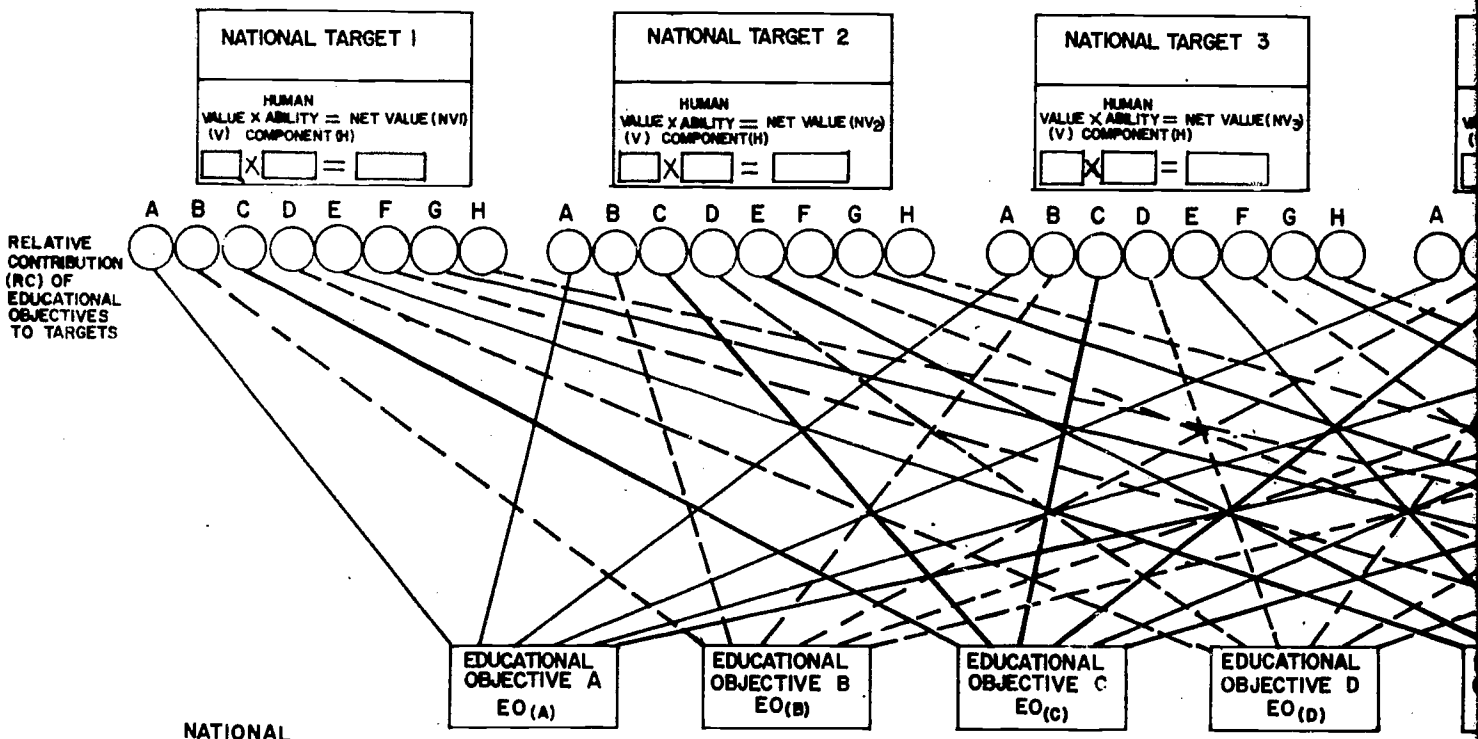
Repeat Step (c) for each of the remaining Educational Objectives

TAKE YOUR COMPLETED PROGRAMME TO A MEMBER OF THE TRAINING STAFF FOR EVALUATION.

DO NOT GO ON TO FRAME 13, THE CRITERION POST-TEST UNTIL INSTRUCTED.

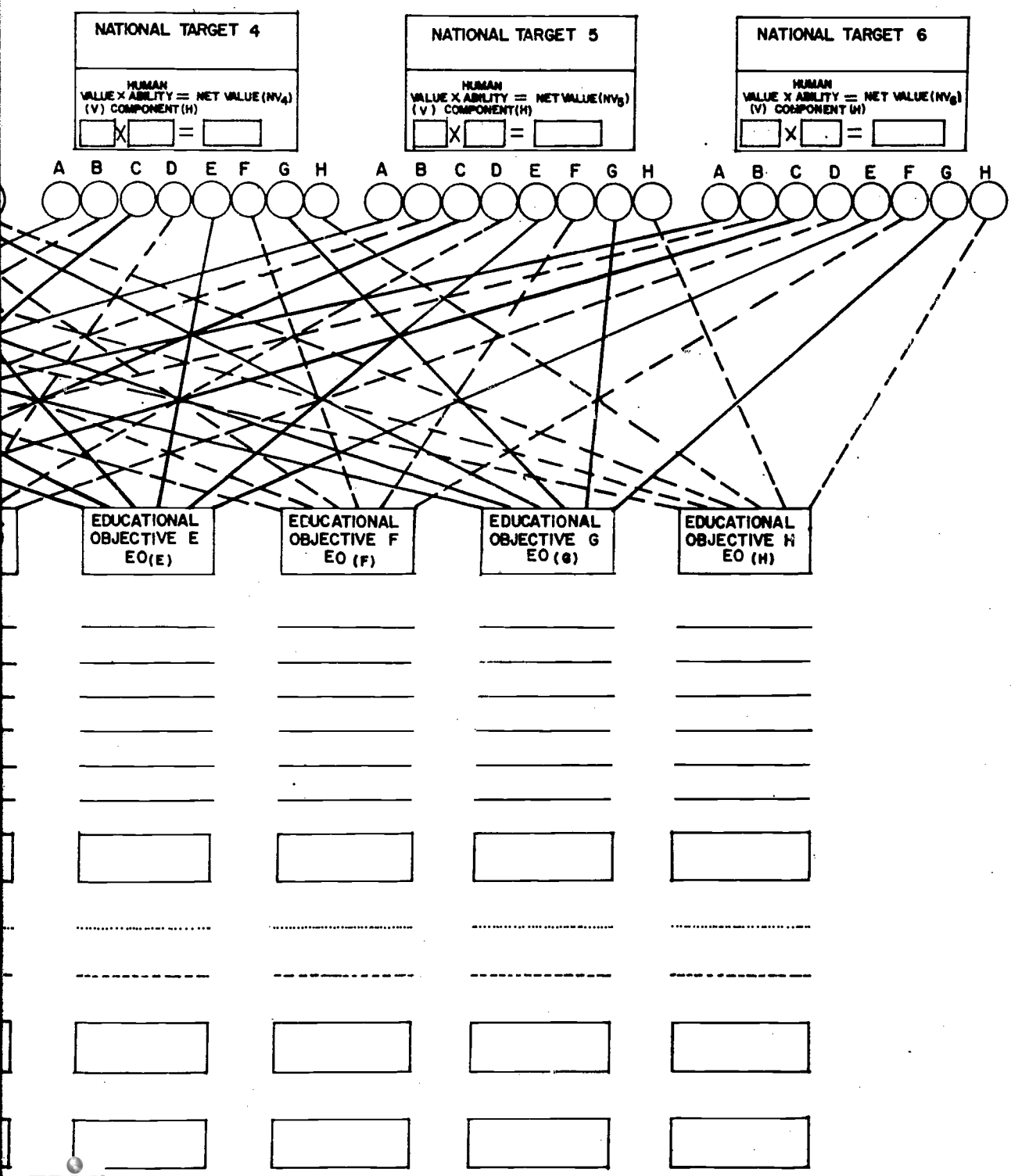
FRAME 12
FORM 6

APPLYING THE VALUE C
METHOD TO SET PRIORIT
EIGHT OBJECTIV



NATIONAL TARGETS					
1	NV × RC				
2	NV × RC				
3	NV × RC				
4	NV × RC				
5	NV × RC				
6	NV × RC				
TOTAL NET VALUE CONTRIBUTION OF EDUCATIONAL OBJECTIVES TO NATIONAL TARGETS					
EDUCATIONAL CONTRIBUTION					
DIFFERENCE BETWEEN CURRENT AND DESIRED ACHIEVEMENT OF EDUCATIONAL OBJECTIVES					
RAW PRIORITY OF EDUCATIONAL OBJECTIVES					
PRIORITY OF EDUCATIONAL OBJECTIVES (BASE 100)					

LUE CONTRIBUTION
RIORITIES AMONG
JECTIVES



FRAME 13: CRITERION POST-TEST

Apply the VC Method to set educational priorities for the following targets and objectives:

National Target$_1$	To increase economic development
National Target$_2$	To improve the social and cultural environment
National Target$_3$	To stabilize the political system

Educational Objective$_{(A)}$	Children should demonstrate their knowledge and skills in arithmetic
Educational Objective$_{(B)}$	Children should be able to read and understand written material in their national language
Educational Objective$_{(C)}$	Children should be able to apply the principles of science to their daily lives
Educational Objective$_{(D)}$	Children should demonstrate their understanding of economic development, social justice, basic human rights, and democratic government
Educational Objective$_{(E)}$	Children should appreciate the arts, music, and literature.

TAKE YOUR COMPLETED POST-TEST TO A MEMBER OF THE TRAINING STAFF FOR EVALUATION

CHAPTER II: THE INDONESIAN MODEL FOR SETTING PRIORITIES

The adaptation of the priority-setting technique in Mr. Nathenson's self-instructional module (Chapter I) presents very clearly the basic concepts of the value-contribution method. Often in this present chapter, we will refer to Chapter I rather than reiterate what was presented there. Thus, we will build upon the concepts of Chapter I in describing the complete model as developed in Indonesia. The model, as presented, represents our recommendations concerning appropriate procedures as developed from the Indonesian tryouts. Occasionally, our recommendation will differ to some degree from the procedures which were used, but we will attempt to indicate the reasons for any change.

Lest the reader consider priority-setting techniques purely academic exercises, we want to reassure him that the results of the work in Indonesia has formed the framework for a complete revision and redirection of the curriculum in that country. The basic procedure also was adapted to a model for establishing life skills objectives, i.e., those achievements of most value if a child is unable to complete more than four or five year of primary school. A successful tryout was conducted in the Philippines* and is currently being implemented in Indonesia.

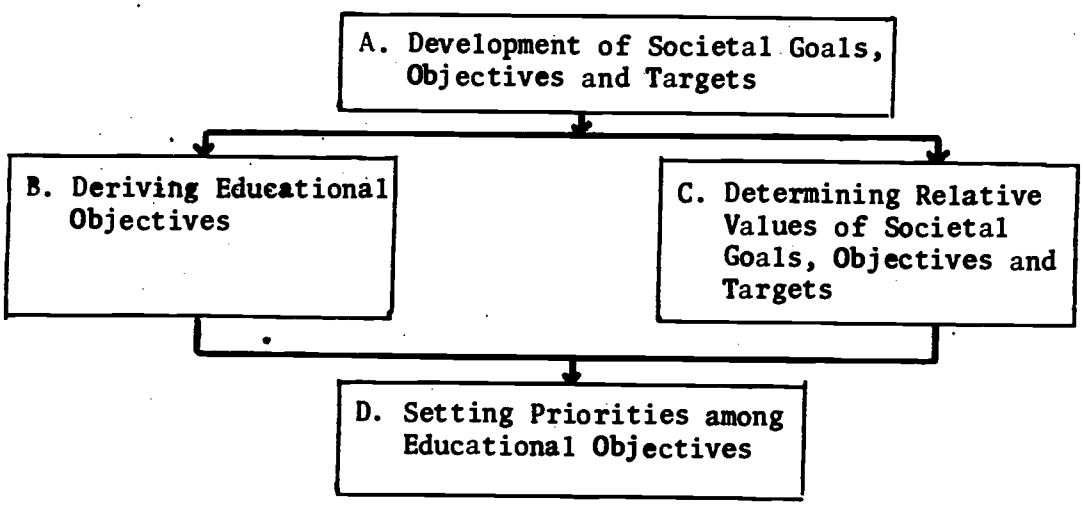
Although the total process is fairly complex, the separation of judgements (as in Chapter I) makes the process both manageable and reproduceable. Decision-makers are provided with a complete track of the many decisions and judgments which have to be made in setting priorities; should a person's view of priorities differ from those resulting from the model, it is necessary only to trace separate judgments in the process to find those where differences may exist. The virtue of the model, thus, is to avoid

* Jasin, A. et al, Life-skills objectives for primary eduation: A preliminary tryout. Saigon, INNOTECH. December 1973 (INNOTECH/LS-FR/73)

the kind of global judgments which often lead to differing viewpoints and to provide a common and acceptable basis for setting priorities.

One of the most important variables in a decision-making system based upon human judgment is who is to make the judgments. The criterion for selecting judges that was applied in Indonesia could well apply to other countries: select those persons and groups to make the judgments which they normally do either implicitly or explicitly. For example, judgments about the relative value of national targets were made by the BAPPENAS (the main Indonesian policy-making body), and judgments about the contribution of educational objectives to national targets were made cooperatively by educators and experts knowledgeable about specific targets. Application of these priority-setting techniques is a time-consuming enterprise, but it can be a wasted enterprise if the appropriate persons are not enlisted to make judgments for which they are qualified.

The Indonesian model follows the concept that education serves the needs of society and that educational objectives and their relative priorities should reflect societal needs. The diagram below shows the linking of education to societal goals, and the remainder of this chapter will make explicit the necessary procedures for deriving educational priorities.



A. Development of Societal Goals, Objectives and Targets

Sources of information for use in developing societal goals are of two kinds: (1) documentation and (2) authorities in various sectors of society.

Documentation which provides a basis for the structure and functioning of a society exists in every country. In Indonesia, five sources were found most relevant:

... The Constitution of the Republic of Indonesia

... Decrees of the Provisional People's Consultative Assembly (MPRS)

... The First Five-year Development Plan (Repelita I)

... Basic Memorandum of the Minister of Education and Culture, November 1970

... Source Book on New Policy in Educational Innovation

Authorities in various sectors of society are usually extremely knowledgeable about specific needs and plans. In Indonesia, a series of half-day meetings were held with authorities from 12 sectors:

... Politics

... Defense and Security

... Science and Technology

... Health and Family Planning

... National Planning Agency

... Finance and Banking

... Religion

... Culture

... Agriculture

... Transmigration (Sector devoted to relocation of farm families from overcrowded areas to relatively virgin land)

... Cooperatives

... Sports

The purpose of meetings with sectoral representatives is to find out needs and plans of each sector of society and to determine education's role in fulfilling these needs and plans. At each meeting, sectoral representatives can be asked to specify (1) short-and long-term sectoral goals, (2) the part education can play in helping to achieve these goals and (3) current educational strengths and weaknesses. This determination of education's role is to be used later in Section B for deriving educational objectives.

Deriving goals, objectives and targets from the information provided by documentation and sectoral authorities is an iterative and judgmental process based upon four criteria :

(1) At whatever level objectives are being developed (i.e. be they purposes, goals, objectives, targets, etc.), an attempt must be made to make all those at the same level have the same degree of specificity.

For example:

... Strive for public welfare

and

... Improve environmental quality do not have the same degree of specificity.

However,

... Increase home industry

and

... Improve medical services have approximately the same degree of specificity.

(2) Lower level objectives must contribute to higher level ones rather than simply being descriptive.

For example:

... Reduce pollution

is

is descriptive of

... Maintain natural resources and beauty.

However,

... Maintain natural resources and beauty contributes to a number of higher order objectives, such as

... Improve standard of living, improve physical well-being and health of citizen, improve environmental quality, etc.

(3) Objectives at the same level must be comprehensive, i.e., they must include all achievements that can contribute to the next higher level of objectives. The value-contribution method as outlined in Chapter I will result in spurious values unless objectives at each level are as comprehensive as possible.

(4) The lowest level of societal objectives should be at such a level of specificity that there can be fairly clear linkage to educational output.

The recommended procedure (and the method employed in Indonesia) is to (1) write on small cards, in rough form, all inputs from both documents and sectoral authorities, (2) arrange them so that those of the same specificity are placed together, (3) combine similar ones, (4) "invent" new ones that contribute to the next higher order, (5) rewrite using the same formats and verb forms, and, finally, (6) present to a Sanctioning Committee of sectoral representatives for final revision and approval. These six steps are time-consuming, but they are justified by insuring that the four criteria (above) are met and that authorities are in full agreement with them. (Since societal goals, objectives and targets are to become the basis for educational objectives, it is necessary that a given society -- as represented by sectoral authorities -- sanction the aims of the society that education is to serve.)

In Indonesia, the iterative process for developing explicit societal objectives resulted in four levels (Purpose, Goals, Objectives and

Targets). Application of the process to other societies may result in more or fewer levels. Those resulting in the Indonesian setting are given on the next few pages.

National Purpose:

Insure a just and prosperous society

National Goals:

A. Strive for Public Welfare

B. Strive for National Unity, Stability and Integrity

C. Strive for International Harmony and Peace

National Objectives:

1. Increase Economic Development and Improve Standard of Living
2. Improve Physical Well-being and Health of All Citizens
3. Improve Efficiency, Honesty and Fairness of Services
4. Improve Environmental Quality
5. Strive for Security and Justice for All Citizens
6. Conduct International Trade and Diplomacy to the Benefit of Indonesia and World Peace
7. Improve Common Understanding and Relations Among All Groups and Regions
8. Nurture the Nobility of Human Character, Spiritual Well-being and Moral Ideals

National Targets & Examples of Occupational Clusters:

A. Increase Heavy Manufacturing

Engineering Design, Research & Development
Metallurgy
Production Management
Purchasing, Finance & Marketing (Economics)
Construction
Mechanical, Electrical & Building Maintenance & Assembly

B. Increase Light Manufacturing & Processing

Engineering Design, Research & Development
Artistic design (cottage industries, etc.)
Chemical, metal & pharmaceutical production
Production Management
Purchasing, Finance & Marketing (Economics)

Construction
Mechanical, Electrical & Building Maintenance & Assembly

C. Increase Home Industry

Weaving
Silver craft
Furniture making (e.g. ratan)
Carving
Batik making

D. Increase Production of Raw Materials

Geological Exploration
Forestry, Metallurgy, Petrochemical Skills
Mining & Petroleum Engineering
Production & Estate Management
Mineral Processing (Mining, Drilling, etc.)
Finance & Marketing (Economics)
Mechanical & Electrical Maintenance

E. Increase Production of Food

Irrigation
Fertilizer production & distribution
Agricultural research
Agricultural extension & information dissemination
Transmigration
Farming & farm management
Financial support & banking services

F. Improve Transportation (for persons)

Road construction & maintenance
Railroad construction & maintenance
Terminal construction & maintenance (air & sea)
Piloting & driving
Mechanical maintenance
Management & planning, including surveys
Traffic control (air, sea, river, land)
(See manufacturing & communications)

G. Improve Transportation (for supplies, raw materials, products, etc.)

Road construction & maintenance
Railroad construction & maintenance
Terminal construction & maintenance (air & sea)
Piloting & driving
Mechanical maintenance
Management & planning, including surveys
Traffic control (air, sea, river, land)
(see manufacturing & communications)

H. Improve Communications

Management & handling of mail
Construction of postal facilities
Construction of telecommunications facilities
Operation of telecommunications systems
Financing of improvements

I. Improve Storage & Preservation Capability

Engineering design & construction
Management and planning
Maintenance of facilities
Financing of improvements

J. Increase Production of Clothing

Design & production engineering (textile, clothing, etc.)
Management and marketing
Financing and banking
Quality control & maintenance

K. Improve Electric Power Capability

Engineering design & management
Construction of power & transmission capability
(dams, generators, transmission lines, etc.)
Finance & Marketing
Mechanical & electrical maintenance

L. Improve Building Construction Capability

Architectural design
Engineering methods & research
Management & planning
Finance & Banking
Mechanical, electrical & building maintenance

M. Improve Maintenance Services

Mechanical repair & service
Electrical & electronic
Civil Engineering
Building maintenance

N. Increase Tourism

Information Dissemination & Publication
Personal Services
Arts
Transportation
Lodging
Financial transactions
Government Services (e.g. Immigration)

O. Increase Private Entrepreneurship

- Banking Services
- Information, Support & Guidance
- Economics

P. Improve Banking Services

- Savings Practices
- Transactions & Communications
- Loans
- Management
- Accounting
- Investment

Q. Improve Medical Services

- Physicians & Nurses
- Technicians (X-ray, laboratory)
- Health information services
- Midwifery
- Pharmacology
- Buildings, facilities, equipment

R. Improve Hygiene, Sanitation and Nutrition

- Health information services
- Sewerage and water treatment & maintenance
- Pest control
- Building design & maintenance
- City planning & laws
- Reduce pollution

S. Improve Recreation & Sports Services

- Areas & facilities (construction & maintenance)
- Supervision & instruction
- Equipment
- Public information

T. Reduce Rate of Population Growth

- Public Information
- Family Planning Services
- Pharmaceuticals & marketing

U. Reduce Migration to Cities

- Improve farm living conditions, including farm income
- Public Information
- City Management

V. Maintain Natural Resources and Beauty

Reforestration & beautification of mining areas
Reduction of pollution
Building design
Protection from exploitation
Public Information
Engineering, forestry, ecology
Laws

W. Achieve Informal Citizenry (political, economic, religious & Social issues)

Writing & publication
Radio & television
Meetings, public speaking
Economics, politics, sociology, religion

X. Increase Participation of Citizens in Government

Knowledge of processes
Public meetings & public information
Protection of rights
Voting for representatives

Y. Insure Fairness and Honesty in Government Services

Personnel Management
Observance of rules & laws
Enforcement
Public information
Protest

Z. Insure Equal Treatment of Citizens Under the Law

Courts, laws, judiciary system
Public information
Management for efficiency of courts

AA. Improve Law Enforcement Capability

Police & police management/coordination
Equipment & facilities (radio, vehicles, jails, etc.)
Information dissemination on laws & rights
Public support

BB. Improve Internal Security Capability to Prevent Subversion/Rebellion

Military Police
Management & Coordination
Equipment & facilities
Public Support & Cooperation

CC. Improve National Defense Capability for External Affairs

Air force (manning, equipment & facilities)
Army (manning, equipment & facilities)
Navy (manning, equipment & facilities)
Public Support & Cooperation

DD. Improve Management, Planning, Efficiency & Productivity

EE. Improve Citizen's Ability to Support and Improve Themselves and Families (including the elimination of poverty)

FF. Increase Respect and Help for Other

GG. Increase Love, Pride and Support of Country and its Cultural Diversity

HH. Increase Devotion to God and Religious Tolerance

II. Increase and Improve Common Usage of Bahasa Indonesia.

B. Deriving Educational Objectives

How does one "derive" educational objectives from national goals and targets? There is no prescribable process which will automatically turn out educational objectives. Human experience, insight and creativity are involved. There are systematic ways, however, by which these human talents can be channelled more effectively.

Developing objectives from societal targets can be systematized by:

(1) Deciding on the age or grade levels for which objectives are desired. In Indonesia we wanted to describe terminal achievements (objectives) for primary (5th grade) intermediate (8th grade) and secondary (12th grade) education.

(2) Prepare worksheets for each societal target, grade level and subject matter. In Indonesia we used nine subject matters:

(1) Language
(2) Mathematics
(3) Science
(4) Religion
(5) Citizenship
(6) Art and Culture
(7) Vocational Education
(8) Health and Sports
(9) Personal Development

(3) Using as resources (a) present curriculum, (b) curricula or objectives from other countries and (c) the judgment of curriculum experts -- attempt to state all possible achievement (at the specified grade level and within the given subject matter) that could possibly contribute to the given target.

Note: With 35 Targets, 3 Grade Levels and 9 Subject Matters, a total of 945 worksheets would be required.

It is important that curriculum subject matter experts at the appropriate school level and subject matter take part in this process.

(4) Combine and rewrite the objectives into a single list by grade level and subject matter, ignoring the targets from which they were derived.

(5) Prepare a set of illustrative behaviors for each objective (usually about five) so that those who are to use the objectives later can be sure of their meaning.

(6) Review, revise and sanction educational objectives.

The above six-step procedure is recommended as a short-cut for that which we followed in Indonesia:

(1) Working with the inputs of sectoral representatives only:

(a) Condense 12 sectors to 5:

- Politics
- National Defense and Security
- Science and Technology
- Social Welfare
- Economy, Industry and Finance

(b) Making explicit the conditions and needs of each sector

(c) Writing rationales concerning the part education can play in meeting sectoral needs,

(d) writing generalized statements of objectives (being cognizant of knowledge, value and skill components), and

(e) estimating the appropriate grade level at which these generalized objectives can be achieved.

(2) Working with societal targets, perform steps 1 through 5 as recommended above.

(3) Combine results of (1) and (2) above into a single set by grade level and subject matter.

(4) Review sets of objectives from Indonesia as well as other countries to insure that all kinds of achievements are covered.

(5) Review, revise and sanction educational objectives.

The recommended steps, thus, combine the treatment of sectoral information, societal targets and previous curricula and objectives lists into a single procedure. Both time and unnecessary overlaps can be avoided. The aim is comprehensiveness. Even should very low value objectives get into the list, the value-contribution method should result in giving them a low priority since they would be judged to contribute little or nothing to national targets.

The review and sanctioning function of Step 5, above, has two necessary components:

(a) Review by educators and sectoral representatives in the field (demographic) to insure that the objectives plus their illustrative behaviors are reasonable statements of the kinds of achievements youngsters in various parts of the country can reasonably attain. (A three-week field review involving 325 persons was conducted at five sites throughout Indonesia.) A field survey should provide answers to the following questions:

Are there important objectives that have been overlooked?

Are the objectives, as written, clear and accurate?

Do the illustrations give a true picture of appropriate behaviors? Which should be changed? What additional illustrations are needed?

Are the age/grade levels correct?

For each objective:

Is the achievement solely of value as preparation for additional education?

Is it solely of value as preparation for non-school activities or occupations, i.e. is it terminal?

Is it of value both as a preparatory and a terminal achievement?

Is it not relevant for either?

(b) A final review meeting by curriculum experts to revise and sanction objectives and illustrations.

The educational objectives derived from national targets in Indonesia are given as an appendix to this report. Even though the procedure resulted in 222 objectives across the three grade levels, the objectives possibly are not as specific as needed for curriculum redesign. Indonesia currently is preparing a more-specific set.

C. Determining Relative Values of Societal Goals, Objectives and Targets

Chapter I, pages 16-18, outlintes the basic value-contribution method for determining the relative value of "national targets", i.e., the assignment of 100 points among a set of targets representing their relative value or contribution. That chapter also reiterated the important concept of "relative", e.g., a value of 50 is five times as valuable as a value of 10 or ten times as valuable as a value of 5.

In the Indonesia setting, there were

1 Purpose
3 Goals
8 Objectives
35 Targets

Representatives of three agencies in Indonesia met to judge the relative contributions of (a) Goals to Purpose, (b) Objectives to Goals and (c) Targets to Objectives. These agencies were the National Planning Agency, the Ministry of Manpower Development and the Office of Educational Development. Their selection abided by our criteria of asking those persons a groups to make the kinds of judgments which they n rmally do (probably in a less systematic way).

Chapter I is consistent in the allocation of 100 points across a set of objectives as they contribute to a single higher-order objective (e.g. 8 Objectives to a single Goal). This procedure becomes too much of a "bookkeeping" chore because of the need to maintain a given total.

Our recommended procedure throughout (and one that has been used successfully by Jasin in the life-skills tryouts *) is to ask each person to

* ibid.

judge the relative contribution by assigning a value of "10" to those which they consider to contribute most. Other objectives (goals, etc.) would then be judged in relation to those of "high contribution". For example, if an objective were considered to contribute only one-half as much as those of "high contribution" it would be assigned a "5" (one-half of 10). Similarly, one judge to contribute one-tenth as much would be given a value of "1". By following this procedure, the results would be of judged relative contribution, i.e. objective X makes 5 times as much contribution to goal A as does objective Y.

Judges thus should go through the complete list of objectives, looking for those which contribute most to the goal under consideration, assigning those a "10". They should then go through the list, one objective at a time, making judgments about each one's relative contribution (in relation to the "10's"(and to all other previous assignments that they have made). If by chance, they earlier overlook, an objective that contributes even more than a "10", they simply need to assign it on even higher number, e.g. "12", "20" or whatever.

Although the recommended numerical assignments make the judges "bookkeeping" chore simple, project staff will then have to reduce each individual's judgments to a common base (100 or 1000) so that all judges end up with a common base.

$$\frac{1000}{\text{total of assigned contributions}} \times \text{Assigned contribution of objective X} = \text{Contribution of objective X to base 1000}$$

V.N. Campbell in Chapter III suggests the possibility of using a modified Delphi technique to gain group concensus from the judgments of individuals. The procedure was found somewhat contrary to the Indonesian cultural pattern, and an arithmetic mean was used. We do recommend trying out Dr. Campbell's approach since it has the dinstinct advantage of bringing to light the various rationales used in assigning relative contributions.

Once a concensus is reached for the relative contributions of (a) Goals to Purpose, (b) Objectives to Goals and (c) Targets to Objectives, it is a relatively simple mathematical procedure for deriving relative values (refer to Chapter I).

The relative contributions of Goals to Purpose are identical to relative values, because there is only a single purpose. The relative values of the three Indonesian Goals to the single National Purpose in Indonesia is given below.

Table 1

CONTRIBUTION OF NATIONAL GOALS TO NATIONAL PURPOSE
(Value of National Goals)

NATIONAL GOALS	VALUE-CONTRIBUTION[1]
A. Strive for Public Welfare	48.53
B. Strive for National Unity, Stability & Security	30.52
C. Strive for International Harmony & Peace	20.95

National Purpose: Insure a Just and Prosperous Society

[1] "Contribution" is identical to "Value" since the contribution of Goals to a single National Purpose represents their relative value to that purpose.

When the number of objectives (or goals, etc.) to which contributions are to be judged exceed one, the value-contribution method outlined in Chapter I must be used:

> Value for a given lower order objective is calcuated by multiplying its contribution to a given higher order objective (repeating for each higher-order objective) and summing across all higher order objectives. The formula for calculating the value of a single National Objective in Indonesia based upon its relative contribution to the 3 National Goals:

$$V_{O_j} = \sum_{i=1}^{3} V_{G_i} \quad C_{O_j}$$

V_{O_j} = Value of a single National Objective (j)

V_{G_i} = Value of a given National Goal (i)

C_{O_j} = Contribution of Objective "j" to Goal "i"

For exemplary purposes, Tables 2 gives the relative contribution of the 8 National Objectives to the 3 National Goals. Table 3 shows how relative values were derived.

TABLE 2

CONTRIBUTION OF NATIONAL OBJECTIVES TO NATIONAL GOALS

National Goals \ National Objectives	Economic Development	Physical well being	Efficiency/ Honesty	Environmental Quality	Security/ Justice	International Affairs	Common Understanding	Moral Character
	1	2	3	4	5	6	7	8
A. Strive for Public Welfare	27.1	11.9	12.5	5.4	13.6	9.9	9.9	9.7
B. Strive for National Unity, Stability & Security	17.7	10.2	11.5	5.3	24.7	5.5	14.5	10.5
C. Strive for International Harmony & Peace	16.3	8.8	11.2	5.0	8.8	27.2	8.5	14.3

TABLE 3

VALUE OF NATIONAL OBJECTIVES

(VALUE OF NATIONAL GOALS X CONTRIBUTION OF NATIONAL OBJECTIVES)

National Goals \ National Objectives	Economic Development	Physical well-being	Efficiency/ Honesty	Environmental Quality	Security Justice	International Affairs	Common Understanding	Moral Character
	1	2	3	4	5	6	7	8
A. Strive for Public Welfare (Value: 48.53)	13.13	5.78	6.06	2.62	6.60	4.81	4.81	4.72
B. Strive for National Unity, Stability & Security (Value: 30.52)	5.41	3.11	3.52	1.62	7.53	1.71	4.41	3.20
C. Strive for International Harmony & Peace (Value: 20.95)	3.41	1.84	2.35	1.05	1.85	5.69	1.75	2.99
TOTAL ÷ 100	22.0	10.7	11.9	5.3	16.0	12.2	11.0	10.9

The identical procedure should then be followed for calculating the value of National Targets based upon their relative contribution to eight National Objectives. The result in Indonesia gave the following relative values:

A.	Heavy Indust.	20	S.	Recreation/Sports	24
B.	Light Indust.	25	T.	Population Growth	29
C.	Home Indust.	23	U.	Migration to Cities	23
D.	Raw Materials	26	V.	Natural Resources	26
E.	Food Product.	28	W.	Informed Citizens	29
F.	Transport (Persons)	39	X.	Participation in Gov't	29
G.	Transport (Supplies)	36	Y.	Gov't Services	37
H.	Communications	40	Z.	Equality	42
I.	Storage	22	AA.	Law Enforcement	39
J.	Clothing	23	BB.	Internal Security	32
K.	Electricity	28	CC.	National Defense	32
L.	Building Const.	20	DD.	Management/Efficiency	30
M.	Maintenance	25	EE.	Self Support	28
N.	Tourism	26	FF.	Respect Others	26
O.	Entrepreneurship	30	GG.	Support Country	29
P.	Banking	26	HH.	Devotion to God	32
Q.	Medical Services	27	II.	Common Language	19
R.	Hygiene/Nutrition	28			

It is of interest that the six highest valued targets in Indonesia (in 1972) were:

Improve Communications
Improve Transportation (for persons)
Improve Transportation (for supplies)
Insure Equal Treatment of Citizens under the Law
Improve Law Enforcement Capability, and
Insure Fairness and Honesty in Government Services

It should be remembered that such values reflect not only absolute value but also the societal changes that are desired (Targets were written with the verbs "increase", "Improve", etc. -- change verbs).

A last, a very necessary step, is to have those persons who judged the relative contributions of Goals, Objectives and Targets to review the resulting Target values. If these persons have cause to change values, it should be done at this time by tracing backward through the various contributions to determine which should be increased or decreased. In any case, responsible persons must sanction the resulting target values.

D. Setting Priorities among Educational Objectives

The steps in setting priorities are:

(1) Judge human ability component of each national target

(2) Judge relative contribution of educational objectives to national targets

(3) For each educational objective, judge the proportion of its achievement that can or should be made by the educational system

(4) For each educational objective, judge the difference between the percentage of persons presently achieving it and the percentage who would be achieving it in an ideal (but attainable) society twenty-five years hence.

(5) Calculate priorities

(1) Judge human ability component of each national target.

Persons making these judgments should be educators and experts in particular sectors related to the national targets. Independent judgements, combined arithmetically later, (as was done in Indonesia) or the use of a modified Delphi technique (see Chapter III) are appropriate techniques depending upon circumstance and culture.

The question posed to judges can be:

"Education can only assist in the achievement of a national target to the extent that the target represents human capability. Some portion of each target achievement will result from inputs related only slightly to human capability. Examples are capital investment, government policy, natural resources, external support, etc."

"Judge each target separately concerning the proportion of that target achievement than may be ascribed to human capability as opposed to other inputs."

The human ability component from the Indonesian tryouts is found in Table 4.

TABLE 4 HUMAN ABILITY COMPONENT OF NATIONAL TARGETS

National Targets	Human Abil. Component (H %)	National Targets	Human Ability Component (H %)
A. Heavy Indust.	20.0	S. Recreation/Sports	55.0
B. Light Indust.	37.5	T. Population Growth	75.0
C. Home Indust.	41.2	U. Migration to Cities	55.0
D. Raw Materials	37.5	V. Natural Resources	63.3
E. Food Product.	60.0	W. Informed Citizens	81.2
F. Transport (Persons)	32.5	X. Participation in Gov't	75.0
G. Transport (Supplies)	28.8	Y. Gov't Services	82.5
H. Communications	32.5	Z. Equality	81.2
I. Storage	23.8	AA. Law Enforcement	72.5
J. Clothing	50.0	BB. Internal Security	70.0
K. Electricity	25.0	CC. National Defense	65.0
L. Building Const.	41.2	DD. Management/Efficiency	75.0
M. Maintenance	65.0	EE. Self Support	92.5
N. Tourism	42.5	FF. Respect Others	83.8
O. Entrepreneurship	72.5	GG. Support Country	91.2
P. Banking	60.0	HH. Devotion to God	91.2
Q. Medical Services	55.0	II. Common Language	80.0
R. Hygiene/Nutrition	62.5		

(2) Judge relative contribution of educational objectives to national targets.

Who is to judge?

First, educators (particulary curriculum experts who are familiar with the complete curriculum) must take part. Familiarity with the complete curriculum is important because judgments about the relative contributions of all objectives are to be made.

Second, experts in given societal sectors related to specific targets. These experts should only be made responsible for those targets in which they truely have expertise.

Third, members of the project staff to insure that consistent procedures are followed.

How to organize for judgments?

The 35 Targets in Indonesia were such that experts could be classified into eight groups:

... economics
... manpower
... health
... art and culture
... military
... technology
... sports

Probably a similar grouping can be made for any set of national targets in order to reduce the complexity of making educational objective-to-target judgments.

Eight project staff members and sixteen curriculum experts can form a 3-man education team to meet with each of the eight groups of target experts.

Alternatively a single panel of educators could sit for eight days in one-day sessions with a given group of target experts.

How to make judgments?

The use of the "0-10" method (pages 54-55) is particularly applicable here because the large number of educational objectives would make the maintenance of a given total (e.g. 1000 points) unmanageable. A "0-100" scale was used in Indonesia, but it is considered unnecessary.

If groups can be kept small (say 5 persons: 2 target experts, 2 curriculum experts and 1 staff coordinator), group judgments can be made. This procedure is perferrable because it avoids very extensive calculations to reduce individual judgments to a common base. An alternative is individual judgments combined arithmetically.

What judgments to make?

For a given target, the group should determine the relative contribution of each educational objective to its achievement. It is necessary to stress that the judgment is not about the value of a given objective, but about its contribution to the single target under consideration. The staff member on the panel should be aware of this understandable human failing (e.g. "reading is important so it must contribute") and he should be ready to ask the reason why the group thinks that a given objective contributes to the target under consideration.

A note concerning judgments of contribution of educational objectives to national/societal targets:

The achievement of a 5th grade objective can contribute to a given national target in a number of ways:

... A child can leave school at the end of 5th grade and contribute to the target either at that time or at a later time.

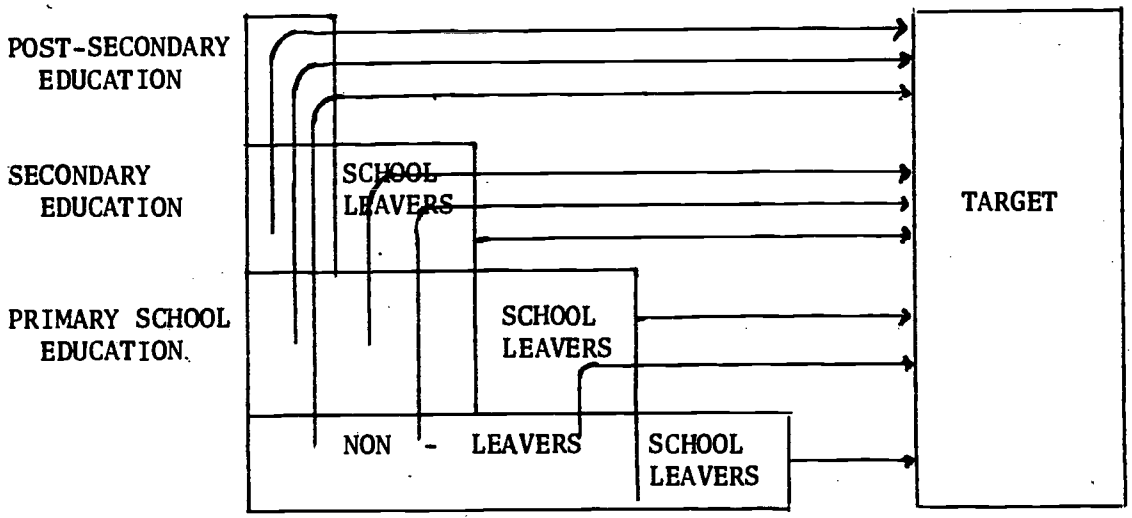
... A child can continue through the 8th grade before leaving school and contributing.

... A child can continue through the twelve grade before leaving school and contributing.

... A child can continue through tertiary education before leaving school and contributing.

These various paths to target contribution can be depicted thus:

(Education Level) (Paths for Contributing to Target)



Making a global judgment about a given educational objective is possible, but it is also quite difficult. To overcome this problem, a three-step procedure is recommended:

a) First, consider all objectives as "terminal", i.e., for school leavers only, and to make judgments of the relative contribution of objectives to a given target on this basis only.

b) Second, consider all objectives as "preparatory", i.e., for those who are to contribute to a given target through additional schooling.

c) Third, estimate for each objective the proportion of its contribution which would be made to a target as a "preparatory" achievement as opposed to a "terminal" achievement.

(Project staff will need to reduce "a" and "b" to a common base, multiply each by the appropriate proportion from "c", and add them together to obtain the contribution value.)

How to record judgements?

A single multiple-page form can be prepared with the educational objectives pre-printed at the left margin and with some six column titles left blank. The particular targets that a given group is to consider can be pencilled in as column headings. Separate sheets can be used for the "a" through "c" steps recommended above.

Targets / Educational Objectives				
1. _____ 2. _____ 3. _____ 4. _____ etc.				

The first of these two questions concerns the statistic which we have labeled "D_Q". The "Q" stands for "quality" of in-school instruction. To find D_Q, one should ask for two judgments. First, what is the current proportion of students graduating from the given school level who can achieve the objective? Second, what is the desired proportion in 25 years? The differences between these judgments provide D_Q.

The second question concerns "D_{QQ}" (quality and quantity): the difference in the proportion of a total age group presently achieving compared to the desired proportion. D_{QQ} is a bit more complicated. First, judgments should be asked about the proportion of a target age group who had not graduated from the appropriate grade level who are able to achieve the objective.

Second, one should ask for the proportion of the total target age group who should be to achieving the objective 25 years from now. The calculation of D_{QQ} was:

$$D_{QQ} = P_I - \left[(P_{IS} \times \%_{IS}) + (P_{OS} \times \%_{OS})\right]$$

where:

P_I = desired proportion of the target age who should ideally be able to achieve the objective 25 years from now.

P_{IS} = proportion of the in-school population who can currently achieve the objective (same as used in D_Q)

P_{OS} = proportion out-of-school (and who have not graduated from the appropriate grade levels) who can currently accomplish the objective

IS (in-school) and OS (out-of-school) percentage were statistics available in the Ministry of Education as to the proportion of appropriate age groups in and out of school.

Again, the same groups of experts who judge relative contribution should be asked to make group judgments about D_Q and D_{QQ}.

(3) For each educational objective, judge the proportion of its achievement that can or should be made by the educational system.

Some objectives can best be taught by the schools, i.e., objectives concerned with mathematics. Some objectives cannot be taught wholly by the school, i.e., objectives concerned with citizenship behavior in the community.

Some objectives should be taught by schools, i.e., grammar in the Indonesian language. Some objectives should not be taught wholly by the school, i.e., objectives concerned with religion.

The same groups of experts who judged relative contribution can be asked to make group judgments about the proportion of the achievement of each objective which schools can or should make.

(4) For each educational objective, judge the difference between the percentage of persons presently achieving it and the percentage of persons who would achieving it in an ideal (but attainable) society twenty-five years hence.

This judgment is different depending upon whether the interest is in improving the quality of education for the inschool population only or for the quality of education for the total population of a given age. There, thus, are two questions and either, or both, can be asked:

1. For the population who go to school, what is the difference in the proportion currently achieving the objective and the proportion who should be achieving it in the future?

2. For a total target age group* what is the difference between the present and the desired proportion achieving each objective?

---

* Approximate target ages by grade levels:

Grade 3 :	Approximately	9-10 years old
Grade 5 :	Approximately	11-12 years old
Grade 8 :	Approximately	15-16 years old
Grade 12:	Approximately	18-19 years old

(5) It is well here to recapitulate what quantified judgments we have thus far garnered:

VT '	=	Relative value of national targets
HT	=	Human ability component in achieving a national target (expressed as a proportion)
C_O	=	Relative contribution of a given objective to a given target
EC_O	=	Educational contribution (proportion of the achievement of an objective than can or should be made by the education system.)
D (either D_Q or D_{QQ})	=	Difference between current and desired achievement of a given objective

These values are all that are needed to calculate EP, the educational priority of a given objective*. The formula is

$$EP = \sum_{T=1}^{T=N} \left[(V_T \times H_T) C_o \right] \times \left[EC_o \times D \right]$$

For convenience, calculations can be in this sequence

a ..... VT X HT (for each target)

b ..... (VT X HT) Co (for each target)

c ..... $\sum (V_T \times H_T) C_o$ (for each objective across all targets)

The result of the above three steps is the relative value of each objective. To determine educational priority, however, we have to include (EC) the educational component -- what schools can or should do, and (D) the difference between present and desired levels of achievement. The final two steps, therefore, are:

* Careful readers may note that the residual (R) suggested by Campbell in Chapter III is not included. Tryouts in Indonesia (in which care was taken to insure that objectives at each level were as comprehensive as possible) never resulted in an R greater than 2 per cent.

$$d \ldots\ EC_o \times D \text{ (for each objective)}$$

$$\ldots\ \sum \left[(V_T \times H_T)\ C_o \right] \times \left[EC_o \times D \right]$$

EP = Step C X Step D

(Note: Round to nearest whole number using a base of 1000 or 10,000.)

IMPLICATIONS AND CAUTIONS

We (and Campbell) consider the value-contribution method a real improvement over existing methods for settling priorities to allocate limited educational resources. But, we also consider the method to have several unavoidably fragile components:

... The calculation of "D" and "EC" are necessary, but they are terribly rough (and one-time) estimates. "D" can be made more reliable if a country were to assess the present achievement levels of each age group periodically (as with the National Assessment of Educational Progress in the United States), and if long-term manpower projections were available for appropriate targets.

"EC" is a cultural, religious, political and educational component that can change with policies and with the various capabilities of formal vs. non-formal education. Continuous review and recalculation of EC for each objective could make it more reliable over time.

... Values change as does policy, and it is only appropriate that educational priorities change over time. The manual procedures recommended in this chapter cannot quickly adapt to change. We recommend that this manual method be done initially; that the results and calculations be computerized; and that a standing

committee meet semi-annually to review and revise inputs and results. One would not expect drastic changes at any given time, but such a policy will allow educational priorities to envolve with the priorities of the society which education serves.

CHAPTER III : SETTING PRIORITIES AMONG OBJECTIVES

by

Vincent N. Campbell*

This chapter reviews a number of techniques of priority-setting, examines a number of the basic constructs leading to the value-contribution method and its possible uses. We are extremely pleased that Dr. Campbell has permitted the printing of his paper here; it was his initial concepts that guided our work in Indonesia.

Sudijarto and Sutjipto

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Contents of Chapter III

Introduction

In any community, there are far more worthwhile educational objectives than there are resources to achieve them. It makes sense to apply the limited resources available to those objectives which are most important or urgent. This calls for setting priorities among objectives, priorities which reflect the community's needs and the expected benefit to society as a result of achieving the objectives. The problem of setting priorities occurs in nearly every level and type of government in business, for that matter in nearly any setting where a complex decision is based partly on the values of the users. The issues and methods discussed here, though developed for educational decisions, are equally applicable to other settings.

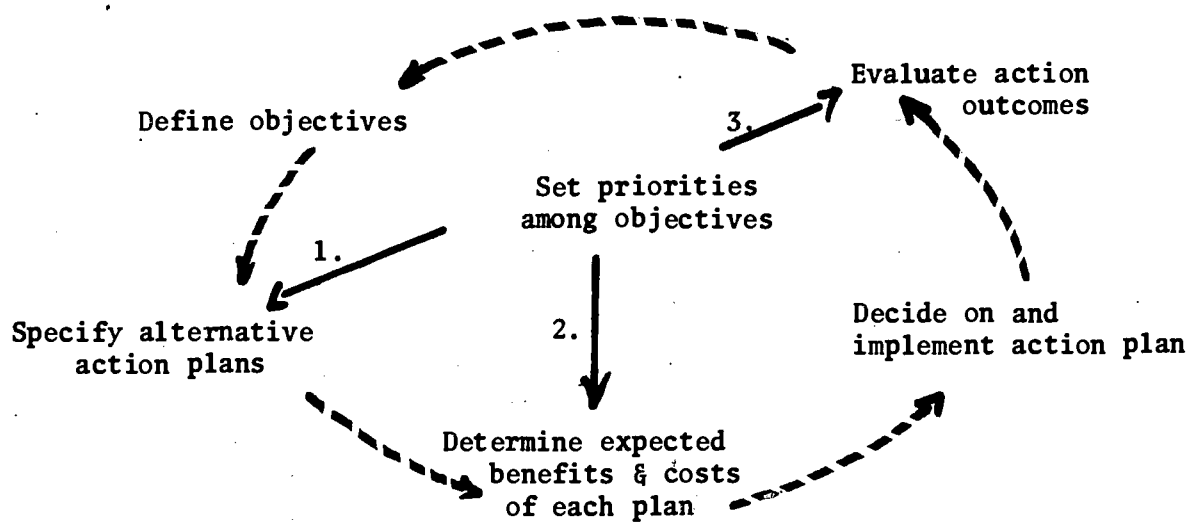
The "Value-contribution" method of setting priorities, to be described, was developed as part of a UNESCO-funded project to assist Indonesia in systematic planning for improvement of the nation through education (Nichols, 1972). Application of the technique to setting priorities among Indonesia's more than 200 educational objectives has led to the revision of the complete national curriculum (Sudiarto, 1973). The method has been widely disseminated through the INNOTECH courses on educational planning and it has been adapted to models for deriving life-skills objectives for children who are unable to complete more than 4 or 5 years of primary education (Jasin, 1973).

The Use of Priorities in Decision-Making

The purpose of setting priorities is to help those who allocate resources to make wise decisions. If priorities are not set, resources may be allocated to whichever needs capture the attention first, or by the convenience of the moment, or, as it quite common, they may be allocated in the same way they have been for years because this does not rock the boat of established prerogatives.

To set priorities is to make a conscious judgment that some objectives deserve more immediate attention or more effort than others. The judgment may be a direct intuitive decision, or the result of a rational analysis. It may be the judgment of one person or a social consensus such as a majority vote. At present nearly all priority-setting is intuitive, but there is an increasing public demand in this country that priorities reflect some public consensus and relate rationally to public goals.

The diagram below shows the role of priorities in decision-making, as conceived here



The outer rim of dotted arrows shows a logical cycle of steps in systematic decision-making. The numbered arrows from the hub indicate the ways in which setting priorities may improve the process, as follows:

1. Setting priorities is a way to decide which objectives should be elaborated into action plans in sufficient detail to determine costs and probable consequences. Development of plans usually represents a sizable investment. Some effort

may be saved by concentrating on objectives having higher priority.

2. It is difficult to estimate relative benefits from achieving different objectives unless priorities have been quantified in some manner.

3. Assigning different values to different objectives (setting priorities) also influences the total evaluation of a course of action, since the probability of successful impact is usually different for different objectives. Thus, a course of action might be considered a failure because it achieved only one of its 5 objectives, unless it had been determined that the one objective achieved was 100 times as important as any of the others.

Intuitive decisions no doubt involve something akin to setting priorities, even though it may be implicit. The reason for separating objectives and their priorities from the action plans designed to achieve them is so that the decision process may be analyzed rationally, which in turn may alter the ultimate decision. Human beings have a natural tendency to focus their attention on concrete actions and to look at the consequences only after the fact (Campbell and Markle, 1967). A goal for which no plan of action comes readily to mind is often ignored entirely. If the priorities of goals are determined in advance, planners may be better motivated to search hard for new ways to achieve those top priority goals which have been given little attention in the past.

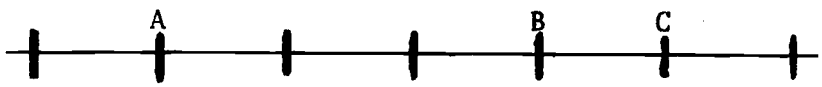
Quantitative Scales of Priority

As used here "priority of an objective" means the expected benefit of achievement of that objective. In the case of public decisions the benefit of concern is to society (or the community) and all the individuals therein.

Benefit is a dimension which has many different scales and units of measurement. Some of these scales are a great deal more useful than others in providing the decision-maker numerical estimates of the relative payoff expected from different plans of action. Any given decision-maker may or may not want such numerical estimates depending upon his confidence in his own intuition and his attitude toward numbers. At the very least, decision-makers who wish rational justification for their decisions would like information which establishes a clear inequality among plans such that one has greater or less expected pay off than the other.

Stevens (1951) defines three types of scales for measurement along a dimension: ordinal, interval, and ratio. The ordinal scale puts measured objects in rank order but tells nothing of the relative distances between ranks. For example, if three educational objectives were ranked first, second and third priority, this would give no indication of whether the first had a lot higher priority than the second and the second only slightly greater than the third, or vice versa, or if the differences were nearly equal.

An interval scale defines equal intervals on the scale so that differences in priority may be compared using cardinal numbers. For example, on the scale below,



the difference in priority between objectives A and B is three times as great as the difference in priority between objectives B and C. However, an interval scale does not enable one to put priorities in proportion to one another and say, for example, that one objective has twice the priority of another.

A ratio scale corresponds to the ordinary scale of real numbers and does permit meaningful ratios or proportions to be expressed. Thus, the achievement of an objective with a priority of 8 would be expected to reap twice as much benefit as achievement of an objective with a priority of 4. And a priority of 0 would indicate no benefit at all to be expected from achievement of the objective. A ratio scale, in other words, has a meaningful zero point from which distances can be measured and compared in ratios or multiples.

Money is an example of a ratio scale and is in fact often used as a measure of benefit. In business where profit is the primary objective, the monetary scale is quite easily applied. In measuring the social benefits of governmental programs such as education, however, a great variety of human events must be evaluated on a common scale, and it is often not easy to translate social benefit into monetary units. As long as the decision-maker is choosing among alternatives, and not trying to estimate the absolute payoff of a plan, no standard unit of measure of benefit is necessary. All that is needed is to know that Plan A is expected to yield 1 1/2 times as much benefit as Plan B and four times as much benefit as Plan C, for example, regardless of what units benefit is measured in. And this is the decision situation toward which the present development of priority-setting procedures is aimed -- choosing among alternative plans, not estimating their absolute value.

A decison on how to allocate resources is logically based on three main inputs: priorities, probabilities of success, and costs. Probabilities and costs are easily expressed on a ratio scale. Probability is a ratio by definition (the expected proportion of occasions on which an event occurs); costs consist mainly of materials, labor, and capital which are easily expressed in monetary terms. Even social costs such as employee stress can often be translated into monetary terms by obtaining estimates of the amount of money that people would pay to avoid such costs. If priorities too can be compared on a ratio scale, the decision-

maker has sufficient information to make clear-cut quantitative comparisons of the payoff expected from alternative courses of action.

To illustrate the advantage of a ratio scale of priorities over lower order scales of measure, consider the following example:

> Plan 1 is expected to achieve Objective A with a 90% probability of success at a cost of $11,000.
>
> Plan 2 is expected to achieve Objective B with a 90% probability of success at a cost of $10,000.
>
> Suppose first that we only have an ordinal comparison of the priorities of Objectives A and B. If they are of equal priority or B is greater, the decision-maker has all the information he needs. That is, Plan 2 is expected to yield equal or greater benefits at lower costs, so the total payoff of Plan 2 is greater. However, if Objective A has greater priority than Objective B the decision-maker is stymied, for he has no way of knowing whether the difference in priority is worth the $1,000 difference in cost, or worth only $10, or worth $100,000. An interval scale in this simple case provides the decision-maker no more information than an ordinal scale.
>
> The ratio scale of priority, however, provides the decision-maker all the information he needs. If the ratio of priority of A to B is greater than 1.1 (that is, greater than $11,000/$10,000) the expected payoff of Plan 1 will be greater than for Plan 2. For example, if achievement of A is expected to yield twice the benefits that achievement of B will yield, then Plan 1 has a higher payoff than Plan 2. That is, two times 90% of $10,000 is more than 90% of $11,000.
>
> If the ratio of priority of Objective A to B is less than 1.1 the expected payoff will be greater for Plan 2. In either case, the decision-maker has information indicating a clear preference between the two plans.

The advantages of a ratio scale of measurement of priority become greater as the number of plans and objectives increases, for typically it will be unusual for a single plan to have both the greatest benefit and the least expected cost.

Of course, the advantages of a ratio scale of priority holds true only if the priority-setters can make valid, reliable judgments on a ratio scale. The value judgments on which priorities are based are subjective and personal, and cannot be validated by checking them against objective facts. Rather, one must rely for validation on such evidence as internal consistency among judgments, reported meaningfulness of the judgments (Do they make sense?), and in the long run greater satisfaction with the results of decisions based on such judgments.

Some degree of reliability, in the sense of stability of a person's judgments over time, is also essential. It is not reasonable to expect sound decisions to be based on priorities which fluctuate wildly during short time intervals. Reliability in the sense of agreement among different priority-setters is highly desirable as a basis for reaching consensus and public justification of decisions, but the absence of such agreement does not necessarily mean that the scale is inappropriate. Differences among priority-setters may validly reflect genuine differences in values. However, it is known that people from similar backgrounds tend to share similar values and beliefs to some degree, and if the scale of priorities yields no agreement at all, this might be cause for suspicion that it does not accurately reflect the users' beliefs.

Desirable Characteristics of a Priority-Setting Procedure

The main purpose of this writing is to recommend a practical, useful procedure by which educational planners and other civic authorities can set priorities among their objectives. In reviewing and comparing techniques for setting priorities it may be helpful to keep in mind the

requirements which any procedure should meet if it is to succeed. Following is a list of conditions which may increase the likelihood of success of any method of setting priorities.

1. The procedure looks valid to its users.
2. Authorities responsible for making decisions are willing to use the procedure, or to weigh seriously the recommendations which other staff have formulated with the aid of the procedure.
3. There is a significant degree of agreement in final priorities derived by different users applying the procedure to the same situation.
4. The basis for any derived priority is retraceable and can be communicated meaningfully to decision-makers and the community to whom they are accountable.
5. All dimensions or types of value, whether economic, social or personal, are ultimately weighed on the same scale.
6. The weight or influence of any factor on a priority is proportional to its probably impact in real life.
7. The procedure accounts for interactions among factors and among objectives.
8. The procedure makes efficient use of personnel:
   a. More attention is given to factors which account for the greatest variance in priorities.
   b. The assignment of priority setting tasks to personnel takes into account skill levels and experience.

Review of Existing Techniques

Most of the scientific and educational literature relevant to setting priorities has not been addressed to priorities per se, but rather to some closely related judgmental process such as decision-making,

problem-solving, needs assessment or evaluation. Much of this literature is oriented toward describing the way human beings actually do make decisions and toward building theories which will predict this behavior. Such descriptive studies are not as relevant here as are efforts to determine how such decisions and judgments should be made. That is, the intent here is to locate techniques which will make priority-setting as effective as possible, regardless of whether anyone has behaved in such a way before. This is sometimes referred to as building normative or prescriptive models. A recent review of the literature by Fischer (1972) examines both descriptive and normative (effectiveness-oriented) models of evaluative decision-making and related experimental evidence.

Priority-setting has two rather distinct aspects:

1. The rational process by which an individual may judge priorities.
2. How to combine the judgments of many people.

Existing literature divides itself fairly clearly into one category or another. The intent here is not to review the body of literature in either area thoroughly, but rather to present the main ideas and a few sources in each area.

Rational Process of an Individual Priority-Setter

A person judging the priority of a particular objective may make a direct judgment on the dimension of priority itself. Or he may analyze the objective into a number of specific consequences and other related factors, evaluate these items separately, and then somehow combine them into an overall judgment of priority. The later procedure is sometimes called decomposition, or dissaggregation.

Direct judgments of the priority of an objective can be made within a variety of scales and guidelines. For example, N objectives may be simply ranked from 1 to N in order of priority. Several types of ratio scales of priority have been explored. One type is provided by answers

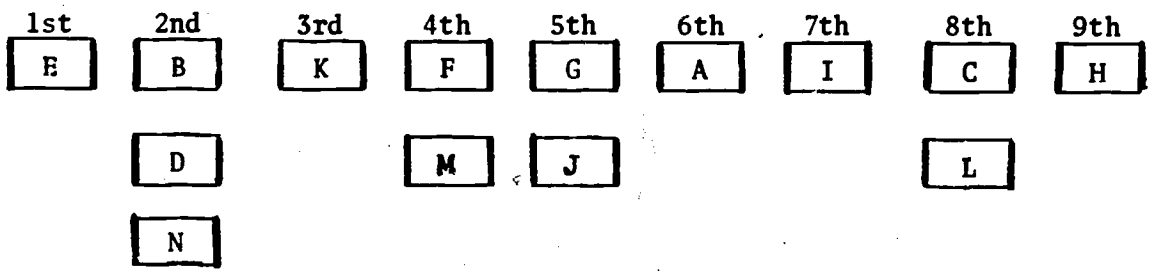
to the question, "What would it be worth (in money) to achieve this objective?" or "What is the most the community should pay to achieve this objective?". Another approach is to assume a fixed quantity of resources (e.g. $10 million) to distribute among the various objectives. This procedure lends itself to the use of mechanical aids such as washers, poker chips, or magnetic tape, which can be divided into piles or segments of various size representing different allocations. Such aids permit quick review of allocations by visual scanning so that adjustments can be made quickly. Techniques of this kind have been explored by other investigators (e.g. Webb, 1972, and Peterson, 1972) as well as by the author

The main advantage of such direct judgment procedures is their speed. The main weakness is that the reasons or mental steps by which a rating is derived are not easily retraceable and there is no systematic accounting of specific factors relevant to the judgment. It could be argued that this presents no problem as long as different users show high agreement on the independent ratings of priority. The assumption is that, whatever the reasons, if agreement is high there will also be high agreement on the implications of the priorities for decisions. A counter argument is that the priority rating may be sensitive to the particular guidelines or way in whihh the objectives are stated (Stake and Gooler, 1970). Thus, changing a few key words with evaluative connotations might greatly alter the perceived priorities of all raters. There is some support for this concern in the finding of many investigators (Fischer, 1972; Hammond, 1971; Huber, et al., 1969) that intuitive judgments tend to focus on very few dimensions, regardless of the decision-maker's intent to take many factors into account. A decomposition procedure which forces the person to examine each dimension and consequence separately should tend to correct such errors, <u>if</u> the specific factors reviewed include those most important to the decision.

Considering the evidence that judged priority depends on which relevant factors come to mind, an alternative to decomposition procedures is to compare each objective with a variety of others on the assumption that such multiple comparisons will bring to mind all the important factors in setting priorities. One such procedure is as follows:

1. Compare each objective with 5 or 6 others, in each case judging which objective has the greater priority or that they are equal. The pairings can be random or systematic as long as all objectives are linked in a common framework of comparison.

2. Arrange the objectives into a partial rank order based on the results of Step 1 such that the maximum number of paired comparisons is satisfied. This is most easily done by sorting small cards, each card representing an objective, as pictured below for Objectives A to N.



In this way all objectives are put on a common ordinal scale of priority.

Objectives may be tied at the same rank (e.g. B, D, and N above) because they were judged equal in priority, or because so few comparisons were made, or because of inconsistencies among pairs (e.g. the intransitive relation where B seems greater than D, D seems greater than N, and N seems greater than B).

3. Select several points along the ordinal scale and estimate the relative priorities of objectives at these points on a ratio scale. In the example, one might select points 2, 5, and 8 on

the 9 point scale. One would then ask what is the ratio of priority of objectives at point 2 to those at point 5? Are those at point 2 six times as important? Twice as important? 1 1/4 times as important? These comparisons can be made between individual pairs of objectives at these points (B vs. G, D vs., J, etc.) or by considering the objectives at each point as a group and making a priority judgment comparing the two groups. In a similar manner one would compare points 2 and 8, and points 5 and 8 until consistent ratios were obtained. Then ratio values for the remaining points could be obtained using points 2, 5, and 8 as the standards - e.g. E at point 1 might be judged twice as important as the objectives at point 2. K at point 3 might have 2/3 the priority of point 2 but 1 3/4 the priority of point 5, and so on.

This "ranks-to-ratios" technique is fairly laborious and still does not permit retracing the reasons for particular judgments of priority. Staff tryouts of this technique in Indonesia indicated that differences between adjacent points tend to be magnified such that when these differences are accumulated to calculate ratios for points far apart on the scale, the ratios are larger than seems proper from direct comparison of the far apart points. If this technique is used it is essential that Step 3 compare two points far apart (e.g. points 2 and 8) as well as those close together, and that ratios among these key points be adjusted until all are consistent on a ratio scale.

Decomposition Techniques.

When judgment of the priority of an objective is decomposed into specific factors, the factors may be of many different kinds. For example, the priority of "having arithmetic skills necessary to solve common everyday

problems such as making change with money" can be analyzed in terms of the consequences of having that skill (e.g., providing for family more economically, success in business enterprise, etc.). If each of these consequences has its own value more or less independently of what other consequences are achieved, then it makes sense to add the expected values of these consequences together to obtain an overall expected value of achieving the objective.

The fact that we often are not sure what the consequences of achieving an objective will be introduces another way of breaking down priority, that is, into the conditions which are jointly necessary for any value to be realized. For example, if the formal education necessary to achieve the arithmetic skills above is to have high priority, then the following factors must occur jointly:

1. There are positively valued consequences (e.g., success in business) which arithmetic skills are likely to help one achieve.
2. People do not already have the useful arithmetic skills.
3. One can foresee feasible educational techniques by which students might be taught these skills.

Perhaps other conditions could be named as well, but the point is that each factor creates priority only to the extent the other 2 factors are also present. For example, if any of these 3 conditions is totally absent the priority of the objective would logically be nil. It is generally accepted that factors which interact in this way should be multiplied together to obtain an overall priority rating.

The simple example above illustrates the main stages of any decomposition procedure for setting priorities: deciding what components or factors the priority setters should consider: deciding what type of judgment should be made about each factor; and deciding how to recombine the judgments of specific components into an overall priority

Apparently there has been no systematic study of the extent to which priorities vary as a function of what kinds of factors are considered by the priority-setter. The existing evidence that even sophisticated decision-makers consider very few factors in making decisons suggests that this is an important and neglected aspect of the decision process. There is scattered evidence regarding the type of judgment made about each factor -- such as whether an outcome is evaluated as a whole or by levels of partial achievement, and whether the value of a certain event and the probability that it will occur are judged separately or lumped together -- but the few findings reviewed do not point to clear recommendations.

Many studies have compared different mathematical ways of combining factor judgments into an overall evaluative rating (Huber, et al., 1971; Fischer, 1972). Results vary somewhat according to the type of breakdown but in general the results indicate that the mathematical method of combining matters little to the overall result, as long as one includes only methods that do not violate common sense. The final set of priorities or evaluations obtained correlate rather highly among nearly all such methods. The mathematical models used include addition, multiplication, exponential, logarithmic, and heuristic models which follow special rules of conjunction or disjunction of conditions. Because of these findings the technique to be recommended here uses the simplest logical combination of rules, which turns out to be either addition or multiplication depending upon the logic of the variables involved.

Next we examine a few specific procedures developed elsewhere for setting priorities and evaluate them against the criteria listed earlier.

Stake's Priorities Planning Technique

Robert Stake (1972) developed a fairly simple procedure for use by school teachers and administrators who wish to set priorities among objectives.

The basic philosophy of Stake's technique is that there are three or four types of factors which priority-setters should consider carefully, but that the way in which these factors are weighted or combined should be left to the intuition of each priority-setter. The factors to be considered are listed across the top of the sample "IOX Priority Planning Sheet" shown on the following page.

The first factor is the need for achievement of the objective as seen by the teacher, the learner, and the community. The greater the need, the higher the priority in general. The second factor to be considered is what resources would be allocated to the achievement of the objective. This is expressed mainly in terms of teacher and student time, which are the resources most directly under the control of the classroom teacher. The third factor is the probability that a specified allocation of resources would achieve the educational objective at a certain level (payoff probability). The fourth factor is contingency conditions which should be considered in the instructional process, such as what objectives are prerequisite to others.

Comparison of this with the diagram shown earlier on page 76 shows that Stake's process of priority planning is defined much more broadly than ours and includes the total decision process outlined in our diagram. In this sense our framework simply agrees with his as to the important factors to be considered in making a decision on allocation of resources. What Stake defines as "need" corresponds most closely to what is defined here as priority of an objective, that is, the benefit to be expected if the objective is achieved. He rates degree of need directly on a simple scale of "low" to "high". Since the reaminder of his procedure concerns how to allocate resources once needs (priorities) have been determined, we will not delve further into it here.

Matrix Techniques

At least two previous techniques build priorities by comparing objectives with each other, two at a time, with the aid of a matrix somewhat as pictured on page 91.

IOX PRIORITY PLANNING SHEET

Educational Objective	Need As seen by	Resource Allocation	Payoff Probability Expected (median on criterion test)	Contingency Conditions Prequisite	PRIORITY for Planning
71. The student will be able to convert Roman numerals to Hindu-Arabic numerals and vice versa.	Teacher Low Learner Low Community	Teacher Learner 1 unit Other	80% 85%	Obj. 53,60	Low
72. The student will be able to use scientific, expanded, and exponential notation.	Teacher High Learner Mid Community	Teacher Learner 2 units Other	50% 55%	Obj. 42	Low
73. The student will be able to convert from one base to another and perform addition, subtraction, multiplication, and division within any given base.	Teacher Mid Learner Low Community	Teacher Learner 4 units Other	70% 80%*	Obj. 53,60	Low
74. The student will be able to apply the concept of accuracy to measurements.	Teacher Mid Learner High Community	Teacher Learner 1 unit Other	90% 95%*	Obj. 28,60	High
75. The student will be able to perform all the basic operations associated with area measures.	Teacher High Learner High Community	Teacher Learner 3 units Other	70% 90%*	Obj. 53	High
76. The student will be able to apply the definition of a fraction and to recognize the different types of fractions.	Teacher Mid Learner Low Community	Teacher Learner 1 unit Other	60% 60%*	Obj. 21,60	Mid

	A	B	C	D
Objective 1				
Objective 2				
Objective 3				
Objective 4				

The categories A to D may be higher level goals for example. The relationship of each objective to each goal is rated and a number entered in the corresponding cell. From the cell entries and perhaps other factors as well, priorities are calculated. The technique we describe and recommend in the next section uses such a matrix. Two such techniques developed previously will be reviewed very briefly here to give the reader their flavor, but not enough details will be presented to guide a person who wishes to apply the techniques.

Cetron (1971) has described a "cross-support matrix" technique for priority setting and program planning in education. A brief outline of the priority setting technique follows:

1. Major goals or "targets" of a nation are listed in the form of simple topical headings, such as AGRICULTURE, EDUCATION, and PUBLIC WORKS. Fields of education and academic disciplines are then listed in a similar manner (AGRICULTURAL SCIENCES, AGRONOMY, ANIMAL HEALTH, etc.). Both targets and disciplines are subdivided into more specific categories as necessary.
2. Each target and each discipline is assigned a separate weight on a ratio scale indicating its estimated importance to achieving national goals. These are called Original Weights.

3. Using a matrix, as illustrated above, each target and each discipline is compared with every other target and discipline, and the contribution of one to the other is estimated on a "logarithmic" scale of sorts (0, 2, 4, 8). These "cross-support" ratings are multiplied by Original Weights and summed across targets to obtain a "Total Relevance" score for each discipline.

4. Current capabilities of the nation in each discipline are then rated on a ten-point scale.

5. The Total Relevance scores and capabilities are then compared, apparently in an intuitive non-quantitative manner.

The stated purpose of the technique is to get the decision-maker to consider all relevant factors, and its strength is that it does force its users to consider interactions among disciplines and among targets. However, the technique has some marked disadvantages:

1. Considering every discipline and target in combination with every other may require thousands of judgments, many of which are likely to be trivial.

2. The user makes thousands of judgments on a ratio scale, but the ultimate product reduces comparisons of priorities to a much lower level, perhaps ordinal or interval, or even intuitive. Worst of all, the user has had to put his data through several mathematical transformations along the way, which seem wasted in view of the final intuitive use. The use of a logarithmic scale for some ratings and an equal interval scale for others is hard to justify. Logarithmic relationships found in psychophysical studies between physical and psychological dimensions are cited as the source, but they do not seem analogous to the comparisons between psychological dimensions treated here.

3. It appears that estimations of Original Weights for each discipline are in themselves direct ratings of priority and if such

ratings are valid there seems little need for the remaining calculations.

To sum up, the cross-support matrix technique seems to give the impression of numerical precision without actually reaping its benefits, and at substantial cost of time and effort.

The "relevance tree" technique is another matrix approach developed by Heneveld and others (BCEOM report, 1970). It assumes two levels of objectives, the lower level objectives being related to the more general higher level ones. The technique is quite open-ended in that the user is asked to choose his own criteria of importance, such as economic urgency and cultural feasibility. Each objective is then rated on a numerical scale for each criterion of importance. Some criteria can have larger scales to reflect more serious impact. The overall importance rating from all criteria added together is then combined with other factors (amount of change desired; relationship between lower and higher level objectives) to obtain a final rating of priority for each lower level objective.

The relevance tree technique suffers from one of the same major weaknesses as the cross support matrix technique, that is, there is a great deal of manipulation of numbers based on rather shaky premises. For example, the results might be expected to vary greatly according to which scales are chosen. Furthermore, relevance and importance of an objective are added when it would seem more logical to multiply them.

Benefits are measured entirely in dollars which seems practical and appropriate as long as non-economic benefits such as greater social justice, can be translated into monetary terms. In the later steps of the procedure assumptions about educational means and methods enter the picture. Sooner or later these factors must be taken into account in educational decisions. Whether it should be done as part of setting priorities or later is not certain, but we recommend it be done later so that ends and means are not confused.

Combining Individual Judgments into a Group Product

Since the individual judgments which enter into priority-setting rely on subjective values and perceptions, regardless of what method is used, there is no objective criterion immediately available to validate such judgments. Yet sweeping educational decisions about allocation of resources must be based upon such priorities, whether explicit or implicit. This places critical importance on the extent of agreement or disagreement among different priority-setters and the means of resolving such differences in arriving at a final decision.

The main questions of interest here concern the size and composition of groups which participate in priority-setting, and the nature of the interaction between group members in forming and combining judgments. Van de Ven and Delbecq (1972) have recently summarized the evidence concerning what types of decisions are best suited to different types of group processes. They distinguish between interacting groups and nominal groups, in which members do not interact with each other. On the basis of the available evidence, they recommend that nominal group process are better for fact-finding and idea generation. For a number of reasons an interacting group inhibits many of the members and suppresses creative thinking. Nominal groups tend to excel over interacting groups (including brain-storming groups) in the quality, quantity, and variety of ideas produced. They also suggest that time may be used more economically in nominal groups since tasks can be started and stopped more quickly.

When the task of a group is to synthesize information or work toward consensus in evaluation, the research suggests that interacting group processes are at least as effective as nominal group processes. It would appear that priority-setting emphasizes the tasks of synthesis and reaching consensus more than it does creative generation of ideas. On this basis either interacting or nominal groups or some combination might be appropriate to the task of setting priorities.

However, there is a substantial body of evidence confirming that the judgments of individuals are strongly influenced by the judgments of other members of the same interacting group. In view of this it would seem sensible to obtain independent judgments from the members of a priority-setting group first, so that the initial range of disagreement could be estimated accurately. Afterwards, group discussion might be used as a basis for reaching consensus. This is the procedure recommended by Huber and Delbecq (1971) for practicing managers of decision conferences, and is the principal which underlies some uses of the Delphi technique (Dalkey, 1971). Some applications of the Delphi technique involve repeated cycles of individual judgments in nominal groups, with the only information presented between cycles being the distribution of judgments of the group members. Such a procedure does in fact tend toward consensus, but it does not capitalize on rational processes of shaping the consensus on the basis of new information and ideas that members present during discussion. Therefore the most sensible use of the technique would seem to involve nominal groups making independent judgments one or more times, with explanations and supporting information being discussed between such judgment cycles.

The size and composition of groups appropriate for priority-setting must depend in part upon the range of knowledge and expertise required to make the individual judgments competently. Huber and Delbecq suggest that, in general, adding members beyong the group size of 10 seems to contribute little to the reduction of judgmental error. Large interacting groups also tend to take longer to complete a given task and represent larger expenditures of man-hours of effort. If larger groups are needed in order to represent the full range of expertise needed, it may be better to divide the task into subgroups or committees approximately 10 members in size, with a coordinating committee to combine the work of the various subgroups.

There is apparently no hard evidence indicating how best to compose groups formed for the purpose of setting priorities among objectives. Our recommendations on this matter are detailed in the next section.

Beyond small face-to-face groups, many studies of objectives, needs, and priorities have involved collecting judgmental data from larger samples of people from appropriately defined populations. Stake (1970) has reviewed the status of this research. In many educational needs assessments in the United States in recent years samples of students, parents, educators, and other citizens have been asked to rate a list of objectives or needs on some type of scale. Typically these individual judgments have then been combined statistically to present averages. Another approach, using the critical incident technique (Abbott et al., 1968), involved collecting thousands of specific accounts of incidents which demonstrated effective or ineffective education of youth in a particular school district. These incidents were then categorized into community concerns as a basis for later development of instructional objectives. It is tempting to define educational priority by the number of citizens who mentioned incidents in a particular category of concern, but this is probably not sound. The number of behaviors reported in a category of concern may well reflect the salience of this category in the public mind, but the above study suggests that it does not reflect perceived importance or educational priority; a sample of citizens rated the importance of the categories and the correlation between salience (number of incidents) and rated importance was only +.16, indicating at most a weak relationship between salience and rated importance.

Summary Evaluation of Existing Priority-Setting Techniques

Of the existing techniques reviewed, many have particular features which are desirable but none satisfies the main requirements outlined earlier. The relevance tree and cross-support matrix methods set a valuable precedent in analyzing the specific factors and consequences which

contribute to the importance of a given objective. In both of these methods, however, the mathematics involved in somewhat cumbersome and difficult to justify.

Attempts to derive a single number which quantifies priority seem commendable in view of the fact that the other inputs to the decision-maker (cost and probabilities) can also be quantified. Cost-benefit ratios of different plans of action can thus be compared, even though such quantitative estimates represent only one basis which the decision-maker may use in arriving at a final decision.

Direct ratings of educational priority are the cheapest technique discovered, but fail to satisfy the requirement that the steps and reasons be retraceable. This is especially important where users disagree as to priority of a given objective.

Group process techniques reviewed suggest valuable differentiations regarding what kind of group process is most appropriate to different types of tasks. A further refinement included in the technique to be recommended is that the size of the group should vary as a function of the importance of the factor being judged.

The Value-Contribution Technique for Setting Priorities

The previous section reviewed and evaluated various techniques of setting priorities among educational objectives. All these techniques lacked some of the desirable characteristics of a rational priority setting procedure set forth earlier. As a result, a new technique was developed with the hope of better meeting these criteria.

The new technique was dubbed "value contribution technique" because the basic kind of judgment on which it is built is estimation of the relative proportions contributed by various sources to some valued achievement. The shakiest and most critical point in any priority setting technique seems to be the scale or type of value judgment made by the priority setter.

In staff tryouts, judging relative contributions to the total value of some achievement seemed more meaningful to staff than other types of value judgments on any ratio scale. As discussed earlier, quantifying priorities on a ratio scale, rather than on a lower order interval or ordinal scale, has the great advantage that the numerical results can be combined with costs to estimate cost-benefit ratios of alternative action programs. In the long run, of course, any priority setting technique must be judged by the extent to which it improves decisions of the users and thus better meets society's needs, leads to fewer regrets and reversals, and other important benefits. Until such validation data are available we must rely on the interim evaluation criteria of rationality, meaningfulness, communicability and consensus.

The value contribution (VC) technique has as its main aim the bringing to bear on decisions about priority the most relevant thoughts and information available to the user. Intuitive human judgments are often marvelously subtle and predictive, and we have no hard evidence that a rational judgment procedure yields better results in an area as complex as educational priorities. However, there is a definite possibility that the quality of intuitive judgments can be improved by the support of rational procedures and this is sufficient justification for the pursuit of such procedures. Until there is good evidence as to which works best, rational and intuitive procedures should probably be used in parallel, with the final choice between the two being left to the taste of each particular priority setter.

The VC technique is rational because it combines many specific judgments in a logical manner. Each specific judgment is in itself largely subjective, although objective evidence can be used to alter or confirm these judgments as it becomes available. Combining many specific judgments by some simple mathematical formula, as the VC technique does, seems mechanical and unnatural, even clumsy, to many priority setters

who recognize the greater subtlety and discrimination of their own thought processes. However, the research evidence cited earlier (Hammond, 1971; Huber, 1969) indicates that even highly educated professionals typically consider no more than three or four factors in making any given decision, even though they may verbally claim to use a great many more. In other words, the very limited span of human attention makes intuition a chancy process to depend on whenever a larger number of factors are relevant to a decision.

Another way in which the VC technique seeks to bring relevant information to bear is through use of an abbreviated Delphi technique in which independent judgments of several persons are considered for each judgmental task which may have substantial impact on final priorities. The extent to which judgments of different people can be explored is limited by resources and the efficient use of time. The techniques suggested here are sensitive to these resource limitations but attempt to combine individual judgments into a group consensus in ways which capitalize on the group process principles discussed earlier.

Logic of the Value Contribution Method

The value contribution (VC) method uses the following basic concepts:

Objectives: The desired outcomes among which priorities are to be determined.

Goals: The important purposes served by achieving the objectives.

Value Contribution (C): The relative contribution of different objectives to the same goal.

Value (V): The relative worth of things which are fully achieved, without regard for the gap between current and desired levels of achievement.

Discrepancy (D): The gap between current and desired levels of achievement of an objective. If the objectives concern human achievements, a practical estimate of D is the ideal proportion

of people achieving the objective minus the current proportion achieving it.

Priority (P): The total benefit expected to result from achieving one objective compared to another.

Agency: The group responsible for taking action based on the priorities set.

A fundamental formula in the VC method is $P = V \bullet D$, meaning that priority of an objective is the product of its value when fully achieved times the discrepancy between current and desired levels of achievement. Example: Suppose it has been estimated that the educational objective, "can read" has 3 times the value of the objective, "can sing". For convenience let us say the value of "can read" = 30 and the value of "can sing" = 10. And in the community in which the agency acts, suppose it is ideally desired that 100% can both read and sing, but now only 80% can read and 70% can sing. So for "can read", D = 1.00 - .80 = .20, while for "can sing", D = 1.00 - .70 = .30. Then the priority of "can read" is

$$P_r = V_r \bullet D_r = 30 \times .20 = 6$$

and the priority of "can sing" is

$$P_s = V_x \times D_x = 10 \times .30 = 3$$

The priority of reading is thus twice that of singing, since 6 is twice 3. In other words, the expected benefit to the community of teaching everyone to read is worth two times as much as the expected benefit of teaching everyone to sing.

Why do we multiply V and D, rather than say, adding them? Because an objective has priority only to the extent both V and D are jointly present. If either is zero no benefit can be expected. That is, if the value is zero the priority should be zero because the achievement has no value. If the discrepancy between ideal and current level of achievement is zero, then the objective is already achieved and the priority should be zero since no further improvement is expected.

The value of an objective (V) is determined by its contribution to higher-order goals, each contribution being weighted by the value of the goal itself. Thus, if Objective a contributes to only one goal, the value of the objective is

$V_a = C_{a1} \cdot V_1$, where C_{a1} is the contribution of Objective a to Goal 1, and V_1 is the value of Goal 1.

Note again that we multiply the two factors because if either C_{a1} or V_1 is zero, the objective has no value in relation to that goal.

If Objective a contributes to two independent goals, its value is

$$V_a = (C_{a1} \cdot V_1) + (C_{a2} \cdot V_2)$$

For example, consider the goals:

Goal 1 = Has s ills needed for useful, reward ng work.

Goal 2 = Enjoys diverse recreational pursuits.

Assume Goal 1 is four times as-valuable as Goal 2, so

$V_1 = 4$ and $V_2 = 1$

Not let us assume these two goals are the only ones which the objectives "can read" and "can sing" contribute to, which is clearly not true but serves to keep the example simple. If reading contributes 9 times as much to Goal 1 as singing does, then

$C_{r1} = 9$ and $C_{s1} = 1$.

If reading and singing contribute equally to Goal 2, then

$C_{r2} = C_{s2} = 5$.

(The contributions of all objectives must sum to the same total for every goal; in this case the arbitrary total is 10.)

From the above we calculate the value of reading to be

$$V_r = (C_{r1} \cdot V_1) + (C_{r2} \cdot V_2) = (9 \times 4) + (5 \times 1) = 41$$

and the value of singing to be

$$V_x = (C_{s1} \cdot V_1) + (C_{s2} \cdot V_2) + (1 \times 4) + (5 \times 1) = 9$$

Using the two goals in the above example makes it clear that values calculated for objectives will be good estimates only to the extent all goals served by those objectives are taken into account. Therefore it is important that the goals served be a comprehensive set of goals for the community. However, knowing that human priority setters will never in actuality list every relevant goal and consequence of value, the VC method adds a correction factor called R, which is the residual value of an objective beyond its contribution to stated goals. In arithmetic terms, R is the proportion by which V should be increased because of the objective's residual value. Thus if reading were judged to contribute to other goals besides #1 and #2 above, and this residual value amounted to 50% of its value in service to Goals 1 and 2, then R would be .5 and the total value of the reading objective would be

$$V_r = 41 \times (1 + R) = 41 \times 1.5 = 61.5$$

In practice such a large value of R should suggest to priority setters that important goals have been left unstated and should be identified and added to the set of explicit goals. In applications by the authors to date the goals have been quite comprehensive, so the values of R for educational objectives have usually been zero and in no case greater than .02. The effect of R on priorities in such cases is negligible.

One other type of factor should be included in the final formula for calculating priorities, and that is limitations of ability to achieve the goals and objectives. In the case of a goal this means the extent to which achieving all the listed objectives is sufficient to achieve the goal.

For example, the goal of economic well-being for every person depends partly on being able to read and achievement of other educational objectives, but it also depends on health, family wealth and the local economy. If these other factors combined account for 40% of what it takes to achieve the goal, then only 60% can possibly be achieved by mastery of the stated educational objectives. Therefore in the priority

equation the value contribution of all objectives to that goal should be reduced to .60 of C·V. If we call this "ability limit" factor "A", then the value of any objective (V_a) would be limited as follows:

$$V_z = (C_{a1} \cdot V_1 \cdot A_1) + (C_{a2} \cdot V_2 \cdot A_2) + (C_{a3} \cdot V_3 \cdot A_3) + \ldots \text{ etc.}$$

In the above example, if economic well-being of a person is Goal 3, then

$$C_{a3} \cdot V_3 \cdot A_3 = C_{a3} \cdot V_3 \cdot (.6)$$

A similar factor should be applied at the objectives level, and at this level A refers to the agency's limits of ability to achieve the objective. Up to this point we have calculated the priority of an objective from the total community's viewpoint. But priorities for an agency within the community, such as schools, may be different because their responsibilities and capabilities are specialized and limited. For example, if learning to read is 90% within the ability and responsibility of the schools to achieve, then in calculating school priorities (as opposed to community priorities) the result should be reduced to 90%. Thus, the educational priority of the reading objective is

$$EP_a = V_a \cdot D_a \cdot A_a = V_a \cdot D_a \cdot (.9)$$

Summary. To summarize the above logic, the value of an objective (V_a) is estimated from its expected contribution to goals having different value,

$$V_a = (1 + R_a)\,[(C_{a1} \cdot V_1 \cdot A_1) + (C_{a2} \cdot V_2 \cdot A_2) + \ldots \text{ etc.}], \text{ that}$$

is,

$$V_z = (1 + R_a) \cdot \Sigma_g (C_{ag} V_g A_g), \text{ where "}\Sigma\text{" means "the sum across all goals."}$$

The community priority of an objective is its value times the discrepancy between desired and current levels of achievement, $P_a = V_z \cdot D_a$

The priority of the objective for a given agency is the community priority reduced by the agency's limitation of ability to achieve the

objective. If the agency is the schools, then education priority is

$$EP_a = V_a \cdot D_a \cdot A_a, \text{ or}$$

$$EP_a = (1 + R_a) \sum_g (C_{ag} V_g A_g) \cdot D_a \cdot A_a$$

All factors on the right-hand side of the formula above are subjective judgments which may or may not be more valid and reliable then direct judgments of priority. But they do combine what would seem to be the basic ingredients of priority in a rational manner. Others who study the relation of priority-setting procedures to decision quality may well improve upon the above formula. From our perspective of the moment, it seems to be the most logical formula.

Illustrative Calculation of Priorities by the VC Method

The following example is a hypothetical case of one person setting priorities among 12 objectives which serve five community goals.

The community goals and their relative values are:

Judged Value	Goal
10	1. (Economic livelihood) All adults have sufficient income to live in moderate comfort.
8	2. (Self-realization) Each person has the opportunity and encouragement to realize fully his own potential as a human being.
6	3. (Social Harmony) There is social harmony among all groups and individuals most of the time.
5	4. (Nature) The natural envoronment of the community is pleasant, healthful and well preserved.
6	5. (Government) The governments which serve the community are efficient and responsive to all citizens' needs.

The goal values were derived by assigning the most valued goal an arbitrary value of 10. Each other goal was then given a value proportionate to the one valued at 10. As a check, the other 4 were compared with each other and the values adjusted until all pairs seemed to be in approximately the correct ratio of value. If the reader disagrees with these values or any of the other judgments made in this illustration, it may be worthwhile to recalculate values and priorities substituting his own judgments in order to get a sense of how the results vary according to such differences in judgment.

Suppose the school system in this community has adopted the following major educational objectives for its students, and wishes to set priorities among them so that it may be better prepared to plan and allocate resources:

Objective

a. Can read, write, listen and speak effectively in his native language.
b. Can communicate in a foreign language.
c. Has effective skills of study and inquiry, and enjoys learning.
d. Has acquired arithmetic skills and key concepts in mathematics.
e. Can effectively plan and manage his own time and resources, or those of a group.
f. Participates effectively as a citizen; contributes to community welfare.
g. Treats other people humanely and ethically; keeps commitments.
h. Develops own values and uses them to critically evaluate.
i. Appreciates humanity's cultural diversity and the common characteristics of human beings.
j. Cultivates expressive communication and appreciation in the arts, music and/or literature.
k. Understands the physical world and man's relations to it.
l. Maintains good physical and mental health.

The estimated contribution of each objective to each goal is shown in Table 1. The initial procedure used for each goal was to pick a highly contributing objective and arbitrarily call its contribution C = 10, then judge the other objectives' contribution in proportion: For example, being able to use one's own language well seems quite important to having a job, so it was assigned a C of 10 for Goal 1. The estimated contributions (Est. C) to each goal are shown in the left-hand column under each goal in Table 1.

The estimated C for each objective under a goal used an arbitrary reference value of 10 for convenience. The logic of the method requires that C sum to the same number for every goal. To achieve this the estimates of C were adjusted by a constant for each goal. The constant is computed for each goal at the bottom of Table 1, and the adjusted estimates of C are shown in the right-hand column under each goal. The sums of adjusted C in the "Total" row differ slightly from 60.0 only because of rounding error. All calculations in this illustration are rounded to 2 or 3 digits because the estimates are assumed to be no more precise than this.

Table 1. Contribution (C) of each objective to each goal

Short title for objective	Goal 1 Economic livelihood Est C	Goal 1 Adjus C	Goal 2 Self-realization Est C	Goal 2 Adjus C	Goal 3 Social harmony Est C	Goal 3 Adjus C	Goal 4 Nature Est C	Goal 4 Adjus C	Goal 5 Government Est C	Goal 5 Adjus C
a. Own language	10	8.6	8	5.9	4	4.0	3	2.9	8	5.8
b. Foreign language	1	0.9	5	3.7	4	4.0	1	1.0	2	1.5
c. Inquiry/learning	8	6.9	10	7.4	4	4.0	6	5.7	10	7.3
d. Math	6	5.2	2	1.5	0	0.0	1	1.0	5	3.7
e. Plan and manage	11	9.5	10	7.4	3	3.0	6	5.7	7	5.1
f. Citizenship	2	1.7	5	3.7	8	8.0	12	11.4	14	10.2
g. Treat others well	7	6.0	3	2.2	10	10.0	5	4.8	9	6.6
h. Own values	3	2.6	9	6.7	5	5.0	2	1.9	8	5.8
i. Humanity	3	2.6	6	4.4	9	9.0	4	3.8	8	5.8
j. Arts	2	1.7	9	6.7	5	5.0	1	1.0	1	0.7
k. Physical world	5	4.3	4	3.0	3	3.0	12	11.4	6	4.4
l. Health	12	10.3	10	7.4	5	5.0	10	9.5	4	2.9
TOTAL	70	60.3	81	60.0	60	60.0	63	60.1	82	59.8
Adjustment Factor	60/70	= .86	60/81	= .74	60/60	= 1	60/63	= .95	60/82	= .73

Next we estimate the extent to which each goal can be fully achieved by achievement of the 12 stated educational objectives. This justed limitation (A) is shown for each goal in the first column of Table 2. For example, "economic livelihood" is judged to be only 60% achievable through these 12 objectives above, while "self-realization" is judged to be 95% achievable through these 12 objectives.

For each objective the product of V and A (that is, V·A) is then multiplied by the contribution (C) of the objective to that goal. The right-hand side of Table 2 illustrates these calculations for one objective (a). The contribution of Objective a for all 5 goals together is the sum of the CVA, which is (CVA) = 156.

Table 2. Ability limits (A) and values (V) of each goal and calculation of the value of Objective a.

Goal	A	V	V·A	X	Ca	=	CVA
1. Economic livelihood	.60	10	10	X	8.6	=	52
2. Self-realization	.95	8	7.6	X	5.9	=	45
3. Social harmony	.85	6	5.1	X	4.0	=	20
4. Nature	.75	5	3.8	X	2.9	=	11
5. Government	.80	6	4.8	X	5.8	=	28
			Total, or Σ(CVA)			=	156

By the same formula, Σ(CVA) has been calculated for each of the 12 objectives and the answers are shown in the first column of Table 3. The remainder of Table 3 shows the fir calculation of the educational priority of each objective. In preparation for this calculation the residual values (R) of each objective were estimated. If "plain unconstructive fun" had been included as a goal, most of the residual values would have been much smaller. In the case of "math" the R of .25 is attributed mainly to the practical uses of math around the home.

Table 3. Calculation of educational priorities (EP) of objectives

Objective	$\sum$(CVA)	R	V*	D	A_s	EP
a. Own language	156	.15	179	.35	.85	53
b. Foreign language	65	.20	78	.40	.95	30
c. Inquiry/learning	175	.15	201	.70	.80	113
d. Math	64	.25	80	.50	.95	38
e. Plan/manage	175	.20	210	.55	.60	69
f. Citizenship	171	.05	180	.80	.60	86
g. Treat others well	154	.20	185	.30	.30	17
h. Own values	127	.20	152	.40	.50	30
i. Mankind	137	220	164	.45	.75	55
j. Arts	94	.20	113	.50	.60	34
k. Physical world	128	.10	141	.30	.75	32
l. Health	194	.35	262	.50	.40	52

*Total value of an objective, $V = (1 + R) \sum (CVA)$

The column to the right of R is the total value (V*) of the objective, including the R factor. For example, the value of objective a was increased by 15% from the 156 to 179 because R = .15. The next column is D, the discrepancy between desired and current actual proportion of youth achieving the objective. For objective b (foreign language) the desired level was .50 and the current level .10 yielding a D of .40. For objective j (arts) the desired level was .90 and the current level .40 yielding a D of .50. For all other objectives the desired level was set at 1.00, meaning all youth should achieve it, and the D shown is the difference between 1.00 and the proportion estimated to be achieving the objective currently.

The next column in Table 3, labeled A_s, is the factor reflecting the limitation of the schools' ability to bring about full achievement of each educational objective. These judgments reflect the schools' responsibility and the state of the art of teaching, but not current flows

in the local schools which could be corrected by appropriate action within a reasonable time. A_s is near 1.0 for math (objective d) because the schools have the responsibility and ability to achieve it. On the other hand A_s is only .30 for "Treat others well" (g) because that objective is judged to depend mostly on factors outside school.

Finally, educational priority (EP) is the product of V, D and A_s. Priority for the community is simply $P = V \cdot D$, as noted earlier. But to obtain educational priority we must multiply priority by the school's ability to achieve each objective. Thus $EP = V \cdot D \cdot A_s$.

The superintendent of a school district who arrived at the above priorities might find some surprises. Inquiry techniques, love of learning and citizen skills are frequently paid lip service, but to find that their priorities for action are from 1 1/2 to 3 times as great as nearly all other objectives puts them in a new light. It might lead the school district to search harder for ways to achieve these objectives and perhaps to invest more of the school dollar in them.

Goal-Objective Hierarchies

So far we have dealt with goals and objectives at only 2 levels, that is, a set of goals served by a lower-order set of objectives. The values of the objectives are determined by the goals they serve. The VC technique can be applied equally well to a hierarchy having 3 or more levels of objectives and goals. For example, in Indonesia we had the following hierarchy:

3	national goals
8	national objectives
35	national targets
222	educational objectives divided into 15 topical categories

The relative values (V) of the 8 national objectives were calculated from their contributions to the 3 national goals. Then these values were

used to calculate the relative values of the national targets, which were in turn used to calculate the values of the educational objectives. Finally the discrepancy (D) and ability (A) factors were applied to derive educational priorities of the educational objectives.

Guidelines for Application of the VC Method

The most important requirements for effective use of the VC technique are: knowledge of the ways objectives contribute to goals, knowledge of current achievement levels of specific objectives, and command of the simple arithmetic of proportions. Some steps in the priority-setting process require nearly all of these skills and some require only one or two. It is important that the individuals responsible for a given step in the process represent among them the full array of skills required for that step.

Preparation for priority setting. Priority setters using the VC technique should begin with a thorough examination of each goal and objective and discussion of examples until there is clear definition of each. The same applies to getting clearly in mind the meaning of each factor in the VC formula for calculating priorities.

Priority-setting by a group. Setting priorities for a community or society is a task seldom delegated explicitly to one person, though one person often controls the process temporarily by default. More often a group of elected and/or appointed officials determines priorities, and usually does so implicitly through its action decisions rather than by setting priorities as a distinct task in itself. Below are suggestions for groups undertaking the explicit task of setting priorities by the VC method.

If a group planning to use the VC method is not too large we recommend that a modified type of Delphi technique be used to arrive at a single group estimate of each factor. That is, each member begins by independently making his own estimate of the factors from whatever evidence is on

hand (usually none) and his own experience and values. After these are recorded the group accepts the group average (mean) if there is close agreement on a factor, but discusses reasons for their judgments wherever there are sizable discrepancies. If the discussion yields a clear consensus, this is accepted as the group estimate. If consensus is not clear, another record of independent individual judgments may be taken and again reasons for discrepancies discussed. If it is clear after either the first or second round of discussion that substantial disagreements will persist, a group average is accepted and the discrepant individual estimates are appended to the record so that their implications for the final priorities can be calculated by any interested observer.

The most practical size of unit for group discussion is not a single factor, nor all factors, but rather some intermediate set of factors such as "all goal values" or "the contributions of every objective to one goal". In this way ratios of various pairs of numbers within the set can be discussed and revised jointly.

Since the time which skilled personnel have available to set priorities is limited, it is important that their time be focused on those parts of the procedure which have the greatest impact on the final priorities derived. The parts having greatest impact are defined as those steps in which variations in human judgment make the greatest difference in the numerical priorities which result. Estimating contributions of objectives to goals takes the most time and each separate judgment has the least impact, so it may be hastened by delegating the task to smaller subgroups or individuals. To the extent that different members of any group are differentially knowledgeable about different goals or objectives, the task can be divided among subgroups so that each member concentrates on those areas where his expertise is greatest. When time is critical the task can also be speeded up by allowing wider limits of disagreement for accepting a group consensus estimate without further discussion. Also, most of the arithmetic calculations in the VC process can be completed by

a clerical assistant while priority setters are completing their estimates.

When a higher level group is reviewing the work of a subcommittee staff group, time can be saved if each reviewer first independently reviews the values estimated by the staff and circles any values that he disagrees with by a substantial margin (say 20%). If a clerk tallies a list of the items circled by one or more reviewers, discussion can then be limited to those few items. Twice in the Indonesian application higher level government officials reviewed staff estimates and in both cases the number of changes resulting from a fairly thorough review was very few. Although there may be cultural differences, this suggests that adding the review process may not change the final priorities much.

Using available data. Nearly all estimates of VC factors will be subjective estimates for some time to come, since accurate data are seldom available anywhere to support such estimates. As future job and task analyses, educational assessments and other research provide data on achievement levels and on the contribution of particular objectives to goal achievement, this information should be considered by priority setters using this or any other procedure. In the meantime one should not hesitate to make these estimates subjectively, however difficult they may be. The factors estimated are relevant to the decisions made, whether these decisions are made rationally or intuitively. Not looking at them does not make them go away.

Future reference point. Judgments of the contribution (C) of an objective to a goal should be judgments of what the objective will contribute at some future time when the objective is fully achieved in the community or society of concern. It should not reflect current manpower shortages or deficiencies in skill levels, because that is accounted for later in the process of deriving priorities. In order to provide all users with a reasonably standard time frame for projecting into the future, it is

recommended that priority setters anticipate the community situation as they desire it to be 25 years in the future, and use this as a basis for estimating value contributions. The same time frame should be used for estimating other factors such as desired proportion of the population achieving an objective, and the likely contribution of schools to achieving an objective.

Contribution through higher education. In educational applications the priority-setter encounters a complication that makes it more difficult to judge the contribution of an objective to a goal. This complication is that achieving an educational objective can contribute to a goal in two quite different ways: through direct application of what is learned to the goal, and through enabling more advanced education which in turn contributes to the goal. For example, arithmetic learned in school may be directly applied by a carpenter in his work, or it may serve to help a student complete the college education needed to become an engineer.

Many priority-setters have found it difficult to consider both types of contribution and make a single estimate of C. When the task was split in two most users found it easier. That is, they first estimated the relative contributions of objectives to a certain goal by direct application out of school, and later estimated the contributions to that goal through higher education. The two values of C were then combined and weighted according to which type contributed more to achievement of the goal. For example, suppose the objective "can read" was judged to contribute to the goal "earning a living" with C = 6 by direct application after high school graduation, and C = 9 through higher education. And suppose it was decided that the contribution of reading to earning a living was 2/3 through higher education and 1/3 through direct application. Then the final value of C would be 8, that is (2/3 X 9) + (1/3 X 6) = 8.

Dividing the estimation of C in this way may more than double the time required to complete it. But it may be necessary in order to make the task feasible for some priority setters.

Limitations. The VC method of setting priorities is as simple as we could make it without ignoring vital realities. Yet is is complex enough so that most potential users will probably ignore it unless and until some such procedure comes to be expected as part of their job. With the aid of a small computer everything but estimating the factors is easily automated. Still, the number of human estimates required may seem too large an effort unless there is substantial pressure for accountability of decisions and priorities.

The main source of variability or unreliability in setting priorities by the VC method may lie not in the calculations nor in the estimates themselves, but in the prior task of specifying objectives and goals. If important objectives or goals are omitted and don't come to mind in estimating R, the priorities may vary appreciably. Conversely if two goals overlap so that some of the same achievements are included in both, the resulting priorities will be biased in the direction of overestimating the importance of those achievements. These weaknesses in goal and objective statements can be minimized by weeding out redundancy at the start, and by a thorough review of the statements for important omissions.

Public vs. personal goals. The applications of the VC techniques described here assume public interest to be the total value base. The technique could just as easily include other values such as profit or power, which would be more appropriate for business and other competive enterprises than for a government which exists only to serve its people. Of course other motives such as personal gain often do influence public decisions, and those who wish to predict or describe the actual behavior of decision-makers probably improve their accuracy by taking such motives into account. But if the intent is to set priorities in a way that best serves the public interest, then it is appropriate to consider only public goals. This does not deny that public authorities have personal motives as well. It means only that they are ultimately accountable to the public. And with an ever more alert citizenry leaders

will likely be called on to justify their priorities in terms of the public interest, no matter how they set priorities personally. A rational technique such as VC can be used to justify priorities as well as to set them.

Recommended Uses of the VC Method and Results

The priorities derived by the VC technique are numerical estimates of expected benefit and can be compared as ratios. As noted earlier this means that cost-benefit ratios can be calculated and compared for different action plans. The rational decision maker can thereby arrive at a clear decision to the extent he trusts the method and the inputs. If his trust is low he can weigh priorities, costs and feasibilities subjectively, along with other factors perhaps, in arriving at a final decision on allocation of resources. Whatever the actual basis for a decision, we strongly recommend that an accurate record be kept of the specific decisions made, along with the calculations of priorities, costs and probabilities of success, so that later comparisons of the relative outcomes of mathematical and subjective decision choices is possible.

No rational mathematical process for setting priorities or making decisions has proven its superiority to intuitive decision making in complex decision situations as yet. Therefore, it is not expected that authorities allocating resources will rely solely on priorities established by a new rational technique such as VC without exercising their own direct judgment regarding priorities. One of the advantages of the VC technique is that the many steps by which priorities are derived are explicit and retraceable, so that those who disagree with a given priority and wish to locate the specific judgments which account for the disputed priority can do so. In this way public policy makers can justify their decisions by making public the detailed set of steps and judgments on which a decision was based. This can add appreciably to the trust among various levels of public authorities and to the

credibility of public interest as the primary consideration in public decisions.

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APPENDIX
EDUCATIONAL OBJECTIVES
DERIVED FROM
NATIONAL TARGETS
INDONESIA - 1972

NOTE: The procedure for setting educational priorities in the 1972 Indonesian tryout did not permit the ratio-scale comparison recomended in the body of this report. A stanine scale was employed with the following characteristics:

The top priorities are stanines 7, 8 & 9.

Stanine 9	=	top 4%
Stanine 8 & above	=	top 11%
Stanine 8 & above	=	top 23%

The low priorities are stanines 1, 2 & 3.

Stanine 1	=	low 4%
Stanine 2 & below	=	low 11%
Stanine 3 & below	=	low 23%

When reading Table 11, it would be well to keep in mind that the figures given are priorities for improvement of school education. They indicate where needed improvements can be made over and above what is currently being done. These are the targets toward which new educational developments can be aimed. They are not values; they are priorities.

If, in reading the table, a person sees a low priority given to an objective which he feels is valuable, he should remind himself that high value objectives may have low priority. There may be sufficient persons achieving the objective at the present time (low "D") or the objective may best be taught to a large extent outside of school (low "EC").

SUMMARY OF OBJECTIVES WITH STANDARD SCORES (STANINES) REPRESENTING RELATIVE EDUCATIONAL PRIORITIES OF TWO KINDS: (1) RELATIVE PRIORITIES FOR ALL PERSONS WHO ATTEND SCHOOL AT THE INDICATED GRADE LEVELS AND (2) RELATIVE PRIORITIES FOR ALL PERSONS IN THE COUNTRY OF THE TARGET AGE

Category I (Listening & Speaking)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
(Listening)			
	Grade 3		
1.11	Understand speech of others	2	3
	Grade 5		
1.12	Understand nuances of meaning	4	4
1.13	Listen attentively	5	5
	Grade 8		
1.11	Analyze speech of others critically	5	7
1.12	Listen attentively	5	5
	Grade 12		
1.11	Summarize & analyze what is heard	5	8
1.12	Listen attentively	5	7
(Speaking)			
	Grade 3		
1.21	Express thoughts clearly so that peers, parents and others in community can understand	4	4
	Grade 5		
1.22	Present rationales for a reasoned points of view	5	5
1.23	Appreciate importance of speaking for communication	5	5

Category I (Listening & Speaking)	Relative Educational Priority (Persons in-School)	Relative Educational Priority (All of Target Age)
Grade 8		
1.21 Participate in adult conversation	5	7
1.22 Appreciate importance of speaking for communication	5	6
Grade 12		
1.21 Present well-reasoned talk to adults	7	8
1.22 Appreciate importance of speaking for communication	5	6
Category II (Reading & Writing)		
(Reading)		
Grade 3		
1.31 Understand functional materials such as signs, directions, forms, etc.	6	7
Grade 5		
1.32 Understand newspapers, magazines and appropriate books	5	7
1.33 Take pleasure in reading	6	5
Grade 8		
1.31 Understand semi-technical books and magazines	8	9
1.32 Use library and dictionary efficiently	8	8
1.33 Take pleasure in reading	5	7
Grade 12		
1.31 Understand technical books in area of interest	9	9
1.32 Do library "research" efficiently	9	9
1.33 Take pleasure in reading	6	7

Category II (Reading & Writing)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
(Writing)			
	Grade 3		
1.41	Compose simple notes & letters	5	5
	Grade 5		
1.42	Prepare written school assignments	5	5
1.43	Write legibly	3	5
1.44	Appreciate importance of writing for communication	5	5
	Grade 8		
1.41	Prepare written school assignments	5	8
1.42	Produce original writing on own initiative	5	7
1.43	Appreciate importance of writing for communication	5	7
	Grade 12		
1.41	Write reports that are organized, thorough and easily understood	9	9
1.42	Produce original writing on own initiative	6	8
1.43	Appreciate importance of writing for communication	6	8
Category III (Foreign Language)			
	Grade 8		
1.51	Read "basic" English & carry on simple conversation	6	5
	Grade 12		
1.51	Understand English textbooks, carry on semi-technical conversation, and write in basic English	6	5
1.52	Read "basic" foreign language other than English	3	4

Category IV (Mathematics)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
	Grade 3		
2.01	Understand basic number system and relationships	4	5
	Grade 5		
2.02	Apply basic mathematical concepts	6	8
2.03	Strive for accuracy	5	4
	Grade 8		
2.01	Solve business mathematics, use short-cut and estimation skills	4	6
2.02	Solve algebraic problems (e.g. one unknown) and geometry (simple measurement)	5	6
2.03	Habitually strive for accuracy	6	6
	Grade 12		
2.01	Solve advanced algebraic problems	5	6
2.02	Solve geometric problem	6	9
2.03	Understand basic matrix algebra	6	6
2.04	Perform simple statistical computations	7	8
2.05	Habitually strive for accuracy	6	5
Category V (Natural Science)			
	Grade 5		
3.01	Understand basic facts of natural environments	5	5
3.02	Understand basic relationships important to ecological control of environment	5	5
3.03	Apply scientific method to common problems	6	6
3.04	Apply scientific attitude of inquiry	3	3

		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
Category V (Natural Science)			
	Grade 8		
3.01	Understand semi-technical facts about environment	5	6
3.02	Understand semi-technical principles about plans & animals	6	9
3.03	Understand basic relationships important to ecological control of environment	6	5
3.04	Apply scientific method to formal classroom experiments	7	7
	Grade 12		
3.01	Understand relationship leading to wise and efficient utilization of natural resources	7	9
3.02	Have variety of advanced skills in either biological, chemical or physical sciences	7	7
3.03	Use inquiry skills, seek scientific explanations & appreciate science as basic for progress	7	7
Category VI (Religion)			
	Grade 5		
4.01	Know origins of own religion and moral precepts and duties	4	4
4.02	Believe in and practice principles of own religion while being tolerant of others' beliefs	4	3
	Grade 8		
4.01	Know implications of own religion to other aspects of life	5	4
4.02	Practice own religion in formal observance & in daily life while being tolerant of others' beliefs	4	2

		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
Category VI (Religion)			
	Grade 12		
4.01	Know implications of own religion to other aspects of life, including science	4	3
4.02	Practice own religion in formal observance & in daily life while being tolerant of other's beliefs	3	3
Category VII (Human Rights, Democracy & Social Justice)			
	Grade 5		
5.11	Understand basic principles of human rights, such as right to life, decent standard of living, deliberation & personal reputation	4	5
5.12	Respect others' ideas & opinions	8	8
5.31	Understand democratic principles of equality, decision-making, obeying decisions and process in local government	6	7
5.32	Apply democratic principles at home and in community	3	4
5.41	Understand basic social goals of Indonesia, particularly economic equality & welfare	6	6
5.42	Help other persons who are in need	9	8
	Grade 8		
5.11	Understand basic principles of human rights and the responsibilities that go with them	6	6
5.12	Respect others' ideas & opinions	8	7
5.31	Understand governmental structure	6	5
5.32	Understand democratic principles of equality, decision-making, obeying decisions	6	4

Category VII (Human Rights, Democracy & Social Justice)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
5.33	Apply democratic printiples in home and community	9	7
5.41	Understand basic social goals of Indonesia, particularly economic equality & welfare	9	7
5.42	Help other persons who are in need	9	7
	Grade 12		
5.11	Understand basic principles of human rights and the responsibilities that go with them	6	6
5.12	Respect others' ideas & opinions	9	6
5.31	Understand governmental structure and functions	6	4
5.32	Understand democratic principles of equality, decision-making, obeying decisions	7	5
5.33	Apply democratic principles in home and community	8	6
5.41	Understand basic social goals of Indonesia, particularly economic equality & welfare	7	4
5.42	Help other persons who are in need	7	6
Category VIII (Indonesian Unity, Defense & Security)			
(Indonesian Unity)			
	Grade 5		
5.21	Believe in the importance of unity	4	3
5.22	Understand history of Indonesia and and the cultural history of own area	4	4
5.23	Know geography of Indonesia and own area	2	2

Category VIII (Indonesian Unity, Defense & Security		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
	Grade 8		
5.21	Believe in the importance of unity	6	5
5.22	Relate history of own region to that of Indonesia	5	5
5.23	Know entire history of country and how it relates to rest of Southeast Asia	5	5
5.24	Participate in patriotic activities	6	5
	Grade 12		
5.21	Believe in the importance of unity	4	4
5.22	Relate history of own region to that of Indonesia	5	5
5.23	Know entire history of country and how it relates to rest of S.E. Asia	4	5
5.24	Participate in patriotic activities	6	5
(Defense & Security)			
	Grade 5		
5.51	Understand & support rules and regulations	5	5
5.52	Obey rules and regulations	6	7
	Grade 8		
5.51	Understand & support rules and regulations	5	5
5.52	Obey rules and regulations	7	5
5.53	Understand and support national defense organizations	6	5
	Grade 12		
5.51	Understand and support law & why society must have laws	5	4
5.52	Obey rules and regulations	6	5
5.53	Understand and support national defense organizations	6	5

Category IX (International Understanding)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
	Grade 5		
5.61	Know geography of world and particularly of Indonesian and its neighbors	3	3
	Grade 8		
5.61	Understand basic historical developments of Asia and some world history	4	3
5.62	Know geography of world and particularly of Indonesia and its neighbors	3	3
5.63	Appreciate history as cultural foundation for own lives in understanding economics & politics	4	4
5.64	Understand influence of geography on creation & development of nations	4	4
	Grade 12		
5.61	Know major world history trends and history of groups who have influenced Indonesia	3	4
5.62	Understand influence of geography on creation & development of nations	5	5
5.63	Appreciate history as cultural foundation for own lives in understanding economics & politics	4	5
5.64	Appreciate value of regional cooperation	4	4
Category X (Economic Development, Population & Consumer Education)			
(Population Education)			
	Grade 5		
5.71	Understand problems of over-and-under population	7	6

Category X (Economic Development, Population & Consumer Education)	Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
Grade 8		
5.71 Understand population problems and need to limit population growth	7	6
Grade 12		
5.71 Understand population problems and need to limit population growth	7	5
(Economic Development)		
Grade 5		
5.81 Understand & appreciate economic goals of Indonesia	9	8
5.82 Practice good economic principles for personal and family improvement, including savings	7	6
Grade 12		
5.81 Understand and appreciate economic goals of Indonesia	8	9
5.82 Practice good economic principles for personal and family improvement, including savings	5	5
(Consumer Education)		
Grade 5		
9.41 Understand relationship of value and price in purchases	8	9
9.42 Maximize quality of goods purchased, comparing values and prices	8	8
9.43 Manage personal finances wisely	7	6
Grade 8		
9.41 Understand relationship of value and price in purchases	7	5

Category X (Economic Development, Population & Consumer Education)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age
9.42	Maximize quality of goods purchased, comparing values and prices	8	6
9.43	Manage personal finances wisely	7	5
	Grade 12		
9.41	Understand relationship of value and price in purchases	5	5
9.42	Maximize quality of goods purchased, comparing values and prices	3	3
9.43	Manage personal finances wisely	9	6
Category XI (Art & Culture)			
(Fine Art)			
	Grade 5		
6.11	Enjoy fine art	3	3
6.12	Have simple skills for painting or drawing, etc.	3	3
	Grade 8		
6.11	Know basic ingredients of good art	3	3
6.12	Have sufficient skill to pursue art as a hobby or further study	2	2
6.13	Appreciate art and design in everyday life	2	2
	Grade 12		
6.11	Have sufficient fine art skills to pursue advanced study	2	2
6.12	Have sufficient skill to pursue art as a hobby or further study	2	0*

* A "0" rather than a "1" is given to either zero or negative values.

Category XI (Art & Culture)		Relative Educational Priority (Persons in-school	Relative Educational Priority (All of Target Age
(Music)			
	Grade 5		
6.21	Enjoy traditional, classic and modern music	0	2
6.22	Read simple music	3	3
6.23	Play simple instruments	2	2
	Grade 8		
6.21	Know similarities & differences among Indonesian, other Asian and Western music	2	2
6.22	Have sufficient skill to pursue music as hobby or further study	2	2
6.23	Listen to music regularly	0	0
	Grade 12		
6.21	Have sufficient musical skills to pursue advanced study	2	2
6.22	Have sufficient skill to pursue music as hobby or further study	0	0
(Dance)			
	Grade 5		
6.31	Enjoy both folk & classical dances	1	0
6.32	Perform simple dances, particularly those from own region	0	0
	Grade 8		
6.31	Dance for pleasure or further study	1	1
6.32	Perform both regional and classical dances	1	1

Category XI (Art & Culture)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
	Grade 12		
6.31	Appreciate different styles of dance from many countries	1	0
6.32	Have sufficient dancing skill to pursue advanced study	1	1
(Literature)			
	Grade 5		
6.41	Enjoy simple stories and spend own time in reading	3	3
6.42	Appreciate both poetry and prose	3	3
	Grade 8		
6.41	Enjoy appropriate Indonesian literature	3	3
6.42	Write simple poems, essays or stories	3	3
6.43	Have skill in poetry reading	2	0
	Grade 12		
6.41	Appreciate good literature from many countries	3	1
6.42	Have sufficient skills to pursue more advanced literary endeavors	2	3
Category XII (Vocational Education)			
	Grade 5		
7.01	Understand & appreciate need for all vocational areas for national development	6	6
7.02	Appreciate contribution of all workers to development; hold all workers in equal esteem	7	7
7.11	Have basic skills in plant care	4	4
7.21	Use simple hand tools	5	5

Category XII (Vocational Education)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target age)
	Grade 8		
7.01	Understand & appreciate need for all vocational areas for national development	5	5
7.02	Appreciate contribution of all workers to development; hold all workers in equal esteem	6	6
7.11	Have skill in at least one branch of agriculture appropriate to own area	4	5
7.21	Have moderate skill in at least one industrial or handicraft area	5	5
7.31	Have moderate skill in at least one commercial area	5	5
7.41	Appreciate value of home economics	5	5
7.42	Have moderate skill in home economics area	3	4
	Grade 12		
7.01	Understand & appreciate need for all vocational areas for national development	5	5
7.02	Appreciate contribution of all workers to development; hold all workers in equal esteem	5	5
7.11	Have sufficient skill in agriculture or allied area to begin a career or further study	2	2
7.21	Have sufficient skill in industrial or handicraft areas to begin career	4	5
7.31	Have sufficient skill in commercial area to begin career	4	5
7.41	Appreciate importance of good home atmosphere	5	4
7.42	Have basic home economics skills	4	3

Category XIII (Sports & Health)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
(Sports)			
	Grade 5		
8.21	Participate in a variety of games	4	4
8.22	Understand rules of games played	5	4
8.23	Appreciate importance of sports to good health	5	4
	Grade 8		
8.21	Participate in sports voluntarily and regularly	5	4
8.22	Understand rules & apply good sportsmanship	5	4
8.23	Appreciate importance of sports to good health	5	5
	Grade 12		
8.21	Have sufficient skill in at least one sport to pursue it as life-long hobby	4	4
8.22	Understand rules & apply good sportsmanship	5	4
8.23	Have sufficient skill to pursue a sports career	2	2
(Health)			
	Grade 5		
8.11	Understand basic principles of good health, including nutrition, hygiene and health services	5	5
8.12	Practice cleanliness, nutrition, exercise & health care	6	5
	Grade 8		
8.11	Know structure & function of human body in relation to health	5	4
8.12	Have basic first aid skills	3	3

		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
Category XIII (Sports & Health)			
8.13	Practice cleanliness, nutrition, exercise & health care	6	4
	Grade 12		
8.11	Know sufficient about the functioning of disease & injuries to live a healthy life	3	4
8.12	Have basic first aid skills	4	3
8.13	Practice cleanliness, nutrition, exercise & health care	4	4
Category XIV (Personal Development)			
(Personal Planning)			
	Grade 5		
9.01	Appreciate value of education to selves and community	4	5
9.02	Take personal responsibility for own progress and try to improve selves	6	5
9.03	Have open-minded attitude and flexibility to change	3	4
	Grade 8		
9.01	Appreciate value of education to selves and community	4	5
9.02	Appreciate the types of choices that must be made in vocational planning	4	6
9.03	Take personal responsibility for own progress and try to improve selves	6	6
9.04	Have open-minded attitude and flexibility to change	4	6
	Grade 12		
9.01	Value education as a life-long process	4	4
9.02	Narrow vocational goals to several options in keeping with own potential	7	7

Category XIV (Personal Development)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
9.03	Take personal responsibility for own progress and try to improve selves	5	5
9.04	Have open-minded attitude and flexibility to change	6	5
(Work Habits)			
	Grade 5		
9.11	Have habit of accuracy, attention to detail and meeting deadlines	7	5
9.12	Cooperate with others and take initiative to do more than the minimum required	8	7
9.13	Try to do their best on all tasks	7	7
9.14	Practice good study habits	8	7
	Grade 8		
9.11	Have habit of accuracy, attention to detail and meeting deadlines	7	8
9.12	Practice good study habits	8	7
	Grade 12		
9.11	Have habit of accuracy, attention to detail and meeting deadlines	7	8
9.12	Practice good study habits	7	7
Category XV (Problem-Solving, Planning & Management			
(Problem-Solving)			
	Grade 5		
9.31	Know problem-solving principles as applied to elementary problems	5	5

Category XV (Problem-Solving, Planning & Management)		Relative Educational Priority (Persons in-school)	Relative Educational Priority (All of Target Age)
9.32	Have questioning attitude, seeking explanations	6	5
	Grade 8		
9.31	Understand and practice problem-solving approach	7	7
9.32	Have questioning attitude, seeking explanations	6	6
	Grade 12		
9.31	Practice advanced problem-solving skills and understand bases of formal logic	7	8
9.32	Practice problem-solving in groups	8	7
(Planning & Management)			
	Grade 5		
9.21	Willingly participate in project that includes planning and scheduling	4	4
	Grade 8		
9.21	Initiate & carry out a project that requires planning & scheduling	5	4
9.22	Appreciate importance of and practice planning in personal life	6	6
	Grade 12		
9.21	Initiate & carry out a project that requires planning & Scheduling	4	3
9.22	Appreciate importance of and practice planning in personal life	7	7