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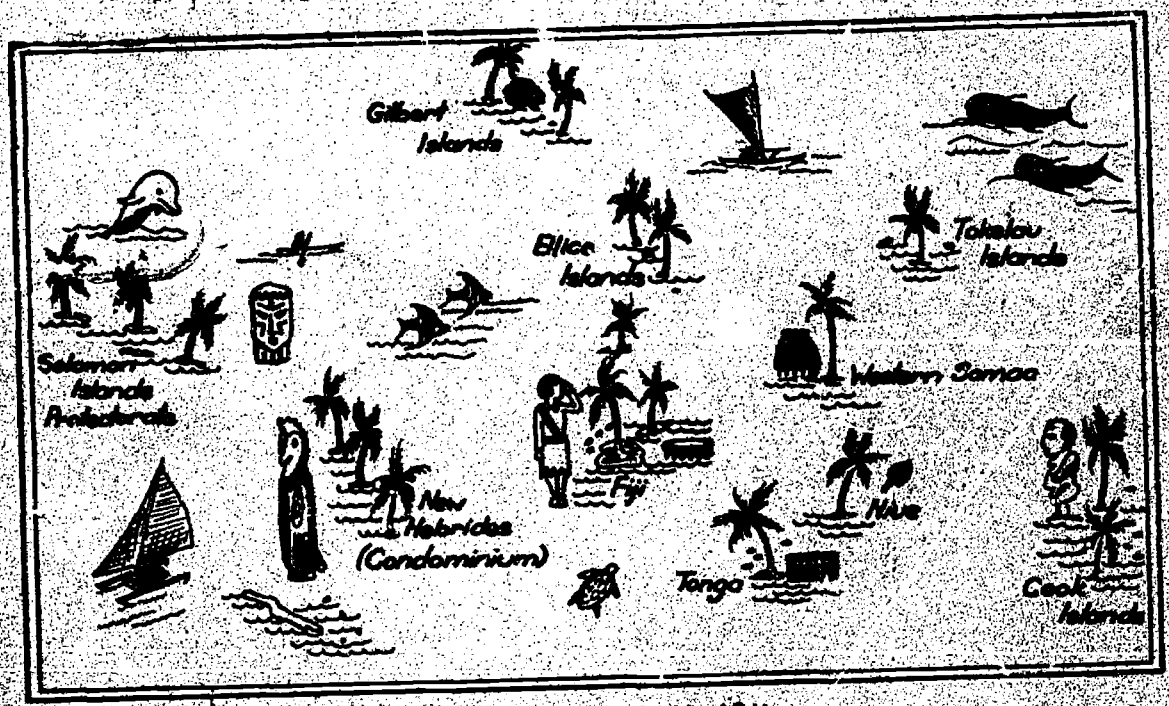
ABSTRACT

Assistance from the United Nations Development Programme provided the opportunity for over one hundred participants to gather for a regional workshop in an attempt to tackle the problems of curriculum development in the South Pacific. The workshop concentrated on four major subject areas--social science, mathematics, English language, and basic science. Reports from each of the work groups comprise the major portion of this final workshop report. The curriculum development processes reported on include initial curriculum planning, development of aims and objectives, trial drafts of curriculum materials, needs assessments, feedback evaluation, teacher orientation courses, and implementation procedures. The program of the entire workshop is outlined following the workgroup reports. Results of a participant questionnaire are summarized, indicating reactions to the format of the workshop and feelings towards the success of the program. (KSM)

UNITED NATIONS DEVELOPMENT PROGRAMME

REGIONAL CURRICULUM WORKSHOP



JAN. 2nd — JAN. 19th.

1973

FINAL WORKSHOP REPORT

SCHOOL OF EDUCATION

UNIVERSITY OF THE SOUTH PACIFIC

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FOREWORD

Dr. G.D. Bishop,
Project Manager and Chief Technical Adviser,
U.N.D.P. Unesco Project - Secondary School Curriculum Development Unit,
University of the South Pacific, Suva, Fiji.

The whole business of curriculum development - from the initial planning, from eliciting aims and objectives, from gauging the base-lines from which to begin operations, to the preparation of trial drafts, checking these drafts for their relevance to differing needs and environments, for their suitability for pupils and for teachers, to collecting feedback, to revision of draft units, to servicing orientation courses for teachers, to final implementation of new curricula in school systems - is a difficult task. But, nonetheless, one that is exciting, challenging and extremely rewarding.

The difficulties of curriculum development on a regional scale are aggravated by difficulties of communication between the eight countries participating in the Project, spread out as they are in an expanse of ocean as extensive in area as the United States. To overcome these difficulties members of the Project have visited all the participating countries, discussing ideas and problems and plans with the Directors of Education and their staff, with principals, with teachers, and with others involved in planning new curricula.

But these visits, while extremely valuable to us in our work, did not really get to the heart of the problem. Instead of single, isolated visits, what was needed was a getting-together of all people involved in curriculum development in all the countries in the Project so that Tongans and Samoans and Niueans and Gilbertese and Fijians and New Hebrideans and Solomon Islanders and Cook Islanders could sit down together in one place and mutually discuss and thrash out their problems, exchange their experiences and expertise and by such a joint cooperative venture develop curricula suited to each country's particular needs and biassed to each country's differing situations.

Such a Regional Conference or Workshop would be a very expensive undertaking. But it was the only way to really tackle the problem of curriculum development in the South Pacific.

REPORT OF THE SOCIAL SCIENCE WORK GROUP

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The Social Science Work Group

Standing (left to right): Mrs. Tiva Tongatule *(Niue)*, John Hekkenberg *(N.Z.)*, Mrs. Gaufa Uesele *(W. Samoa)*, I. Etuata *(Niue)*, Sakiusa Saunokonoko *(Fiji)*, Josaia Yalovigau *(Fiji)*, Alfred Selwyn *(Solomon Is.)*, Rob Whyte *(C.I.)*, Chhattar Pal *(Fiji)*, Shiu Narayan *(Fiji)*, Mata Pepe *(C.I.)*, Ram Hit *(Fiji)*.

Sitting (left to right): John Tealiklava *(Solomon Is.)*, Nakibae Tabokai *(G.E.I.C.)*, Miss Anne Stamford *(N.H.)*, V. K. Bola *(Fiji)*, Miss Cecilia Kave *(C.I.)*, Miss Tili Peseta *(W. Samoa)*, P. J. Hart *(UNESCO)*, Ram Dube *(Fiji)*, S. N. Narayan *(Fiji)*, Miss Salote Falau *(Tonga)*.

REPORT OF THE SOCIAL SCIENCE WORK GROUP

Mr. P. J. Hart, Unesco,
Social Science,
Course Coordinator.

1. Some twenty five participants took part in the Social Science Workshop, from January 2nd - 19th 1973 (see Appendix A).

We were fortunate in securing the services of Mr. John Renner of Christchurch Teachers' College, New Zealand, as an aide-consultant for the whole period of the Workshop, and also Professor R. Crocombe and Mr. P. McMechan of the University of the South Pacific who took part in our deliberations on several occasions.

2. The Purpose of the Curriculum Workshop for Social Science

1) To re-assess the aims and objectives of the four-year course.

2) To re-assess the general structure, format and styling of the four-year course, in the light of the trials so far undertaken, taking note especially of all teaching conditions, children's attainments, and back-up resources.

3) To agree on the themes, unit design and content of Years 3 and 4 of the course.

4) To write the 6 core units, and as many support units for Years 3 and 4 as possible.

5) To make recommendations for Years 5 and 6 Social Science.

We took note of the fact that:

1) this was a Workshop in Curriculum Development and participants were curriculum developers;

2) although we were engaged in writing curriculum materials, curriculum development and textbook production are not the same;

3) our principal concern was to plan some of the school experiences which young scholars in the South Pacific will enjoy during the next few years.

3. Programme

1) During the first week the Social Science group considered purposes 1 - 3, and the three appendices (B1 - B3) indicated the way we set about re-assessing the Aims and Objectives, Structure, Format and Styling, and Themes for Years 3 and 4.

2) There was general agreement that the Aims should continue to stand, that the Structure and Format should continue as now but the quality of layout should be improved.

3) A request was made for a "Social Science Newsletter" to be circulated by the U.N.D.P. Unit once every two months.

4) There was also a suggestion that local (national) Social Science Committees write Teachers' Guides Part I, and a request was made for more explanation to be given with Pupils' Pamphlets and pupil materials. On the whole, the materials to date had "lacked visual impact", and more graphics, colour, and greater use of tapes and radio were requested.

5) Discussion on themes was lively but produced no further changes except for the core topic name for the theme 3.2.1 "Sanctions": it was suggested that the topic name should be "Resolving Conflicts" rather than "Strife and Conflict".

6) Planning units of study

(See Appendix B4 and "Brainstorms for Topics")

The Social Science participants formed themselves into the following six groups to consider the aims and objectives of the core topics.

Name:	Country:	Topic:
Group 1		
Abel Olul	New Hebrides	"Learning to Live"
Mrs. Gaufa Uesele	W. Samoa	
Mata Pepe	Cook Islands	
Joe Yalovigau	Fiji	

Group 2

Sakiusa Saunokonoko	Fiji	"Living in Towns"
Miss Cecilia Kave	Cook Islands	
Ram Hit	Fiji	
Miss Tili Peseta	W. Samoa	

Group 3

Mrs. Tiva Togatabule	Niue	"Resolving Conflicts"
Miss Salote Palau	Tonga	
Shiu Narayan	Fiji	
John Hekkenberg	New Zealand	

Group 4

Chhattar Pal	Fiji	"Feeling Free"
Alfred Selwyn	Solomons	
I. Etuata	Niue	
Ram Dube	Fiji	

Group 5

John Tealiklava	Solomons	"Plans and Planning"
V. K. Bola	Fiji	
Mrs. E. Kamikamica	Fiji	
Rob Whyte	Cook Islands	

Group 6

Miss Anne Stamford	New Hebrides	"Governing and Government"
N. Tabokai	Gilbert & Ellice	
S. N. Narayan	Fiji	

Each group wrote a first draft using ideas from a "Brainstorm" session conducted by Mr. Renner with the whole group of participants. The first drafts were scrutinised by all, and second, amended, drafts were then written by each group. Appendix C1 shows the first and second drafts for each topic. This activity was more arduous and time-consuming than many of us at first realised, but it did enable us to proceed more quickly with the next stage.

Groups then proceeded to plan and write the Teachers' Guide Part II for their unit of study, using the guide in Appendix C2. This was followed by planning and writing (where possible) outlines of pupil materials, and the Teachers' Guide Part I.

Meanwhile, Mrs. Dunckley, artist, had designed envelope covers for each topic, and other graphic materials as requested by each group.

These draft materials - written and graphic - were duplicated during the last week of the Workshop, and later collated by those who were able to stay another week.

7) A session to determine a theme for Year 5 of a Social Science course was held on Wednesday 17th January with Professor R. Crocombe and Mr. P. McMechan in attendance. Ideas for Years 5 - 7 were aired and the following suggestions were made:

Year 5 - Main theme: "Interdependence - a Global View"

Year 6 - Unity

Year 7 - Diversity.

It was agreed that further ideas from national Social Science Committees should be sought before making a definite decision.

8) Mini-sessions. Mr. John Renner also held informative talks and invited discussion at 3 "Mini-sessions" on the following topics:

a) Case studies.

b) Examinations.

c) Evaluation (with Mrs. L. Dale).

These were much appreciated by those who attended.

4. Evaluation of the Functioning of the Social Science Workshop

This is given in Appendix D.

5. Where Do We Go From Here?

1) "What we have done, we have done."

A great deal has been accomplished in a very short time. Not only have draft materials for the core studies for Years 3 and 4 been produced, but participants have learned much about curriculum development, about other countries (and problems) in the South Pacific, and have gained confidence to partake in developing a relevant curriculum for their own schools.

2) Copies of the draft materials for Units 3.1.1, 3.2.1, 3.3.1 and 4.1.1, 4.2.1, 4.3.1 will be sent to Social Science Committees and Work Groups in each country. These committees will then scrutinise them and re-write them where they consider it necessary, to make them appropriate for their own Forms 3 and 4.

3) The revised core units will be printed and trialling may begin in January 1974.

4) Suggestions for support units of study will be made - and a request made in the Newsletter for researchers and writers.

5) Plans for another curriculum workshop to develop further the gains we have made in this - the first International South Pacific one - are being laid.

APPENDIX A U.N.D.P. CURRICULUM WORKSHOP

FULL-TIME PARTICIPANTS IN SOCIAL SCIENCE

John Renner	Secondary Division, Teachers' College, Christchurch, New Zealand.
Mo Kalaam	Box 1210 East West Center, 1777 East West Road, Honolulu, Hawaii 96822.
Ram S. Dube	C/o University of the South Pacific, P.O.Box 1168, Suva, Fiji.
Anne Stamford	British Secondary School, Vila, New Hebrides.
Abel Olul	Ranwadi High School, Central Pentecost, New Hebrides.
I. Etuata	Teachers' Training Centre, Alofi, Niue.
Ram Hit	P.O.Box 145, Nausori, Fiji.
John Tealiklava	Selwyn College, P.O.Box 253, Honiara, Solomon Islands.
S. N. Narayan	P.O.Box 57, Lautoka, Fiji.
Alfred Selwyn	King George VI School, Honiara, Solomon Islands.
Nakibae Tabokai	King George V School, Bikenibeu, Tarawa, Gilbert Islands.
Chhattar Pal	9 Lakeba Street, Suva, Fiji.
E. N. Kamikamica	5 Qauiya Street, Lami, Suva, Fiji.
Tiva Tongatule	Niue High School, Paliati, Niue.
Shiu Narayan	Education Department (Secondary), Suva, Fiji.
John Hekkenberg	C/o University of the South Pacific, P.O.Box 1168, Suva, Fiji.
Mata Pepe	C/o Tereora College, P.O.Box 107, Rarotonga, Cook Islands.
Josaia Yalovigau	Ratu Rusiate Memorial School, Ba, Fiji.
Gaufa Uesele	C/o P.O.Box 1224, Apia, Western Samoa.
V. K. Bola	Nabua Fijian School, Mead Road, Suva, Fiji.
Tili Peseta	C/o Education Department, Apia, Western Samoa.
Cecilia Kave	C/o Tereora College, P.O.Box 107, Rarotonga, Cook Islands.
Salote A. Falau	C/o Queen Salote College, Nuku'alofa, Tonga.
Rob Whyte	C/o Tereora College, P.O.Box 107, Rarotonga, Cook Islands.

Sakiusa Saunokonoko	C/o Ratu Kadavulevu School, Private Mail Bag, Suva, Fiji.
Ron Crocombe	C/o University of the South Pacific, P.O.Box 1168, Suva, Fiji.
Peter McMechan	C/o University of the South Pacific, P.O.Box 1168, Suva, Fiji.
Peter Hart	U.N.D.P. Curriculum Development Unit, University of the South Pacific, P.O.Box 1168, Suva, Fiji.

APPENDIX B1 SOCIAL SCIENCE

TASK 1 RE-ASSESSMENT OF AIMS AND OBJECTIVES

Critical checklist

A. Appropriate Aims of Social Science (p.6 in "Social Science in the South Pacific")

1. What does "cultural inheritance" mean?
2. How "knowledgeable"?
3. Meaning of "appreciate" and "understand"?
4. What "changes" are now occurring in your country?
5. What is "social life"? How is it different from "economic life"?
6. How do you know that pupils have "adapted"? How may we help them adapt?
7. What is "cultural identity"? How do we recognise it?
8. "Integrity" - what is this?
9. What is an "appropriate role"?
10. Marry "diversity" and "interdependence".
11. How much "diversity" is there in your country? What kind of diversity is it?
12. How do you know a person "thinks intelligently"?
13. How do people express "interest" and "concern"?

B. Aims of Social Science (p.14 Appendix 1 of "Social Science in the South Pacific")

1. Is the definition of Social Science too wide?
2. Orientation of curriculum - what are the five principal needs of (your) Society?
3. What are "Society's ends"? How do they differ from "needs"?
4. What is "one's own culture"?
5. List five principal "Social Skills".
6. How can we test "General Learning Outcomes"?
7. What are "individual rights", and "human rights"?
8. What is meant by "democratic processes"?
9. What is "innovation"? Who are "innovators"?

10. What is "objective knowledge"?

11. How do you show you "think critically"?

C. Re-assessment

1. How far are the aims still appropriate for secondary pupils in the South Pacific?

2. Are there any educational and social changes which have occurred since early 1971 which may modify our aims?

3. Should we re-order the aims stated and establish a different order of priority?

4. Can we list changes in national life which may result from the pursuance of our Aims in Social Science?

APPENDIX B2 SOCIAL SCIENCE

TASK 2 RE-ASSESSMENT OF STRUCTURE, FORMAT AND STYLING

A. Structure (p.10 of "Social Science in the South Pacific")

To consider:

1. Are annual themes appropriate to the (modified) aims?
2. Do termly themes now follow from annual themes?
3. In view of the fact that some countries now have four or two terms a year, should we not dispense with a structured three-term thematic approach?
4. Do we still need two courses - Years 1 and 2 and Years 1, 2, 3 and 4?
5. How many composite classes of Forms 1 and 2 remain to influence our styling of units written for Years 1 and 2?

B. Format (p.11) This is the "Unit" approach.

To consider:

1. Have we planned for too many units?
2. Should we differentiate still between "Core" and "Support" units of study?
3. On what basis should we differentiate between "Core" and "Support" studies?
4. So far we have concentrated on writing Core units of study. Has there been a need for specific Support units during the trialling?
5. Are there sufficient resources available for teachers to make their own Support studies until such time as the principal Core studies are written?
6. Following A3 above, shall we have to devise another system for numbering units?
7. Do teachers need more guidance in choosing Support studies to teach in their own schools?
8. Should we establish a system to facilitate the exchange of units throughout the Region?

C. Styling

This is the way in which the unit package is planned and presented. Financial and technical resources available affect the style of each unit package. In planning each unit we are attempting to maximise limited resources. Hence we need always to have in mind an order of priorities in order to determine greatest cost-effectiveness.

Present priorities:

1. Packages have been designed to aid the teacher first, then the pupils. Hence more emphasis has been placed on teacher aids than on pupils' worksheets and pupils' tests.
2. Through the unit packs, we have attempted to alter the teacher's method and style of teaching, believing that by so doing we shall present to pupils better and more varied learning experiences.
3. This may have been arrogance on the part of local committees who styled units of study.

To consider: A. Teaching Methods (pp.8-9)

1. Is there a need for two Teachers' Guides in each packet?
2. Are Teachers' Guides Part I too difficult for most teachers?
3. Are Teachers' Guides Part II too detailed?
4. Are teachers given enough help, in in-service courses or by correspondence, to teach each unit as it is designed to be taught? Do teachers understand the importance of aims for each unit?
5. Is there enough variety in teaching methods in Social Science?

B. Pupil Learning Experiences

1. Are the pupil materials adequate in content and standard of English?
2. Are pupil materials suitable in helping pupils attain more learning?
3. Are pupil learning experiences varied enough?

4. Is the format of pupil material the most efficient, bearing in mind our limited resources?
5. Suggest three improvements we can make in presenting pupil materials.

C. Evaluation

1. How may we improve our formative evaluation?
2. How will we make a summative evaluation of each unit?
3. Can we list criteria for evaluating each unit, and for evaluating the course?

D. General

1. In presenting units of study, are we duplicating what is already available - perhaps commercially - for teaching Social Science in the South Pacific?
2. Are there other - so far untapped - resources and sources we may use to further Social Science?
3. Are there "areas" of waste - and inefficiency - in what has already been produced?

APPENDIX B3 FORMS 3 AND 4 SOCIAL SCIENCE

A. Thematic Outline for Years 3 and 4

Year 3: Principal theme: FREEDOM & CONTROL

Sub-themes: 1. Rules, Regulations and Customs

2. Sanctions

3. Rights and Responsibilities

Year 4: Principal theme: PLANNING & CHANGING

Sub-themes: 1. Urbanisation

2. Making Decisions

3. Community and National Planning

These have been distributed for discussion and comment to all countries. In general, there is acceptance of these themes, but some teachers have queried our collective ability to develop those for Year 3 at FORM 3 level.

Group Task:

To consider the appropriateness of these themes at Forms 3 and 4 levels, and to agree on suitable themes.

B. Suggested Core Topic Names and Principal Concepts

Names are in order and correspond to sub-themes suggested above.

Name	Concepts
Year 3:	
1. Learning to Live	Growth
	Socialisation
	(Enculturation)
	Image
	Stereotype
2. Strife and Conflict	Conflict(s)
	Sanction
	Communication

2.	Feeling Free	Obligation
		Debt/Responsibility
		Restriction
		Service
		Freedom

Year 4:

1.	Living in Towns	Rural/Urban
		Metropolis
		Alienation
		Central-Place
2.	Governing and Government	Democracy
		Autocracy
		Evidence/Fact
		Executive/Legal
		Politics
3.	Plans and Planning	Plan
		Model/Theory
		Economic Growth
		Standard of Living
		Confidence

Group Task:

To evaluate principal concepts and amend topic names if necessary.

C. Suggested Skills and Content for Years 3 and 4

	Skills	Content
Year 3:		
1.	Evaluating	Family and Community Studies
	Analysing	Group Study
		Traffic Rules in Towns
		(Rural) Customs - Historical and World Examples

2.	Map-reading	Warfare - Ancient and Modern
	Reading Original Documents, including Newspapers	Pressure Groups
		Prisons and Punishment
		U.N. and World Affairs
	Synthesising	
3.	Synthesising	U.N. Charter
	Evaluating	Human Rights and Social Work
	Reasoning	Political Manifestos, e.g. U.S.A. and U.S.S.R.

Year 4:

1.	Mapping	Suva City
	Photo Interpretation	South Pacific Towns
	Analytical Field Work (Urban)	World Examples of Metropolitan Areas
		Town Planning
2.	Analysing and Sifting "Opinions"	Patterns of National Government in the South Pacific
	Evaluating Political Systems	Electioneering and Elections
3.	Picture Analysis	South Pacific Development Plans
	Statistical Analysis and Interpretation	World Planning - Environment and Pollution
	Planning	World Communications Network - Intelsat
		Population Planning

Group Task:

1. To add to Skills and Content if necessary in the light of of amended Topic Names and Concepts.
2. To re-order Skills and Content, and assign them to Units - "Core" and "Support".
3. To name units.
4. To plan units.

APPENDIX B4 SOCIAL SCIENCE

PLANNING UNITS OF STUDY FOR YEARS 3 AND 4

A. We have drawn up the principal themes and sub-themes appropriate to our Aims for Social Science, and we have suggested topic names for the core studies.

Our next task is to plan drafts of units of study.

B. Important Question:

"What do we want the children to become

to know

to be capable of

as a result of this unit of study?"

C. Steps to follow:

1. Write down the intention of the unit.
2. List the ~~aims~~ of the unit under the following headings:
   - (a) Knowledge - Ideas
     - Facts/Content
   - (b) Skills - Social
     - Intellectual/Thinking
   - (c) Attitudes - to learning
     - to others
     - to themselves.
3. Put aims in order of priority.
4. Ask question: "How are we going to realise these aims?"
5. List: (a) resources teacher will require;
   (b) resources pupils will require.
6. Consider ways of teaching and write down methods teacher may use for this unit of study.
7. Ask question: "Which learning experiences do we wish children to have?"
8. List children's learning experiences which may be used for this unit of study.
9. Write pupil tests or other evaluation procedures.

D. When each group has prepared drafts we shall hold a "Report and Criticise" Session during which drafts will be amended.

BRAINSTORMING - ENCOURAGING PUPIL PARTICIPATION AND DEVELOPING THINKING SKILLS

This sequence follows a pupil activity, e.g. field work, film strip, looking at a picture, reading a book or a paragraph, etc.

1. What does this word/phrase bring to mind? OR
   What did you notice/see/hear/read? (field trip, film strip, book)

   This question gathers information. Record on the blackboard.
   Note: It is worth numbering the contributions. Never refuse a contribution. If a class is reluctant to contribute have them write three or four responses on note paper before the oral session.
   Thinking skill, remembering.

   BRAINSTORMING

2. Do any of these words go together? OR
   Do you see ways in which these words go together?

   This question encourages the pupils to group words according to relationships that they see. Mark with symbols - coloured chalk. Possible follow-up question: What makes you think so? to establish a basis for grouping.
   Thinking skill; synthesising.

   GROUPING

3. What names would you give these groups? OR
   Can you think of a name for any of the groups that we have found?

   This question closes the sequence, encourages pupils to state some important concepts that they associate with the opening activity.
   Record on the blackboard.
   Thinking skill, synthesising.

   LABELLING

Developed from original work by Hilda Taba.

J. M. Renner, 9 January 1973
Consultant

ENCOURAGING PUPIL PARTICIPATION
AND DEVELOPING THINKING SKILLS

SHEET TWO : FORMING GENERALISATIONS

As on sheet one, this question sequence follows an appropriate pupil activity, e.g. field work (visit), film strip, looking at a picture, etc.

1. You have seen three pictures of village life in Africa. What did the pictures bring to mind? OR What did you notice about the pictures? OR What did the pictures tell you about village life in Africa?

   This question gathers information. Pupils' contributions should be recorded on the blackboard. Never refuse a contribution. If a class is reluctant to contribute ideas, have them write three or four responses on paper before conducting the oral session.
   Thinking skill, remembering.

   BRAINSTORMING

   This activity provides a body of information for the class to work with.

2. Now, what differences do you notice between the African villages you have seen and your own village? AND What similar features do you notice?

   This question gives pupils the opportunity to identify and to describe relationships as they see them. Use coloured chalk to mark and annotate on the blackboard.
   Thinking skill, comparing.

   COMPARING

3. What can you say generally about villages? OR What can you say in general about village life? OR Can you make a general statement ... ?

   This question requires the pupils to discover ideas that are common to two or more of the examples used.
   Record on the blackboard.
   Thinking skill, synthesising.

   GENERALISING

Developed from original work by Hilda Taba.

J. M. Renner, 9 January 1973
Consultant

SOCIAL SCIENCE

"BRAINSTORMS" FOR TOPICS

Year 3:

Learning to Live

Obedience	Child Rearing	Culture
Group Decisions	Eating Habits	Obligation
Respect	Safety	Values
Loyalties	Hating and Loving	Attitudes
Responsibilities	Punishment	Roles of People
Consideration for Others	Traditions	Occupation

Strife and Conflict

Fight	Inciting	Traditional Controls
Punishment	Prevention	Policeman
Crime	Strike	Social Mores
Regulations	Riots	Courthouse
Intolerance	Conviction	Compromising
Prison	Discriminate	Rebellion
Criticism	Social Pressure	Warfare
Argument	Prejudice	
Law and Order	Belief(s)	

Feeling Free

Freedom of Speech	Happiness	Business
Movement	Pleasure	Cooperation
Leisure	Security	Survival
Religion	Education	Toleration
Protest	Politics	Customs
Human Rights	Discipline	Beliefs
Selfishness	Respect for Others	Integrity
Escape	Self-help	Dimensions
Freedom of the Press	Liberate	Ideas

Year 4

Living in Towns

Housing	Traffic	Purpose
Poverty	Job Opportunities	Slums
Movement	Crime	Services
Settlement	Specialisation	Manufacturing
Division of Labour	Sub-division	Pollution
Loneliness	Fashion	Delinquency
Consideration	Racial Problem	Planning
Entertainment	Tradition	Congestion
Competition	Planning	Sewerage
Local Government	Market	Shops
Offices	Earning/Salary	Imports
High Cost of Living	Budgeting	Rents
Labour	Exploitation	Unemployment
Communications	Boredom	Underfed
Night Life	Rush	Tourism
Commute	Time	Disturbance
Cosmopolitan	Drugs	Drunkenness
Sex	Prostitution	Health
Dislocation		

Governing and Government

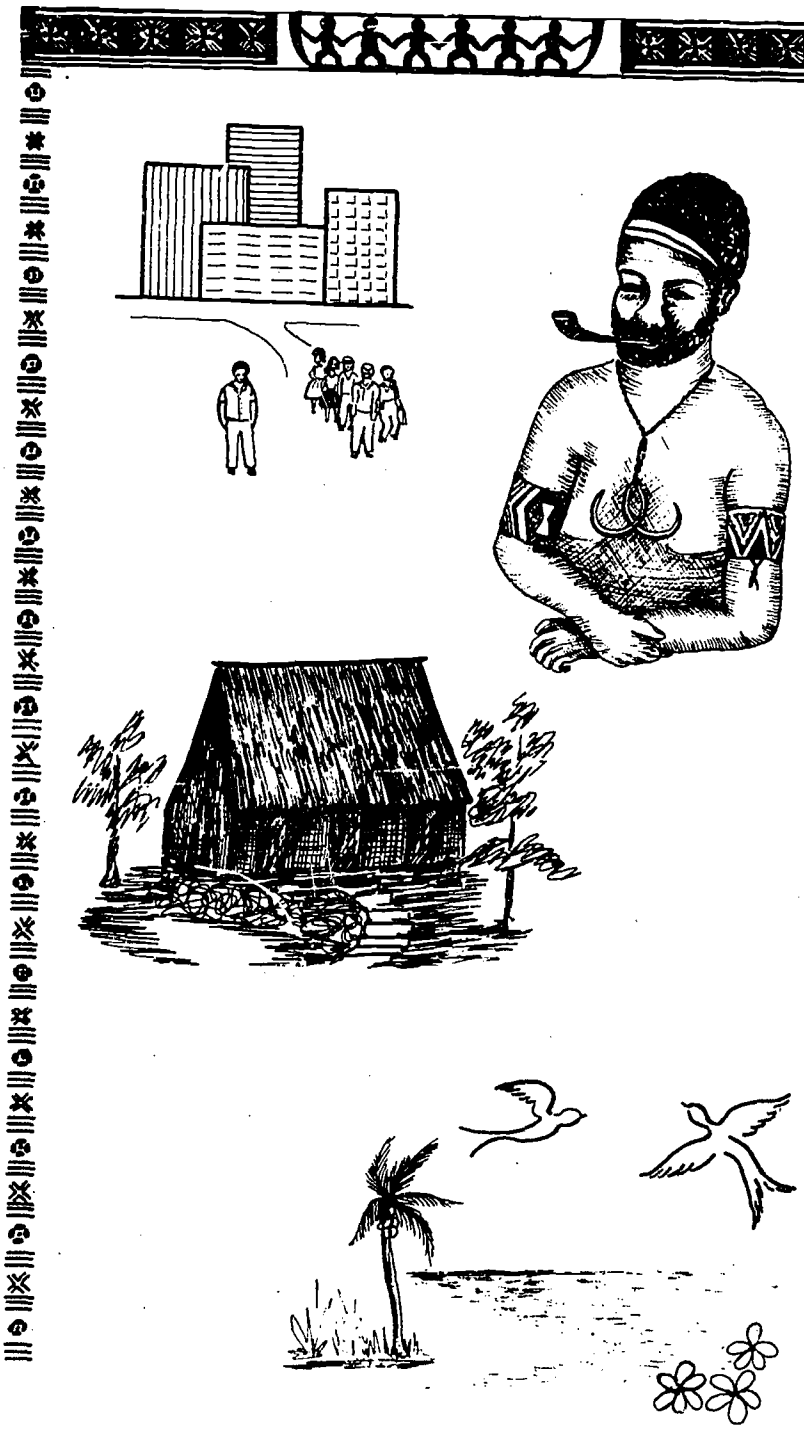
Freedom of Speech	International Relations	Intermarriage
Service	Nation Building	Company
Authority	Nationalism	Political Party
Taxes	International Law	Awareness
Priorities	Communication	Minority Groups
Laws	Individualism	Bribery
Selfishness	Chiefs	Campaign
Self-help	Ministry	Propaganda
Wastage	Local Government	Integrity
Who Votes?	Men/Women's Liberation	Colonial Relations
Opposition	Value Judgement	Administration

Status Quo	Regional Cooperation	Ombudsman
Power Politics	News Media	Voluntary Service
Flexible Mind	Security	Military
Secret Police	Council	Foreign Aid
Balanced Growth	Justice	Paternalism
Economic Development	Service Organisation	

Plans and Planning

Development	Land	Survey
Intelligentsia	Expertise	Aids
Change	Theory	Wages
Growth	Low-cost	Foreign Ownership
Costing/Estimates	Deflation	Economic Growth
Importance	Inflation	Land Tenure
Drafting	Irrigation Schemes	Time
Services	Adaptation	Investment
Preservation	Education Schemes	Overpopulation
Tax	Finance	Agreement
Roads	Standard of Living	Research
Banks and Loans	Discussion	Projects
Industries	Expansion	Wage/Price Control
Natural Resources	Distribution	Birth Control
Nationalisation	Priorities	U.N. Grant
Investment	Consultation	Brain Drain
Capital	Rural/Urban	Migration
Trade Agreement	Exploitation	Regionalism
Terms of Trade	Political Stability	
Growth Models	Exports/Imports	

APPENDIX B5 GRAPHICS FROM THE WORKSHOP



APPENDIX C1 DRAFTING AIMS AND OBJECTIVES

GROUP 1 "LEARNING TO LIVE"

1. Principal Concepts (Intention)

It is the intention of this unit that it should help the children to learn

(a) to become good and responsible citizens;

(b) to know their own specific customs and cultures;

(c) to be able to live in this changing world;

(d) interdependence among the communities in which they live.

2. Aims

(a) Knowledge:

1) Should be knowledgeable of his/her culture and traditions.

2) Be able to cooperate with others.

3) Have a sense of responsibilities.

4) Tolerance.

5) Acquire attitudes and knowledge which will lead to active participation in the community and national life.

(b) Skills:

1) Art and Craft (use of hands) - housebuilding, etc.

2) Learning to be good listeners (communications).

3) Cooperative.

4) Understanding of others.

5) Self-confidence.

(c) Attitudes:

1) Roles he/she plays in his/her community.

2) Loyalty, respect and consideration; tolerate others.

3) Be honest with themselves.

4) To know himself/herself and others.

3, 4 & 5. (a) Teachers' Resources:

1) Role Plays and Games (Migrations).

2) Filmstrips.

3) Visitors to the Classrooms.

4) Newspapers and Pictures.

5) Radio.

Second Draft

Theme : Rules, Regulations and Customs

Topic : "LEARNING TO LIVE"

1. Intention:

It is the intention of this unit that it should help the children to learn:

(a) to be responsible in community affairs;

(b) to know their own customs and traditions;

(c) to adapt to changes and to initiate changes;

(d) to understand that there is a need for interdependence among the communities in their countries.

2. Aims:

(a) Knowledge - That the children should

1) know the customs and traditions of their own communities;

2) know how and why rules and regulations are made;

3) know of rules of conduct and behaviour;

4) know that there are rules made by decree and rules made by consensus.

(b) Skills:

1) Listening Skills.

2) Cooperating.

3) Manipulating Skills (making models of houses and canoes, etc.).

4) Thinking Skills - Application, Evaluation and Interpretation.

5) Practising Participation Skills.

(c) Attitudes:

1) To hold a positive attitude to others and to themselves.

2) To have respect and consideration for others.

3) To have respect for the traditions of their communities.

4) To hold a sense of responsibility.

GROUP 3

Year 3:

Sub-theme : "STRIFE AND CONFLICT"

1. Intention of the Unit

Over a long period of time a community develops a system of law and order. When these are threatened or break down, strife and conflict result. The intention is to show the importance of law and order and the result of strife and conflict, and reasons behind conflict.

2. Aims of the Unit

(a) Knowledge: Reasons for conflicting, disagreeing, conflict resulting in arguments, fights, disorders, ill-feelings, disrupting relationships, losing family ties, friendship. Downfall of nation, organisation, business, political parties. Importance of law and order, outcomes, cooperation, peace, friendship, prosperity, happiness, prevention of conflict by arriving at mutual agreement or compromising, the use of police control, formulating of rules and regulations.

(b) Skills: To be tolerant, sociable and can be a good leader as well as a good follower.
To be able to make decisions with consideration to others.
To be able to assist others in time of need.
To be able to assess a conflicting situation objectively.

(c) Attitudes: To develop positive attitude in such a way that strife and conflict can be avoided by mutual agreement, tolerance, understanding and consideration. These maintain law and order.

3. Order of Priority of the Aims

(a) In this case we must have knowledge to develop the skills

(b) which result in developing the attitudes required.

Second Draft

Theme : Sanctions

Title : "STRIFE AND CONFLICT"

1. Intention of the Unit

The intention of the unit is to make the children aware of the types, causes, the effects and the ways of settling conflict and the importance of law and order.

2. Aims

(a) Knowledge:

1) The types of conflict, e.g. social, economic, political.

2) The reasons for conflict, e.g. disparity of wealth (rich and poor). Competition with the community.

3) The outcome of conflict, e.g. breakdown of the governing system, social relationships, organisations.

4) To make children aware of law and order and natural pattern of authority.

5) The ways of settling conflict, e.g. compromise, debate, arbitration, forms of physical warfare.

(b) Skills:

1) To be tolerant of others' reactions in conflict situations, e.g. racial, military, traditional.

2) To be able to resolve conflict amicably with consideration for others.

3) To be able to lead, follow and assist others.

4) To be able to assess conflict situations and to cope with them.

(c) Attitudes:

1) To develop the attitude that many forms of conflict can be settled by mutual agreement.

2) To develop tolerance in situations of strife and conflict.

3) To foster understanding with the aim of resolving conflict.

4) To make children appreciate that laws are made to maintain the orderly function of society.

GROUP 4

Year 3:

Theme : Rights and Responsibilities

Title : "FEELING FREE"

1. (a) Make them knowledgeable about the basic freedom.
   (b) Make them aware of limits to personal freedom.
   (c) They should be capable of recognising the freedom of other people, movements, thoughts and speech.

2. (a) Knowledge - Meaning of freedom
   - Types of freedom
   (b) Skills - Express thoughts without fear
   - Make decisions without prejudice
   - Be able to communicate freely with members of the society
   (c) Attitudes - Appreciate freedom of others
   - Have a free mind
   - Feel more responsible.

3. -

4. -

5. By referring to political writers
   teacher - human rights (constitutions)
   pupils - school regulations
   - abstracts from national constitutions.

6. Explain the meaning of freedom, discuss the diversity of usage. Explain types of freedom under human rights, etc.
   - Organise a debate where they can argue freely.
   - Class discussion of the values of the society.

7&8. - Able to criticise and argue effectively;
   - To take proper turns;
   - Participation and consideration of ideas;
   - Consulting books, processing and selecting ideas.

Second Draft

Theme : Rights and Responsibilities

Title : "FEELING FREE"

1. Intention of the Unit

The intention of the unit is to help the children realise that while freedom has many definitions, it is a universal idea. It should help to make the children appreciate the personal freedoms they can enjoy, the limits attached to these and the responsibility they carry.

2. Aims and Objectives

(a) Knowledge:

1) The children will understand that there are different meanings of the word freedom. e.g. independence, generosity, acting without restraint, self-determination, willingness to act, openness, ease of action, privilege.

2) Freedoms as provided under the national constitution as well as those covered by the United Nations Human Rights Charter, e.g.

(i) freedom of movement;

(ii) freedom of thought, conscience and religion;

(iii) freedom of opinion and expression;

(iv) freedom of assembly and association;

(v) freedom to choose one's own government;

(vi) freedom to marry and found a family.

3) Changes in freedom, e.g.

(i) decision-making at the local level;

(ii) more freedom to choose one's life partner;

(iii) freedom to choose subjects one wants to study in school;

(iv) freedom to choose one's government;

(v) freedom from slavery to economic equality.

(b) Skills:

The child should be able to:

1) have sufficient writing and speaking skills in order to be able to express freely;

2) apply the understanding of freedom to everyday situations without limiting the freedom of other people;

3) apply the understanding of freedom to problem-solving.

(c) Attitudes:

1) Respect for property - public and private.

2) Respect for other people's rights.

3) Appreciation of the idea that freedom implies, facing consequences of one's own actions.

GROUP 2

Year 4:

Core Topic Name : "LIVING IN TOWNS" (Urbanisation)

1. Intention of this Unit

To help the children of the South Pacific to live in their towns.

To make them aware of the differences in values between rural and urban settings.

2. Aims and Objectives

(a) Knowledge

1) To make them understand certain terms associated with living in towns,

e.g.

urbanisation	planning
urbanism	exploitation
urban growth	consumer
metropolis	alienation
cosmopolitan	central place.
commuting	

2) To make the children aware of the complexities of living in a town and associated problems.

3) To find out the causes and characteristics of rural-urban movement.

4) To give the children some basic understanding of the organisation of towns and their various functions/ facilities/services.

(b) Skills:

1) Studying and interpreting data, charts, models, photographs and maps.

2) Studying how conflict arises in a town and how it may be resolved in various ways,

e.g. by cooperation, planning, budgeting, etc.

3) To think intelligently about problem-solving.

(c) Attitudes:

1) To make the children aware that town living has its advantages and disadvantages.

2) That the children should develop attitudes of toleration, cooperation, or understanding of other town dwellers.

3) -

4) -

How to realise these aims:

Teacher Resources:

Books: "Living in Cities"

"Living in an Urban Area"

"Pacific Islands Yearbook"

"Pacific Islanders in N.Z.", Rev. Challis

Statistics Department publications

Pupil Resources:

Field trips

P.I.M.

Newspapers

Working with a major store - Range of influence

Second Draft

Theme : Urbanisation

Topic : "LIVING IN TOWNS"

1. Intentions of the Unit

While it is recognised that not all South Pacific children live in towns, it is our basic assumption that in the Pacific urbanisation is increasing. South Pacific towns will continue to grow.

Hence the intentions of this unit are:

(a) to help the children of the South Pacific to understand the nature of towns;

(b) to enable the children to be aware of the implications, problems and benefits of town life;

(c) to develop an understanding of the forces of change at work in towns.

2. Aims and Objectives

(a) Knowledge:

1) To make them understand certain terms associated with living in towns,

e.g.

urbanisation	planning
urbanism	exploitation
urban growth	consumer
metropolis	alienation
cosmopolitan	central place - diffusion
commuting	of ideas.

2) To help the children become aware of the complexities of living in a town,

e.g. budgeting, alienation, structured time, etc.

3) To give the children some basic understanding of the organisation of towns and their various functions/ facilities/services,

e.g. zoning, planning, housing, traffic control.

4) To find out the causes and characteristics of rural-urban movement.

Note: A case study of Auckland city, to show how the above processes and influences affect the South Pacific's largest urban area, is strongly advised.

(b) Skills:

1) Interpreting data, charts, models, photographs and maps.

2) Investigating how/why problems arise in a town and how/why they may be resolved in various ways,

e.g. Problem: How to keep a town clean.

Can be resolved by cooperation between the City Council and the public.

Budgeting, planning, etc.

3) To think intelligently,

e.g. problem-solving.

(c) Attitudes:

1) The children should develop attitudes of toleration of other people,

e.g. a rural child should develop attitudes of toleration with a wider range of people;

a town child should develop attitudes of toleration with the varied minority groups who live in towns.

2) Willingness to cooperate with other groups for the "common good".

GROUP 5 "PLANS AND PLANNING"

Intention

(a) To become aware that planning is necessary for development:

1) problem-solving;

2) developing lives;

3) is continuous, short- and long-term;

4) step by step process - decision-making based on available facts and resources;

5) change according to differing circumstances.

(b) To know:

1) how individuals plan their lives;

2) how families plan;

3) how communities plan;

4) how nations plan for the economic and social advancement of their people based on information inputs.

(c) We want children to be capable of:

1) making decisions themselves;

2) appreciating aims of community planning;

3) understanding the need for government planning;

4) preparing a plan of development of their own community.

The intention of this term's work is in keeping with the aims of Social Science as stated on p.14. Firstly, that pupils gain an insight that planning in traditional society was normal and based on the needs, customs and available resources of that society at that particular time. Secondly, that changes occurring within their country can be influenced by careful planning. These changes can/may/should consider the cultural identity of the people (undergoing change?). Thirdly, that as a result of this unit students will be willing/able/confident in making decisions after considering the facts presented. Finally, students will arrive at the conclusion that planning is a personal, communal, national and regional (international) responsibility (involving a great deal of compromise).

Second Draft

Theme : Community and National Planning

Topic : "PLANS AND PLANNING"

1. Intention

The intention of this unit is that pupils should become aware that planning is necessary to provide society with the means to discover new resources and to develop fully the existing resources, both human and physical - to control their exploitation and to conserve these while at the same time gaining from them the maximum value for the members of that society.

2. Aims and Objectives of this Unit of Study

(a) Knowledge:

1) As a global concept - that planning is a means to improvement and overcoming existing and anticipated problems.

2) Planning is an attempt to improve the quality of life.

3) Planning occurs at 4 basic levels:

(i) individual;

(ii) family;

(iii) community;

(iv) national.

4) To be aware of the Development Plans of Fiji and Western Samoa, and of their own country's Development Plan.

5) Planning is a means of more orderly organisation.

6) Planning is a means of responsible parenthood.

7) Planning is a continuous process, and is amenable to change from time to time.

8) Planning is a step by step process in which decisions are based upon informative inputs.

9) Planning may be of a short- or long-term nature.

10) Planning should be related to the needs of the people rather than the decisions of the planners.

11) Planning is indigenous to the people of the Pacific.

12) Planning can aim at the preservation of valued mores, beliefs and behaviour patterns in a society.

13) Planning develops greater interdependence within and between groups.

(b) Skills:

1) Thinking -

(i) application;

(ii) analysis;

(iii) synthesis;

(iv) evaluation.

2) Communication -

(i) numeracy - understanding tables and figures;

(ii) literacy - arguments, and why decisions are made;

(iii) graphicacy - map reading, graph reading, construction;

(iv) oracy - group discussion, debate, decision-making, reaching compromise agreements.

3) Social -

(i) responsibility - acceptance for and of decisions made;

(ii) cooperation - in decisions and game plans; group work;

(iii) participation - in game plans.

(c) Attitudes:

1) Tolerance - in compromise agreements.

2) Positiveness - towards future in planning for a more happy and fruitful life.

3) Evaluative critique - constructive ability to criticise.

GROUP 6

Making Decisions "GOVERNING AND GOVERNMENT"

Aims and Intentions:

That children should

(a) be knowledgeable about basic concepts of government particularly as shown in their local community;

(b) be aware of the inevitable changes in government taking place locally and around the world;

(c) be able to think critically and intelligently about the form of government best suited to their country;

(d) appreciate the diversity yet interdependence of peoples in the national and international communities.

Knowledge:

Ideas - concepts of government;
democracy, autocracy.

Facts - structure of government in their own local community;
structure of government in their own country
(structure of government in other communities and countries to be dealt with in support studies).

Skills - the ability to reach decision by rational debate;
to be able to evaluate the pros and cons of political arguments and political systems.

Attitudes:

To learning 1) that they should seek to understand before making any value judgements;
2) to be able to differentiate the functional and the theoretical aspects of government.

To others 1) to respect the opinions of others and the rights of others to hold those opinions.

To themselves 1) to have self-confidence;
2) to have a pride in themselves for what they are and as members of a world community;

3) that they should, in President Kennedy's words,
ask not what the country can do for them but
ask what they can do for their country.

We feel that the emphasis should be on attitudes.

We are going to realise these aims by dramatising situations as far as possible and asking the pupils to suggest solutions.

Visits to local councils, etc.

Talks by government representatives.

Radio reports or newspaper reports of parliament, etc.

Second Draft

Theme : Making Decisions

Topic : "GOVERNING AND GOVERNMENT"

1. Aims and Intentions

That the children should:

(a) be knowledgeable about basic concepts of government particularly as shown in their local community;

(b) be aware that changes in government are inevitable, reflecting changes in society;

(c) be aware that governments themselves initiate change by legislation;

(d) be able to think critically and intelligently about the form of government in their country;

(e) appreciate that many aspects of traditional local government are worth preserving;

(f) appreciate the diversity yet interdependence of the people under one government.

2. Knowledge

Ideas - concepts of government,
e.g. participation and discussion as opposed to direction and obedience.

Facts - 1) the structure of government in their own local community;
2) the structure of government in their own country;
3) understanding the process by which decisions are made in local government and in national government;
4) to appreciate the achievements of both their local and national governments.

3. Skills

(a) the ability to accept decision after reasoned discussion and debate;

(b) the ability to differentiate the functional and theoretical aspects of government.

Attitudes

To learning 1) that they should seek to understand issues before judging them.

To others 1) to respect the opinions of others and right of others to hold those opinions.

To themselves 1) to have self-confidence;

2) to have a pride in themselves for what they are and as members of a world community;

3) that they should, in President Kennedy's words, not ask what the country can do for them but ask what they can do for their country.

(c) We feel that the emphasis should be on attitudes.

(d) We are going to realise these aims by:

1) dramatising situations as far as possible and asking the pupils to suggest solutions - role plays;

2) conducting mock elections in class;

3) visits to local councils or parliament;

4) talks by government representatives;

5) radio reports of parliamentary sessions;

6) newspaper reports of parliamentary sessions.

4. Resources Teacher Will Require:

Teachers' Guide Part I

Outline of government structures in South Pacific Region

Teachers' Guide Part II

Outline of lesson plan and activities.

5. Resources Pupils Will Require:

Pupils' Pamphlet

Pupils' Worksheets - issues for dramatisation

Newspapers

Radio

Visits, e.g. to local council, parliament, etc.

Speakers, e.g. local council members, district officers, etc.

6. Methods of Teaching

(a) Teaching of basic concepts - Pupils' Pamphlet, reading and discussion.

(b) Knowledge of governmental structures in South Pacific - Pupils' Pamphlet, mainly diagrams.

(c) Changes in government - Pupils' Pamphlet and discussion.

(d) Understanding election processes - role plays.

(e) Understanding how decisions are reached - role plays and debate.

7. Learning Experiences

(a) That the children should know what it is like to be a voter electing a representative.

(b) That the children should know how decisions are made and feel what it is like to be one who makes the decisions.

Attitudes

To learning 1) that they should seek to understand issues before judging them.

To others 1) to respect the opinions of others and right of others to hold those opinions.

To themselves 1) to have self-confidence;

2) to have a pride in themselves for what they are and as members of a world community;

3) that they should, in President Kennedy's words, not ask what the country can do for them but ask what they can do for their country.

(c) We feel that the emphasis should be on attitudes.

(d) We are going to realise these aims by:

1) dramatising situations as far as possible and asking the pupils to suggest solutions - role plays;

2) conducting mock elections in class;

3) visits to local councils or parliament;

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5) radio reports of parliamentary sessions;

6) newspaper reports of parliamentary sessions.

4. Resources Teacher Will Require:

Teachers' Guide Part I

Outline of government structures in South Pacific Region

Teachers' Guide Part II

Outline of lesson plan and activities.

5. Resources Pupils Will Require:

Pupils' Pamphlet

Pupils' Worksheets - issues for dramatisation

Newspapers

Radio

Visits, e.g. to local council, parliament, etc.

Speakers, e.g. local council members, district officers, etc.

APPENDIX C2 SOCIAL SCIENCE

PLANNING UNITS OF STUDY

OBJECTIVES IN SOCIAL SCIENCE

SOME VERBS FOR STATING LEARNING OUTCOMES

General Instructional Objectives

Analyse	Apply	Appreciate
Comprehend	Compute	Create
Demonstrate	Evaluate	Interpret
Know	Listen	Perform
Recognise	Speak	Think
Translate	Understand	Use
Write		

Creative Behaviours

Alter	Ask	Change
Design	Generalise	Modify
Paraphrase	Predict	Question
Rearrange	Recombine	Reconstruct
Regroup	Rename	Reorganise
Reorder	Rephrase	Restate
Restructure	Retell	Revise
Rewrite	Simplify	Synthesise
Systematise	Vary	

Complex Logical Judgemental Behaviours

Analyse	Appraise	Combine
Compare	Conclude	Contrast
Criticise	Decide	Deduce
Defend	Evaluate	Explain
Formulate	Generate	Induce
Infer	Plan	Structure
Substitute		

General Discriminative Behaviours

Choose	Collect	Define
Describe	Detect	Differentiate
Discriminate	Distinguish	Identify
Indicate	Isolate	List
Match	Omit	Order
Pick	Place	Point
Select	Separate	

Social Behaviours

Accept	Agree	Aid
Allow	Answer	Argue
Communicate	Compliment	Contribute
Cooperate	Dance	Disagree
Discuss	Excuse	Forgive
Greet	Help	Interact
Invite	Join	Laugh
Meet	Participate	Permit
Praise	React	Smile
Talk	Thank	Volunteer

Study Behaviours

Arrange	Categorise	Chart
Cite	Circle	Compile
Copy	Diagram	Find
Follow	Itemise	Label
Locate	Look	Map
Mark	Name	Note
Organise	Quote	Record
Reproduce	Search	Sort
Underline		

Miscellaneous Behaviours

Aim	Attempt	Begin
Complete	Consider	Correct
Determine	Develop	Discover
Distribute	Do	End
Erase	Expand	Extend
Feel	Finish	Fit
Fix	Get	Give
Guide	Include	Inform
Lead	Make	Open
Pack	Present	Produce
Propose	Provide	Put
Raise	Relate	Repeat
Send	Share	Shorten
Signify	Spread	Start
Store	Suggest	Supply
Support	Take	Touch
Try	Use	Vote
Watch	Work	

APPENDIX D

QUESTIONNAIRE FOR SOCIAL SCIENCE GROUP PARTICIPANTS

Name: .....

Country: .....

January 1973

This questionnaire has been designed to evaluate some aspects of the functioning of the Social Science Workshop. Please answer each item by placing a tick (✓) in the appropriate box, or writing in the space provided. If you wish to make additional comments about any aspects raised, write on the back of the page.

	YES	NO	NO ANSWER
1. One of the purposes of the Social Science group was to reassess the aims and objectives and general structure of the four-year course. Do you consider that this was a worthwhile purpose?	*All*		
2. Were you satisfied with the way we did this?	*Majority*		

3. How could we have been even more effective in fulfilling this purpose?

a) Inform participants beforehand about the nature of the Workshop.

b) Ask each person to write a short criticism at the end of each day's work.

c) Too little time devoted to this.

4. Are you satisfied with the following aspects of the four-year course?

	YES	NO	NO ANSWER
the themes now agreed upon	*Majority*		
the unit system	*Majority*		
the content	*Majority*		

5. Which areas of content, method and teaching organisation recommended by the Workshop do you find most acceptable?

Content: *1). Discussion of aims,*

2). Individual units, e.g. 'Plans and Planning'.

Method: *1). 'Brainstorming'.*

2) Problem solving.

3). Group work and group visits.

Teaching Organisation: *1). Provision of a "Teachers' Resource Booklet".*

2) Teaching according to aims.

3) Provision of all the materials the teacher needs.

6. Which areas do you find least acceptable?

Content: .....

Method: .....

Teaching Organisation: .....

This question was misunderstood by nearly all participants.

7. What have you learned most from the unit writing you have done?

1) Writing and editing is very exacting.

2) It is time-consuming.

3) Whole process of curriculum writing.

4) To think clearly and simply and avoid verbosity.

5) To (always) keep the pupils clearly and simply in mind.

6) "Sometimes I'm wrong."

8. What resource materials, which were not available at this Workshop, do writers need?

1) Pacific Island Year Book - Current Edition.

2) Annual report of each country.

3) "Fiji Times" each day.

4) Dictionaries.

9. What could we do to organise unit writing more effectively in the future?

1) Writers need more technical guidance.

2) The workshop should be of longer duration.

3) Easier access should be available to Library and other resources.

4) Give more guidance, and send out draft programme to all participants before they attend the workshop.

5) Faster duplicating, photographing and artist facilities needed.

6) Put one English Language specialist in each group.

10. How should we make use of the unit you have written (e.g. by providing certain back-up resources, advising local Social Science Committees, etc.)?

Of the finished drafts of units it was suggested that:

1) Local committees review them.

2) Members of the workshop should comment on all units written and send amendments to P. J. Hart at U.S.P.

It was also suggested as a follow-up to the workshop that:

1) More publicity should be given to the emerging Social Science programme, and committees should collect feedback from local communities.

2) Each country should produce its own Social Science Resource Booklet for circulation to other countries.

3) The satellite should be used to link up Social Science groups

4) U.N.D.P. team should now look at the over-all pattern of Educational Planning in the eight countries represented at the Workshop.

Addenda

Principal points made by Social Science participants in the General Questionnaire:

1) There was adequate time for discussion during the Workshop.

2) The working day was about the right length.

3) There was not enough time to discuss teaching approaches adequately, nor enough time to prepare drafts and writing.

4) All (except one) felt that relationships between people in their own writing groups were satisfactory.

5) The reference materials and teaching aids were not really satisfactory.

6) Few understood the purpose of the Workshop before arriving, but all (except one) thought it had been successful, and all benefited personally from it.

7) The Workshop was not long enough.

8) All would like to participate again in another Workshop.

REPORT OF THE MATHEMATICS WORK GROUP

TABLE OF CONTENTS

The Mathematics Work Group

Back row (left to right) : Laurie Williams *(Fiji)*, Miss Lapulou Taulahi *(Tonga)*, John Tourlamain *(N.H.)*, Murray Robertson *(Niue)*, Peter Ellery *(C.I.)*.

Third row (left to right) : Gurdayal Singh *(Fiji)*, Sam Domoni *(Fiji)*, Peter Etches *(C.I.)*, Des Burge *(Australia)*.

Second row (left to right) : 'Atunaisa Havea *(Tonga)*, Roger Whiting *(G.E.I.C.)*, Perenise Sufia *(W. Samoa)*.

Front row (left to right) : Pip Leaton *(UNESCO)*, Anand Rao *(Fiji)*, Geoff Sykes *(G.E.I.C.)*, Venkat Raylu *(Fiji)*, Kali Lakshman *(Fiji)*, Livi Tanuvasa *(W. Samoa)*.

REPORT OF THE MATHEMATICS WORK GROUP

Mr. E. Leaton, Unesco,
Mathematics,
Course Coordinator.

1. ORIGINAL AIMS

1.1 The basic aims of the Workshop were to give training in and opportunity for the writing of mathematics material.

1.2 Although it was felt that these had been accomplished, many participants expressed the opinion that the Workshop had been of great value in other respects. Included among these were opportunity for

- contact between people from different parts of the South Pacific Region (this applied particularly to people people from outlying islands);
- discussion of mathematical issues outside (as well as within) the main Workshop framework;
- the promotion of cooperation and tolerance;
- the University to become more regional in nature.

See

Appendix 1	List of participants.
Appendix 2	Discussion about the place of Social Mathematics units. Some views.

2. METHODS OF WORKING

2.1 First we considered

- curriculum development procedures in the countries of the Region;
- the way in which the U.N.D.P. Mathematics section has been functioning;
- the aims and objectives of Mathematics teaching;

- the influence of these aims on
  - (a) methods of teaching;
  - (b) classroom organisation;
  - (c) the content of courses;
  - (d) textual material.

See

Appendix 3	Discussion about curriculum development in the Region. Some observations.
Appendix 4	A paper about the aims and objectives of Mathematics teaching; their influence on methods, organisation and syllabus.
Appendix 5	A paper about methods of writing.

2.2 Following this, time was devoted to

- production of topic outlines;
- group (sometimes small, sometimes large) criticism and suggestions;
- draft writing and distribution of duplicated drafts,
- further group analysis of mathematical content and of the level of the English language which was used;
- revision of draft and distribution of duplicated revised drafts.

See

Appendix 6	Specimen outline unit: "TRIGONOMETRY".
Appendix 7	Photograph: A group at work.
Appendix 8	A discussion about the way to teach logarithms: Approach A or Approach B?

2.3 Participants were able to take away all duplicated productions. Some of these were at first draft stage and some at the revised stage.

3. MATERIAL PRODUCED

3.1 Materials produced during the Workshop included:

Teachers' Guide on "Methods of Teaching".

Teachers' Guide on "The Use of the Newspaper".

Teachers' Guide on "The Use of Work Cards".

Teachers' Guide on "The Use of Puzzles and Problems".

Work Card Supplement to "Decimals I".

Work Card Supplement to "Angles".

Pupils' Pamphlets
- "Indices".
- "Logarithms".
- "Trigonometry I".
- "Trigonometry II".
- "Trigonometry III".
- "Calculating Devices".
- "Air Travel (Samoan Version)".
- "Reading and Writing Numbers".
- "Circles".
- "Shipping".
- "Sets".
- "Number Bases I".

Teachers' Guides
- "Money".
- "Directed Numbers".
- "Air Travel".
- "Statistics".
- "Area II".

New Pupils' Pamphlets which were started included:
- "Solids and Drawings".
- "Networks".
- "Geometrical Transformations".
- "Polygons".
- "Matrices".

See

Appendix 9	Unit: "Use of the Newspaper".
Appendix 10	Unit: "Use of Work Cards".
Appendix 11	Unit: "Air Travel (Samoan Version)"

3.2 Continuation of materials production

Participants decided that on return to their countries:

- the pattern of the Workshop should continue (communication would be by post or, if possible, by satellite);
- country writing groups would be enlarged;
- the U.N.D.P. Project would circulate drafts, comments, etc.

Commitments to further writing were also made. It was also envisaged that, besides producing new material, the concept of a continual revision of existing material would be built into the curriculum development system we were creating.

4. RECOMMENDATIONS

(These were general but not necessarily unanimous.)

4.1 Concerning workshops

- More time was needed to reach the production stage. A workshop of three weeks' duration was adequate if general lectures were given in the evening or made optional.
- Better facilities were needed for production.
- More notice should be given of the nature of the workshop.
- In a future workshop, it was felt desirable, for the sake of continuity, that perhaps half the people should be the same but that new people should also be given the opportunity of taking part.

4.2 Concerning communication

- Regional newsletters should be put into Mathematics Forum.
- This Report of the Mathematics Group should be put into Mathematics Forum.

- The U.N.D.P. Unit generally should make more use of Extension Services representatives for imparting information.
- Country Broadcasting Commissions would welcome taped interviews, reports, etc.

4.3 Concerning U.N.D.P. assistance

It was recommended that this be continued after December 1973.

4.4 Concerning Regional Mathematics Development Committees

Where these did not exist, it was recommended that committees of local teachers be created. In other countries it was recommended that these committees be strengthened.

4.5 Concerning examinations

It was recommended that a written statement be sent to Directors of Education pointing out

- that New Zealand had agreed to examine South Pacific courses at School Certificate level;
- the extent to which these School Certificates were acceptable in countries overseas;
- the present stage in the formation of a South Pacific examining body.

APPENDIX 1 MATHEMATICS PARTICIPANTS

NAMES AND ADDRESSES

	NAME	COUNTRY	ADDRESS
1.	Gurdayal Singh	Fiji	Curriculum Development Unit, Education Department, Suva.
2.	Kali Lakshman	Fiji	Curriculum Development Unit, Education Department, Suva.
3.	Laurie Williams	Fiji	Stella Maris Primary School, P.O.Box 97, Suva.
4.	Pip Leaton	Fiji	U.N.D.P. Section, U.S.P., P.O.Box 336, Suva.
5.	Samuela R. Domoni	Fiji	Nausori District School, P.O., Nausori.
6.	Gunga Dhar	Fiji	Central Fijian School, Nausori.
7.	Shantilal Patel	Fiji	Shri Vivekananda School, Nadi.
8.	Anand Rao	Fiji	Shri Vivekananda School, Nadi.
9.	'Atunaisa Havea	Tonga	In-Service Training Centre, Nuku'alofa.
10.	Lapulou Taulahi	Tonga	Tonga High School, Nuku'alofa.
11.	Mosikaka Kavapalu	Tonga	Tonga College, 'Atele.
12.	Gina Tekulu	B.S.I.P.	King George VI School, Honiara.
13.	Noel McNamara	B.S.I.P.	King George VI School, Honiara.
14.	Fred Jungwirth	New Hebrides	Onasua High School, Efata.
15.	John Tourlamain	New Hebrides	British Secondary School, Vila.
16.	Peter Ellery	Cook Is.	Nugao Teachers' College, P.O.Box 117, Rarotonga.
17.	Peter Etches	Cook Is.	Tereora College, Rarotonga.
18.	Des Burge	Australia	51 Wattle Road, Brookvale 2100.
19.	Roger Whiting	G.E.I.C.	King George V School, Bikenibeu, Tarawa.
20.	Geoff Sykes	G.E.I.C.	Hiram Bingham High School, Beru.
21.	Murray Robertson	Niue	High School.
22.	Livi Tanuvasa	W. Samoa	Leififi Intermediate School, Apia.
23.	Perenise Sufia	W. Samoa	Education Department, Apia.

APPENDIX 2 DISCUSSION ABOUT THE PLACE OF SOCIAL MATHEMATICS UNITS

"Most of the children in my country receive about two years of secondary education; we call them our general stream. The others, the academic stream, go on to Form VI."

"We should make certain the general stream pupils know sufficient mathematics to become useful citizens."

"What they need is a sound understanding of the four operations and their use in day to day living."

"Of the twenty four units produced, about thirteen can be used by general pupils. Parts of another four have some use."

"There is a need for units on Banking, Savings Bank Interest, Agriculture and Mathematics, Budgeting, Hire Purchase and Buying."

" Academic streams are able to use some of the overseas texts. They usually have the help of experienced teachers. General pupils are not able to use overseas texts."

*****

"But this isn't the case where I am! All the children in Secondary School are expected to sit the Fiji Junior and then the Cambridge Overseas School Certificate."

"We can't afford to spend much time on such units. We have to concentrate on getting pupils to examination standards."

*****

"We have a different problem. Our classes are not always streamed. Academic and general ability pupils can be in the same class. Sometimes a class is made up of pupils from more than one form."

"Parents want their children to do the same work as those at prestige non-governmental schools. Some of these have only academic stream pupils."

"All parents want their children to go to U.S.P."

*****

"Units like Hire Purchase or Bank Interest can be useful but they are hard to write well. Adults know they are important but children do not always realise this."

"Many old mathematics courses contained this sort of work. Unless it is well taught and motivated properly pupils get bored. So do teachers."

*****

"Most units of this type would use the same basic work. The situations vary slightly. The same types of graphs might be in different units only the axes would have different names."

"Should we concentrate on the background mathematics? Hire purchase then becomes an application of percentage."

"That approach will work with good pupils. Less able ones find it hard to relate the situation and the mathematics needed."

"Work cards might help to overcome this."

*****

"We might look at it a different way. The English programme enables English teachers to deal with the general needs for speech and understanding. Special language for Mathematics should be dealt with by the Mathematics teacher. Could we not cooperate with Social Science? They would deal with some of this work as a part of their course. We then need to supply the mathematical skills and become involved in the work as an integrated effort."

*****

APPENDIX 3 DISCUSSION ABOUT CURRICULUM DEVELOPMENT IN THE REGION. SOME OBSERVATIONS

- Countries are at different stages of development. Some have an established Curriculum Development Committee; others none.

- In some areas the curriculum is dependent upon external examinations; in others, on the particular wishes of teachers.

- Entrance examinations referred to are the New Zealand School Certificate and the Cambridge Overseas School Certificate.

- It is clear that teachers are not satisfied with these external examinations and very strongly desire a declaration concerning a South Pacific School Certificate.

- Because of the lack of such a declaration some countries are hesitant to join wholeheartedly in the U.N.D.P. Project.

- It was felt that the U.N.D.P. materials could form a basic core for these overseas examinations. Even so, special units would have to be written to cope with variations both in content and notation.

- While it was felt desirable that each country should develop its own production unit there were few in existence at present. Anxiety was expressed about the cost of booklets and the difficulty of production. One suggestion related to the formation of a Central Production Unit. It was agreed that the problem needed urgent consideration.

- The variations in standard and levels of English comprehension throughout the Region were noted. It was accepted that the materials produced should cater for these differences.

- Primary curriculum development will soon have an effect on the starting points for secondary work. The present topic system should enable countries to cope with any changes which are necessary.

- Whilst accepting the idea that mathematics should be presented through problem situations, it was agreed that sufficient attention should be given to the development of skills in computation.

Concerning the units printed so far these points emerge:

- It was felt desirable that at the back of each unit there should be a summary of the salient features.

- There was a suggestion that in some cases more exercises could be included to consolidate ideas. Also teachers could be encouraged to supplement the material with assignment cards of their own.

- Assignment cards were also of value for dealing with local environmental situations.

- There was an expression of opinion that there were many good traditional topics that should be included.

- Some participants felt very strongly the need for a unit on "Set Language", as this language provides for a unification of mathematics.

- Advantages of the pamphlet system were outlined:

    1) Many people could join in with the writing
    2) The system was flexible:
        (a) Choices could be made by countries.
        (b) Alterations could easily be made in the light of changing situations or new ideas.
    3) Children like the system.
    4) Topic pamphlets do not have the inhibiting effect on development that a hard-covered textbook has.

- Difficulties of the pamphlet system were financial and administrative.

APPENDIX 4 THE AIMS OF MATHEMATICS TEACHING

AND THEIR INFLUENCE ON

A. A SYLLABUS

B. METHODS OF TEACHING

C. ORGANISATION OF A CLASSROOM

A. High order objectives relate to:

(a) enjoyment;
(b) citizenship;
(c) cooperation;
(d) responsibility;
(e) self-reliance;
(f) courage;
(g) comprehensiveness of the Form 1 - 4 programme;
(h) need to take into account the varying environments, etc.

Dependent upon these objectives are the more mathematical aims. These aims may be separated into two groups - those which relate to ability and those which concern content.

B. Ability Aims

To develop:

(a) the awareness of mathematical problems and the competence to define, analyse and solve these problems;
(b) logical thinking and reasoning abilities;
(c) the ability of children to make their own mathematical discoveries, generalisations and deductions;
(d) the ability to communicate with precision and clarity;
(e) an awareness of the part that mathematics is playing and has played in the development of human society;
(f) a feeling for the power and beauty of mathematics.

Do you agree with these?

Are there any more aims which we should include?

C. Content Aims

To develop:

(a) mathematical knowledge and understanding for everyday situations;

(b) an awareness of the applications of mathematical methods in other fields of study;

(c) an awareness of the part that mathematics has played and is playing in the development of human society.

It is useful to try to analyse further the activities involved in doing mathematics. Only by providing opportunity for these shall we be able to implement these aims.

B.* Ability Activities

Looking for relationships.

Handling relationships.

Symbolising.

Producing short ways of representing ideas.

Producing strategies (How can we play a game to win?)

Predicting.

Abstracting.

Generalising.

Experimenting.

Comparing methods and proofs.

Inventing new ideas.

Describing.

Convincing people (proofs).

Explaining.

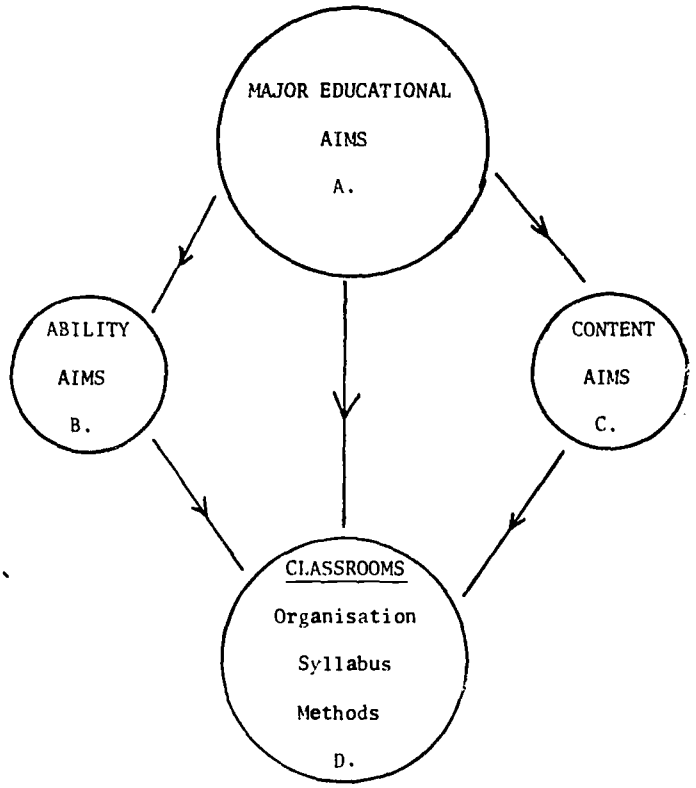
Being precise.

Presenting ideas clearly.

Looking for quick methods.

Estimating.

We may picture our situation something like this:



The more we understand about the aims A, B and C, the better equipped we shall be to plan D, the nature of our classroom.

D. Organisation

Besides trying to implement all the aims that have been outlined, there are many variables that have to be catered for. They include:

(a) rural - urban;

(b) high ability - low ability;

(c) high level of English - low level of English;

(d) well trained teachers - inadequately trained teachers.

(e) children with a good mathematical background - poor mathematical background.

To implement our aims and cope with the variables, these procedures are suggested:

(a) We encourage group methods of teaching.
   - Children are more active and learn better.

(b) Children should work from topic booklets.
   - Children like the system.
   - It facilitates flexibility of organisation (see Introduction for Teachers).

(c) We encourage teachers to supplement topic booklets with assignments based on the locality.
   - Material produced should involve activity methods but only the teacher can produce assignments directly related to his own school environment.

(d) We examine a minimum quality of material but allow children and teachers to go at a faster pace if they wish.

Syllabus

Broad topic areas that come to mind are outlined. When considering them, we have to decide whether they fit in with our aims.

Number patterns
Decimals
Fractions
Number machines
Problems and equations
Clock arithmetic
Coordinates
Area
Distance
Time speed
Travel
Volume
Weight density
Logarithms
Slide rule
Computers
Commercial arithmetic
Number bases
Polygons
Construction of spatial models
Drawing of spatial objects
Ready reckoners and calculation devices
Everyday mathematics
Statistics
Applied mathematics

The circle

Geoboards

Symmetry

Geometrical instruments and patterns

Angles

Geometrical problems, puzzles, topology

Handling shapes

History of numberation and calculation

Networks

Trigonometry

Curves

Technical drawing

Logic

Problem situations and investigations

Chess

Directed numbers

Formulae

Finite mathematical systems

Sets and mappings

Constructions

Properties of shapes

Matrices

Vectors

Scale drawing

Navigation, surveying

Transformations

Pythagoras

Algebraic problems

APPENDIX 5 METHODS OF WRITING

A. Some suggestions about the way in which we produce material

1) We should pose problems rather than impart information.

2) The problems should be pitched at the right level - not so easy as to be trivial but not so difficult as to put children off. Mathematics essentially consists of trying to solve problems and unless we give opportunity for this they will never develop mathematically.

3) We should bear in mind the various mathematical activities that can be carried out and give children the maximum opportunity for these activities.

4) We should keep the English simple and down to the minimum.

5) The Pupils' Pamphlet should be such that children can work by themselves from it.

B. How do we prepare a topic unit?

Some starting points:

1) List the subject matter. Is there too much or too little? Perhaps subdivide the unit into two smaller units or combine with another unit.

2) Sometimes it is a good idea to prepare a sample test before beginning to write a unit. This reminds us of the subject matter we are dealing with.

3) Analyse the subject matter and express it in problem form. (How do we think the material developed historically? It was probably because of the need to cope with some difficulty or problem.)

4) Outline the objectives of the unit.

5) Read in other books of the ways in which the material has been presented. Note what is useful. Could it be expressed in Pacific terms?

C. Organisation of working team

Some suggestions:

1) One or two writers prepare an outline.

2) Outline duplicated and presented to team.

3) Team jointly makes suggestions and recommendations.

4) Original writers produce a draft. Draft duplicated.

5) Draft considered by whole team. Suggestions and recommendations made.

6) Draft revised (paste up method).

7) English vetted.

8) Revised version duplicated (typing and stencils can be done; writers will have to produce their own drawings).

D. Final production

We would like:

1) Pupils' Pamphlet, charts, experiment sheets, visual aids, models, etc.

2) Teachers' Guide:

   (a) Objectives.

   (b) Suggestion for teaching.

   (c) Answers to exercises.

   (d) Specimen test.

Maybe the answers to exercises and the specimen test should go in the Pupils' Pamphlet? What do you think?

APPENDIX 6 OUTLINE OF A POSSIBLE DRAFT

ON "TRIGONOMETRY"

Gina Tekulu
Noel McNamara

Suggested plan of units

There will be 3 units. The standard reached would be:

1) Meanings of sine, cosine and tangent (restricted to angles less than 90^{o}).

2) Reading of tables.

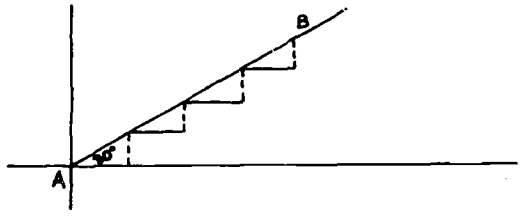
3) Solution of problems - "solution of right-angled triangles".

4) Graphs of sine, cosine and tangent.

Unit 1

Section A. Introduction to sin, cos.

Map of Local Area or Classroom Plan.



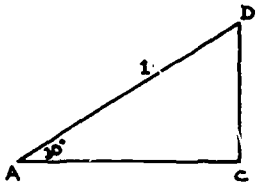
Problem:

If I walk from A to B, how far to the right (east) and how far upwards (north) have I walked?

Directed Solution (after some discussion):

1. Divide up distance A to B into unit distances.
2. Make right-angled triangles as shown.
   "Discover" that they are all the same.
3. Distance to the right is
   4 times horizontal distance of one
   of the right-angled triangles.

4. Discover that this distance to the right for unit distance from A to B is all we need to know in the problem to answer the first question.



AC is called cosine 30^{o}.

Likewise explain sine 30^{o}.

Section B.

Generalise the last section to any angle (between 0^{o} and 90^{o}).

Section C.

By measurement (on graph paper) draw up a table of sine and cosine for angles 0^{o}, 10^{o}, 20^{o} ..... 90^{o}.

Use the table to solve problems similar to opening problem.

Section D.

Back to original example. Let the class find the coordinates of point B (with origin at A). Let them see (discover) that

X coordinate = 4 cosine 30^{o}

Y coordinate = 4 sine 30^{o}

Generalise this to

$X = h \cos \theta$

$Y = h \sin \theta$

Sections E and F.

Summary and Problems.

Unit 2 (Plan Draft)

Section A. Revision of Unit 1.

Section B. We need to know or be able to find easily sin or cos of any angle. (Give problem reasons.)

One method - Graphical - Revise unit on "Ready Reckoner".

Section C. Draw graphs (smooth curves) of sine and cosine from 0^{o} to 90^{o}.

Use the graphs to find sine and cosine of any angles.

Section D. Introduce tables at the back of unit and compare answers in Section C with tables. Use tables.

Section E. Problems using tables.

Section F. Summary of results.

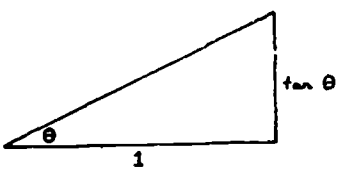
Unit 3

Section A. Introduction (by problem) of tangent as a ratio OR as a distance:

i.e.

$$\text{tangent} = \frac{\text{sine}}{\text{cosine}}$$

OR



Section B. Measuring tangents (including a graph of tangent); then to tables.

Section C. Problems related to introduction.

Section D. Summary of results.

Appendix. Because of frequent use of θ introduce Greek alphabet and a few words on symbols in Mathematics.

Unit 4 (Not planned)

By means of coordinates find sine and cosine of angles greater than 90^{o} and also deal with some trigonometrical identities.

APPENDIX 7 A GROUP AT WORK

"How do you get across to children

the idea of an 'empty set'? Or

should you try to do this?

Perenise Sufia, Des Burge,

Peter Ellery, John Tourlamain.

APPENDIX 8 TEACHING LOGARITHMS

APPROACH 'A' "ANTI" LOGS

1. For practical purposes logs to base 10 are becoming anachronistic. When I get stranded on the proverbial desert island I hope I have my briefcase (with slide rule in it) or I have to remember to bring a calculating machine.

2. Students can learn to use slide rules at Forms 2/3 level. If addition and subtraction of integers has been introduced using slide rules (uniform scale) then from the isomorphism on pp.1-3 of 'Introduction to logs' we can make 'base 2' slide rules. By cutting off at 10 we see how a commercial slide rule is constructed. It is possible to obtain good 10" slide rules at between F$1 and F$1.25 if ordered in bulk and no customs duty levied (e.g. from Dupont Jackson, Auckland). Could it be the ambition of every regional Education Department: All school leavers know how to use a slide rule (and possess one!).

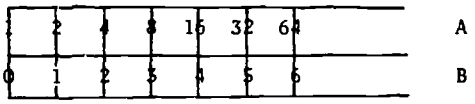
3. Base 10 logarithms can be taught for historical purposes but there is no need to make too much song-and-dance about them. They should be a non-examinable 'optional extra' in any South Pacific School Certificate. Their use has one minor advantage over slide rule 3-figure rather than 2-figure accuracy, but for most practical calculations this is irrelevant. If real accuracy is required we use old-fashioned long multiplication and division or find somebody with a computer.

4. Base 'e' logs are extremely important for theoretical purposes. But we are now outside Forms 1-4 area.

5. Where do indices fit in? I think there is a case of considering the function $x \longrightarrow a^x$ $(a>o)$ and its inverse, but not before Form 4 level. It helps if the student knows what a group is.

APPROACH 'C' LOGARITHMS

1.



- Isomorphism of set A under 'x' and set B under '+'.
- Explanation, standard index layout.

$$32 \times 64 = 2^5 \times 2^6$$
$$= 2^{11}$$
$$= 2046$$

- x, ÷, squares, cubes, etc.

  Development of index ideas.
- Extension of table.
- Construction of a slide rule.
- Change of base.
- What does $2^{\frac{1}{2}}$ mean, etc.?
- Graph of $y = 2^x$. Use of graph as a store of logs.

2. Extension to base 10

- What is $10^{\frac{1}{2}}$, $10^{\frac{1}{3}}$, $10^{\frac{1}{4}}$, $10^{\frac{3}{4}}$, $10^{\frac{2}{3}}$, etc.?

  (Establishes meaning of 10^x.)
- Graph of $y = 10^x$.
- Use of graph. $3.6 \times 2.2 = 10^{\overline{\ \ }} \times 10^{\overline{\ \ }}$

  $= 10^{\overline{\ \ }}$

  $= \overline{\ \ }$
- Comparison of graph information with that in 3-figure tables. Use of tables.
- Extension of logs to those of number in non-standard form.

$25.7 = 10 \times 2.57$ $\quad$ $257 = 10^{-1} \times 10^{\overline{\ \ }}$

$= 10^{1} \times 10^{\cdot\overline{\ \ }}$ $\quad$ $= 10^{-1+\cdot\overline{\ \ }}$

$= 10^{1.\overline{\ \ }}$ $\quad$ $= 10^{\overline{1}.\overline{\ \ }}$

- Construction of slide rules (on cardboard).
- Use of accurate slide rules.

- 2 -

Introduction.

There are many reasons why the Newspaper becomes a valuable though inexpensive tool in the classroom.

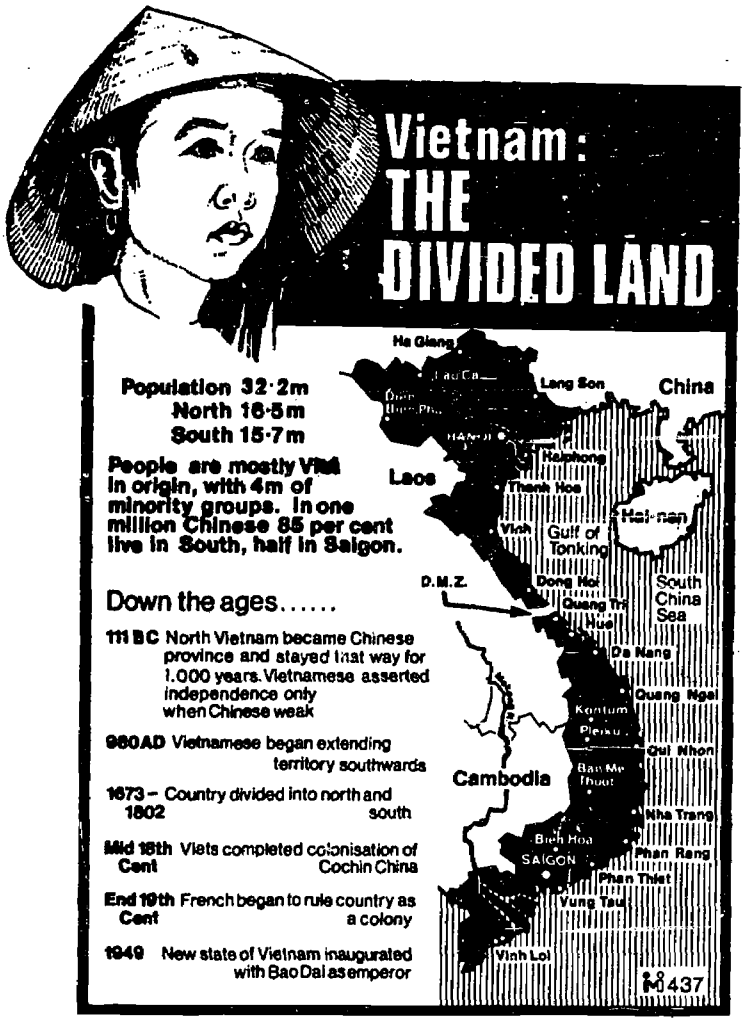
- it is a source of a wide variety of additional material from which work cards may be made.

- there are some number patterns situations which occur in the newspaper.

- children may be assisted in understanding just what is in a newspaper.

- there are some types of problems which students may meet in later life.

When producing assignments for children you will found it useful to have a few complete newspapers, as well as cut-out articles or questions on large card.



Scale 1cm = 50Km

1. Study this map carefully before you answer the following questions about it.
   Using the scale given, find:
   (a) the distance between Saigon and Hanoi.
   (b) the shortest distance between the southern most part of China and Da Nang.
   (c) the approximate area of Hai-nan.
   (Do you know the area of your own country?)
2. Of the 1 million Chinese, how many of them live in
   (a) South Vietnam ?
   (b) Saigon ?
3. The population of North and South Vietnam put together is about 32 million.
   What percentage of the population is made up by the minority groups?
4. Can you show the following dates on a time line ?
   111 B.C., 980 A.D., 1673 A.D., 1873 A.D, Mid 18th century and late 19 century.

RADIO FIJI

RADIO FIJI 1332 broadcasts on 860 kHz in Suva, 680 kHz in Labasa, 640 kHz in Lautoka, 1210 kHz in Sigatoka, 1332 kHz in Rakiraki.
RADIO FIJI TWO broadcasts on 710 kHz in Suva, 810 kHz in Labasa, 890 kHz in Lautoka, 980 kHz in Sigatoka and 1470 kHz in Rakiraki.
When programmes are not being broadcast in English, Radio Fiji 1 broadcasts in Fijian and Radio Fiji 2 in Hindustani.
English language programmes can be heard continuously also on FM 98.4 mHz in Suva.

English Language Programmes

FRIDAY

5.55-6.00am RADIO FIJI 1.
6am Radio Fiji News and weather.

7.00-8.00am RADIO FIJI 1.
7.00 BBC News, 7.10 Radio Fiji News and weather

8.00-10am RADIO FIJI 2.
8.00 BBC News, 8.10 Radio Fiji News and weather, 8.45 Weather at Sea, 9.15 Housewives' Choice.

10am-12 noon RADIO FIJI 1.
10.15 "Music-go-round" Studio School.

12 noon-1pm RADIO FIJI 2.
12.30 News Summary, weather and shipping.

1.00-2pm RADIO FIJI 1.
1.25 Radio Fiji News, 1.30 Radio Australia News, Weather, Ships in Port.

4.00-5pm RADIO FIJI 2.
4.05 Weather, 4.07, Afternoon Concert, 4.45 Weather at Sea.

5.00-6.30pm RADIO FIJI 1.
6.00 News Headlines.

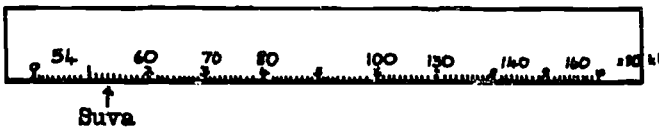
6.30-8.00pm RADIO FIJI 2.
6.30 Fiji and the World.
7.25pm - Interview with Mr Vijay R. Singh, Minister for Urban Development, Housing and Social Welfare.

8.00-9.15pm RADIO FIJI 1.
9.00 Radio Australia News, Radio Fiji News Headlines.

10.00-11pm RADIO FIJI 2.
11.00 News Headlines.

1. At what times does the English listener have to change stations.
2. How long is the 1st English broadcast on Fiji 1.
3. At what times is there no English broadcast ?
4. What times of the day is there a NEWS broadcast ?
5. Which has more English. Radio Fiji 1 or Radio Fiji 2.
6. Graph the amount of times for broadcast in English, Fijian, Hindi (assuming Radio Fiji 1 and both start at 5.55 and finish at 11 p.m.

Look at a Radio and mark in the points on the dial. Show by using an arrow, the various stations.



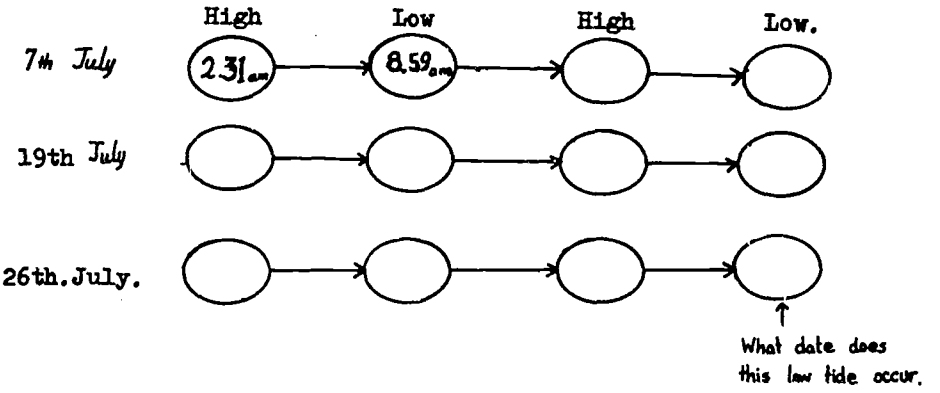
TIDES

JULY, 1972

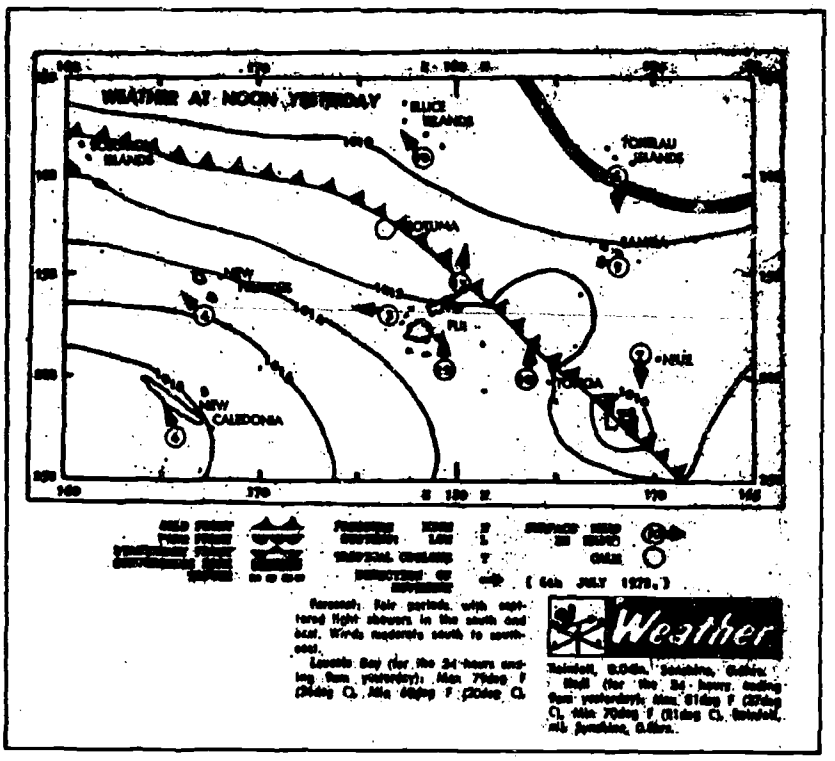
	High Water		Low Water	
	a.m.	p.m.	a.m.	p.m.
7	2.31	2.59	8.59	8.09
8	3.25	4.13	9.50	10.09
9	4.24	5.11	10.50	10.59
10	5.18	6.07	11.50	11.58
11	6.12	7.00	——	12.43
12	7.08	7.51	12.50	1.31
13	7.54	8.41	1.43	2.20
14	8.44	9.30	2.34	3.07
15	9.33	10.18	3.26	3.53
16	10.24	11.06	4.18	4.39
17	11.18	11.54	5.11	5.25
18	——	12.08	6.06	1.11
19	12.42	1.05	7.01	6.59
20	1.31	2.03	7.57	7.48
21	2.18	3.00	8.52	8.39
22	3.07	3.53	9.42	9.30
23	3.53	4.41	10.29	10.18
24	4.38	5.26	11.12	11.03
25	5.22	6.06	11.53	11.48
26	6.04	6.48	——	12.32
27	6.47	7.29	12.33	1.11
28	7.30	8.10	1.18	1.51
29	8.14	8.53	2.03	2.31
30	8.58	9.37	2.50	3.14
31	9.49	10.29	3.40	3.59

	Moon Phases	Time	Time
11	New Moon	6.39	6.44
18	First Quarter	6.36	6.46
26	Full Moon	6.36	6.40
4	Last Quarter	6.36	6.42

Complete this diagram showing times of high tide and low tide.



Is the time between high and low tides always the same time apart?



Complete this table.

	Max temp.	Min temp.	Difference.	Sunshine	Rainfall	Wind *
Laucala Bay						
Nadi.						

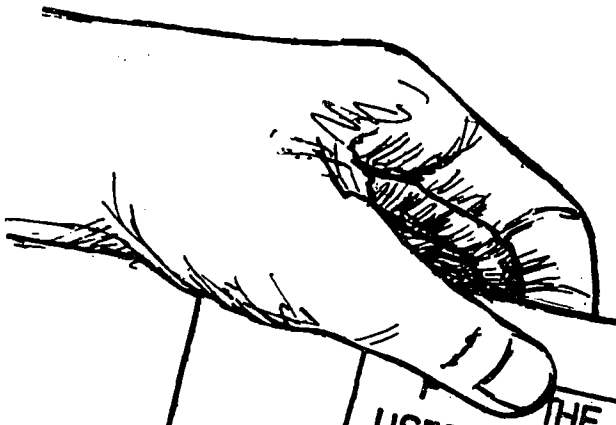
* Use map to find force of wind in each place.

Which place had the better day - Nadi or Laucala Bay.
Give your reasons.

APPENDIX 10 SOME SPECIMEN PAGES

TEACHERS' GUIDE

Work Cards



WORK CARD 18

THE AREA OF CARD USED TO MAKE A MATCHBOX

1. Take the matchbox to pieces.
2. Spread the pieces flat on your desk
3. Find the area of the pieces of card.
4. If a factory produces two million boxes each month, what is the total area of card used.

WHAT ARE THEY?

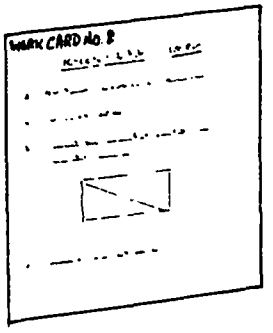
Work cards are used to give additional prc blems or exercises to individual pupils or groups. The UNDP Mathematics course uses the unit approach, which allows countries and schools to select topics from those produced, and to choose the order in which these topics will be introduced.

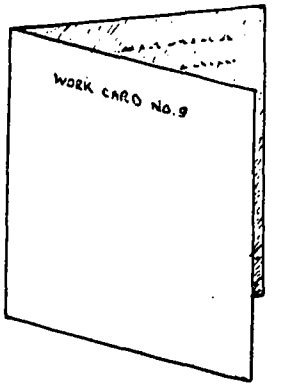
In the same way, teachers can select or prepare work cards suited to the needs of their own pupils. Some cards will be used to provide further exercises on the units for the majority of the pupils, while the brighter pupils do more advanced and extended work, and the less able work examples where the mathematical steps are smaller, and the English is simpler. Teachers can prepare work cards based on the local environment, which will be particularly meaningful to the pupils.

HOW TO MAKE THEM

Page 2.

Work cards (sometimes known as ACTIVITY CARDS or ASSIGNMENT CARDS) are, as the name suggests, made of card rather than paper. The card should be strong enough to stand a lot of wear. They may be either single cards or folders:-





The single cards are usually rectangular and can be used either horizontally or vertically. Common sizes are:-

6 x 4 in. (approximately 15 x 10 cm.)

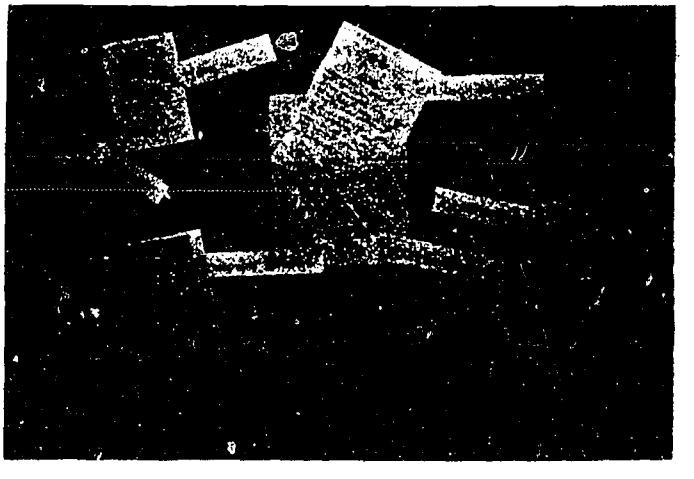
8 x 6 in. (approximately 20 x 15 cm.)

Index cards, as used in libraries, are useful too, but the smaller sizes should be avoided.

Several educational supply firms produce work card blanks, either plain, or with a grid of squares in a light grey ruling. These firms also produce plastic pockets or wallets in a variety of colours to store the cards. If commercially produced pockets are being used, the work cards should be made to fit. Once a size of card has been decided upon, it should be taken as a standard.

Coloured cards, preferably in light pastel shades, may be used to differentiate between topics or grades of difficulty.

The problems or exercises on the work cards may be printed, duplicated, typed, or written. (See photograph).



Printing is justified if the cards are likely to be used by a large number of schools. Locally duplicated cards are valuable when extra work is needed for the majority of pupils in a class.

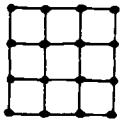
Normally, however, cards will be produced by the class teacher using a typewriter or pen. Handwriting, if used, should be large and clear. Felt-tip and fibre-tip pens are useful, providing the lines produced are narrow, and the ink is of the permanent, non-washable type. Fibre-tip pens allow the use of strong diagrams in colour.

WORK CARD NO.

In the patterns below, a dot • marks a junction, a point where lines meet. Copy them into your book and fill in the answers in the empty spaces.

is a [1×1] pattern. It has [4] junctions.

is a [ ] pattern. It has [9] junctions.



is a [ ] pattern. It has [ ] junctions.

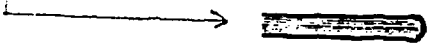
Continue the patterns for 4×4 and 5×5.

Can you say how many junctions a 10×10 pattern has?

Can you say, without drawing it, how many junctions a 99×99 has?

In addition, newspaper cuttings, photographs, magazine pictures, or suitable material from text books can be pasted on cards with questions written below. It is essential that whatever method is used, the diagrams and written matter should be clear and legible, and where possible, attractively laid out.

Can you find the thickness of one page of your text-book. Measure the thickness of all of them (do not include the covers) and give your answer in millimetres. Find the number of sheets of paper (not the number of pages). Then work out the thickness of one sheet. Repeat this with another book and find whether the answers are the same. 33



book

Bad lay-out

WORK CARD NO 33

FIND THE THICKNESS OF A SHEET OF PAPER

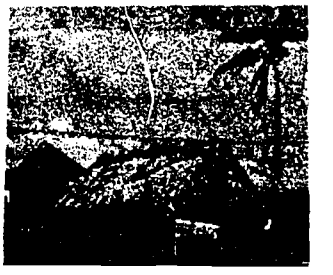
1. Measure the thickness of all the pages in your text-book in mm. (not the covers)
2. Find the number of sheets of paper. (not the number of pages)
3. Thickness of ____ sheets = _____ mm.
   Thickness of 1 sheet = _____ mm.
4. Repeat this with a different book. Are the two answers the same?

Good lay-out

Work cards should have clear titles and numbers, and may indicate which unit (s) they are connected with. Pupils should write the title and number either on prepared answer sheets or in their exercise books. Answers may be written on the back of the card, or on answer cards stored separately, so that pupils can check their own work.

The cards are designed for use by individual pupils or groups of pupils, working by themselves, and should require little or no explanation by the teacher. Definitions or explanations on the cards should be avoided or kept to a minimum. If instruments or materials are required. These should be listed at the top of the card. References to material in other units may be given if this material is not fresh.

The amount of written matter on the card should be kept to a minimum, and the questions prepared carefully. The mathematical content and the level of English used should be suited to the needs of the pupil. In cases of doubt, the English teacher should be consulted about the grammatical constructions used in the questions. Questions should be difficult enough to be challenging and stimulating, but easy enough not to discourage.



This is a MWENGA (Gilbertese house)

WORK CARD NO.

1. Go outside and find a MWENGA.
2. What is the total length of pandanus leaf used to make the roof? Here are some questions to help you.
   (a) How many separate (/ = te rau) pieces of thatch are there?
   (b) On each piece how many leaves are used?
   (c) What is the length of each piece of leaf?

or.

WORK CARD NO.

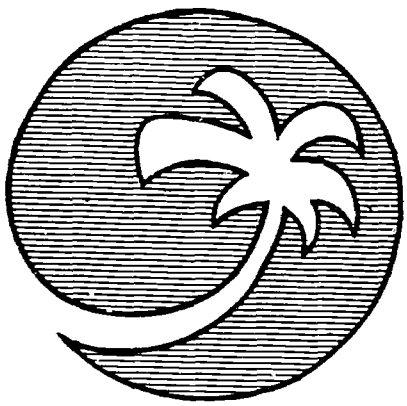
1. Go outside and find a MWENGA.
2. Estimate or measure the volume of the mwenga.
3. What is the volume of air inside?
4. What is the volume of oxygen inside?

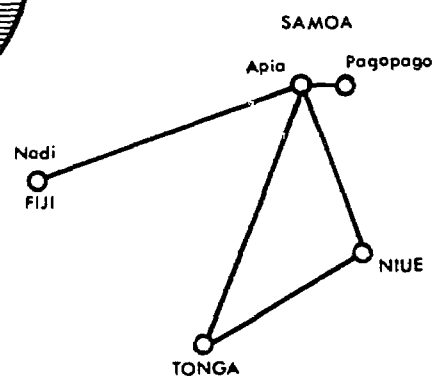
   (ask your basic science teacher for help if you can not answer this).

A.11

MATHEMATICS AIR TRAVEL

DRAFT



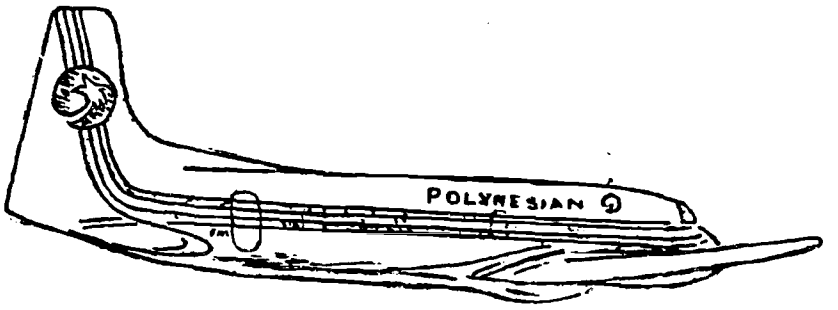


POLYNESIAN AIRLINES

Pupils pamphlet

TRIAL MATERIAL PRODUCED BY THE UN—DP (U.N.E.S.C.O.) CURRICULUM DEVELOPMENT UNIT, UNIVERSITY OF THE SOUTH PACIFIC, IN COLLABORATION WITH CURRICULUM DEVELOPMENT UNITS AND TEACHERS IN THE SOUTH PACIFIC.

POLYNESIAN AIRLINES.



DISCUSSION :

What do you know about Polynesian Airlines ?

Talk about the airline with your teacher.

- How many planes are there ?
- What colour are they ? Have you seen them ?
- Can you name them ?
- Can you tell us something about the origin of their names ? e.g. "Who's Losi ?"
- Faleolo is the name of our Airport. What islands do the Polynesian Airline planes go to ? Can you name the airports at these islands ?
- Do you understand the terms "Domestic Services" and "Regional Services ?"

Next time you go to Apia, you should pay a visit to their main office if you want to find out more about Polynesian Airlines.

NOW

READ and THINK

DO YOU KNOW HOW TO READ THE TIME ?

DO YOU KNOW HOW TO WRITE THE TIME ?

DO MANY PEOPLE IN SAMOA WORK TO TIME ?

Read this PUZZLE.

Livi went to see his friend Perenise one Friday afternoon. Perenise wasn't at home.

So Livi left a note behind.

The note read:

> MEET YOU AT THE
> MAIN LIBRARY AT 8.30
> TOMORROW.
> LIVI.

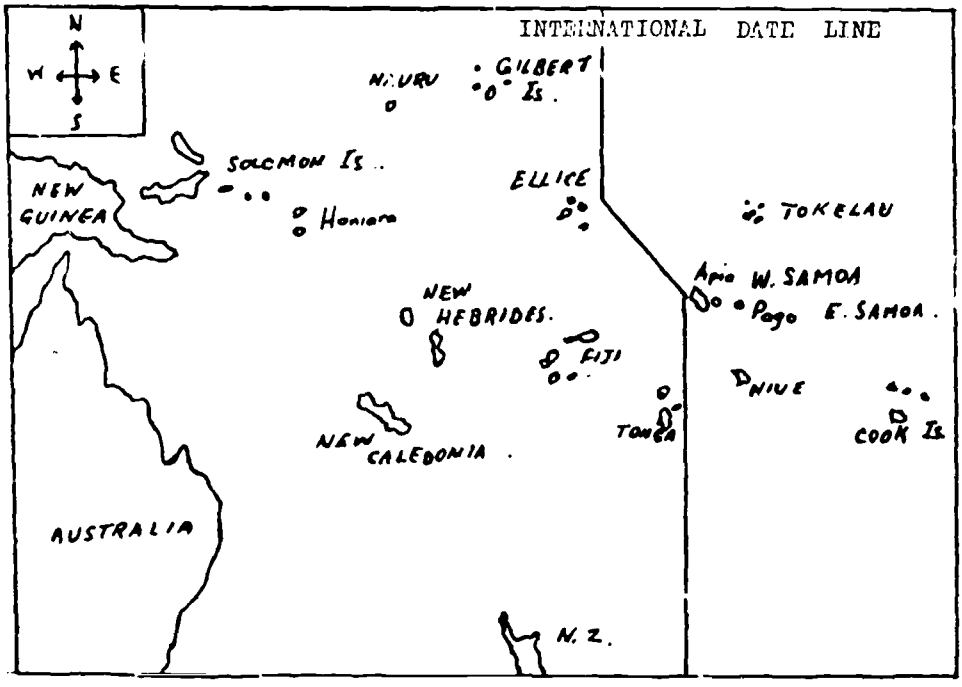
Perenise got back that evening and found the note. He read it.

It was 8.30 the following day when Perenise arrived at the Main Library. He waited there but his friend never turned up. So he left. Livi was at the Main Library by 8.30 but there was no sign of his friend. He sat there for a while before he left. The two boys didn't meet that day.

Now can you explain why the two boys didn't meet. If you can't, go on to page 3 and do Exercises 1, 2 and 3.

- 7 -

TIME IN DIFFERENT COUNTRIES



Look at this map carefully. Trace your finger on the International Date Line.

Name any two countries that lie with Western Samoa on the Eastern side of the Date line. Name any two countries which are on the Western side of the Date line.

Is Tonga in East or West of that line ?

What do you know about the changes of times and days between East and West of the Date line ? (Discuss this with your teacher).

Is the Eastern side one day ahead or one day behind the Western side ?

Which of the two statements below is true ?

(i) If it is Sunday in Samoa, it is Monday in Fiji.

(ii) If it is Sunday in Samoa, it is Saturday in Fiji.

2. Now can you answer these questions ?

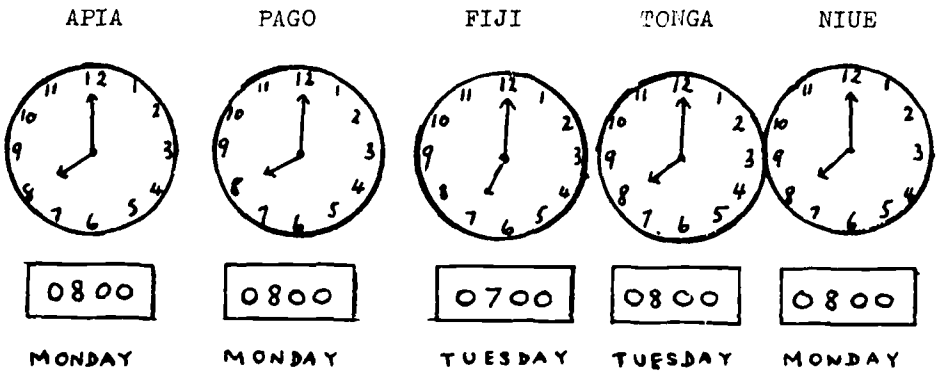
(i) What day is it in Fiji when it is Wednesday in W. Samoa ?

(ii) What day is it in W. Samoa when it is Friday in Tonga ?

(iii) What day is it in Niue when it is Tuesday in W. Samoa ?

(iv) What day is it in Fiji when it is Wednesday in Tonga ?

3. THE DIFFERENCE IN TIME.



The clock faces above show the different readings for the same time in different countries.

Answer these questions :

(i) What time is at your school now ? Is that the same time in all of W. Samoa now ?

(ii) If it is 10.00 a.m. in Samoa, what time is it in Pago ?

(iii) If it is 8.30 p.m. in Pago, what time is it in Fiji ?

(iv) If it is 0200 hours in Samoa, what time is it in Tonga ?

(v) If it is 1115 hours in Tonga, what time is it in Fiji ?

(vi) If it is 1930 hours in Fiji, what time is it in Samoa ?

(vii) If it is 6.45 p.m. on Friday in Samoa, what time is it in Niue ?

(viii) If it is 0425 on Tuesday in Samoa, what time is it in Fiji ?

4. Copy and complete this table. Use 24 hour time.

SAMOAN TIME	FIJIAN TIME	NIUE TIME	TONGAN TIME
Sunday at 9.30 a.m.			
		Friday at 2.15 p.m.	
	Wednesday at 10.00 a.m.		
			Tuesday at 1.40 p.m.

THE POLYNESIAN AIRLINE.

D. DISCUSSION.

1. Discuss the following questions with your teacher.

When do you need to know about the changes of days and times in different countries ?

Have you travelled to any other Pacific island ?

Have you travelled by plane ?

Have you seen one of the Polynesian aircrafts ?

Name some of them that you can remember.

On the Time Table on page 10

What does PH stand for ?

What does TE stand for ?

What does FJ stand for ?

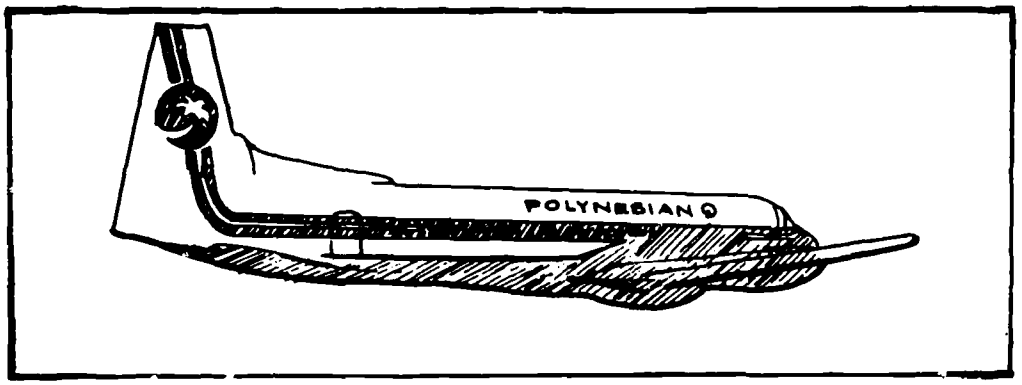
Palauni wants to fly from Apia to Fiji. He wants to be there by Sunday. He catches flight PH260 from Faleolo at 1615 on Friday. He stops at Pago. He changes his flight No. to TE625 and he flies to Nadi (Fiji).

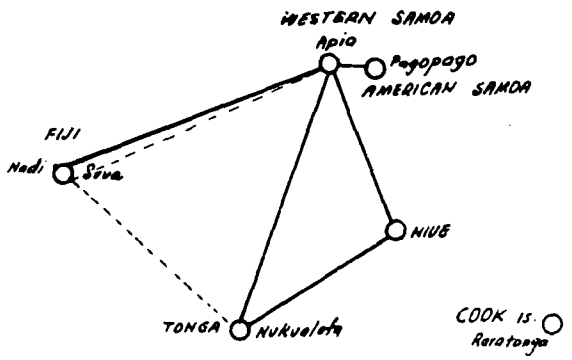
Does he really change his plane in Pago ?

Is PH company different from TE company ?

THE POLYNESIAN AIRLINE

ROUTE AND TIME - TABLE.





APIA TO	AIRCRAFT	FLIGHT NO.	DEPART	ARRIVE	NO. OF STOPS	Connecting CITY
Pago Pago	748	P.H.216	TUES. WEDN. FRID. 04.45	TUES. WEDN. FRI. 05.20	0	-
	748	P.H.250	Daily 13.30	- 14.05	0	-
	748	P.H.252	FRID. 14.00	FRI. 14.35	0	-
Nadi, Fiji	748/DC8	P.H./T.E. 216/629	TUE. 04.45	WED. 07.20	1	Pago Pago
	748	P.H.525	WED. SAT. 16.00	THURS. SUN. 18.20	0	-
	748/DC8	PH./T.E. 260/625	FRI. 16.15	SAT. 19.05	1	Pago Pago
Tonga	748	PH.419	MON. WED. 07.15	TUES. THURS. 09.35	0	-
	748	P.H.419	FRI. SUN. 07.15	SAT. MON. 09.35	0	-
Niue	748	PH.419 PH.420	MON. 07.15	MON. 12.10	1	Tonga
Cook Islands						

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1. Discuss the Time Table and the Route with your teacher.

2. Now write the answers of these questions in your exercise books.

(i) What time does the flight No. "PH 216" leave Faleolo on Tuesday ?

(ii) What time does the flight "PH 252" arrive Pago Pago on Friday ?

(iii) If you leave Faleolo for Pago Pago on Monday at 1330 or 1.30 p.m. what must be your flight number ?

(iv) If you leave Faleolo for Nadi on Wednesday, do you have to call in Pago Pago ?

(v) If you fly from Faleolo to Nadi, what must you do with your watch during your flight ?

(vi)) What time will you arrive Niue if you leave Faleolo on Monday at 7.15 a.m. ?

(vii) What time is the earliest flight from Faleolo to Pago Pago on Monday ?

(viii) Does the Polynesian Airline fly from Nadi to Tonga ?

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F. "HOW LONG IS YOUR FLIGHT ?"

1. Discuss these problems with your teacher. Use the time table.

(i) How long does it take to fly from Faleolo to Pago Pago ?

(ii) How long does it take to fly directly from Faleolo to Niue ?

Is it: 1 day 2 hrs 20 mins ? ((How do you get your answer ?)

2 hrs 20 mins ?

3 hrs 20 mins ?

(iii) How long does it take to fly from Faleolo to Tonga ?

Is it: 1 day 2 hrs 20 mins ? (How do you

2 hrs 20 mins ? get your answer ?)

3 hrs 20 mins ?

(iv) Faleolo is about 500 miles from Nadi and about 300 miles from Niue.

Why does it take longer to go from Faleolo to Niue than to go from Faleolo direct to Nadi ?

2. Copy and complete this table.

From	To	Departure	Arrival	Time Taken
Faleolo	Pago	0445	0520	35 mins.
Faleolo	Tonga	0715	1210	
Faleolo	Fiji	1600	1820	
Faleolo	Pago		1405	35 mins.

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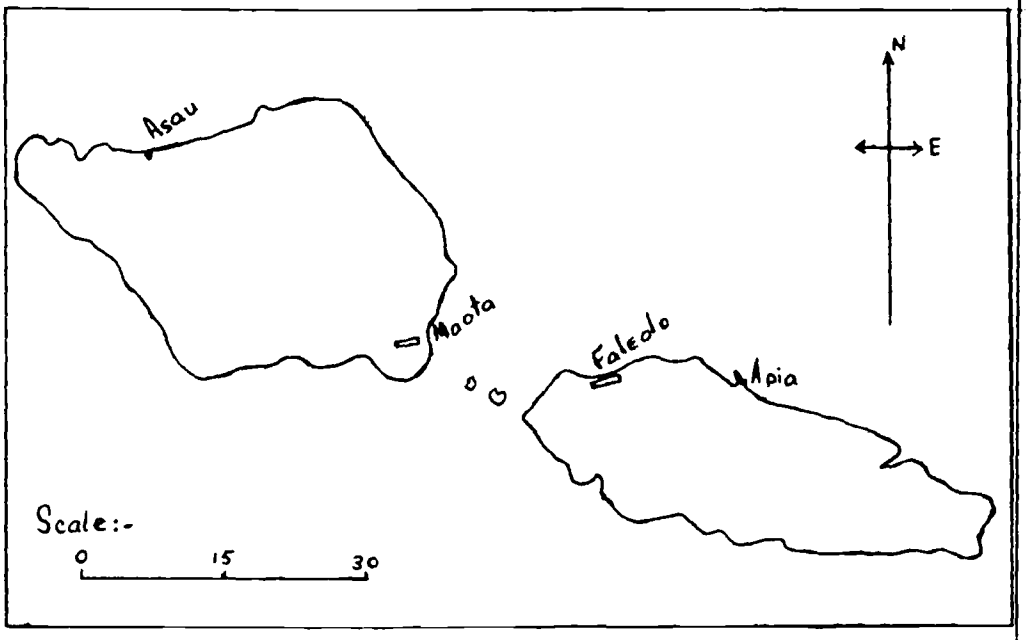
DISTANCES AND DIRECTIONS:

WESTERN SAMOA.



Exercises :-

(i) The scale on the map is 1 inch to 15 miles. Measure the following lines and find out what distances they are on the ground. (Use the above scale).

(a) ——————

(e) ——————————

(i) ——————————————

(o) ——————————————————

(u) ——————————————————————————

2. Using your ruler to help you, choose the correct answer to complete the following :-

(a) The approximate distance between Apia and Faleolo is
(i) 10 miles (ii) 18 miles (iii) 25 miles.

(b) Between Asau and the main airport is a distance of about
(i) 50 miles (ii) 65 miles (iii) 70 miles.

(c) The approximate distance between the two main islands is
(i) 13 miles (ii) 16 miles (iii) 20 miles.

(d) On the map the distance in incnes from Faleolo to Maota is about (i) 1 inch (ii) 1.25 inch (iii) 2.5 inches.

3. Let's take a scale of 1 inch on a map to represent 100 miles on the ground. Write down your answers to these:

What does (i) 2 ins. represent ?
(ii) 2.5" " ?
(iii) 4.25" " ?

Use the same scale (1" to 100 mls) to complete the following table.

Distances between APIA and	Approximates on the map	Approximates on the ground
Pago Pago	0.5 ins.	-------mls.
Nandi	----ins.	640 mls.
Rarotonga	----ins.	810 mls.
Niue	3.5 ins.	-------mls.
Tonga	----ins.	450 mls.

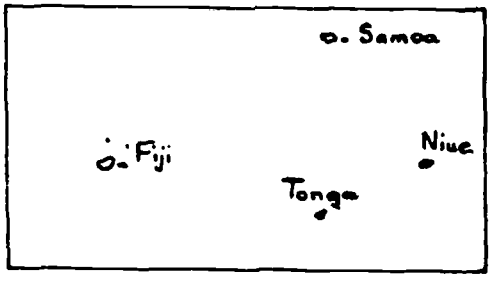
4. Directions :-

(a) The sun rises from the ----- and sets in the west.
(b) Is your island (country) north or south of the equator ?
(c) When you look at a map, you'll find that "east" is always to your right, and "----------" is always to your left.

True or False ?

(d) Study this map:-

Describe the position of each group of islands, in relation to Samoa, e.g. Fiji is to the south-west of Samoa. True ?



REPORT OF THE ENGLISH LANGUAGE WORK GROUP

TABLE OF CONTENTS

The English Language Work Group

Back row (left to right) : V. Mishra, Finau Seru, Shiu Ram Singh, Mr. Ramdour, Krishna Datt, Vinod Masih *(Fiji)*.

Middle row (left to right) : Mrs. Rejieli Racule, Mosese Uluinavitilevu, David Blakelock, Shiu Charan *(Fiji)*.

Front row (left to right) : Waisake Kedraika *(Fiji)*, Mrs. Palagi Faasau *(W. Samoa)*, Raymond Pillai *(Fiji)*, Doug McKeating *(Fiji)*, Walter Ramo *(Solomon Is.)*, Miss S. Pilkington *(G.E.I.C.)*, R. C. Rakesh *(Fiji)*, Miss Ana Taufeulangaki *(Tonga)*, Miss V. Khan *(Fiji)*, Miss U. Singh *(Fiji)*.

REPORT OF THE ENGLISH LANGUAGE WORK GROUP

Mr. D. McKeating
Senior Education Officer,
Secondary English,
Department of Education, Fiji.

List of participants

Gilbert and Ellice Islands	Miss S. Pilkington
Tonga	Miss Ana Taufeulangaki
Samoa	Mrs. Palagi Faasau
New Hebrides	Mrs. B. Jungwirth
Solomon Islands	Mr. W. Ramo
Cook Islands	Mr. J. Keown
Fiji	Mr. D. Blakelock
	Mr. Shiu Ram Singh
	Mr. Waisake Kedraika
	Mr. Subramani
	Miss V. Khan
	Mr. Ram Brij
	Mr. Pritam Singh
	Mr. V. Mishra
	Mr. Vinod Masih
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	Mr. D. J. Halliday
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	Mr. R. C. Rakesh
	Mr. J. R. Sharma
	Miss U. K. Singh
	Mrs. Rejieli Racule

Help was given in the opening sessions by Mr. G. Coates and Miss H. Katofono of the Fiji Education Department. Mr. R. Pillai, U.S.P., assisted throughout the Workshop.

Purpose of Workshop

(a) To discuss how the outline syllabus for English, prepared by Mr. Hill, the former U.N.D.P. English specialist, could best be used.

(b) To give teachers training and practice in writing material for use in Form 1.

(c) To produce material which could be trialled in schools later in the year.

Where we started from

(a) The Syllabus

An outline Form 1 - 4 syllabus had been prepared before the Workshop began by the U.N.D.P. English specialist. Unfortunately, he was no longer in the Region at the time of the Workshop.

The Outline Syllabus for each week consists of the following:

1. A suggested theme or topic for the week. (See Appendix A.)
2. A list of vocabulary for revision. These items are taken from the Tate Oral English Course, which is the course used in most primary schools throughout the Region.
3. A list of new vocabulary for teaching. These items are taken from L. A. Hill's 2075 headword list, which is based on Michael West's "A General Service List".
4. A list of prepositions and adverbial particles for revision. (From the Primary Course.)
5. A list of prepositions and adverbial particles for teaching. (From the 2075 headword list.)
6. Structures for revision.
7. Structures for teaching. (From A. S. Hornby's "A Guide to Patterns and Usage".)
8. Common errors for corrective work. These are errors which have been found to be common in pupils' written work throughout the Region.
9. A pair of phonemes for ear and speech training in phonemic contrast.

The syllabus also suggests the amount of time to be spent on each aspect of a week's work.

The suggested time allocation, assuming 7 x 40 minute periods, is:

Ear and speech training	5 x 10 minutes
Aural comprehension	1 x 20 minutes
Oral and written composition	2 x 30 minutes
Rapid reading comprehension	1 x 30 minutes
Revision and corrective work	2 x 30 minutes
New vocabulary, idioms and structures	2 x 30 minutes

(b) Samples of material prepared before the Workshop

Samples of the type of material which could be written had been prepared by the U.N.D.P. English specialist. These were taken from existing published material and were not directly related to the syllabus.

Further samples, based directly on the syllabus, were prepared by myself, by Mr. Pillai of the U.S.P., and by Mr. Coates of the Fiji Education Department. (See Appendix B.)

(c) Other aids to writing

The U.N.D.P. English specialist had produced an analysis of the Tate Oral English Course, Books 1-14. In writing material we assumed that items listed in this analysis had been covered in the primary school, although revision would, of course, be necessary.

I prepared an alphabetical list of all the words from the 2075 headword list included in the Forms 1 and 2 syllabus so that items could be more easily transferred from one part of the course to another and a record kept of transferred items.

Programme

1. Discussion of proposed syllabus

In the first 3 sessions participants were given copies of the outline syllabus and other aids to writing. This material was then discussed and explanations given as to how it could be used.

The samples prepared before the course were studied in detail to show how they related to the syllabus.

The questionnaire, shown in Appendix C, was also distributed and discussed.

From the discussions during these sessions it became apparent that the participants wished to modify both the contents of the outline syllabus and the general approach to teaching implied in some of the sample material.

The major modifications were:

(a) That it would be better to teach most of the new vocabulary items and structures orally before using them in written work. That Teachers' Guides to oral work should be prepared together with suitable illustrations.

(b) That some of the vocabulary listed for revision was so well known that specific revision was unnecessary. It was agreed that the revision course could omit vocabulary covered in the Tate Oral English Course Books 1-9, with the exception of verbs known to cause common difficulty.

(c) That some of the lists of new vocabulary were too long to be taught in one week. That some words, considered to have little relevance in the Region, could be omitted and that others could be introduced later in the course.

(d) That words not in the 2075 headword list but of regional significance should be included.

(e) That longer comprehension passages for intensive reading should be prepared in addition to the speed writing and aural comprehension passages. That the questions on these intensive reading passages should be designed to make children aware that it is sometimes necessary to pay close attention to the details of written material in order to determine its exact meaning.

A full list of the recommended modifications can be found in Appendix D.

2. Work on details of syllabus

The participants were divided into groups of 4-5 to work out the details of modifications to the first 25 weeks of the syllabus - each group working on 5 weekly units. This involved:

(a) going through the list of vocabulary for revision, looking up each word in the analysis of the primary course and noting those in Books 1-9;

(b) discussion of 'difficult' words needing revision;

(c) discussion of 2075 headword lists.

The proposals of each group were discussed in a further session and the syllabus was modified accordingly.

3. Production of 1st draft of aural comprehension and speed reading passages

To give participants practice in working with the syllabus and writing aids, they were asked to produce speed reading and aural comprehension passages.

Each member of a group of 4 or 5 wrote one speed reading and/or one aural comprehension passage. The group then met and discussed the work produced by its members and suggested modifications. Three days were allowed for this.

These first drafts were then duplicated and some of them were examined and discussed in a full meeting of the English Work Group.

At this stage it became apparent that some participants were finding it difficult to produce material of the right level of difficulty. Much of the writing went far beyond the linguistic controls of the course and some of it covered only a very few of the items suggested in the syllabus for the particular week.

The main reasons for this were:

(a) unfamiliarity with the content of the primary English course;

(b) lack of teaching experience at the Form 1 level;

(c) unfamiliarity with the level of the understanding and control of English achieved by Form 1 pupils in schools outside the urban areas.

4. Production of 2nd draft of comprehension passages and 1st draft of other material

A session was held to discuss specific topics for intensive reading passages, oral work, and composition.

One group worked on the production of Teachers' Guides for oral work.

Others worked on the second draft of comprehension exercises and carried out research necessary for the writing of passages for intensive reading.

5. Final session

At a final session we discussed what had been achieved and what work could best be done by a very small group of participants who were able to stay another week.

It was decided that this group should work on

(a) editing second drafts;

(b) producing second drafts of work still incomplete;

(c) analysing second drafts to find out which items from the syllabus remained to be covered for a particular week.

In this final session we also drafted the recommendations which the group wished to make to the newly appointed U.N.D.P. English specialist on his arrival. (See Appendix D.)

APPENDIX A WEEKLY TOPICS

FORM 1

1. Myself and My Family
2. School Life (1) Types of schools in various countries
3. Naughty Children
4. Houses
5. Natural Disasters (1) Hurricanes
6. Animals (1) Animals that work for us
   Animals as pets
7. Living in the House
8. Illness (1)
9. Hospitals
10. Sports and Games
11. Bravery
12. Transport
13. Famous People (1) The Wright Brothers
14. Road Accidents and their Prevention
15. City Life
16. The Town Mouse and the Country Mouse
17. Fishing
18. The Sea and Leisure Activities
19. Copra Production
20. Festivals and Celebrations
21. Dreams
22. Escape
23. A Famous Person (2) Gandhi
24. Islands
25. Legends (1) Local Legends
26. Counting and Measuring
27. Choosing a Career (1) The Farmer
28. Entertainment
29. Choosing a Career (2) The Nurse
30. School Life (2) The End of the Year

FORM 2

1. Legends (2) Legends from Other Lands
2. Animals (2) Animals that Provide Us with Food, Clothing, etc.
3. Famous Firsts (1) The First Trans-Pacific Flight
4. Choosing a Career (3) The Carpenter
5. Natural Disasters (2) Earthquakes and Volcanoes
6. Handicapped People (1) The Blind

   A Famous Person (3) Louis Braille
7. Religion (1)
8. Leisure Activities
9. Ghosts and Hauntings
10. The Cinema
11. Space Exploration
12. Food and Cooking
13. Animals (3) Harmful Animals
14. Economic Importance of the Sea
15. Phosphate Mining
16. Handicapped People (2) The Deaf and Dumb

    A Famous Person (4) Helen Keller
17. Telling the Time
18. Clothes (1)
19. Clothes (2)
20. School Life (3) Examinations
21. Animals (4) Animals in Captivity
22. Handicapped People (3) Cripples

    A Famous Person (5) Douglas Bader
23. Shopping
24. Natural Disasters (3) Floods, Droughts and Fires
25. Sugar Production
26. Choosing a Career (4) The Dentist
27. Communications (1) Letters, Parcels and Telegrams
28. Exploration

    A Famous Person (6) A Well-known Explorer
29. Jobs
30. Communications (2) The Telephone, Radio and Television

APPENDIX B

SAMPLES OF MATERIAL

BASED ON THE SYLLABUS

PREPARED BEFORE THE WORKSHOP

A Naughty Boy — Week 3

There was once a foolish boy called Tevita. He was unkind and cruel to his younger brother and sister. He pinched them and pulled their hair and threw stones at them. He stole their toys and tore their books to pieces. But he was very sly so he did not do these cruel things when his parents were watching him.

At home he was lazy and did not help his parents. He was also idle at school and his work was always careless and untidy. He was often rude to his teachers and was always getting into trouble. The headmaster sometimes punished him for his rudeness and idleness.

The children in Tevita's class hated him because he was always fighting with them. He was noisy in the classroom and he boasted and told lies. One day he told the other children that his aunt had given him two dollars because he had been kind and thoughtful and polite when she visited his house. The children knew that Tevita was usually unkind, thoughtless and impolite so they did not believe him. They said he was boasting again and laughed at him. "Show us the two dollars, boastful boy," they shouted.

When they laughed Tevita grew very cross. He ran off trembling with rage and went home in a temper. He decided to steal two dollars from his mother and show it to the children. His mother was at home but Tevita was very sly. He waited until she went into the kitchen, then he went to the box where his mother kept her money.

He had just taken the money from the box when his mother came in and saw him. She frowned when she saw what he was doing and was very angry with him. "You silly boy," she said, "it is wicked and dishonest to steal."

Tevita was ashamed. He said he was sorry and started to cry. Sometimes when he cried and said he was sorry, it helped him to get out of trouble. But this time his mother was very angry with him and punished him because he was dishonest.

Questions

1. What did Tevita do to his younger brother and sister?
2. When did he do these things?
3. How do you know Tevita was lazy?
4. What was Tevita's school-work like?
5. Why did the headmaster sometimes punish Tevita?
6. Why did the other children hate Tevita?
7. What did he tell the other children one day?
8. Why did the other children not believe him?
9. What did Tevita do when the children laughed at him?
10. What did Tevita decide to do?
11. How do you know Tevita was sly?
12. When did Tevita's mother come into the room?
13. What did she do when she saw Tevita?
14. What did Tevita do?
15. What happened sometimes when Tevita cried and said he was sorry?
16. What happened to Tevita this time?

The Naughty Twins — Week 3

My cousins, Pita and Timi, are twins. They are nearly five years old and they are very naughty. Yesterday, when no one was watching, they went into the neighbour's garden and pulled out several plants. The neighbour, Mrs. Brown, is a widow. She came out and scolded Pita and Timi, but they threw stones at her and ran off. Mrs. Brown was in a rage. "You wicked boys!" she shouted at the top of her voice. "I'll give you a beating if you come back."

Mrs. Brown came and complained to my aunt. "Your boys are very naughty, Mrs. Faletau. They tore my plants to pieces and threw stones at me."

"I am sorry, Mrs. Brown," said my aunt. "I'm sure they didn't do it on purpose."

"Of course they did. They're as bold as brass, those two," replied Mrs. Brown and she went away in a bad temper.

My aunt was very much ashamed. She called Pita and Timi and asked, "Did you pull out Mrs. Brown's flowers?"

"I didn't, mummy. It was Pita," said Timi and pointed to his brother.

"No, it was Timi," said Pita, and he pinched Timi.

"You are telling lies, aren't you? You must not lie," said my aunt. "Now tell me the truth. Did you throw stones at Mrs. Brown? She's very cross."

"She's a silly old woman," answered Timi.

"She's stupid," added Pita.

"Don't be rude," said my aunt, and smacked them both. "Now shut up and pay attention to me. I'm displeased with you because you've been a nuisance." The twins looked away in shame and tried to hide one behind the other. "I'm going to keep you in until daddy comes home. Go to your room, and don't leave without asking for permission. And don't get into more trouble or else I will give you a more severe punishment."

The twins were very good for the rest of the day.

Questions

Choose the correct answer.

1. (a) Timi is older than Pita.
   (b) Pita and Timi are the same age.
   (c) Timi is younger than Pita.
2. (a) Timi is 5 years old.
   (b) Timi is older than 5 years.
   (c) Timi is less than 5 years old.
3. (a) My aunt is called Mrs. Brown.
   (b) My aunt is called Mrs. Faletau.
   (c) Timi's neighbour is called Mrs. Faletau.
4. The twins threw stones at Mrs. Brown because
   (a) she is stupid.
   (b) she is a silly old woman.
   (c) she scolded them.

5. (a) Mrs. Brown gave the twins a good beating.

   (b) The twins were given a severe punishment.

   (c) The twins kept out of trouble the rest of the day.

6. Did anyone see the twins go into the neighbour's garden?

7. Why was Mrs. Brown in a bad temper?

8 Do you think the twins were sorry because they had been naughty?

READ PASSAGE 'A' Week 3

A. Ana's little brother, Pita, is very naughty. He is always getting into trouble. One night when Ana came home she found that that he had torn her reading book to pieces. It was not an accident. He did it on purpose. Ana was in a very bad temper and was very angry with her brother. She asked him why he had torn her book but he turned away and said, "Shut up!" Then he ran off towards her bedroom shouting at the top of his voice. He was going to tear another book to pieces but Ana caught him and held him back. He tried to fight with her and when their mother came he threw a book at her. Pita's mother smacked him and told him to try to keep out of trouble.

Week 3

PUT THE RIGHT WORDS IN THE SPACES. DO NOT LOOK BACK AT PASSAGE 'A'.

B. Ana's little brother, Pita, is very naughty. He is always getting ____ trouble. One night when Ana came home she found that he had torn her reading book ____ pieces. It was not an accident. He did it __ purpose. Ana was __ a very bad temper and was very angry ____ her brother. She asked him why he had torn her book but he turned ____ and said, "Shut __!" Then he ran ___ towards her bedroom shouting __ the top of his voice. He was going to tear another book ____ pieces but Ana caught him and held him ____. He tried to fight ____ her and when their mother came he threw a book __ her. Pita's mother smacked him and told him to try to keep _____ trouble.

C. WRITE OUT THIS STORY PUTTING WORDS FROM THE LIST IN THE SPACES

You may need some words more than once.

in/off/on/to/with/away/back/out of/into/up/at

One day Meli tore his arithmetic book _____ pieces _____ purpose. His teacher was very angry _____ him but Meli was a rude boy. He turned _____ and said, "Shut _____." Then he ran _____ shouting _____ the top of his voice. He started to fight _____ some boys in the playground and threw stones _____ the girls. His teacher was _____ a very bad temper. He caught Meli, and held him _____ when he tried to run _____ again. He gave Meli a severe scolding, then he said, "You are always getting _____ trouble, Meli. If you can keep _____ _____ trouble for a week, I shall be very pleased _____ you."

APPENDIX C

QUESTIONNAIRE ON THE

FORM 1 - 4 ENGLISH SYLLABUS

Notes

1. The idea of this questionnaire is
   (a) to get more ideas on how the best use can be made of the proposed Form 1 English syllabus, and
   (b) to get you to study the syllabus and the other tools carefully so that you will have a clearer over-all picture of the job we have to do.
2. If you find the whole thing confusing and alarming, don't panic; we all felt like that when we first saw the syllabus. However, a few of us have tried writing material for this syllabus already and have found it a fascinating job. It is slow and demanding work but can be very satisfying when things start to work out.
3. In this Workshop we shall be dealing with the Form 1 syllabus.
4. It is suggested that material for Ear and Speech training should be written by people with technical training in this field; if you are one of these, please volunteer, otherwise don't worry about it
5. You should have copies of the basic equipment needed for writing:
   (a) The Form 1 - 4 English Syllabus (Pink);
   (b) Suggested Form 1 - 4 English Course Samples (White);
   (c) Consolidated Analysis of the Tate Oral English Course (Thin Green);
   (d) Index of the Tate Oral English Course (Thick Green).

Questionnaire

1. Look at the suggested weekly schedule of work on page 1 of the Syllabus. Do you think the time allocation is realistic in terms of (a) the amount of material to be covered and (b) the total time allowed for English in schools known to you?

2. Are there any other activities which you think should be included in the weekly schedule of work?

3. Suggest an order in which the lessons could best be taught in each week.

4. (a) What sound contrasts do the pupils you teach have most difficulty with?

   (b) Which of these cause them to have serious problems with their written work?

5. Read page 2. Are there any points on which you would like clarification?

6. Refer to the Samples (white book) page 33. Can you suggest any other ways in which known vocabulary in the Syllabus could be revised? (N.B. The 'sample' is not at Form 1 level.)

7. Refer to the Samples pages 47 - 56 and 60 - 66. Can you suggest any other ways in which new vocabulary could be taught? (The new vocabulary in the Syllabus is in the lists headed 2075.)

8. Read pages 10 - 11 of the Samples. Have you any comments you wish to make on Aural Comprehension, e.g. on how it could best be handled in the classroom?

9. Read pages 12 - 19 of the Samples. Do you consider this type of note taking (using simpler material of course) would be useful or possible in Form 1?

10. Read pages 20 - 28 of the Samples.
    (a) Which of the two suggested methods of dealing with Composition would be most suitable in Form 1?

    (b) Can you suggest any other methods of dealing with Composition?

11. Read pages 29 - 31 of the Samples. Do you think more difficult comprehension work should be included in addition to the 'rapid reading' type suggested?

12. Read pages 37 - 46 and 57 - 59 of the Samples. (Note: Some pages are in the wrong order. Follow the numbers given above.) Can you suggest any other ways of dealing with this type of work?

13. Look at the 2075 word list on pages 5 - 24 in the Syllabus. List the words which you consider are definitely familiar to the Form 1 pupils you teach, or have taught recently. (Note: If you have not taught at this level please ignore this question.)

14. Please bring the completed questionnaire with you to the next meeting of the English group. Use this sheet for noting any other points on which you would like to comment in the meeting or on which you would like clarification.

APPENDIX D

RECOMMENDATIONS MADE BY

THE ENGLISH LANGUAGE WORK GROUP

The following recommendations on the Form 1 English syllabus were agreed to by participants from

The Cook Islands

Fiji

The Gilbert and Ellice Islands

The New Hebrides

Samoa

The Solomon Islands

Tonga.

1. That Teachers' Guides to short (10 - 15 minute) oral lessons should be written to introduce new vocabulary and structures and to revise known items and that suitable illustrations should be prepared to help with this oral work where appropriate.
2. That most of the comprehension exercises and written exercises on structures, prepositions, etc., should reinforce and test the learning of items previously presented orally.
3. That in addition to speed reading and aural comprehension exercises there should be longer passages for intensive reading with more searching questions. Such exercises could be set near the end of a week's work and could incorporate many of the learning items from that week.
4. That some of the 2075 words considered by the group to have little relevance in the Region or to be unsuitable at Form 1 level should be omitted or taught later in the secondary course.
5. That words not in the 2075 list but of regional significance should be included.
6. That some of the less common Hornby Structures should be omitted or taught later in the secondary course.
7. That no specific revision work on vocabulary items taught in the Tate course up to the end of Book 4 need be written except for certain verbs which commonly cause difficulties.

8. That in-service training courses would be necessary to show teachers how to handle the new material.

9. That differences in cultural backgrounds of pupils in the Region should be taken into account and that alternative units should be prepared for various countries when necessary.

10. That some extensive reading material to fit the course should be produced to supplement existing published readers. Much of this could be produced by rewriting existing material.

11. That a reasonable time allocation for each week's work might be:

Lesson 1*	Ear and Speech training and Oral Work	20 minutes
	Written exercises to reinforce and test Oral Work	20 minutes
Lesson 2	Ear and Speech training and Oral Work	20 minutes
	Speed Reading exercise	20 minutes
Lesson 3	Ear and Speech training and Oral Work	20 minutes
	Written exercises	20 minutes
Lesson 4	Ear and Speech training and Oral Work	20 minutes
	+Composition - preparatory Oral Work	20 minutes
Lesson 5	Composition - further Oral Work and writing	40 minutes
Lesson 6	Ear and Speech training and Oral Work	20 minutes
	Aural Comprehension	20 minutes
Lesson 7	Intensive Reading exercise	40 minutes

* This assumes 40 minute periods, but the schedule could easily be adapted to fit into primary school timetables with shorter sessions.

+ Some participants suggested dividing composition work into 3 x 20 minute sessions with both oral and written work in each session.

APPENDIX E SOME FIRST AND SECOND DRAFTS FOR COMPARISON

(a) Extract from an intensive reading passage for Week 3

1st Draft

Philip was fifteen years old and was an orphan. Seven years previously, in 1794, his parents had been killed in an accident. Philip was thin and so small that many people thought he was eleven years old. He lived in Manchester, a new industrial town in Britain. With the new cotton mills it was growing into a great ugly town with tall chimneys which poured out smoke day and night. Every day the population increased because people were coming into the town to find work in the cotton mills. The houses for the workmen were small, dark, damp and crowded.

The city parish looked after Philip and other orphans and also children whose parents were poor. These children were sent to work in the cotton spinning mills. They never had enough to eat and their clothes were shabby. . . There were no seats on which they could sit and they had only half an hour to eat their bread and cheese. They could not rest when they were tired and if they did they received a severe scolding and many times a beating as their punishment.

2nd Draft

Philip was fifteen years old. Seven years before, in 1794, his parents had been killed in an accident so he was an orphan. He was thin and so small that he looked like an eleven year old boy. He lived in Manchester, a new town in Britain. It was growing into a crowded dirty town. It had many cotton mills with tall chimneys which poured out dirty smoke all day and all night. Every day the population grew bigger because more and more people kept coming into the town to find work in the cotton mills. The houses for the workers were small, dark, damp and crowded.

Orphans like Philip, and other children whose parents were very poor, were sent to work in the cotton spinning mills. They were badly treated there. They never had enough to eat and their clothes were old and torn. . . There were no seats on which they could sit and they were allowed to stop working for only half an hour to eat their bread and cheese. They could not rest when they were tired. If they did, they got a severe scolding or a beating as their punishment.

(b) Extract from a speed reading exercise

1st Draft

After the hurricane, Babu fell very ill. At first he thought he had caught the flu. Then he remembered that he had drunk a lot of water from a well when he was helping his neighbours to rebuild their houses. Babu was very displeased because he wanted to help in the hurricane relief work. Now he had to stay in bed.

All day Babu lay on his string-bed in a little tin hut. It was hot inside the hut. Babu felt feverish. His head ached and he felt very weak. His mother, Mangri, rubbed some pain balm on his forehead and on his chest. She covered him with an old blanket. The smell of pain balm and the heat made Babu very sick.

Dukhi, Babu's father, was worried when his son coughed or groaned, or when he did not breathe well. He could not take Babu to hospital because broken branches and telephone poles were lying across the roads.

2nd Draft

After the hurricane, Babu fell very ill. He had a sore throat, his head ached, his stomach ached, and he had pains in his arms and legs. At first he thought he had caught flu. But when his stomach ached he remembered that he had drunk a lot of water from a well when he was helping his neighbours to rebuild their houses. Perhaps the water in the well had not been clean. Babu was very displeased because he wanted to help in the hurricane relief work. Now he had to stay in bed.

All day Babu lay in bed in his little hut. It was hot inside the hut. Babu felt feverish. His head-ache grew worse and he felt very weak. His mother, Mangri, covered him with an old blanket and sat beside his bed.

Dukhi, Babu's father, was worried when his son coughed or gave a groan, or when he did not breathe well. He could not take Babu to hospital because broken branches and telephone poles were lying across the roads.

(c) Extract from an aural comprehension passage for Week 14

1st Draft

Mere was walking home from school, but she was not sensible. She was walking in the middle of the road, where it is not safe to walk. She came to a dangerous curve in the road. She could hear a big noise, but she still did not go to the side of the road.

The noise was a motor-car. The driver was going fast because he was in a hurry. As he came round the bend, suddenly he saw Mere in the middle of the road. He could not slow down and so he blew his horn to give Mere a warning. Mere was very frightened and she jumped out of the way. At the same time the driver held on to his steering wheel and tried to steer his car to the side of the road. But his car went sideways and hit a pole at the side of the road. Mere heard a terrible crash.

2nd Draft

Careless Mere

Mere was walking home from school, but she was not very sensible. She was walking in the middle of the road, where it is not safe to walk. She came to a dangerous curve in the road. She could hear the noise of something coming round the bend, but she still did not go to the side of the road.

The noise was made by a motor-car. The driver was driving in the middle of the road because he was in a hurry. As he came round the bend, he suddenly saw Mere in front of him. He could not slow down

and so he blew his horn to give Mere a warning. Mere was very frightened, and she jumped out of the way. The driver was trying to avoid Mere. He steered his car to the other side of the road, but the car skidded and hit a pole at the roadside. Mere heard a terrible crash.

(d) Extract from a comprehension exercise for Week 5

1st Draft

On the twenty-fourth of October, the high winds which were moving south from Funafuti, hit Rotuma Island. High winds up to 150 knots rushed through the island and flattened houses, trees and crops. Bebe left Rotuma that night in a complete mess and moved on southwards.

The next morning saw Bebe at work on the Yasawa island chain. The people there only watched and waited for the dangers brought by the hurricane. News was immediately sent once again to the rest of Fiji about the area Bebe covered. It was moving in a circular pattern covering a total area of 450 miles. The centre was 225 miles from the edge. This centre is usually called the eye of the hurricane.

Preparations were then made in Viti Levu and other islands. They knew they could not avoid such terrible forces of nature but man still has the strong will to face such dangers. To the people of Fiji this period was a very important one.

In the towns, people moved here and there checking on their buildings. Some made wind-breaks over their windows and some were busy putting in screws or nails over their roofs. These had become loose over the years of peace. Housewives were seen in the food shops getting as much food as they could. They knew that it would not be safe wandering along the streets trying to shop in the middle of a hurricane. Children played on because they did not know how harmful the hurricane would be.

2nd Draft

On October 24th hurricane Bebe reached Rotuma. The wind was blowing at over 150 miles per hour. As the storm moved over Rotuma the wind flattened houses, trees and crops. Then it moved south towards the Yasawa Islands.

Radio Fiji kept broadcasting hurricane warnings. These warnings told people which way the hurricane was moving. As the storm reached the Yasawa Islands, the people on Viti Levu and the other islands began to prepare for it because they knew they could not escape from it.

In the towns people prepared their buildings. They put hurricane shutters over the windows so that they would not get broken. Some people repaired their roofs and put new nails in them so that the strong wind would not blow the roofs away. Housewives hurried to the shops to buy food because they knew it would not be safe to go outside to the shops in the middle of a hurricane.

APPENDIX : SAMPLES OF WORK PRODUCED BY THE WORKSHOP

Oral Work on Timetables (1) Week 2

Aim: To revise short answers -

Yes, he does

No, he doesn't

Yes, they do

No, they don't

Yes, it is

No, they aren't etc.

Tell the pupils to look at their weekly timetable and ask them questions about it, e.g.

T: Do you have English every day?

Cl: Yes, we do.

T: Do you have P.E. on Wednesday?

Cl: No, we don't.

T: Do you have Social Science on Tuesday morning?

Cl: No, we don't.

T: Is Maths the first lesson on Tuesday?

Cl: Yes, it is.

T: Is the last lesson on Wednesday English?

Cl: No, it isn't.

Put the following timetable on the blackboard.

Tell the class it is *Uitabo's timetable. He is a boy* in I C at King George V School, Tarawa.

* A girl's name could be substituted.

LESSON TIME	7.30	8.10	8.50	9.30	10.10	10.30	11.10	11.50	12.30	1.10
Mon.	Maths	Maths	English	P.E.	BREAK	Social Science	Social Science	Art	Art	
Tues.	P.E.	English	English	Maths		Woodwork Boys Needlework Girls		Science	Science	

Ask questions like these:

Does Uitabo have P.E. on Tuesday?

Does he have Maths after break on Monday?

Are the English lessons on Tuesday before break?

Does Uitabo have Needlework on Tuesday?

Do the girls learn Woodwork?

Is the English lesson after Maths on Monday?

Oral Work on Timetables (2)

Aim: To revise have/has

Tell the pupils to look at their weekly timetable while you make a series of statements about it, e.g.

You have English every day.

You have P.E. on Tuesday afternoon.

You have Maths after break on Monday.

Ask the children to make similar statements when you supply the name of a subject or a time.

T: Maths.

P: We have Maths on Monday.

Cl: We have Maths on Monday.

T: After break on Tuesday.

P: We have Art after break on Tuesday.

Cl: Repeats.

Now use Uitabo's timetable to practise He has etc.

This can be practised as above and also in response to questions from the teacher:

T: What does he have after Maths on Monday?

Cl: He has English.

(There is no need to repeat the rest of the sentence.)

This oral work can be reinforced by getting the pupils to write down statements about the timetables.

Oral Work on Timetables (3)

Aim: To revise various ways of expressing time.

Use timetables to revise such forms as:

10.30 (ten thirty) - half past ten.

11.45 (eleven forty-five) - a quarter to twelve.

9.10 (nine ten) - ten past nine.

Ask questions such as:

What time does the first lesson start?

What time do you have lunch?

Note: Try to avoid talking about such times as 11.12, 1.33, etc. If pupils ask about alternative ways of saying such times explain that it is usual to say either eleven twelve or twelve minutes past eleven. Such forms as twelve past eleven are not in general use.

Intensive Reading Week 2

Education in the South Pacific

Many years ago there were no schools in the South Pacific countries. In countries like Fiji, Tonga, Samoa and the Solomon Islands children did not learn English or Mathematics at school. They did not go to a classroom to have lessons in subjects like Social Science or Basic Science. They did not have teachers who wrote on the blackboard with chalk. They did not have to write compositions as you do today.

Children in those days did not learn things from teachers in schools. They learnt a lot of things from their parents who were their teachers. They had lessons every day. In a family the father was the head of the family and the head teacher. He taught his sons the correct way to plant taro and yams. He taught them how to catch fish. The father also taught his sons to build houses and boats. He trained them to use bows and arrows, war-clubs and spears.

The mother of the family usually taught her daughters a lot of things. She taught them how to cook food like taro, yams, fish, and shellfish. She showed them how to wash clothes and clean the house. She also taught them how to look after their younger brothers and sisters and how to care for the sick ones in the family. The girls also collected shellfish from the sea and got food from the gardens. The children learnt songs and dances from their parents. Learning the songs and dances taught the children the history of their people. The children were told to obey and respect their parents, their visitors and the old people of the village. You see then that the children did not go to school to learn how to live happily. Their parents taught them those things.

Then the missionaries came to Fiji, Samoa, Tonga, the Solomon Islands, the Cook Islands, and other Pacific Islands. They came to teach the people in the South Pacific about God. They wanted people to follow the Christian religion and to know God. They wanted the people to stop praying to stones and other things. Many missionaries were Europeans who came from England. Some missionaries were Methodists and some were Roman Catholics.

When the missionaries arrived in a country they first learnt the language which the people spoke there. The missionaries in Fiji learnt the Fijian language. The missionaries in Tonga learnt the Tongan language. After they had learnt the language of the people the missionaries then taught them how to read and write it. They did this to help the people to read the Bible. The missionaries wrote the Bible in the people's own language. The people were very happy to see that they could send messages without speaking and many of them learnt how to read and write their own language. Many people became Christians and began to learn more about God.

Later the missionaries built schools where children could go and learn to read and write. The missionaries taught the children how to do arithmetic or mathematics and how to read and write their own language. The children also learnt how to read and write the English language.

The missionaries also trained other people to teach young children in schools. These people were called pastors because they taught people about God too. The schools which the missionaries built were very small. Very few schools were built. Not all the children attended school. Many stayed at home and helped their parents.

In the schools there were not as many books as you have today. But still they learned to read. Those who did not go to school did not learn how to read and write.

For many years there were only mission schools in all the countries in the South Pacific. Then the government of every country thought of building schools to help children to be educated. The government also began to train teachers to teach the children. They asked the governments of other countries for assistance and teachers came from countries like England, Australia and New Zealand and taught the children. More boys than girls went to school because many parents thought that girls should work only in the home.

Later more parents began to send their children to school. They thought that if the children went to school they could get good jobs and a lot of money. They thought this because many Europeans who went to school and could read and write had jobs in offices.

In many villages people held meetings and formed "school committees". These committees collected money and built schools for their children. Children were taught English, their own language which we call the vernacular, arithmetic (or mathematics), social science, art and craft, music and health science. In Fiji children sat for examinations like the Secondary Schools' Entrance Examination. Those who passed went to secondary schools. Those who failed helped their parents at home. Other countries had their own examinations.

Today most parents try to send their children to school. The government in each country is also interested in children's education and there are many good school buildings in towns for children to be educated. There are also many good, trained teachers who help the children to learn many things.

In the Cook Islands, Niue, Tonga, and Nauru all children have to go to school. In Fiji and Samoa most children go to school.

At school today children do not only learn how to read and write and do mathematics. They learn how to live happily together.

In 1968 the University of the South Pacific was started. Many students from the Pacific islands and other countries attend the University. Then they go out and help their own people and their government.

We see then that education is very important for everybody. Everybody should be educated and live happily with other people.

Questions

Choose the correct answer.

1. Many years ago there were
   a) many schools in the Pacific.
   b) a few schools in the Pacific.
   c) no schools in the Pacific.
2. In those days there were
   a) many teachers.
   b) thirty five teachers.
   c) no teachers.
3. Children in those days learnt from
   a) their parents.
   b) trained teachers.
   c) nurses and doctors.
4. The head of the family was
   a) the mother.
   b) the father.
   c) the uncle.
5. The children learnt the history of their people from
   a) teachers at school.
   b) the University.
   c) songs and dances.

6. The missionaries came to the South Pacific to
   a) have a holiday.
   b) buy and sell things.
   c) teach people about God.
7. The missionaries who came to the Pacific
   a) knew the Pacific languages.
   b) learnt the languages from the Pacific people.
   c) did not want to learn the languages.
8. The missionaries helped the people to become
   a) Christians.
   b) Hindus.
   c) Muslims.
9. Why did the missionaries teach the people how to read and write?
10. Who helped the missionaries to teach the children?
11. Why were more boys than girls sent to school?
12. Name the four countries in the Pacific where all children have to go to school.
13. When was the University of the South Pacific started?

Prepositions and Adverbial Particles — Week 7

A. Read the following passage and pay careful attention to the words underlined.

Mrs. Weaver left Jenny and Bobby at home and went out shopping. An hour later she came back into the house. She put the shopping basket on the kitchen table. When she went into the lounge she saw that everything was untidy. Toys were lying on the floor. The ashtrays had fallen off the stools and there was ash on the carpet. The electric fan had been turned on and pieces of paper were blowing off the study desk. The covers were off the cushions and the cushions were on the floor. The vase was not on the dining table but was on the bookcase. There were some mud stains on the carpet. Water was running out of the washbasin tap and the hand towel was wet.

Mrs. Weaver was very angry. "Jenny! Bobby!" she shouted at the top of her voice. "Come here at once."

When Jenny and Bobby came into the lounge, Mrs. Weaver said, "Miss Collins is coming to our house for tea this morning. I want you to tidy up the lounge before she comes. The vacuum cleaner is out of order so you'll have to sweep the floor with a broom."

B. Write out the following passage, filling in the blanks with words from the list at the beginning.

into, off, on, out of, to, up

Mrs. Weaver told Jenny and Bobby to tidy ..(1).. the lounge. "Pick those toys ..(2).. ..(3).. the floor. Put the ashtrays ..(4).. the stools and clean the ash ..(5).. the carpet. Put the covers back ..(6).. the cushions and put the cushions ..(7).. the chairs. Take the vase ..(8).. the bookcase and put it ..(9).. the dining table again. Turn the fan ..(10).. and pick the rubbish ..(11).. ..(12).. the floor. Clean the stains ..(13).. the carpet. Turn that tap ..(14).. Take the hand towel outside and hang it ..(15).. the clothes-line."

When their mother went ..(16).. the room, the children tidied ..(17).. the lounge. "I wish the vacuum cleaner weren't ..(18).. order," said Jenny as she swept the dirt ..(19).. the room.

Half an hour later Miss Collins came ..(20).. the house. Mrs. Weaver took her ..(21).. the lounge and turned ..(22).. the fan. "Goodness gracious!" said Miss Collins. "What a tidy house you have!"

Aural Comprehension — Week 10

This will be dramatised and recorded. Trial schools will be provided with taped recordings.

[Theme music fades out]

Radio Announcer: Hullo, and welcome once again to "Sunday Sports Magazine". For those of you who missed last night's broadcast of the

wrestling match at Prince Charles Park between Changam Naidu and Sher Ali, here's a decription of the last few minutes.

[Taped commentary cuts in]

Vimal Pooran (Sports Reporter): ... Ali is still winning by 3 points but he looks very tired. The two men are facing each other. Ali slips and loses his balance, and Naidu jumps forward and pulls Ali by the hair. Ali punches Naidu in the stomach. [Hoots, jeers, whistles break out] Naidu didn't like that, I'm sure, and neither do his supporters. Naidu is squatting on the mat and holding his stomach. Sukhdeo, the referee, moves quickly and faces Ali. They are standing close together and referee Sukhdeo is saying something to Ali. He must be giving Ali a warning. Punching just isn't allowed in this game. Naidu gets up slowly. He is shaking his head. That punch must have hurt him badly. Ali rushes towards Naidu. Naidu takes a step back. He springs into the air and strikes Ali on the chest with his feet. Ali falls backwards on to the ropes. [Shouts of encouragement] Naidu leaps at him. He picks Ali up and throws him down. [Cheers increase] Ali quickly rolls over on to his stomach, but Naidu dives on him and is sitting on top of Ali's back. He is twisting Ali's arm behind his back. Ali is in pain but he isn't going to give up. No, he has given up. It looks as if Ali's arm is broken. Yes, the match is over. Referee Sukhdeo is raising Naidu's right hand, which means Naidu is the winner. [Whistles, cheers, pandemonium] Naidu, the new champion, is a very happy man today. He's running around the ring shouting for joy. I'm going to go down to the ring and ask him for an interview. [Tape cuts off abruptly]

Radio Announcer: Sports Reporter Vimal Pooran did manage to get an interview with Naidu.

[Taped interview cuts in]

Pooran: Well, that was a very exciting match, Mr. Naidu. How do you feel after winning the title?

Naidu: I feel happy and very proud, Mr. Pooran. I am the new champion.

Pooran: What do you think about Ali who has lost the match?

Naidu: I don't think he's any good.

Pooran: Can you say why?

Naidu: He is not a wrestler. He should play netball.

Pooran: Where did you learn to wrestle, Mr. Naidu?

Naidu: Where? I am the proud son of Appal Naidu. He was a great wrestler. He was the best wrestler in the country. He taught me to wrestle.

Pooran: How do you train before a wrestling match?

Naidu: Oh, I do exercises in the fresh air to strengthen my body. I practise hand-stands to strengthen the muscles in my shoulders. And I eat a lot of rice and drink plenty of milk. I also practise my wrestling tricks.

Pooran: What will you do next? Will you wrestle against Ali again?

Naidu: Yes, Mr. Pooran. I want to show Ali once more that he can't beat me at wrestling. After that I won't wrestle any more. I want to teach my son, Kutti, to wrestle. Then I will buy a cafe and sell ice-cream. I am a very quiet man, Mr. Pooran, and I want a quiet life.

Pooran: Thank you very much, Mr. Naidu. I hope you win again.

Naidu: I will. I am the champion.

Questions

1. Where was the wrestling match held?
2. Was the match held on Saturday or Sunday?

REPORT OF THE BASIC SCIENCE WORK GROUP

TABLE OF CONTENTS

The Basic Science Work Group

(Left to right)

Extreme back row : P. Nouata *(G.E.I.C.)*

Back row : P. Buist *(C.I.)*, M. Waqa *(Fiji)*, J. McLean *(Fiji)*, A. Sutherland *(Australia)*, B. Singh *(Fiji)*, P. Manaraj *(Fiji)*, Mrs. E. Dale *(Australia)*, I. Kay *(N.H.)*, Mrs. D. Hubbard *(Niue)*.

Middle row: T. Tangaroa *(C.I.)*, K. Tuiloma *(Fiji)*, M. Latu *(Tonga)*, J. Furnish *(Tonga)*, Mrs. S. Achal *(Fiji)*.

Front row : T. Lefale *(W. Samoa)*, A. C. Dass *(Fiji)*, J. George *(C.I.)*, L. Andresen *(UNESCO)*, B. Karan *(Fiji)*, A. Lodhiya *(Fiji)*, A. Marsters *(C.I.)*.

3. What did Naidu do when Ali slipped and lost his balance?

4. Why did the referee give a warning to Ali?

5. What was the referee's name?

6. Why did Ali give up?

7. Why did the referee raise Naidu's arm?

8. Why does Naidu practise hand-stands?

Are the following statements true or false?

9. Naidu trains for a match by eating plenty of ice-cream.

10. Naidu does not want to wrestle again.

11. Naidu is the son of Appal Naidu.

12. Naidu wants to teach his son, Changam, how to wrestle.

After the hard work, some recreation.

'giti -

a Pacific style

feast

REPORT OF THE BASIC SCIENCE WORK GROUP

Mr. L. Andresen, Unesco,
Basic Science,
Course Coordinator.

1. Participants

Cook Islands	Mr. Tere Tangaroa
	Mr. John George
	Mr. Aaron Marsters
	Mr. Paul Buist
Fiji	Mrs. Sneh Achal*
	Mr. Bir Singh
	Mr. Parmanand Maharaj
	Mr. A. C. Dass
	Mr. A. Lodhiya
	Mr. B. Karan
	Mr. Isireli Rainibogi
	Mr. K. Tuiloma
Gilbert and Ellice Islands	Mr. Pafini Nouata
	Mr. J. Pugh
New Hebrides	Mr. I. Kay
Niue	Mrs. D. Hubbard
Solomon Islands	(unrepresented)
Tonga	Mr. Mana Latu
	Mr. J. Furnish
Western Samoa	Mr. Tavita Lefale

(* Unesco Counterpart)

2. Leaders and Consultants

U.N.D.P./Unesco	Mr. L. W. Andresen, Science Specialist
University of the South Pacific	Mr. John McLean, Biologist, S.N.R.
	Mr. R. Northcott, Physicist, S.N.R.
	Mr. Meli Waqa, Science Education, S.O.E.*

Overseas

Mr. J. A. Sutherland, Agriculturalist, Armidale Teachers' College, N.S.W., Australia.

Mr. L. G. Dale, Deputy Director, Australian Science Education Project, Toorak, Victoria, Australia.

(* Unesco Counterpart)

3. Purposes of the Workshop

1) To give experience in science curriculum decision-making.

2) To provide training in the design and construction of science curriculum materials (specifically Teachers' Guides for Form 3).

3) To produce some materials that may be of use in the U.N.D.P. Unit's Form 3 programme.

4. Programme

1) Pre-Workshop planning

(a) Decisions regarding positions to be taken.

Non-negotiable positions:

(i) We will write Teachers' Handbooks.

(ii) We will write within the framework of the U.N.D.P. draft Form 3 syllabus.

(iii) Class teaching will be activity-oriented.

Negotiable positions:

(i) Detailed handbook structure.

(ii) Plan for action (what will be done, by whom and when).

(b) Administrative decisions.

(i) All positions will be communicated to participants in writing.

(ii) Some form of involvement of participants (democratic choice) will be used in deciding the negotiable positions.

(iii) Clear written guidelines will be developed for participants to follow in producing the handbooks

(what they are to do and how they are to do it).

(iv) The broad aims of Basic Science are to be available in written form so that criteria can be developed for judging what can and what cannot be included in a unit.

(v) Teams of three or four writers should ultimately be formed.

(vi) A pattern of this type to be followed:

Planning ⟶ Drafts ⟶ Evaluation ⟶ Drafts ⟶ Evaluation ⟶ Final Product.

2) First week

On the Thursday and Friday of the first week, the whole group met and decided the following:

(a) The composition of each writing group.

(b) The writing topic for each group.

(c) A rough timetable for the following week.

(d) The detailed structure of the Teachers' Handbook.

Several discussions were held on the following subjects:

(a) Broad aims of science education, especially with reference to Agriculture and Rural Development.

(b) The present aims and objectives of Basic Science.

(c) The history of the Basic Science project to date.

(d) The development of an Australian science project (A.S.E.P.)

3) Second week

(a) Discussions and studies.

(i) Study of operating procedures.

(ii) Examination of manuscript preparation guides.

(iii) Discussions on the specification of broad and specific teaching objectives.

(iv) Guide to preparation of the first draft.

(b) Writing and evaluation.

(i) First drafts of all units were written.

(ii) Evaluation meetings were held for most units.

4) Third week

(a) Discussions and studies.

(i) Further study of writing objectives.

(ii) Guide to preparation of the second draft.

(b) Writing and evaluation.

(i) Life Sciences evaluation meeting, and drawing up of a revised Form 3 programme.

(ii) Preparation of pictorial charts on unifying themes in Basic Science.

(iii) Second drafts of Physical Science units written.

(iv) Revised first drafts of Life Science units written.

(v) General meetings on the Aims of Science Education, and preparation of an Aims statement.

5. Samples of Output

1) Statement of operating procedures.

1 General

(a) We shall write Teachers' Handbooks initially. We shall accept for discussion recommendations regarding pupil materials.

(b) Life Sciences - 3 or 4 units will be written.
Physical Science - 2 units will be written.

(c) Aim at the greatest amount of classroom pupil activity, preference being given to handling objects.

(d) For classroom group activities 7 should be the maximum group size. All members of a group should be actively involved.

(e) Use the cheapest, simplest equipment available that will do the job efficiently, improvising where this can be reasonably done.

(f) Objectives will be written with the unit, and tests will be written later, based on the objectives.

(g) We shall suggest what recorded work should be made by pupils. We do this, where possible, by providing

questions for pupils to answer. We provide the teacher with some guide to the sort of answer expected.

(h) An inquiry approach will be used.

2 Teachers' Handbook Structure

(a) Title.

(b) Index of contents.

(c) Introduction on what the book is about, what pre-requisities exist, what connections with other units.

(d) Objectives - General
- Specific.

(e) Equipment (including information about materials to be prepared in advance).

(f) Information on what and how to teach the pupils.

(g) Audio-visuals.

(h) References.

(i) Glossary.

(j) Feedback questionnaire.

3 The Task Procedures

(a) Work in teams.

(b) Elect a spokesman.

(c) Designate other responsibilities to team members.

(d) Stages for writing

(i) First draft - write briefly what each handbook heading will consist of.

(ii) Team meeting to consider first draft.

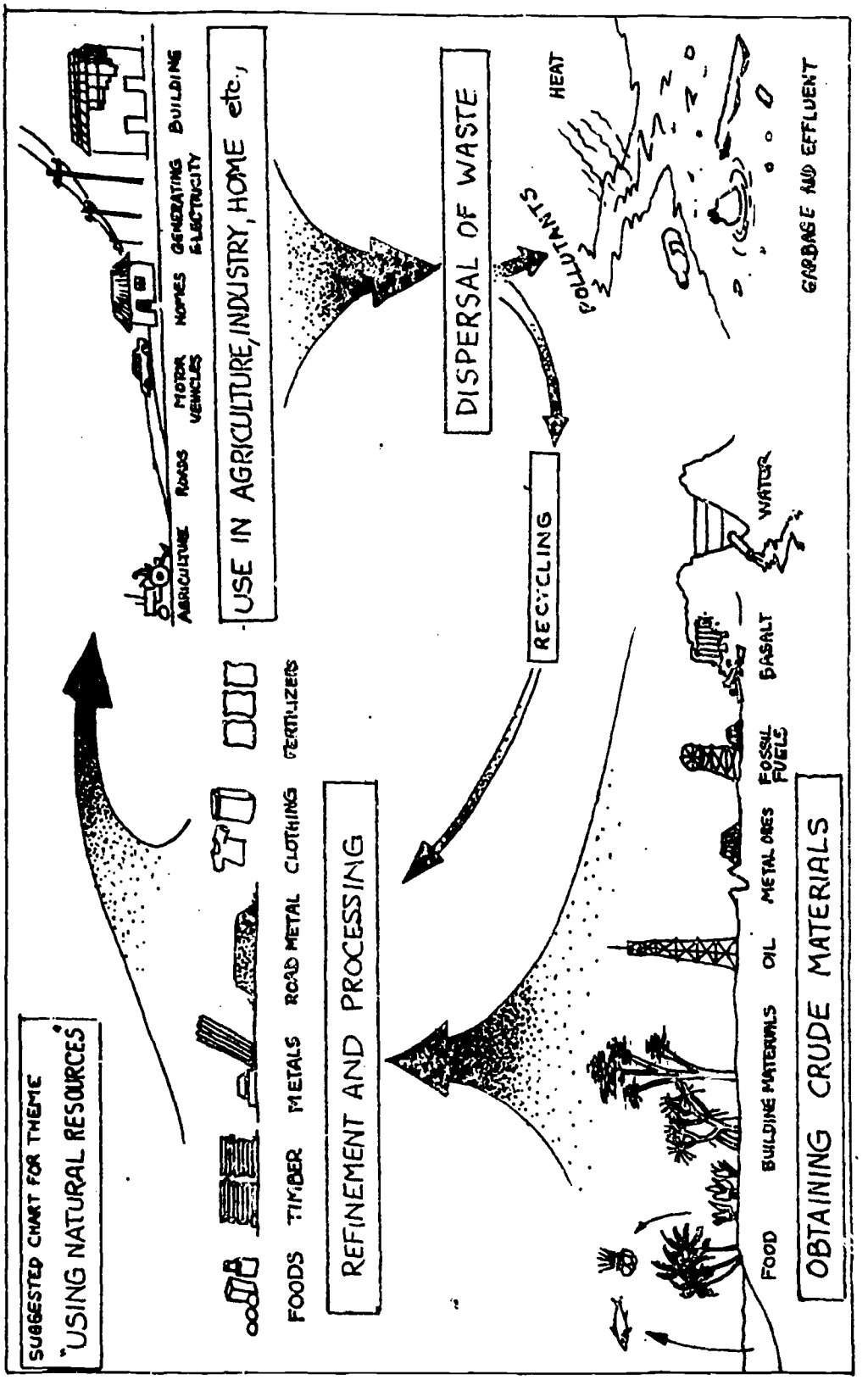
(iii) Evaluation meeting.

(iv) Second draft - the complete final manuscript is written.

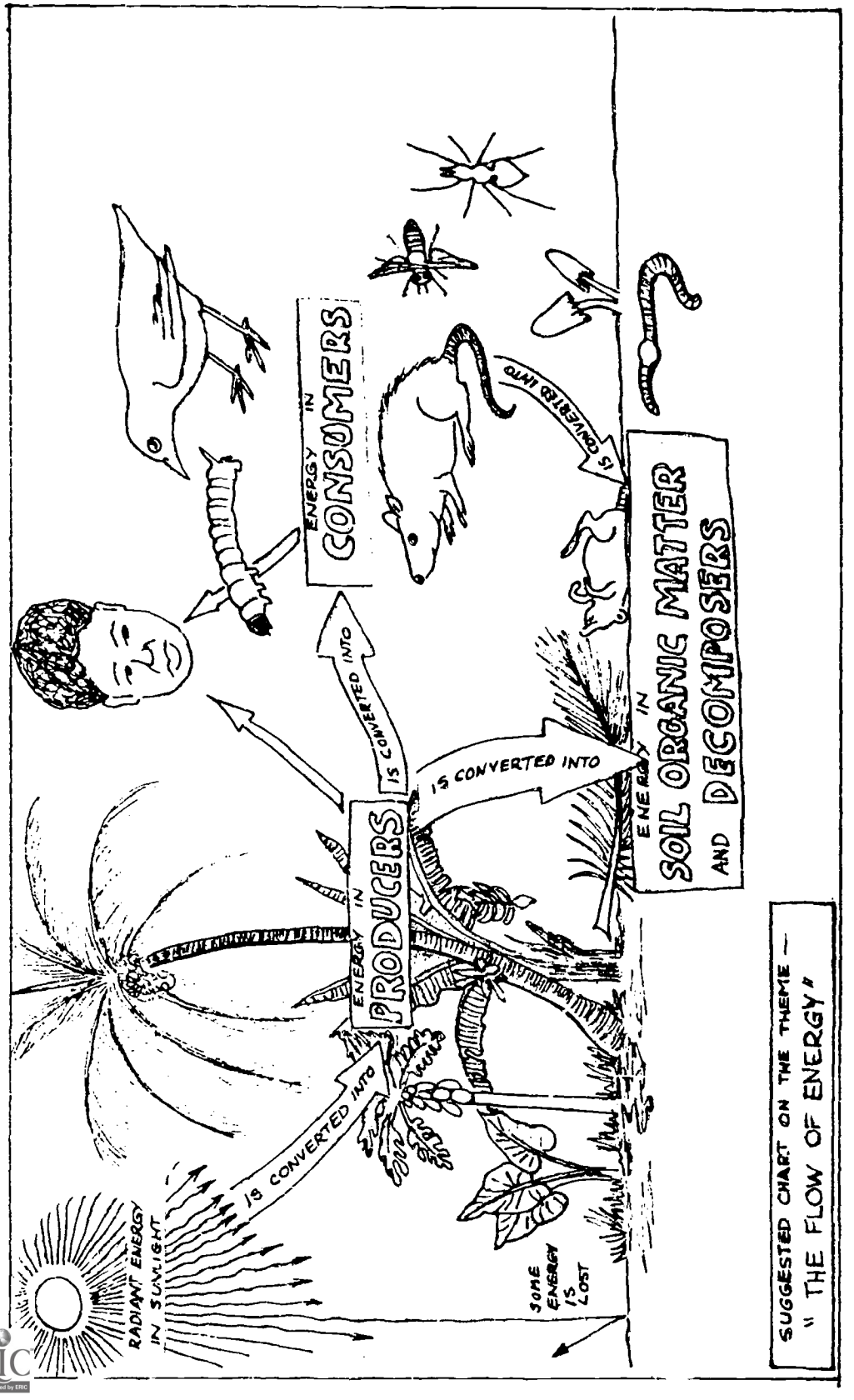
(v) Team meeting to consider second draft.

2) Samples of pictorial charts on unifying themes.

(a) "Using Natural Resources"



(b) "Flow of Energy in Nature"



3) Aims of science teaching (final draft).

A meeting of the Workshop participants was asked "Why teach science at junior secondary level in this region?". The discussion that followed produced a set of aims for science teaching. This paper is an attempt to state the feeling of the meeting.

Aims of education

Since science teaching forms part of the total education of the child, its aims are statements of what science teaching can contribute towards achieving the aims of education in general.

Science teaching can help to equip pupils for life in society. It can do so by giving the pupils information, by giving them experience and training in doing things and by assisting in the development of certain attitudes in the form of interests, concerns and preferences.

The main aims of science teaching

(a) To contribute to the pupils' development by giving practice in investigating and problem solving and by encouraging independent thinking.

(b) To increase the pupils' understanding of their present environment and their possible future environment.

(c) To develop the pupils' realisation of the extent to which man is dependent upon his natural environment, particularly his dependence upon the land and its products.

An expansion of the aims follows.

To contribute to the development of the pupil's mind

A major contribution science teaching can make to equipping a pupil for life is to develop the pupil's ability to think clearly and independently and to solve problems.

Pupils can be required to conduct their own investigations using techniques and procedures that lead to efficient inquiry. Attitudes which lead to flexibility, rationality and precision in thinking and action can be encouraged.

At the same time, pupils can learn that science and its methods have their limitations. Science is a developing body of

knowledge and its statements are not unquestionable statements of truth but change as new understanding develops. Its methods are efficient and can be applied to solving many kinds of problems but not all problems are accessible to scientific investigation.

To increase the pupils' understanding of their environment

The environment of the child includes everything that affects him, directly and indirectly: his body, people and other organisms, things and phenomena made by man, and things and phenomena that occur naturally.

The environment of which the pupil is currently aware is of most relevance and interest to him and, hence, is the immediate basis for teaching science understanding. New things and experiences can be introduced to expand his awareness and understanding.

It is impossible to predict the possible future environment of many pupils. However, certain trends are known and can be used to determine what new things and experiences should be introduced. On the present evidence available, a good case can be argued for concentrating on developing an understanding of the pupil's present environment.

The pupils should realise man's place in his environment and how his interactions with the environment affect both him and his environment. They should also be aware of the interactions among men, between groups and in society as a whole.

A significant part of the environment of most pupils is concerned with man-made things. The pupils should learn that knowledge in the fields of science and technology has increased greatly in recent years and they should realise the impact that advances in these fields are making on the island way of life.

Science teaching at junior secondary level is a preparation for further studies in science for pupils who wish to have careers in science and technology and related fields. However, this consideration should not greatly influence the choice of topics to be studied as an environment-based science course could provide a good foundation for later studies in science.

To develop the pupil's realisation of the extent to which man is dependent upon his natural environment

In the present state of economic development, people in the Pacific islands are almost entirely dependent on their natural environment, particularly on the products of agriculture, fishing and subsistence farming. Rapid change from this state is unlikely, according to current predictions.

On the smaller islands, the time is rapidly approaching when populations will become large enough to overtax the available food resources. Pupils of all islands must realise the need for maximum use of natural resources and conservation and protection of their current resources assets.

Although the main economic products of the region are of agricultural origin, significant contributions are made by mining, fishing and small manufacturing industries. Pupils should realise the extent of dependence on natural resources in the area.

4) Sample of a teaching unit (drafted by participants)

Second Draft of "ADAPTATIONS TO HABITAT"

Writers : Kay (New Hebrides), Parmanand (Fiji), Tuiloma (Fiji), Hubbard (Niue)

Edited by U.N.D.P. Curriculum Unit

C O N T E N T S

1. Introduction

Throughout time all organisms have been slowly undergoing changes in their structure and behaviour. Some of these features enable organisms to be more successful in a particular habitat where the change can be used. Birds have different beaks which make them more efficient at eating a particular type of food. These changes that give the animal some advantage in its habitat are called ADAPTATION.

If the conditions in the habitat change, the adaptation can become a disadvantage which may lead to the death of the animal. During a bad year, if there are few flowers, the nectar-eating bird may starve to death because its beak has become modified and enables it to drink nectar only. During normal conditions the beak is an advantage because it enables the bird to feed on a source of food which other birds do not use.

This unit deals with some selected types of adaptations and shows how the organisms are able to utilise their habitat more successfully.

The teacher should remind pupils of the examples of plant and animal adaptations that they studied in Forms 1 and 2, e.g. birds' beaks, dentition of carnivores and herbivores, etc.

The theme of adaptation runs through all of the Form 3 units of life science, and will lead into detailed studies of life-cycles in plants and animals which will be studied in Form 4.

Editor's Note:

While an adaptation may be described as advantageous, an organism has no conscious control over it; the best adapted individual will be the one which survives and has offspring. The concept of natural selection is too sophisticated to bring in here but the foundations are being laid in this lesson. Great care will be needed by the teacher to avoid slipping into Lamarckian ways by crediting organisms with the ability to adapt themselves (man is the exception here)- all other living organisms survive in a particular habitat because they are best suited to it. A change in the habitat structure can often lead to extinction of species.

2. General Objectives

To enable the pupils

(a) to become aware of the wide range of adaptations which occur in nature;

(b) to identify and classify adaptations in plants and animals found in local habitats;

(c) to become aware of how adaptations are unique to each organism and that this limits the organism to its own particular habitat;

(d) to recognise that different organisms may have adaptations which make it possible for them to do the same things, e.g. different plants have tendrils which make it possible for them to be climbers.

3. Apparatus

Item	Number per group	Comment
LESSON 2		
1. House flies	10	Live specimens
2. Hand lenses	1	
3. Sugar solution		35% Soln. 35g/100ml or sugar lumps
LESSON 3		
4. Geckos	2	Live
5. Snails	2	Live
6. Plastic bags	2	
7. Smooth paper	1 piece	
8. Rough wood	1 piece	
9. Cement	1 piece	
10. Painted wood	1 piece	
LESSON 4		
11. Choice chambers	1	
12. Jam jars	1	
13. Berlese Funnel	1	
14. Woodlice/Beetles	5 or more	Live
15. Worms	5	Live
LESSON 5		
16. Potted bean seedlings		) Teacher
17. Potted tomato seedlings		) demonstration
18. Potted maize seedlings		)

4. LESSON 1 SOME STRUCTURAL ADAPTATIONS IN PLANTS

Specific objectives

The student will learn

(a) to observe plants and understand that they have certain structures which may be useful to them;

(b) to compare the adaptations of different plants to discover that different plants may use different structures to do the same thing.

Instructions to teachers

It is essential that the pupils go outside to observe climbing plants growing in their natural environment. The pupils should record their observations in the form of a chart.

Plant name	Where it was growing	What it was growing on	What supported it	Sketch
Passion fruit	In waste-land	Dead bush	Tendrils	

During a discussion the pupils should be able to identify the various adaptations of plants. These are:

tendrils

twining stems

holdfasts

aerial roots

thorns.

The pupils should be able to infer from this that different plants use different structures for support.

5. LESSON 2 SOME STRUCTURAL ADAPTATIONS IN ANIMALS

Specific objectives

The pupils will learn

(a) to observe that there are different types of mouthparts found in different insects;

(b) to classify insects according to their mouthparts: e.g. biting, sucking and chewing;

(c) to discover that different types of mouthparts may be found in the different stages of the life-cycle of an insect.

Instructions to teachers

The teacher should direct the pupils to plants on which he knows that the following insects will be found:

aphids

caterpillars

butterflies (or moths)

bugs.

Before the pupils leave the classroom, they should draw up a table with the following headings:

Name of insect	How it feeds	What it feeds on

During a discussion at the end of the period the teacher should get the pupils to name insects they know of and the way in which they feed.

The pupils should make lists to classify the insects that they have named, according to their types of mouthparts (e.g. biting, sucking, piercing).

Suggested Questionnaire for Pupils' Guide

1. What type of mouthparts do caterpillars have?

   (Biting jaws)

2. What does a caterpillar feed on?

   (Leaves of flowering plants)

3. In which direction does the food enter the mouth?

   (Vertically/horizontally?)

4. What does a butterfly feed on?

   (Nectar)

5. Why do you think that a coiled feeding tube is better than a housefly's mouthparts for drinking nectar?

   (Because the fly's mouthparts are too short to reach the nectar in some flowers)

6. What advantage do you think that there is to the butterfly in having a different feeding mechanism to the caterpillar?

   (It does not compete with its offspring for the same food)

6. LESSON 3 PHYSIOLOGICAL ADAPTATIONS IN ANIMALS

Lesson objectives

(a) To observe colour change in geckos (or prawns).

(b) To compare the colour change of geckos using a controlled experiment.

Alternative experiment

(a) To compare the quantities of slime produced by a snail under different conditions.

(b) To infer the reason as to which surface causes a snail to produce most slime.

Instructions to teachers

(a) The pupils should place each gecko in a plastic bag.

(b) Both geckos should be placed on a piece of white paper near the light. When both geckos are the same colour one should be placed on a dark surface.

(c) The pupils should observe and record any colour changes that occur.

Alternative experiment

Use fresh water prawns in jam jars instead of geckos.

(d) The pupils should record the time taken for the colour change to occur in the gecko (prawn).

By discussion, the teacher should try to obtain the following ideas about colour changes:

(a) Does a gecko undergo a rapid colour change?

(b) What was the colour change?

(c) What conditions cause the change in colour of the gecko (prawn) - the colour of the background or the presence of light?

(d) What advantage does the gecko gain from changing its colour? Does it help it to catch its food?

(e) What are the enemies of geckos?

(f) Where are the enemies of geckos normally found?

(g) Is it likely that the gecko relies on its colour change to protect it from its enemies?

Alternative activity

Instructions to teachers

(a) The pupil should take a snail and allow it to walk in as straight a line as possible, over each of the surfaces (i.e. smooth, rough, wet) which should be placed flat on the desk.

(b) The snail should be made to repeat its walk with the surfaces in a vertical position.

The pupil should observe:

1) how much slime is deposited on each of the surfaces;

2) how fast the snail is able to move over each of the surfaces.

3) From their observations, the pupils should answer the following questions:

   (i) On which horizontal surface was most slime produced? Or was it the same on all surfaces?

   (ii) On which vertical surface was the most slime produced?

   (iii) Is the slime used either to stick the snail onto the surface so that it doesn't drop off? Or to make its passage smoother?

   (iv) Is it easier for the snail to walk on a wet or a dry surface?

   (v) What would happen to the soft foot of a snail if it moved over rough surfaces without producing slime?

   (vi) In what way does the slime help the snail?

7. LESSON 4 BEHAVIOURAL ADAPTATIONS IN ANIMALS

Specific objectives

(a) To observe behavioural adaptations in animals.

(b) To record data, in the form of a graph.

(c) To infer that animals have behavioural adaptations to make it possible for them to exist in their particular habitat.

The Berlese funnel experiment is a suggested alternative to the Choice Chamber. It can be constructed by using a 2lb tin. Cut the top and bottom off and make a cardboard funnel. The top of the funnel should be the same size as the tin. Stick the funnel to the bottom of the tin with tape. Put some sticks into the bottom of the funnel, and ¾ fill the funnel and line with leaf litter. The sticks should be arranged so that there is plenty of space between them, their only function being to prevent the litter falling through.

Below the funnel there should be a jam jar with detergent and water. Above the funnel there should be a source of light and heat. This could be an electric light bulb or a candle, placed on the soil.

The Choice Chamber

This can be made from a chalk-box or other box of about the same size. Half the bottom should be covered with white paper and the other half with black, or dark, paper.

It is best to choose animals which will not climb out of the box in this experiment.

Instructions to teachers

(a) The pupils should place 5 (or more) woodlice or beetles into the choice chamber and allow them time to move to whichever part of the chamber they choose. When most of the animals are at one side of the chamber, the pupils should record the numbers of individuals in each of the

parts. The woodlice should then be taken out and the chamber turned round on the bench so that it is facing a different direction. The woodlice should then be reintroduced and allowed to settle. Again the pupils should record the number of individuals in each half of the chamber.

This procedure should be repeated three more times with the chamber being turned each time.

The results should be recorded in the form of a bar graph.

(b) An earthworm should be placed into the jam jar and allowed to settle. The pupils should note the position in which the worm eventually comes to rest. The worm should be removed and the experiment repeated again.

The pupils should record their observations in their notebooks.

Alternative activity to Choice Chamber

The teacher should set up 5 Berlese funnels 24 hours before the period.

During the period the pupils should observe and record any animals that have drowned in the detergent solution.

By discussion, the teacher should elicit from these experiments that

(a) animals move away from light and heat;

(b) animals living in the soil, or under wood, or stones, lie so that the greatest amount of their body is in contact with a supporting surface which resembles their natural habitat.

The earthworm will lie against the side of the jar to attempt to copy its natural surroundings.

8. LESSON 5 SENSITIVITY IN PLANTS

Specific objectives

(a) To observe sensitivity in plants.

(b) To compare the sensitivity of different plants.

Instructions to Teachers

(a) The pupils go outside to find plants which are sensitive to light or touch. Possible examples of light-sensitive plants include:

Sunflower, oxalis, hibiscus, morning glory.

Examples of plants that are sensitive to touch include:

Mimosa, leaves of flamboyant seedlings, the tendrils of climbing plants.

(From their observations the pupils will list the plants that are light- or touch-sensitive.)

(b) The teacher should prepare potted seedlings of bean, maize, tomatoes, for a demonstration experiment to compare light sensitivity. The teacher will place the seedlings in a shaded position which has some sunlight. After 24 hours the pupils will record their observations by means of diagrams.

(c) During discussion, the teacher will elicit from the pupils that some plants respond to light in different ways,

e.g. flowers that close in the evening;

flowers that open in the early morning or evening but close at midday;

leaves that close in the evening.

Some plants respond to touch,

e.g. the closing of the leaves of the flamboyant seedling and mimosa leaves.

The teacher should be aware that the coiling of tendrils is stimulated by contact with a supporting surface.

9. Glossary

Adaptation	:	Special feature that enables an organism to survive in a particular environment.
Tendril	:	Part of a plant adapted to coiling around a support. It may be a modified stem as in passion fruit or a leaf as in a pea.
Twining stem	:	A stem that coils itself round a support.
Aerial root	:	The root of a plant formed on a stem and used mainly for climbing.
Holdfast	:	Organ by which certain plants attach themselves to rock or other surfaces.
Proboscis	:	The long mouthparts of an insect used for sucking up liquids.

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5) List of all topics upon which units were drafted:

(a) Energy and changes in matter.

(b) Life requires energy.

(c) Food, a source of energy.

(d) Ecological categories.

(e) Types of energy.

(f) Why they live there.

(g) Life depends on the physical world.

(h) Changing matter.

The drafts of these units are appended (Appendices B).

Second drafts in manuscript form have been completed at the end of the Workshop. In some cases the unit titles have been changed to reflect the outcome of evaluation meetings. These will be duplicated after the Workshop, and subsequently distributed to all participants. In edited form they will be evaluated for possible publication as U.N.D.P. Basic Science units.

6) List of all unifying themes considered.

(a) Flow of energy in the environment.

(b) Cycling of nutrients in the environment.

(c) Interdependence of life forms.

(d) Forms of energy.

(e) Use of earth resources.

(f) Changes in the environment.

6. Evaluation of the Workshop

1) What participants felt about the Workshop

(a) Many regarded the most interesting general session as the one on Integration, and some feel this could be discussed more.

(b) Most felt that the main purposes the Workshop achieved were for participants to learn about curriculum development procedures in Science, and to gain experience in writing science materials.

(c) Many found the Workshop valuable in giving better understanding of the aims of science teaching, sharing of common problems through discussion and gaining new ideas about science curriculum.

(d) Most found the available time too short in which to properly write new curriculum materials.

(e) Most wanted more preliminary information about a future workshop.

(f) Most regard January as the best time of year for workshops.

2) What consultants felt about the Workshop

(a) That the course directors should produce a single syllabus for Basic Science.

(b) That science groups or individuals be nominated in each country to provide certain information needed by the U.N.D.P. Unit such as statistical evidence on the situation in each country as far as is needed to support

statements and decisions made by the U.N.D.P. Unit.

(c) That it be made clear to Departments of Education that the work involved in a Workshop of this kind is too difficult for those without a good academic background (e.g. B.Sc.).

(d) That every effort be made to increase the supporting staff of the U.N.D.P. Unit in the realms of editorial work, evaluation, and teacher education.

(e) That the work of the U.N.D.P. Unit include a documentation of what is being done. This information to be available to consultants at future workshops.

(f) That the next workshop be to produce materials by preparing manuscripts ready for publication. The aims, philosophy, teaching approach, etc., should be circulated to all participants in advance so that they understand what sort of materials they are to write.

(g) That planning for the next workshop be started several months in advance, and that consultants be involved in the planning.

3) What the organisers felt about the Workshop

(a) That it was the most directly relevant and positively valuable venture of the U.N.D.P. Unit so far.

(b) That it was expensive but the money was well spent.

(c) That it must be followed by future workshops.

(d) That its value to the U.N.D.P. Unit was considerable, and that the efforts of such a workshop in stimulating our own work are an extremely valuable outcome.

(e) That the standard of participation by teachers was generally high, but that Directors of Education should in future send people with the academic background that will enable them to participate more meaningfully.

(f) That the contribution of consultants was most valuable. Future workshops should continue to employ consultants and engage them in pre-workshop planning.

APPENDIX A UNITED NATIONS SPECIAL FUND PROJECT

SECONDARY SCHOOL CURRICULUM DEVELOPMENT UNIT

THE UNIVERSITY OF THE SOUTH PACIFIC

BOX 1168, SUVA, FIJI.

CIRCULAR TO : All Basic Science Participants at the January U.N.D.P. Curriculum Workshop.

FROM : L. W. Andresen,
Science Workshop Organiser.

29th January, 1973.

Dear Science Participant,

Thank you for your valuable participation in our recent Curriculum Workshop. It was a great personal pleasure for me to work with you all. I believe you set a very high standard of collective endeavour in your Science Work Group. We all learned a great deal, the organisers and advisers included, and the written products of your work are something we can be very proud of.

I wish to do my utmost to encourage you all to continue writing along the lines we drew up together at the Workshop. Everything you write by way of a simple science teaching unit, whether it be Teachers' Handbook or Pupils' Worksheet or an Activity Guide, is a valuable exercise for you personally. In addition, it could be a most useful contribution to our Curriculum Unit's production of Science Teaching Materials.

If you do intend to try writing, I recommend that you firstly choose a simple topic that fits into one of the "Unifying Themes" we drew up and that Mr. Sutherland drew charts of. Secondly, plan your unit in first draft form and send it along for us to evaluate it. After that, go ahead with the final draft.

Enclosed with this circular you will find a number of documents.

They are:

1. Copies of all 7 final drafts of units written at the Workshop.
2. List of all Science Workshop documents issued (final list).
3. Aims of Science Education (final version).

Finally may I wish you all a happy and rewarding year ahead in your work as teachers, and express the sincere hope that we shall meet you all again, perhaps at a future workshop. In the meantime if there is anything we can do to help you on any aspect of science curriculum or teaching, do not hesitate to write to us.

Yours sincerely,

Lee Andresen,

Unesco Science Specialist

APPENDICES B

BASIC SCIENCE CURRICULUM WORK GROUPS

A. Second Draft of "HEAT, ITS EFFECTS AND MEASUREMENT"

Writers : Pugh (Gilberts), Nouata (Gilberts), Dass (Fiji)

Edited and in parts rewritten by U.N.D.P. Curriculum Unit

C O N T E N T S

1. Introduction

This book contains teaching notes on four activity-based lessons about heat, temperature, change of state and the particle model of matter.

It assumes that pupils have already met the three states of matter but that they have not studied them closely. It assumes pupils have used sources of heat and thought of heat as a type of energy, without trying to define it or measure it. It assumes pupils are familiar with measuring temperature with thermometers. It introduces pupils to the calorie (large or kilocalorie) which is in common use as the unit of heat for classifying fuels and foods. It does not attempt to teach the methods of traditional calorimetry, the method of mixtures, or methods of calculating heat using formulae. It does not introduce specific heat.

It tries to develop familiarity with the particle model of matter and with the idea of energy, both concepts that have been met in earlier years of Basic Science. Hence this unit builds on a wide variety of past activities and ideas, too many to list here.

It links closely with other Form 3 units on energy, and with those on chemical change where combustion is investigated.

It is expected that all activities will be suitable for use in a classroom, but a simple laboratory would be an advantage.

2. General Objectives

It is hoped that by studying this unit, pupils will

(a) develop a clearer concept of what heat is and understand the principles of the method used by scientists for measuring heat;

(b) be able to define heat operationally and distinguish between temperature and heat using operational definitions;

(c) improve their understanding of what happens in changes of state, and be able to apply a model to interpret change of state.

3. Equipment

	Item	Number per group	Comments
	LESSON 1		
1.	Small flame	1	Spirit or bunsen
2.	Test tubes, pyrex	2	
3.	Test tubes holder	1	
4.	Thermometer, ^{o}C	1	0^{o}-100^{o} or -10^{o}-110^{o}
5.	Cooking oil	5 - 10 ml	
	LESSON 2		
6.	Large metal vessel e.g. tin can	1 (Demo)	1 litre or larger
	Item 4 above	1 (Demo)	
7.	Tripod stand	1 (Demo)	
	Item 1 above	1 (Demo)	
8.	Matches or methylated spirits	1 box 1 ml	
	Item 4 above	1	
9.	Beaker	1	
	Item 7 above	1	
	LESSON 3		
	Item 9 above	1	Or tin can
	Item 7 above	1	
	Item 4 above	1	
10.	Candle wax or animal fat Items 2 and 3 above	Small quantity e.g. 5 - 10 ml	Other substitutes are possible
	LESSON 4		
11.	Wooden tray	1	Any size
12.	Marbles	Sufficient to half fill tray	Small marbles are best

4. LESSON 1 CATCHING HEAT FROM A FLAME

Objectives

Pupils will learn that

(a) the heat from a flame depends on the time for which it burns;

(b) in measuring heat, we pass it into a standard liquid (water) and agree upon a standard mass (1 Kilogram).

Activity 1 How much heat does a flame give?

A thermometer is held in a few centimetres of water in a test tube. It is heated by holding it in a fixed position over a small, shielded flame. Temperatures are read every minute. A graph of time against temperature is drawn.

Since the quantity of heat that passes from the flame to the water depends upon the time, we agree to "standardise" or fix the time for all future activities. We will keep time the same if we want the heat to be the same.

Activity 2 Which liquid shall we use?

A thermometer is held in a few centimetres of water in a test tube and heated by holding it above a shielded flame for a fixed time, e.g. 2 minutes. The final temperature is noted.

A similar mass of cooking oil is put in a clean tube, the same thermometer is inserted, and it is held in the same position over the same flame for the same time. The final temperature is noted, and is found to be greater than that of the water. Since different substances show different temperature rises when the same heat is put into them, we will agree to standardise the substance. We choose water as the STANDARD HEAT-MEASURING LIQUID. If we want to know how much heat we have in future, we will put the heat into some water and see what happens to the temperature.

Activity 3 What quantity of liquid is best?

A thermometer is held in a few centimetres of water in a tube, over a small shielded flame for 2 minutes and the final temperature noted.

This is repeated, using twice the volume (twice the mass) of water. The temperature reached is lower. Different masses of water show different temperature changes when we put the same heat into them. We must agree to standardise the mass of the water. If we want to show how much heat we have in future, we will put the heat into a STANDARD MASS of water - namely, 1 Kilogram.

5. LESSON 2 MEASURING HEAT FROM A FLAME

Objectives

Pupils will learn that

(a) a calorie/large calorie or kilocalorie of heat when passed into a kilogram of water will raise its temperature 1 degree centigrade;

(b) heat can be operationally defined using this method of measurement;

(c) the calorific (heat-producing) value of a fuel can be measured by passing its heat into water.

Activity 1 What is a calorie of heat? (Teacher demonstration)

A shielded flame is placed beneath a large (preferably metal) vessel containing 1 litre (1 Kilogram mass) of water. A thermometer is inserted into the water. This is a STANDARD MASS of STANDARD HEAT-MEASURING LIQUID. How much heat does the flame produce? The temperature is watched and the time taken for it to rise 1°C, then 2°C, 3°C, etc. For each rise of a degree Centigrade we say 1 Calorie of heat has been added. The Calorie is the STANDARD HEAT QUANTITY we measure.

Activity 2 How do we define heat? (Class discussion)

(1) How do we observe heat?
(We put it into a substance and it makes the temperature rise.)
Stage (1) of defining heat: "If heat is put into a substance it makes the temperature rise."

(2) How do we measure heat?
(We put it into a standard mass of standard substance - water - and measure the temperature rise.)
Stage (2) of defining heat: "If heat is put into 1 Kilogram of water and the temperature rises $1^{o}C$, we had 1 Calorie of heat."

Compare this with the operational definition of temperature. Is heat the same as temperature? How are they different? How are they related?

Activity 3 How is the heat value of a fuel measured?

Burn a known quantity of fuel (say 20 match sticks or 1 gram of meths.) below a beaker containing, say, 100 grams water and fitted with a thermometer. Note the temperature rise.

Suppose it rises $5^{o}C$. Does this mean we put 5 Calories of heat into the water? Did we use the standard mass of water? 100 grams is only $\frac{1}{10}$ of a kilogram of water. So the heat produced from the fuel was only $\frac{1}{10} \times 5$ Calories.

Fuels and foods have their calorific (heating) values measured by careful versions of these methods. So we say that a certain quantity of food produces so many Calories. This indicates the energy it gives our bodies when we digest it.

6. LESSON 3 CHANGE OF TEMPERATURE AND CHANGE OF STATE

Objectives

Pupils will learn that

(a) temperature does not change during change of state;

(b) heat is being either put into or taken out of things during change of state.

Activity 1 At what temperature does water boil?

Pupils work in groups. They boil some water in a beaker or tin can, and keep it boiling using a small flame. They hold a thermometer in the water while heating it and then while it boils they also hold the thermometer in the steam just above the water surface. They observe the changes of temperature that occur, and relate them to the change of state. When was the temperature rising? When did it stop rising? Why did it stop? Did we stop putting heat into the water?

Activity 2 At what temperature does wax melt?

Groups put some solid animal fat or candle wax into a test tube and insert a thermometer. The test tube is placed in the boiling water of Activity 1. They observe the changes of temperature that occur and relate them to the change of state.

After all the solid has melted, they remove the tube from the water and let it cool in the air. Again they observe the changes of temperature and relate them to the change of state. (Similar questions to those in Activity 1.)

Questions

1) How many changes of state have we examined? What were they? How did we cause each to happen?

2) At what temperature did water start to boil? How did the temperature change while it was boiling?

3) At what temperature did wax (or fat) start to melt? How did the temperature change while it was melting?

4) At what temperature did wax (or fat) start to solidify (freeze)? How did the temperature change while it was solidifying?

5) Can we make a statement about what happens to temperatures while these substances are changing their state?

6) Complete the statements:
To melt something we must put heat .... (in/out).
To solidify something we must put heat .... (in/out).
To boil something we must put heat .... (in/out).
Can you make up a similar statement about condensing something?

7. LESSON 4 A MODEL TO EXPLAIN CHANGE OF STATE

Objectives

Pupils will learn that

(a) a model of fixed stationary particles helps us interpret solid behaviour;

(b) a model of moveable particles helps us interpret liquid behaviour;

(c) a model of rapidly moving particles in continuous motion helps us interpret gas behaviour.

We saw that during change of state temperature remained constant, though heat was being added or removed.

Today we will try to explain why this happens.

Activity 1 What is a model of solids and liquids?

Take a shallow square box and place some marbles in it, on a table. One end of the box is raised a little from the table.

What do you observe?

What are the marbles doing?

(Answers: 1) There are some marbles in the box.
2) The marbles are stationary.
3) The marbles have arranged in a certain way.)

These marbles are a picture of what a solid substance may be like if we could see its particles.

Now shake the box gently and observe.

What happens to the arrangement of the marbles? (The arrangement is disturbed or broken.)

Why did the arrangement get broken? (Because the marbles moved.)

Why did the marbles move? (Because we had shaken the box.)

In shaking the box we gave the marbles a certain amount of energy which made them move.

The particle explanation/interpretation of change of state:
In solid state the particles are arranged in a definite pattern. When heat is applied to it the particles gain energy (heat) which makes the particles move and the arrangement is broken. When the arrangement is broken, the particles start to move around freely and we say that liquid state has been obtained.

Heat applied to the solid at the change of state is used to break the arrangement of particles and not to increase the temperature of the particles. This is why at change of state the temperature remains constant.

Activity 2 How does the model explain gases?

Shake the box vigorously,

What did you see happen to some of the marbles? (Some flew out of the box.)

Why did they fly out of the box? (Because they were shaken vigorously.)

Vigorous shaking gave the marbles enough energy to fly away from the box.

Particles in the liquid state if given enough energy will do the same. For example, water when boiled leaves the container (vaporises).

At the point when water changes to steam, heat is used to give the particles energy to leave the container and is not used to increase the temperature of the particles.

Hence at the point of change of liquid to gas the temperature remains constant.

Repeat the procedures described above, letting pupils observe the model as it illustrates the changes solid ⟶ liquid ⟶ gas
and the reverse changes gas ⟶ liquid ⟶ solid.

Emphasise that it is NOT possible to ever see these particles or prove that they exist or behave like this. This model is merely a good way of explaining the changes of state that we observe. It is a PICTURE we use - not necessarily the same as the real thing.

8. References

1) Inquiry into Physical Science - Measuring Heat.
2) Nuffield Chemistry II - Warming and Boiling Liquids.
3) Energy Sources (S.C.I.S.) - Mixing Warm and Cold Water.
4) Nuffield Combined Science I - Heating Water and Cooking Oil.

5) Interaction of Matter and Energy - Motion Generates Heat.
6) Physics Handbook - Changes of State.
7) Nuffield Physics II - Melting and Boiling.
8) Curriculum Development Unit Bulletin No.19 (N.Z.) - Latent Heat.
9) C.S.E Chemistry - Observing Particle Motion.

3. Glossary

Temperature	What a thermometer measures
Degrees Centigrade	Units of temperature
Standardise	To have an agreed amount
Calorie (large calorie or Kilocalorie)	A practical unit of heat measurement
Operational definition	One that tells how we observe and measure a thing
Calorific value (heat value)	The quantity of heat a known amount of fuel or food produces when burnt or digested
Model	A mechanical thing or a mental picture used for explaining or interpreting things we discover in nature
Energy	We say that motion, sun's rays, heat and sound are types of energy.
Particle	A small piece of matter, perhaps the pieces from which matter is made

B. Second Draft of "THE SPEED AND ENERGY OF CHEMICAL CHANGE"

Writers : Buist (Cook Is.) and Hubbard (Niue)

Edited by U.N.D.P. Curriculum Unit

C O N T E N T S

1. Introduction

This unit contains five activity-based lessons designed to make the pupils become aware of the energy relationships in chemical changes and of the different speeds of chemical changes.

The pupils should be encouraged to apply their observations to everyday activities and to relate them to energy in life processes.

The unit contains core activities with extension work for more able pupils where time and facilities permit.

The unit must be linked with all other energy units in life and physical sciences.

2. General Objectives

Pupils will learn to

(a) observe and compare different forms of energy involved in chemical changes;

(b) classify chemical changes according to whether they are self-sustaining or non-self-sustaining;

(c) observe the speeds at which a variety of chemical changes occur.

(d) apply the particle model to chemical changes so that the different speeds can be explained;

(e) apply this information on chemical changes to everyday experiences.

3. Outline of Suggested Teaching Procedure

(a) The total time suggested for the unit is 5 double periods or 10 single periods.

(b) The class should be split into conveniently-sized groups according to the equipment and facilities available but each group should preferably not exceed four pupils.

(c) When using the Particle Model to explain the observed speeds of chemical change it must be made very clear to the pupils that it is a model. It is one useful method of explaining what is happening.

(d) Some extension activities have been included for use with higher ability pupils and where additional facilities and chemicals are available.

4. Equipment

Item	Number per group	Comments
LESSON 1		
1. Burner	1	Spirit or gas
2. Beaker	1	250ml
3. Candle	1	A small piece
4. Matches	1 box	
5. Paper	A small piece	
6. Tin lid	1	7-10cm diameter with hollow in it
7. Tripod or stand	1	To hold tin lid
8. Wood	Small splinter	
9. Liquid samples of kerosene, cooking oils, methylated spirits	A few drops of each	The teacher could distribute these from a bottle
10. Copper sulphate	50ml	Teacher needs a stock bottle
11. Nails, iron or galvanised	1	
12. Magnesium ribbon	2cm strip	
13. Ammonium dichromate	A few grams	For teacher demonstration
LESSON 2 Items 1, 2 and 4 above		
14. Test tubes	2	Boiling tubes (large test tubes)
15. Cork and delivery tube	1	
16. Carbon rods	2	Centre terminals of old dry cells
17. Copper wire (insulated)	2	40cm long
18. Limewater	20ml	
19. Copper carbonate	A few grams	
20. Copper sulphate solution	200ml	Same solution as 10

	LESSON 3 Items 1, 4, 6 above (Extensions 6, 9 and 11)		
21.	Mosquito coil	1	Or incense
22.	Steel wool (Extensions)	One pad	
23.	Cotton wool	Small piece	
24.	Turpentine	10ml	
25.	Dilute hydrochloric acid	40ml	
26.	Iron filings	½g	
27.	Zinc	Small piece	
	LESSON 4 Items 4, 13, 25 above		
28.	Test tube rack	1	
29.	Test tubes	5	
30.	Ink	1 bottle	Teacher demonstration
31.	Magnesium ribbon	10cm long	
	LESSON 5		
32.	Beaker	2	250ml, one with hot water, the other with cold water
33.	Dilute hydrochloric acid	2 test tubes	One hot, one cold
34.	Magnesium ribbon	3cm long	

Notes on equipment

Solutions:

Dilute hydrochloric acid - 2 litres of this should be available. Wash with water if spilt on skin or the benches. Prepared by adding 300ml of concentrated acid to ¾ of the container full of water.

Copper sulphate solution - 1 litre. Made by dissolving 250g of crystals in water.

Solids:

Magnesium ribbon - is used in Lessons 1, 4 and 5. Care must be taken when this is ignited. No one should look directly at the flame because damage to the eye can result. If ignited it must NO be held in the hands or come in contact with skin or clothing.

Other equipment:

A class set of corks fitted with a glass or polythene delivery tube should be prepared.

5. LESSON 1 CHEMICAL CHANGES : DO THEY GIVE OUT ENERGY?

Objectives:

Pupils will learn

(a) that heat energy is needed to make things start burning;

(b) that different things ignite at different temperatures;

(c) that during a chemical change chemical potential energy can be converted to other forms of energy such as heat, light and sound;

(d) to apply this information to the use of fuels.

Activities

(a) Each group can light a candle with a match and identify the types of energy produced as sound, heat and light.

(b) Using the candle the pupils can ignite a piece of paper and a thin strip of wood and observe again the types of energy produced. They should also discover that the wood needs to be held in the flame longer than the paper before it ignites.

(c) Each group takes a tin lid which has indentations made previously with a hammer and a nail around the outside. They place in these hollows small samples of kerosene, methylated spirits, cooking oils, magnesium ribbon and a match head. Heat the tin lid over a burner placed in the centre of it. Observe the order in which these substances ignite.
(We intend to describe an alternative way of performing this - Editor)

(d) Each group can add a strip of magnesium ribbon (1cm in length) to ¼ test tube of dilute hydrochloric acid. By feeling the test tube the pupils should identify the energy given off as heat.

Extension

(e)* Add a sample of any of the following: iron (a clean nail) or magnesium or zinc (a galvanised nail) to half a test tube of copper sulphate solution and again feel the test tube to identify the type of energy given off as heat.

(f)* The teacher can ignite a small pile of ammonium dichromate on a tin lid with a match and feel the under-side of the lid when the change has finished. Heat and light energy can be identified.

Applications

(a) Liquid fuels such as petrol, kerosene, methylated spirits, white spirits, etc., all ignite at different temperatures, but when they burn all convert chemical potential energy to heat and light.

(b) A match contains the element phosphorus and ignites at a low temperature. The heat produced by the friction of the head of the match on the side of the box will give enough heat for this. Paper or dry leaves will ignite at a higher temperature, and the wood used on a fire at an even higher temperature.

(c) In an explosion the energy is given out all at once.

(d) Respiration in all living things is a chemical change. The chemical potential energy stored in sugar (glucose) is converted into energy which is needed for all life processes.

6. LESSON 2 CHEMICAL CHANGES : HOW DO WE KEEP THEM GOING?

Objectives

To enable the pupils to

(a) observe that heat and/or electrical energy are needed for some chemical changes to occur and keep going;

(b) classify chemical changes into those which are self-sustaining and non-self-sustaining;

(c) infer that photosynthesis is a chemical change which is not self-sustaining;

(d) apply the information to the manufacture of coral lime, cooking and other local examples.

Activities

Core

(a) Pupils will heat copper carbonate powder in a test tube connected to a delivery tube leading into a test tube containing lime water, which is supported by a beaker.

Teacher should discuss with the pupils how they know that a chemical change has occurred.

Pupils will remove the tube from the flame and observe and then reheat. The pupils should note that the bubbling ceases when the heat is removed and starts again on reheating.

(b) Electrolysis of copper sulphate

The pupils will set up the equipment as shown in the diagram (omitted here).

Pupils should record what they observe at each electrode in their workbooks after the following stages:

(i) Before connecting the wire to the positive terminal.

(ii) After connecting the wire.

(iii) After disconnecting the wire.

(iv) After reconnecting the wire.

Teacher should elicit from the children

(i) that electrical energy is produced in the dry cell;

(ii) that electrical energy causes a chemical change in the copper sulphate solution;

(iii) that this chemical change will only occur when there is electrical energy available.

Discussion

During discussion the pupils will classify the reactions in Lessons 1 and 2 into those which are self-sustaining and non-self-sustaining.

Applications

(a) The relationship between photography and photosynthesis as chemical reactions which use light energy and are non-self-sustaining will be established using revision of Form 2 material.

(b) The production of coral lime as a chemical reaction requiring continuous strong heat will be discussed.

(c) The use of heat energy in cooking.

7. LESSON 3 CHEMICAL CHANGES : HOW FAST?

Objectives

(a) To observe that chemical changes can occur at different speeds.

(b) To compare the different speeds of oxidation reactions using iron.

(c) To apply the information to cooking, respiration and burning.

Activities

Core

(a) Burning as a chemical change that can occur at different speeds

(i) Each group of pupils will take 32 match sticks and remove the heads from all except two of them. The pupils will then pile 16 of the matches (including one with its head) loosely together and will bind the remaining 16 tightly together and tie with copper wire (again including one with its head).

Pupils will ignite the match with the head on in each pile and will record the time taken for the matches to become ashed.

(ii) Each group will take one mosquito coil and will light it. The pupils will observe the speed of burning before, during and after blowing the coil.

These two experiments should show that the speed of burning varies. The teacher will elicit from the class the fact that a chemical change has occurred during burning.

(b) A comparison of the speeds of oxidation of iron

Pupils will hold some finest grade steel wool over a spirit burner flame in some tongs and observe.

Pupils will then place a small amount of steel wool pieces on a dry tin lid and a similar amount of steel wool pieces on a damp filter paper on a tin lid.

The pupils will record their observations of each change. (This experiment could provide revision of Form 2 rusting experiments.)

Extension

(c)* Comparison of speeds of combustion. Each group will have 4 pieces of cotton wool which they will place on a large tin lid. The pupils will put a dropper full of methylated spirits, turpentine, kerosene and water on separate pieces and will ignite the cotton wool. The time taken to ash the cotton wool will be observed and recorded.

This experiment should show that different substances burn at different speeds.

(d)* Each group will have a rack of 4 test tubes containing 10ml dilute hydrochloric acid. To separate tubes they will place equal weights of magnesium ribbon, iron and zinc. The pupils will observe:

(i) the amount of bubbling;

(ii) the time taken for the metals to disappear.

This experiment should also confirm that different chemical changes occur at different speeds.

Application

During discussion the pupils will relate speed of chemical change to

(a) cooking (*boiling, oven compared with frying*);

(b) respiration (rapid during exercise, slower during rest).

8. LESSON 4 CHEMICAL CHANGES : CAN WE SPEED THEM UP?

Objectives

Pupils will learn

(a) how to change the number of active particles in a liquid i.e. to dilute a solution;

(b) that when we use greater concentrations a chemical change is speeded up;

(c) to apply the Particle Model to these chemical changes so that one explanation can be obtained of the observed speeds.

Activities

Each group takes 5 test tubes and half fills 3 of them with water. The fifth test tube is filled with dilute hydrochloric acid. The pupils will then dilute this acid further by

(a) tipping half of its contents into the second tube half full of water and replacing the original tube in the rack, labelling it No.1;

(b) tipping half of the contents of the second tube into the third tube half full of water and replacing the second tube in the rack, labelling it No.2;

(c) carrying on this process until there are four test tubes each with successively less acid particles in them.

(We intend to suggest an alternative way of doing this - Editor)

Discuss with the pupils that the number of acid particles must have been halved in each dilution.

Give each group a strip of magnesium ribbon 10cm long, get them to divide it into four equal pieces. Each group will place one piece of magnesium into each of the four test tubes and observe how fast they disappear.

Observation should lead the pupils to conclude that the magnesium dissolves faster in the test tubes containing more acid particles. The Particle Model may be used to explain that there are more particles of acid to collide with the magnesium, so that the chemical change is speeded up.

Applications

To the dyeing of materials. A dilute solution will give a lighter colour than a more concentrated solution if the materials to be dyed are left in for the same length of time.

The teacher could demonstrate this by diluting ink and placing strips of blotting paper in the solutions for a few minutes, removing them and comparing colours.

9. LESSON 5 CHEMICAL CHANGES : ANOTHER WAY OF SPEEDING THEM UP

Objectives

Pupils will learn

(a) that an increase in temperature will increase the speed of a chemical change;

(b) to apply the particle theory to this change in an attempt to explain the observed increase.

Activities

(a) Each group takes a beaker of hot water and a beaker of cold water and places 2cm of magnesium ribbon which has been scraped with a knife in each beaker. The beakers are set aside and after some time they should observe that there are more bubbles on the magnesium in the hot water than in the cold water. They conclude that the chemical change is going faster in the hot water.

(b) Each group is given 2 test tubes half full of dilute hydrochloric acid. (The teacher has heated one of these tubes plus acid in a beaker of hot water.) 2cm strips of magnesium ribbon are added to each test tube and again the conclusion should be that the change occurs faster in the warm acid.

The teacher then discusses the way that particles when heated will move faster, so that there should be more collisions in the hot acid or hot water. This will mean that the speed of chemical change is increased.

Applications

(a) The speed at which things dissolve is increased by using hot solutions.

(b) Foods cook faster when they are heated because there will be a faster speed of chemical change.

(c) Warm-blooded animals (mammals and birds) have faster life processes than cold-blooded animals because their chemical changes are happening at higher temperatures.

Extension

For more able pupils word equations could be used for some of these chemical changes,

e.g.

Magnesium	&	Hydrochloric Acid	makes	Magnesium Chloride	&	Hydrogen
(solid)		(solution)		(solution)		(gas)

10. Audio-Visuals

Use charts in Years 1 and 2 for revision:

Chart L.23	Chemical change Different kinds of matter
Chart L.19	Matter and energy Chemical changes - living things Particle Model of matter.

11. References

A.S.E.P. 'A Model for Matter'
C.S.E. Chemistry, pp.44-46
Curriculum Development Unit Bulletin No.33/N.Z.
Probing the Natural World/I and II

12. Glossary

Chemical potential energy	Energy stored in chemicals
To dilute	To make weaker
Galvanised	Coated with zinc
To ignite	To set something on fire
To sustain	To keep going

C. Second Draft of "SPECIAL WAYS OF LIVING"

Writers : Singh (Fiji), Karan (Fiji), Lefale (Western Samoa)

Edited and partly rewritten by U.N.D.P. Curriculum Unit

CONTENTS

1. Introduction

Most living things are free-living. They live alone in their natural habitats. But many other organisms use another living thing with which they live. For example, the remora fish needs to have a shark to carry it about and provide it with food and a place to live. Dog ticks need to have dogs or other animals to provide them with food and a place to live.

There are three main kinds of these associations between living things. These are parasitism, symbiosis and commensalism. In all these associations, living things have developed special adaptations in structure, physiology or behaviour to enable them to carry on their special ways of living.

The purpose of this unit is to give pupils first-hand experience of some of these special ways of living and the adaptations seen in some organisms. It is hoped that by reading, observing and discussion, pupils will come to know more about

- a plant ectoparasite (e.g. cuscuta)
- an animal ectoparasite (e.g. dog tick, headlouse)
- an animal endoparasite (e.g. stomach worm)
- an epiphyte (e.g. orchid on tree)
- an example of symbiosis (e.g. nodules on legumes).

The unit will rely heavily on reading and preparation by the teacher.

It is hoped that in studying more on the topics, teachers will relate the topics to community hygiene. Teachers should feel quite free to substitute local examples for those suggested in this unit.

2. General Objectives

By studying some selected associations between living organisms organisms, it is hoped that pupils will

(a) become aware that organisms which have specialised modes of life have developed certain structural, physiological and/or behavioural adaptations to fit them for this life;

(b) develop a better understanding of community hygiene.

3. Equipment

Item	Number per group	Comments
LESSON 1 1. Plant parasite specimen on its host	1 (Demo)	
LESSON 2 2. Hand lens 3. Ectoparasite specimens	1 As many as possible	x 5 See lesson notes
LESSON 3 4. Endoparasite specimens	As many as possible	See lesson notes
LESSON 4 5. Epiphyte specimens 6. Seashore animal specimens	Numerous Numerous	See lesson notes See lesson notes
LESSON 5 7. Microscope 8. Glass slide 9. Methylene blue	1 (Demo) 1 (Demo) 1 drop (Demo)	See lesson notes

4. LESSON 1 A PLANT PARASITE (e.g. cuscuta or dodder)

(Note: This lesson can only be taught if the teacher can find an example of a plant parasite such as dodder or cuscuta. Cuscuta is easily obtainable in Fiji.)

Aims

To show the special adaptations of a parasite plant and compare its structure with that of a free-living plant.

Content

Pupils should study dodder, either in situ (if it is available near the school) or the teacher could bring into the classroom part of host plant with the parasite attached to it. The main things for the teacher to point out are

(a) the specialised haustoria or "suckers" which enable the parasite to obtain its food from the host;

(b) the small amount of foliage (or no foliage at all) because it is not needed;

(c) the large number of seeds produced;

(d) the effect of the parasite on the host plant. (In some cases a parasite will eventually kill its host plant.)

Instead of telling pupils all this information, the teacher may be able to use questions to elicit some of the answers from children, i.e. such questions as

"Why does the parasite need a haustorium?"
"Why do you think there are no (or few) leaves on the parasite?"

The teacher must also explain carefully the meaning of the words "parasite" and "host". He must also show that the parasite benefits from the association at the expense of the host.

(If the teacher could locate some plant parasites growing near the school, an activity sheet for the students could involve them in obtaining first-hand information about plant parasites - Editor)

5. LESSON 2 LIVING ON OTHER ORGANISMS

Aims

By studying an animal ectoparasite students should be able to describe and explain the adaptations to this mode of life.

Content

Choose a common animal ectoparasite, e.g. louse, dog flea, tick, etc. Provide class with specimens. Pupils to observe specimens and discuss

(a) adaptation for anchorage (feet, body shape, size);

(b) adaptation for feeding (mouthparts, etc.);

(c) adaptation for reproduction (only the main features of life cycle);

(d) very briefly - prevention and control of the parasite;

(e) Teacher explains the meaning of the word 'parasite' and the meaning of ecto (outside).

6. LESSON 3 LIVING INSIDE OTHER ORGANISMS

Aims

Pupils to be able to describe and explain the adaptations of internal parasites to their peculiar environment.

Content

Some internal parasites can be studied - hookworm, tapeworm, ascaris, filaria worm, etc. These parasites may be available from the local health centre, or charts may be used. Here the adaptations to be emphasised are mostly structural and physiological,
e.g. body shape, size, organs for attachment, loss of certain organs (or systems), great development of reproductive capacity, ability to live in environment with little oxygen.

The teacher should also to refer to prevention and control of the parasites in the community, e.g. breaking the life cycle by personal cleanliness and other aspects of hygiene.

7. LESSON 4 ANOTHER WAY OF LIVING

Aim

To have pupils understand that some forms of life use other living things as a place to live, but they do not take anything from the host or damage it. This form of association between two forms of life is called commensalism.

Content

The teacher must first find an example of an epiphyte growing on the trunk of a tree. Orchids and other epiphytes are very common and it is best if the teacher can find one of these growing near the school. If none are available close to the school, the teacher must remove one from a tree and bring it to school.

(a) Teacher shows the epiphyte to the class and asks questions about it:

"What is the name of this plant?"

"Where do we see it growing?"

"Can we put it on another tree and make it grow there near our house?"

"If we do this, why must we tie it to the new tree?"

(b) By discussion, teacher helps pupils to see that the epiphyte does no damage to the host, and the only reason it grows there is that it receives enough light and support in that position.

(c) Teacher questions class to find whether they know of any other examples of commensalism.

If not, the teacher may mention some others which may help children to think of further examples. Some examples are:

(i) the remora fish which attaches itself to a shark;

(ii) small red worms which hide in bunches of sea weed;

(iii) barnacles and other animals which sometimes attach themselves to crabs and large shells;

(iv) lichens which grow on the moist and shady side of coconuts and other trees.

(A homework activity sheet could be included here - Editor)

8. LESSON 5 SYMBIOSIS AS A WAY OF LIFE

Aim

The purpose of this lesson is to lead pupils to understand that organisms of different kinds sometimes live together and each one benefits the other in some way. This association is called symbiosis.

(Note: It is unfortunate that in some of the most important examples of symbiosis, one of the organisms is a microbe and therefore cannot be easily shown to the pupils. For example, no ruminant animals such as goats and cattle could live without the microbes which live in the first stomach or rumen. The microbes gain a food supply from the host, but they also digest the fibre for the host and so enable it to live on coarse fibrous foods. But without a microscope and other apparatus it is impossible to withdraw some stomach contents from a cow and show the microbes present.

However a very important example of symbiosis is the bacterium called Rhizobium which forms nodules on the roots of all legumes. Even if there is no microscope for the children to see the bacteria, at least they can see the nodules.)

Content

(a) Either collect different examples of legume nodules (e.g. on Mimosa, Glycine, Leucaena, etc.) or ask children to collect some specimens showing nodules and bring these to school.

(b) Teacher explains how the bacteria living inside the nodules are able to take nitrogen from the air in the soil and make it into a substance which can be absorbed by the legume plant.

(c) Explain that the legume benefits by receiving a supply of nitrogen from the bacteria, and the bacteria benefit by receiving some energy food made in the leaves of the legume.

(d) Explain that this kind of association or "living together" is called symbiosis.

Note: If you have a microscope it is very easy to show the nodule bacteria to pupils. Clean a nodule in water, dry it, and use your thumbnail to crush it onto a glass slide. Remove the solid bits and spread the juice out a little. Let it dry in air. Then "fix" it by passing the glass 3 times slowly through a flame (bacterial film upwards). Put a little stain or dye such as methylene blue on the film for 5 minutes. Wash off stain gently with water and examine under microscope.

9. Glossary

Association

Parasites

Ecto-

Endo-

Commensals

Symbiosis

Haustorium

Adaptation

Free-living

Leguminous plant

Host

Epiphyte

10. Bibliography

(a) New Zealand Biology Text Book 2

(b) Introduction to Parasitology - J. D. Watson

(c) Introduction to Parasitology - Smyth

(d) Introduction to Biology - Mackean

(e) Parasites of Man in Niugini - Ewer and Jeffrey

11. Audio-Visuals

Charts on life history of
- a plant parasite
- a common ectoparasite.

Slides or health charts on human endoparasites.

Drawing of haustorium on a branch.

Table listing differences between a parasite and a free-living plant.

D. Second Draft of "LIVING COMMUNITIES"

Writers : Tangaroa (Cook Is.), George (Cook Is.), Furnish (Tonga)

Edited and partly rewritten by U.N.D.P. Curriculum Unit

C O N T E N T S

1. Introduction

A community is a group or system of plants, animals and decomposers living together in a certain environment. The community is maintained because energy is coming into it and is being passed from plants to herbivores to carnivores. Because some energy is lost to the system where it is passed from one form of life to another, in any community the total weight (or biomass) of all the carnivores is less than the total weight of the herbivores and this is less than the total weight of plants. Children must understand a community before they can understand what is meant by an ecosystem.

2. General Objectives

The chief objectives of this unit are to lead children to an understanding of

(a) the structure of a community;

(b) the dependence of a community on a supply of energy coming into it;

(c) that in a community there are more producers than herbivores and more herbivores than carnivores. This is sometimes called the Pyramid of Numbers.

3. Equipment

Item	Number per group	Comments
LESSON 1		
1. Hand net	1	For collecting insects
2. Knife	1	For cutting grass
3. Bottles	Several	For keeping small animals

LESSON 2		
4. Spirit burner	1	
5. Matches	1 box	
6. Coconut oil	2ml	Or substitute edible oil
LESSON 3		
Items 4 and 5. as above	1 each	
7. Small coin	1	
8. Soap	Small piece	
Item 6 above	2ml	
LESSON 4		
9. All living material gathered during Lesson 1		

4. LESSON 1 WHAT IS A COMMUNITY?

Objective

To lead children to discover that a community usually includes green plants (or producers), herbivorous animals and carnivorous animals.

Content

(a) This lesson is best done by the children collecting all the living things in a small area of grassland or wooded area and sorting them into 3 groups:
- plants
- herbivorous animals like caterpillars
- carnivorous animals like spiders frogs, etc.

If children make a thorough search of a small area - say five yards by five yards - it should be possible to collect representatives of each group of organisms. The teacher should examine an area before he takes the children there, to make sure that the different forms of life are present.

(b) The teacher explains that such a group of plants and animals living together is called a community. He should also introduce the words "producer", "herbivore" and "carnivore" and explain what they mean.

If the children cut the grass from the area they examine and collect the animal life in bottles, this material can be kept and used in later lessons.

5. LESSON 2 WHAT KEEPS COMMUNITIES ALIVE?

Objectives

To help the children to understand

(a) that communities are able to exist because the organisms provide provide food for one another;

(b) that food contains energy;

(c) that in a community food is passed from one group of organisms to another.

Content

(a) By questioning help children to realise that herbivores can live only by eating plants.

- "What keeps a cow alive?"
- "What do caterpillars eat?"
- "Who knows what fish feed on?"

(b) Set alight a little vegetable oil. Ask questions to bring out the fact that the oil gives out heat and light energy. Where does this energy come from? Try to get children to say that the oil (a food) contains energy.

(c) Burn a little dried grass. Try to get children to tell you that the grass also contains energy.

(d) Teacher then explains that herbivores are able to live because they obtain energy from the plant food they eat.

(e) Teacher then asks children to name some common carnivores. These should be written on the board. Make sure that the list contains some small carnivores like spiders, hornets, frogs, centipedes and insect-eating birds, as well as large carnivores like owls, hawks, sharks, lizards and snakes.

(f) Further questioning should lead to the response that carnivores are able to live because the herbivores they eat supply them with energy.

(g) The teacher should then go back to the plants and ask the question "Where do plants get their energy from?" Children should be able to reply that plants receive energy from the sun.

(h) Children should then write down a simple statement such as
"Communities are able to live because plants turn solar energy into food. The energy in plant food is then passed to herbivores and then onto carnivores".

6. LESSON 3 THE LOSS OF ENERGY

Objective

To have children understand that when energy passes from one organism to another, some of the energy is lost in the system.

Content

(a) Heat a small coin by holding it for a moment in a flame, using tweezers. Then put it on a small cake of soap. After a few minutes, have children feel that the coin is no longer warm. Ask the question "Where has the heat energy gone?" Answer: "It is lost in the air and the surroundings."

(b) Again set alight a little oil. Ask the questions

- "What kinds of energy are coming from the oil?" (Heat and light.)
- "What is happening to this energy?" (It is being lost from this system.)

(c) Ask the question "Where do we get our energy from?" (From our food.)

(d) Have the children feel their skin.

- "Is your skin warm?"
- "Where has this heat energy come from?"
- "Some of the energy in our food helps us to run and dance and use our muscles; but can you tell me what happens to some of the energy in our food?"

The answer required is that some of it is turned into heat energy and finally is lost from our bodies into our surroundings.

(e) It may then be possible, by questioning and discussion, to help children to realise that some of the energy in a fly is lost when it is eaten by a spider; source of the energy in a seed is lost when it is eaten by a bird; and so on.

Looking more closely at the example of a spider eating a fly, follow some of the interactions in the system. The spider spins its web (energy used) and the fly is trapped. The spider kills the prey (using energy for movement), sinks its fangs into its prey and injects digestive juices. The digested contents are then sucked up by the spider and the chemical substances from the digested organs of the fly are taken into the digestive system where they are absorbed and become part of the spider's system. The chemical substances of the exoskeleton are not digested (energy "lost") and so are discarded.

We can see that there are two main areas of energy loss and use - firstly in the digestible material and secondly in the energy needed to get the food digested.

7. LESSON 4 THE PYRAMID OF NUMBERS

Objective

To help children to discover

(a) that there is a Pyramid of Numbers in a community;

(b) that the reason for this situation is that energy is lost as it passes from one organism to another.

Content

This lesson should consist partly of pupil activity (counting or weighing the material gathered in the first lesson) and discussion guided by the teacher.

A good, carefully-prepared chart showing the Pyramid of Numbers is very useful.

8. Glossary

Community	Producer	Herbivore
Carnivore	Solar Energy	Pyramid of Numbers

9. Audio-Visuals

Chart on Pyramid of Numbers.

E. Second Draft of "LIFE DEPENDS ON THE PHYSICAL WORLD"

Writers : Latu (Tonga) and Rainibogi (Fiji)

Edited and partly rewritten by U.N.D.P. Curriculum Unit

C O N T E N T S

1. Introduction

All organisms are affected in various ways by the physical world about them. For example, they are affected in various ways by light, heat, water, the atmosphere and the nutrients contained in the soil.

The purpose of this unit is to lead children to understand how some of these physical factors affect plants and animals. An important part of the physical environment are the various nutrient atoms that are needed by living things, and this unit leads to a discussion of the important nitrogen and oxygen-carbon cycles.

2. General Objectives

As a result of studying the interrelationships between living organisms and the physical world it is hoped that the pupils will

(a) become aware that energy in its various forms affects the everyday activities of living organisms;

(b) realise the dependence of life on certain chemical elements and how these "cycle" between living organisms and the environment;

(c) appreciate that man needs to be careful how he uses his environment to avoid wasting or losing his natural resources.

3. Equipment

Item	Number per group	Comments
LESSON 1		
1. Large cans	3	For growing plants
2. Sand	1 bucket	Sufficient to fill cans
3. Soil rich in humus	1 bucket	
4. Cabbage seeds	10	Other small seeds may be used
5. Clay	1 bucket	
LESSON 2		
6. Cobalt chloride paper	3	Small strips in a dessicator
7. Plugs of cotton wool	3	
8. Test tubes	3	
9. Simple beam balance	(See Form 2, Unit M, page 30)	
LESSON 3		
10. Graph paper	2 sheets/ student	Cm scale
LESSON 4		
Partly completed nitrogen cycle chart		
LESSON 5		
Partly completed carbon and oxygen cycle chart		
LESSON 6		
Nil		

4. LESSON 1 DO PLANTS NEED NUTRIENTS FROM THE SOIL?

Pupils grow plants to show the need for soil nutrients and the presence of humus in the soil.

Outline of suggested teaching procedure

A single period will be sufficient for pupil activity in this lesson but material and equipment must be ready beforehand.

Groups of students grow chinese cabbage seeds both in sand and in soil rich with humus. The sand is washed thoroughly with tank water; 5 seeds are sown in each can. Beer cans are used to hold both sand and soil samples. Water the seeds twice a week.

Pupils observe growth over the next month or so.

Pupils draw the plants as they appear after a month.

Teacher ask pupils to name some of the plant nutrients present in the soil.

Notes for teacher

(a) The main plant nutrients in the soil are nitrogen, phosphorus and potassium. Other elements such as copper, zinc, iron and manganese are needed only in fairly small amounts and are called trace elements.

(b) The presence of humus in the soil helps to hold plant nutrients (not easily washed away by water).

Editor's note : One of the objectives of science teaching as listed by members of the Science Group was ". . . encouraging independent thinking, investigating and problem solving". This lesson lends itself very readily to

(a) some quick recapitulation about what was found out by students in Forms 1 and 2 about sandy clay soils, the best soils - loams - being a mixture of both of these with humus.

(b) Students could devise the experiment and perhaps a comparison of sand, clay, sand and clay (50/50), and sand/clay/humus soils could be made.

(c) Such "applied" revisionary experimentation would also emphasise basic agricultural practices.

(d) Be careful to set up all tins with approximately the same amount of soil and when it is watered, make sure that the same volume is added to each (preferably about 20ml 2 or 3 times a week).

(e) Students will be able to make "predictions" about what may occur and subsequently they will be able to see if they were right.

5. LESSON 2 HOW DOES HEAT AFFECT LIFE?

Outline of suggested teaching procedure

This lesson is intended to take up a single period. It is suggested that this lesson should be taken on a sunny day.

These questions can form the basis for revising the work the pupils have so far known in relation to this topic. Some suggested answers for the teacher are bracketed after each question.

1) What are some of the plant needs? (Water)

2) Where does a plant get its water from? (Soil)

3) How does the water get to the leaves? (Tubes, xylem)

4) What does the plant use the water for? (Make food, photosynthesis)

5) Does the plant use all its water from the soil? (No)

6) What does the plant do to the excess water? (Gives off)

7) What do we call the process by which a plant loses water? (Transpiration)

8) Which plant will have a greater rate of transpiration, a plant growing in the open sun or a plant growing in the shade? (We'll find out)

9) Has moving air (wind) got anything to do with the loss of water in plants? (We'll find out)

Pupils, working in groups, take their test tubes, plugs of cotton wool and the hand-out into an area of shrubs. They select a plant with leaves that will fit easily into the test tubes and then try to pick two different places - shady side/sunny side. Each group will leave the third test tube empty as a control. They observe the three test tubes for a period over 5 - 10 minutes. Pupils can then work on the hand-out.

Hand-out No..... Group..... Date.....

Question	Answer
1) Do all leaves give off water?	
2) Do different plants give a different answer?	
3) In what situation, sun or shade, is much water given off?	
4) Why?	
5) Can we measure the amounts of water collected in the test tubes? If so, how?	
6) Is the liquid in test tubes really water? Prove.	
7) What do you find in the third test tube?	

Note for teacher

Within minutes or even seconds fine mists of water could be visible condensing on the side of the test tubes. But in order to get a worthwhile result, you will need to leave the tubes undisturbed for several hours. It might be a good idea then to take this lesson in the morning. This can be done later on in the day. To find out whether the liquid is water or not, pupils can dip the piece of cobalt chloride paper into the liquid inside the test tube. Cobalt chloride paper is blue, but when it gets in touch with water, it turns pink. This is to be explained and tested before the class goes out for the activity. Pupils should be able to show that most leaves give off water but the amount varies according to the position of the leaves in relation to the sun from which comes radiant heat.

Teacher's demonstration

"Does moving air increase or decrease the rate of plants' transpiration?"

A potted plant could be balanced on a simple balance beam by gravel.

This experiment can be set up and left in the classroom for a few days. If the day is windy, the experiment can be set up near a

window. Pupils are asked to mark the position of the pointers at the start of the experiment. Later they can do their recording after every hour for, say, a day, as to the position of the pointer (one from each group can do this). The same process can be made on a calm day for the same period of time. They can compare their recording and note any difference. Use a long sasa as the pointer to give greater readings.

Notes for teacher

(a) Make sure that you cover the pot and soil surface with the plastic bag to prevent any loss of weight by evaporation from the soil or pot surface.

(b) Having a growing plant has an advantage in that the experiment can be conducted over a long period.

(c) The disadvantage is that only small plants can be tested and small losses of water may not be detected (depending on the sensitivity of the balance).

(d) The above experiment will show that on a windy day the pointer will move down more while the opposite result is seen when the day is calm. Let pupils give you this result. A slight loss of water in the plant will be indicated by the movement of the pointer.

(e) Air movement increases evaporation rate by moving the water particles away from the stomata. Name situations, e.g. sunny day/windy day when clothes hung on the clothes-line get dried quickly.

Questions to wonder about

(a) Why would facts on transpiration rates be vital to those concerned with irrigation projects?

(b) What happens to the water once it has been transpired?

Answers (for the teacher)

(a) Comparative transpiration rates would give some indication of water volumes required to be supplied by irrigation.

(b) Water enters the water cycle - evaporation - cloud formation - precipitation - movement through soil - osmosis - ascent through xylem cells - use in photosynthesis or evaporation again. A chart will show well. Ref. Form 1.

Note: Another lesson "EFFECT OF HEAT ON ANIMALS" has yet to be written.

6. LESSON 3 WHAT EFFECT HAS LIGHT ON LIFE?

From previous studies pupils already know

(a) that plants need light in the making of food on the leaves (photosynthesis);

(b) that plants need different amounts of light when young (seedlings) than when mature;

(c) that not all plants need the same amount of sunlight;

(d) that the main source of light energy is the sun.

Outline of suggested teaching procedure

A single lesson will suffice.

Pupils will visit a tree-covered area nearby and work individually. They observe the pattern of growth of plants - some big, some small - some growing out in the open sun, some in the shade. They name known plants (English/vernacular names). They compare the leaf-size, stem size, thickness of leaves/stem and colour. They make recording of their observations in their notebooks.

Pupils collect several specimens of a plant growing in shade and specimens of the same plant growing in the open. As far as possible they pick plants of about the same age.

They compare the area of, say, ten leaves in the sun with the area of the same number of shade leaves by tracing the outline onto the graph papers - one for sun leaves and one for shade leaves. Pupils then count the number of squares covered. Which ones have more surface area, sun leaves or shade leaves?

Using two more plants (sun/shade) from the specimens collected already, they count eleven leaves and then with a ruler they measure the length of the stem between the first and the eleventh leaf. They divide the distance by ten to get the average inter-node length for the two groups of plants. Is there a marked difference in inter-node length between the two groups of plants? Are all the results alike?

Note for teacher

A conclusion the pupils will reach would be leaves of shady plants grow bigger hence have a large surface area. Also the inter-nodes of the stem are much longer because plants tend to grow towards the light. The same species of plant growing in the open sunlight will have the opposite of the above result - smaller leaves and short stem. But how does a plant vary its growth pattern in this way? Growing plants have light sensitive substances called hormones. Hormones control many of the processes within the plant body. Some of these hormones are concerned with controlling the growth of cells and they determine the size to which a leaf or stem grows. The actively dividing cells at growing points of a plant (stem tips or leaf base) produce these hormones. A greater concentration of hormone causes enlargement and growth while minimum growth occurs when hormones are absent. These hormones are destroyed by strong sunlight and thus leaves grow bigger in the shade and the inter-nodes of the stem are much longer. Hormones can have the effect of preventing branching so the plant puts all its energy into growing upwards towards the sun.

Points to stimulate further discussion

(a) What happens if plants grow close to each other? Give reason.

(b) Do animals need light? If so, why?

Answers

(a) They grow tall and thin. Competing for light.

(b) Yes. (i) So that they can see.
(ii) Light helps in the formation of Vitamin D under the skin. (Ref. Health Science.)

7. LESSON 4 HOW DOES NITROGEN PASS BETWEEN ORGANISMS AND THEIR ENVIRONMENT?

Give each pupil a duplicated copy of the questions and a sheet of the half-finished chart of the Nitrogen Cycle.

First revise what they have previously learnt about nitrogen and the meaning of producers, consumers, legumes and root nodules from last year.

A big part of this lesson is stimulating the pupils by questioning to think for themselves.

Start with free nitrogen in the air and let each pupil complete his own chart from the questions on the duplicated sheet.

Draw a similar incomplete chart on the board and follow the pupils.

When they have completed their charts ask where these words could fit in the chart - producers, consumers, decomposers, nitrogen fixing bacteria.

A single period would be sufficient to cover this lesson.

These questions are to be duplicated and a copy is given to each pupil. The answers to the following questions will help you to complete the chart of the Nitrogen Cycle.

1) Where is the best place to start?

2) What part of the air is nitrogen?

3) Could plants and animals use this nitrogen? If so, how?

4) Does the nitrogen that enters the plant remain as free nitrogen or is it made to combine with other elements?

5) What would be a good name for bacteria that help plants to make use of nitrogen in the air?

6) Does the combined nitrogen enter all parts of the plant?

7) What happens to the nitrogen when these parts of the plant are eaten by animals or the plant dies?

8) Where does the nitrogen go when the dead bodies of plants and animals decompose?

9) What kind of organisms cause dead plant and animal material to decompose?

10) Would the faeces of these animals contain some of the nitrogen?

11) What might we call these organisms that cause plant and animal material to decompose?

Notes for teacher

(a) Root nodules of legumes are inhabited by many bacteria of different kinds. They change free nitrogen from the air into nitrates that plants can absorb and use as nutrients.

(b) Nitrates are used by plants for making proteins for the leaves, stems and fruits.

(c) The bacteria inhabiting root nodules are called nitrogen fixing bacteria.

(d) Bacteria that cause the breakdown or decomposition of dead plant and animal matter are present in the soil and are called decomposers.

(e) Nitrogen is continually entering the air by the action of decomposers and continually returning to the cycle through the action of nitrogen fixing bacteria.

8. LESSON 5 HOW DO CARBON AND OXYGEN PASS BETWEEN ORGANISMS AND THEIR ENVIRONMENT?

Pupils answer these questions from work covered last year. Thus construct on the board an incomplete chart of the carbon and oxygen cycle similar to the one used in Lesson 4.

1) What elements is carbon dioxide made of?

2) How much carbon dioxide is there in the air?

3) How much oxygen is there in the air?

4) Is there carbon in our food?

5) Do all parts of plants contain carbon?

6) From where do the carbon and oxygen come when we breathe out carbon dioxide?

Pupils answer the questions on the duplicated page and then complete the chart.

Questions are to be duplicated and sheets given to pupils.

Answer these questions and then complete the unfinished carbon and oxygen cycle you made.

1) Where does oxygen in the air come from?

2) Where do plants get carbon from?

3) In what form is carbon present in air?

4) What happens to the carbon in the dead bodies of plants and animals when they decompose?

5) What are other ways in which carbon in plant material may find its way back to the air?

6) Are there bacteria that play any part in this cycle? If so, where? What might they be called?

9. LESSON 6 WHAT CAN WE DO TO HELP THE SOIL TO CONSERVE PLANT NUTRIENTS?

The soil has great power to renew itself if we use it properly.

Select two cultivated areas, one of which has been used extensively for growing crops for food and the other a relatively new piece of ground.

A class trip to these two places should provide much information. The information supplied by pupils should be used for comparison.

Discuss with the class what they have seen and relate differences especially in plant growth in the two areas to possible levels of plant nutrients in the soil.

Get the pupils to find out the answers to the questions in the duplicated sheet. From their answers list on the board possible ways we can help the soil to keep sufficient plant nutrients in the soil.

Questions to be duplicated and sheets given to pupils. Questions on past history of both cultivated areas that pupils have seen. The answers should be obtained from the owners of the areas by the students.

1) What was the former state of the cultivated area? Was it virgin land?

2) If it was virgin land was the vegetation burnt to clear the site?

3) If it was not virgin land was the vegetation burnt or the plant material buried into the soil e.g. by ploughing?

4) What planting practices have been followed? Have similar crops been repeatedly grown in this same area? If so, for how long?

5) Are the kinds of crops grown mainly food crops?

6) Has crop rotation been practised?

7) Has the piece of land been allowed to fallow? If so, for how many years?

8) Have fertilisers been used?

Notes to teacher

(a) The point that the soil has great power to renew itself if it is used properly cannot be over-emphasised.

(b) Clearing of vegetation for planting destroys both beneficial micro-organisms and humus.

(c) Planting of one kind of crop repeatedly in the same area will cause one kind of plant nutrients to be used up. Crop rotation is therefore recommended.

(d) Heavy removal of plant nutrients by intensive growing of food crops should be avoided. This can be one way by which we can help to conserve plant nutrients in the soil.

(e) If sufficient land is available for cultivation fallowing should be practised.

(f) If sufficient land is unavailable then a way of helping the soil to keep sufficient plant nutrients is to apply sufficient fertilisers frequently.

10. Glossary

Hormones

Internodes

Decomposers

Nitrogen fixing bacteria

Nutrients

Transpiration

Irrigation

11. Bibliography

A. Sutherlan'. An Introduction to Tropical Agriculture

McKean: Introduction to Biology (Tropical Ed.)

Buckley et al.: Science Makes Sense Book 1

12. Audio-Visual Aids

Chart of water pathways in plants.

Chart of Water Cycle from Form 1 (Lesson 7).

Outline of Nitrogen Cycle (details to be filled in by class).

Outline of Carbon and Oxygen Cycle (details to be filled in by class).

F. Second Draft of "CHANGING MATTER"

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Edited by U.N.D.P. Curriculum Unit

C O N T E N T S

1. Introduction

This unit follows up the work of units "N" and "O" covered in Form 2 and other earlier units of the course.

The object of this unit is to introduce chemical changes in elements and compounds. We intend to achieve this by introducing the concepts of decomposition, combination, oxidation and reduction, in most of which heating is involved. To bring out these concepts, essential core activities have been given, However, the alternatives suggested could further complement the lessons.

By the end of the unit, the pupils should have learnt something about changing matter as distinct from changing state. They will have met some new substances and will have learnt to define and distinguish between elements and compounds. They will also have learnt to use word equations to represent chemical changes. They will be able to recognise with growing confidence when a chemical change is taking place.

2. General Objectives

(a) The pupils will observe reactions involving

(i) decomposition of compounds,

(ii) combination of elements,

(iii) oxidation,

(iv) reduction,

and be able to describe these and classify them as chemical changes.

(b) The pupils will be able to
to identify and construct an elementary definition of,
and
to use
the terms "element" and "compound".

They will be able to state the appearance, origins and uses of a limited number of examples of elements and compounds.

(c) The pupils will be able to represent chemical changes by using word equations wherever the reactants and products are easily identified.

3. Equipment

	Item	Number per group	Comments
	LESSON 1		
1.	1.5 volt cells	4 - demonstration	
2.	Burner	1	Bunsen or primus
3.	Carbon rod	1 - demo	
4.	Copper carbonate	1g	
5.	Copper wire	demo	For all connections
6.	Iron nail	1 - demo	
7.	Lead bromide	5g	See notes
8.	Lead nitrate	1g	See notes
9.	Paper clips	2	
10.	Tongs	1 pair	
11.	Tripod stand	1	
	LESSON 2		
	Items 2, 10, 11 above	1 each	
12.	Iron filings	1g	
13.	Magnesium ribbon	2cm	
14.	Steel wool	Small amount	See notes
15.	Sulphur powder	1g	
	LESSON 3		
	Oxygen generation materials	Demo	See notes
	Items 2, 10, 11 above	1 each	
	Item 13 above	2cm + 8cm demo	
16.	Red phosphorus	Small quantity	Or side of matchbox
17.	Trough or basin	1 demo	
18.	Test tube	1 demo	
	LESSON 4		
	Carbon dioxide generation materials	Demo	See notes
	Item 2 above	1	
19.	Blow pipe	1 demo	
20.	Charcoal block	1 demo	
21.	Matches	1 box	
22.	Lead oxide	$\frac{1}{2}$g	Yellow (litharge
	Items 10 and 13 above		

4. LESSON 1 DO ALL SUBSTANCES SPLIT APART?

Objective

The pupils will learn that the process of decomposition on some unstable substances is a chemical change involving splitting apart.

Time

2 periods (double period).

Introduction

The pupils have met physical changes and some chemical changes. Remind them about these, e.g.

(a) How did you separate the mixture salt water?

(b) How could you get the salt water back?

(c) In what way were the properties of the products similar to those of the original mixture?

(d) What did you see happen when you heated sugar?

(e) Was a new substance formed? How did you know? Could you get back the sugar from it? What sort of change did we call it?

(f) What happens to the food we eat as it passes through our bodies?

Emphasise the fact that when we were "splitting apart" mixtures no new substances were formed. The properties of the products resembled those of the original substance. We could always get the original substance by putting these together again. However, when we were splitting apart substances like sugar and wood new substances were formed with properties that are completely different from those of sugar or wood. We cannot get the original substance again by mixing the new substances together.

Development

The class in groups (no more than 5 in each group) collects various substances that can be found around the room. The substances should be small in size. (The samples can be collected in advance.) They take a small sample of each on a tin lid or in a test tube and heat over a flame. Pupils to observe carefully any changes. They group the substances as follows:

Substances that changed	Substances that did not appear to change
Paper	Chalk
Wood	Rock
Cloth	Nail
	Coins
	Shells
	Paper clips
	Glass pieces, etc.

Introduce some chemicals to further establish the splitting apart process, substances that show colour change when split apart, e.g. copper carbonate or lead nitrate.

Give each group about 1 gram of green copper carbonate powder and the same quantity of lead nitrate crystals on separate tin lids. They heat these (separately) and observe very carefully all the changes.

The splitting apart process in these activities is very clear because of obvious colour changes.

For teacher only

(a) Green copper carbonate powder, when heated, will give a colourless gas, carbon dioxide, and leave a black substance (residue) copper oxide.

(b) White lead nitrate crystals, when heated, will give brown fumes of nitrogen dioxide, colourless gas, oxygen and leave an orange/yellow substance (residue) lead oxide behind.

Children need not know these names.

(c) Do not heat lead nitrate in a test tube. It would be difficult to clean the test tube.

Discussion

Some substances split up on heating and others did not. The ones that did are called unstable substances. Some substances can be split apart by other means like passing electric current. All these substances that do split up are known as compounds. There is a term for this splitting up process. To "compose" means to form (e.g. composition in English means forming a passage or a story by uniting various sentences). To "decompose" means to split apart. So the term used is decomposition.

Do you think all substances should split apart? Can you suggest the name of any substance that does not split apart?

There are certain substances that cannot be split apart by all the methods known to scientists. These substances are termed elements. Some elements that exist as elements in nature are gold, carbon and sometimes sulphur. Most of the other elements like oxygen, nitrogen, iron and aluminium exist either in mixtures (air) or in compounds (bauxite).

Written exercise

1) Classify the substances that you collected and heated under the following headings:

   (a) Substances that changed.

   (b) Substances that did not appear to have changed.

2) (a) When we _____ copper carbonate, it turned from _____ to _____.

   (b) Draw a labelled diagram to show how you heated copper carbonate.

3) (a) What was the colour of lead nitrate?

   (b) What did you do to it to get it to change?

   (c) What was the colour of the gas evolved and what was the colour of the substance (residue) left over?

4) (a) Copy the following word equation:

Copper carbonate $\xrightarrow{\text{heat}}$ black solid and colourless gas.

(b) Complete the following word equation:

Lead nitrate $\xrightarrow{\text{heat}}$ yellow solid and _____ gas.

Optional activity

Demonstration lesson: Electrolyse molten lead bromide.

Procedure: Connect four 1.5 volt torch batteries in series.

Take 5 to 10 grams of lead bromide in a beaker or in an evaporating dish.

Connect an iron nail to the positive and a carbon rod to the negative terminal of the cells. Insert both into the lead bromide.

Gently heat the lead bromide to melt it and observe fumes of bromine (brown in colour) near the carbon rod. A globule of molten lead (grey) forms near the iron nail.

Caution

(a) Lead compounds are poisonous.

(b) Do not let bromine come in contact with your skin (poisonous).

(c) In case of an accident, wash the affected area with plenty of water.

Discussion

The compound, lead bromide, decomposes or splits apart to give the elements lead and bromine, when the electric current is passed through it in the molten state.

Word equation: Lead bromide $\xrightarrow[\text{current}]{\text{electric}}$ lead and bromine.

5. LESSON 2 HOW CAN WE BUILD COMPOUNDS FROM ELEMENTS?

Objectives

Pupils will learn that

(a) elements in general can combine chemically;

(b) how to chemically combine some particular elements to form compounds.

Time

2 periods.

Introduction

In each of the 3 activities, an element will combine with another element to form a compound.

First, see if pupils remember the concepts of the previous lesson. Ask them questions like:

1) Suggest a method for decomposition of a compound.

2) How can you know that the result of the decomposition of a compound is an element?

Activity 1

One student from each group mixes a pinch of sulphur and a pinch of iron filings on a tin lid. Then heat this gently over flame. Pupils observe the changes in appearance carefully.

Activity 2

One pupil from each group takes a small amount of steel wool. Hold it with a pair of tongs and carefully ignite it over a burner. Observe the changes in the steel wool.

Activity 3

Use the same procedure as in activity 2 with a very small piece of magnesium ribbon. (Caution: Read note below.)

For teacher only

(a) Iron filings and sulphur combine chemically on heating to form an iron-sulphur compound (iron sulphide or ferrous sulphide), which is black in colour.

(b) Steel wool, which is basically iron, combines chemically with the oxygen in the air to form an iron-oxygen compound (iron oxide - black). It ignites very quickly and care must be taken.

(c) Magnesium combines chemically with the oxygen in the air to to form magnesium oxide (white powder).

(d) It burns very brightly and can affect the sight. Pupils should not look at the flame directly.

(d) It is difficult to show at this stage that steel wool and magnesium ribbon combine with oxygen part of the air. (This will be shown in Lesson 3.) Also, the pupils may think that there were decomposition processes. Be prepared to do the demonstration suggested in the discussion to clear their doubts.

Discussion

In activity 1, we saw that two elements when mixed and heated, combined chemically to form a new substance (compound). In activities 2 and 3, steel wool and magnesium combine with some other elements from the air to form compounds. To show that these were not splitting apart (decomposition) processes, a beam balance can be used to show an increase in weight. This can be achieved by a demonstration where a bigger sample of steel wool or magnesium ribbon is burnt on tin lids, being weighed before and after burning.

Elements have been chemically combining to form compounds. We term this process chemical combination.

Exercise

Pupils complete in their record books:

1) (a) Black iron filings combined with _____ coloured sulphur form _____ coloured compound.

(b) Draw a labelled diagram to show how you heated the iron-sulphur mixture.

(c) Write a word equation to represent activity 1.

2) (a) What did you see happen to the steel wool when it was burnt?

(b) How do you know that a chemical combination has taken place?

3) (a) Describe in two or three sentences what you saw happen to the magnesium ribbon when it was brunt.

(b) How do you know that a compound was formed?

(c) What do you think magnesium combined with to form this compound?

6. LESSON 3 ADDING OXYGEN

Objective

Pupils will learn

(a) that compounds can be built by adding oxygen to some elements;

(b) names of some particular compounds (oxides) and methods of making them from their elements.

Remind the pupils that air is a mixture (Form 1 course).

Revise the last lesson by going over the exercise and lead into the the new activities from the last question (i.e. What do you think magnesium combined with to form this compound?).

Demonstration

(a) Take some water in a trough or basin, put about 5 to 8 cm piece of magnesium ribbon on a crucible or bottle top and place it over the water in the trough. Ignite the magnesium ribbon and quickly put a bell jar or a beaker over it. Magnesium continues burning. The water level in the bell jar rises to about a fifth to take the place of the gas used up. (Burning may have stopped before all the magnesium has been burnt out.)

(b) Pupils perform a similar activity in groups by inverting a jam jar or beaker over steel wool or red phosphorus burning on a tin lid in a dish of water. The red paper from match box sides is a source of red phosphorus.

(c) Demonstrate magnesium, steel wool and red phosphorus burning in a jar of pure oxygen.

(Insert here a standard method of preparing pure oxygen. Several jars full would be prepared before the lesson - Editor)

(d) Revise and repeat if necessary Lesson 28 of Form 1 Basic Science. Iron filings or steel wool rusts in a jar inverted over water.

Discussion

Pupils have observed that burning was more intense in pure oxygen than in air. Ask them why they think it was so. Since the result of burning these substances in air and oxygen is the same, the pupils should be able to conclude that it is the oxygen in the air

that combines with the elements when they are burnt. Pupils know already that about one fifth of the air is oxygen. The rise in water level by about a fifth indicates that water has now taken the place of oxygen.

Compounds in which elements combine with oxygen are oxygen compounds, e.g. magnesium-oxygen compound. These oxygen compounds are called oxides. So we have oxide of magnesium, oxide of phosphorus, etc.

This process of adding oxygen to form compounds is called oxidation.

Exercise

Ask the pupils to complete the following exercise in their activity record books:

1) (a) Describe in one sentence what you saw when phosphorus burnt in a jar of oxygen.

   (b) How was the burning of phosphorus in air different from burning of phosphorus in a jar of oxygen?

   (c) Write a word equation for burning of phosphorus in oxygen.

2) (a) How do you know that it was the oxygen from the air that combined with magnesium when it burnt?

   (b) Draw a diagram to show how you carried out this activity.

   (c) Write a word equation for the burning of magnesium in air or oxygen.

3) List the names of all the elements that you know, that will burn in air to form oxides.

7. LESSON 4 CAN WE REMOVE OXYGEN FROM CERTAIN COMPOUNDS (OXIDES)?

Objective

The pupils will learn

(a) that reduction is the reverse process of oxidation;

(b) some examples of how particular oxides can be reduced.

Introduction

We will show the pupils that when an element has combined chemically with oxygen, this oxygen can sometimes be removed by the process known as reduction. The oxygen in some of these compounds (oxides) is easy to remove whereas in others it is not.

Revise the previous lesson. Bring out the concept of oxidation. Ask the class to name some of the oxides they have come across during the last lesson or their Form 1 or 2 work. List these. Pupils suggest ways of removing the oxygen from each of the examples listed.

We will use two activities in which it is not very difficult to remove the oxygen.

Lesson development

Pupils' activity

Ask a pupil from each group to collect a very small amount of lead oxide powder, a match stick (fresh) and a box of matches (or a burner).

(a) One pupil in each group puts a small amount of lead oxide along the top upper side of the match stick. Holding it with a pair of tongs ignite with another lighted match (or burner).

(b) Pupils observe carefully what happens.

For teacher only

(a) If not satisfied with the result then use the block of charcoal (or piece of any burnt wood). Make a hollow in the upper side, put a small amount of lead oxide powder and blow flame on to it using the bunsen burner flame and a blow pipe.

(b) After the match stick has completely burnt the pupils should see small globules of lead metal on it (or inside the hollow of the charcoal block).

(c) Explain to the pupils the use of charcoal block as the substance that removes the oxygen from the red lead. Use a control experiment and burn lead oxide on a tin lid by itself.

Teacher demonstration

After briefly discussing the activity ask the pupils whether they think oxygen can be removed from the compound carbon dioxide. This can be achieved by burning magnesium ribbon in a jar of carbon dioxide.

(a) Prepare a jar of carbon dioxide before the lesson.

(b) Ignite a ribbon of magnesium (about 4cm) in tongs and lower it in the jar of carbon dioxide. Pupils observe carefully.

For teacher only

After burning magnesium ribbon in the jar of carbon dioxide the pupils should be able to see the formation of white ash magnesium oxide and a black substance carbon on the side of the jar.

Discussion

In the first activity we noticed that oxygen was removed from lead oxide.

Similarly in the second activity oxygen is removed from carbon dioxide gas.

This process of removing oxygen from compounds is known as reduction.

Exercise

1) (a) Describe in two or three sentences how oxygen was removed from lead oxide.

(b) Draw a labelled diagram to show how you carried out this activity.

(c) Write a word equation for the reduction of lead oxide.

2) (a) What two things did you see when magnesium ribbon burnt in the jar of carbon dioxide?

(i) .....

(ii) .....

(b) Write a word equation for this activity.

8. References

For teacher:

1) Nuffield Chemistry I & II.

2) Nuffield Combined Science I & II.

3) Common Core Science.

4) Curriculum Development Bulletin 33 (NZ).

5) Certificate Chemistry 1 & II by Care and Sellwood.

6) C.S.E. Chemistry.

7) Probing the Natural World II.

8) Nuffield Chemistry - Introduction and Guide.

For pupils:

1) Any elementary chemistry text.

2) Matter, Energy and Life, Book 2.

9. Glossary

Combination	Joining together
Combustion	Burning to give carbon dioxide and water
Decomposition	Splitting apart; breaking up
Electrolysis	Using electrical energy to split apart
Oxidation	Addition of oxygen to form a chemical compound
Reduction	Removal of oxygen from a chemical compound

APPENDIX C DOCUMENTS ISSUED

(FINAL LIST)

1. Curriculum Development in Science Years 1 - 4.
2.* Curriculum Workshop January 2-19, 1973. List of participants.
3. Target Population.
4. Basic Science for Forms 3 and 4: An Introduction to the Physical Sciences Component of the Course.
5. Basic Science Forms 1 - 4: Physical and Earth Science Components (2 sheets).
6. Basic Science for Forms 1 - 4: A Suggested Syllabus in Life Science.
7. A Strategy for Agricultural Education, McClymont.
8. A Science Course (based on McClymont's paper).
9. Basic Science Aims and Objectives.
10. Writing Criteria Derived from Course Objectives.
11. Sequence of Operations in Science Curriculum Development.
12. Operating Procedures.
13.* Manuscript Preparation and Correction.
14. What Ends to Seek.
15.* Notes for Writers at Form 1 Level,
16.* Tate Oral English - Word List.
17. Science Workshop Participants (List of Names).
18. Preparation of the First Draft.
19. What are Science Processes?
20. Writing Objectives.
21. Writing Objectives for ASEP Units.
22. Preparation of the Second Draft.
23. Life Sciences - Organisation of Units in Form 3.
24. Some Examples of Suggested Recorded Work.
25.* Questionnaire for Participants.
26. Suggested Pictorial Charts on Unifying Themes (6 sheets).
27. The Aims of Science Teaching (Final Draft).
28. Final Report.

(* Originated from outside the Science Work Groups)

PROGRAMME

CURRICULUM WORKSHOP, JAN.2 - 19, 1973

Tues.Jan. 2nd	10.30	Participants meet at School of Education University of the South Pacific
	10.30 - 11.00	Coffee
	11.00 - 11.30	Welcome addresses: Vice-Chancellor U.S.P. and others
	11.30 - 12.30	Conference details Introduction of course directors and advisers Registration of participants
	12.30	Lunch
	2.00 - 3.00	Curriculum Innovation. Dr. G. D. Bishop
	3.00 - 4.00	General Discussion - led by course directors in Mathematics, Social Science, Basic Science, English Language
Wed. Jan. 3rd	8.30 - 10.00	The Importance of English in Curriculum Development. Mr. D. McKeating
	10.00 - 10.30	Coffee
	10.30 - 12.30	Educational Media. Mr. B. Cahill/Mr. G. Singh
	12.30	Lunch
	2.00 - 4.30	Group Work Participants break up into four working groups - Maths, Basic Science, Social Science, English
Thur.Jan. 4th	8.30 - 10.00	Evaluation of Curricular Materials. Mr. Gurmeet Singh
	10.00 - 10.30	Coffee
	10.30 - 12.30	Integration of the Curriculum Some introductory remarks by: Mr. J. A. Sutherland, Armidale Teachers' College, (Agriculture/Biology) Australia. Mr. A. Dale, Director, Australian Science Education Programme Mr. J. Renner, Christchurch Teachers' College, (Social Science) New Zealand. Principal Examiner in U.E. Social Science.
	2.00 - 4.30	Group Work
	Evening	Films
Fri. Jan. 5th		Group Work
	6.00 - 7.00	Conference Reception in Bure at U.S.P.
Sat. Jan. 6th		Nukulau Launch Trip
Sun. Jan. 7th		Free

Details of the second and third weeks of the Workshop will be given out during the first week.

WEEK 2 - JANUARY 8 - 14

Mon. Jan. 8th	8.30 - 10.00	Group Work	
	10.00 - 10.30	Coffee	
	10.30 - 12.30	Group Work	
	12.30 - 2.00 pm	Lunch	
	2.00 - 4.30 pm	Group Work	Tea 3 - 3.15 pm.
Tue. Jan. 9th	8.30 - 10.00	Group Work	
	10.00 - 10.30	Coffee	
	10.30 - 12.30	Group Work	
	12.30 - 2.00 pm	Lunch	
	2.00 - 4.30 pm	Group Work	Tea 3 - 3.15 pm.
	5.00 - 6.00 pm	Tennis, Table Tennis	
Wed. Jan.10th	8.30 - 10.00	Group Work	
	10.00 - 10.30	Coffee	
	10.30 - 12.30	Group Work	
	12.30 - 2.00	Lunch	
	2.00 - 4.30 pm	Group Work	
	5.00 - 6.00 pm	GET TOGETHER U.S.P. Club Kava will be served.	
	7.30 - 9.00 pm	FILMS Media Room, School of Education	
Thur.Jan.11th	8.30 - 10.00	DEMONSTRATION OF EDUCATIONAL MEDIA RESOURCES by Armstrong & Springhall Ltd. At the same time SONY will video-tape the demonstration. Room E.101	
	10.00 - 10.30	Coffee	
	10.30 - 12.30	GROUP REPORTS. One person from each Group will report to the whole Workshop, outlining what the group has been doing and concentrating on: how far it has got; the group's plans for the remainder of the Workshop, etc. Room E.101 School of Education.	
	12.30 - 2.00 pm	Lunch	
	1.00 - 3.00 pm	Hunts' Travel will confirm your flight home arrangements. Remember to bring your ticket.	
	2.00 - 4.30 pm	Group Work	
	5.00 - 6.00 pm	Tennis, Table Tennis	
Fri. Jan.12th	8.30 - 10.00	Group Work	
	10.00 - 10.30	Coffee	
	10.30 - 12.30	Group Work	
	12.30 - 2.00 pm	Lunch	
	2.00 - 4.30 pm	Group Work	
	6.00 - ? ?	Barbecue by the Swimming Pool (Please bring your swimming costume!)	
Sat. Jan.13th	FREE FOR SHOPPING		

Sun. Jan.14th (1) A tour of the environs of Suva - by bus. The tour will also include a trip by river taxi to the delta of the Rewa River - surf bathing. This tour will last one whole day - so remember your packed lunch.
We have not worked out the exact cost of this tour. I hope to subsidise most of the cost as an 'official' 'field excursion' There may be a small cost for you to bear. Fuller details tomorrow.

(2) If sufficient numbers are interested, another glass-bottom launch trip to Nukulau.

Some activities for Week 3

Tue. Jan.16th Talk by Prof. R. Crocombe, Professor of Pacific Studies, University of the South Pacific, on: "Is Pacific Culture a Myth?"
7.30 pm. Room E.101 (Lecture Theatre)

Wed. Jan.17th FEAST - Pacific Style. Followed by Island Dancing.
6.30 pm. Dining Room (Band in attendance)

Thur.Jan.18th Another GET-TOGETHER - Kava.
5 - 7 pm. U.S.P. Club

Fri. Jan.19th (1) HOME NIGHT - as many of you as can be accommodated will be the guests of local citizens in their homes.

(2) Night Out.

Remember your early morning flights!

For those staying on we have much work and entertainment in store for you.

WEEK 3 - JANUARY 15 - 19

Mon. Jan.15th	8.30 - 10.00	Group Work
	10.00 - 10.30	Coffee
	10.30 - 12.30 pm	Group Work
	12.30 - 2.00 pm	Lunch
	1.30 - 2.00 pm	Mini Session - Room E.101 (Mr. J. Renner: Using Case Studies in the Classroom)
	2.00 - 4.30 pm	Group Work. Tea: 3 - 3.15 pm.
Tue. Jan.16th	8.30 - 10.00	Group Work
	10.00 - 10.30	Coffee
	10.30 - 12.30 pm	Group Work
	12.30 - 2.00 pm	Lunch
	1.30 - 2.00 pm	Mini Session - Room E.101 (Mr. J. Renner - Principal Examiner in Social Science, U.E.: "Examinations")
	2.00 - 4.30 pm	Group Work. Tea: 3 - 3.15 pm.
	7.30 pm	Prof. R. Crocombe, Professor of Pacific Studies "Is Pacific Culture a Myth?" Room E.101 (i.e. Lecture Theatre)
Wed. Jan.17th	Group Work	
	Preparation for Final Report to General Conference on Thursday. Group Resolutions.	
	1.30 - 2.00 pm	Mini Session (Evaluation)
	6.30 pm	FEAST - Pacific Style. Followed by Island Dancing. (Dining Room)
		Royal Fiji Police Band 8.30 - midnight.
Thur.Jan.18th	8.30 - 10.00	Group Work. Final Report.
	10.00 - 10.30	Coffee
	10.30 - 12.30	Final General Session Final Reports of Groups. Conference Resolutions.
	pm	Afternoon Free for shopping etc.
	5.00 - 7.00 pm	GET-TOGETHER. U.S.P. Club
Fri. Jan.19th	GROUP WORK	
	HOME NIGHT - please see details on notice-board.	

U.N.D.P. CURRICULUM WORKSHOP

QUESTIONNAIRE FOR PARTICIPANTS

A SUMMARY OF YOUR ANSWERS AND COMMENTS

Number of questionnaires processed : 69.

	YES	NO	NO ANSWER
1. Were the sessions involving speakers in the first week generally interesting?	42	6	21

Social Science and English found them more interesting than Science and Maths.

Absent or no answer

2. What was the subject of the talk you found most interesting?

Integration (large numbers).

Also mentioned: Evaluation.

3. Would you have liked more sessions involving speakers in the first week?	24	31	14

Social Science and English would have liked more sessions than Science, Maths.

4. Would you have liked other topics to be raised in these general sessions?	22	18	29

Social Science and English more interested in other topics.

Many absent in first week

5. If so, which ones?

Received mention: *Examinations*

Music

Agriculture

Classroom Evaluation

Educational Standards across the Region

	YES	NO	NO ANSWER
6. Would you have liked to hear other speakers (either local or overseas people)?	31	16	22

Social Science more interested than the other three groups.

7. If so, whom do you suggest as being able to contribute to such a workshop?

Many in favour of Education Department officials and Teachers' Training College people from other parts of the Region being present.

8. Were you given reasonably adequate opportunity to discuss and question points raised in general sessions

at the end of each session?	45	11	13
sometime during the Workshop?	45	8	16

Science group least satisfied with discussion time during Workshop.

9. Which main topics would you have liked to discuss more fully?

Items mentioned: *Aims of education and cultural conflicts arising from them.*
Integration.
What is happening in Education in other countries outside the Region.

Weeks 2 & 3 : WORKING SESSIONS

	YES	NO	NO ANSWER
10. Do you think that the working day was			
too long?	14	45	10
too short?	17	23	24
11. During the Workshop were you given enough time and opportunity to plan the following for your subject group?			
syllabi	33	24	12
topics to be taught	38	23	8
teaching approaches	33	28	8

Science least satisfied with time for syllabi and topics; Social Science least satisfied about teaching approaches.

12. Were you given sufficient time for preparing drafts and writing?	27	29	3

English group generally satisfied; other groups were not.

13. Did you feel that the relationships between people in your writing group were satisfactory for working and planning?	61	5	3

14. Were the following facilities, in general, satisfactory?			
rooms available for writing	48	20	1
Maths least satisfied.			
reference material	41	24	4
Soc. Sc. least satisfied.			
aids (charts, filmstrips, etc.)	30	16	23
English, Soc. Sc. and Maths not very satisfied.			
laboratory equipment	10	19	40
Majority did not answer.			

	YES	NO	NO ANSWER
15. Were you allowed adequate time for shopping and recreation?	54	8	7

16. Have you any other comments about the arrangements for working?

Large number mentioned:

having talks in the evenings, and the mornings available for writing.

Also mentioned:

longer library hours,

better room facilities for writing.

GENERAL

17. Did you understand the purpose of the Workshop before you arrived?	20	46	3

Soc. Sc. group understood the purpose least of the four groups.

18. Were you given adequate information about the purpose of the Workshop before you arrived?	12	52	5
19. Do you think you now perceive the real purpose of the Workshop?	66	2	1

20. Please state this purpose, briefly.

Most mentioned:

Planning and developing curricula and material production.

Writing training.

Learning curriculum development procedures.

Also mentioned:

Sharing ideas and information and experiences across the Region.

	YES	NO	NO ANSWER
21. From the point of view of this purpose, do you think the Workshop has been reasonably successful?	63	1	5
22. Has the Workshop been of value to you personally, e.g. by giving you new ideas or experiences?	69		

23. (Refers to 22) If so, in what way has it been most valuable?

Sharing ideas, gaining mutual understanding across the Region.

Skill in writing and curriculum planning.

24. (Refers to 22) If not, how have you been most disappointed?

A few mentioned:

Slow start, wasted time at the beginning.

25. What is your feeling about the length of the Workshop?

too short	39	14	16
too long	2	23	44

26. Why? ((Refers to 25)

Too short because not enough time to finish writing materials, and insufficient time for general planning.

27. Can you make any other suggestions for improving these workshops?

Most mentioned:

More preliminary information.

More time for writing.

Also mentioned:

Better facilities for materials production.

	YES	NO	NO ANSWER
28. What time of the year is most suitable for you to attend such a workshop? *Most mentioned: January or December through to January*			
29. Would you like to participate in such a workshop again?	62	..	7

30. Any other comments?

Most mentioned:

Gratitude for the Workshop.

Also mentioned:

Have workshops in other islands.

Let the Region have a workshop-type relationship with U.N.D.P. such as Fiji enjoys all the time.