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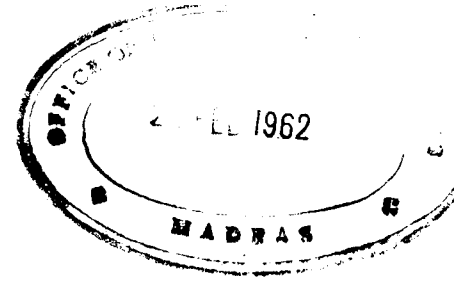
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THE SOUTH INDIAN TEACHER

Vol. XXXV

FEBRUARY 1962

No. 2

EDITORIAL

CONDITIONS OF TEACHING SCIENCE

We are living in an age of science and technology. Russia and the United States believe that their progress depends upon the advancement of Science. Industry can flourish and develop only when education in Science is given due prominence. Both Germany and Russia attach great importance to the study of science. There is a growing recognition in our country too, that neglect of science will hamper the growth of industries, both major and minor. Our Prime Minister Nehru has been repeating frequently that steps should be taken to provide all facilities for education in Science, as the country needs more and more scientists. If the countries in the West have advanced far, it is due to the great attention paid to the teaching of science both in the Secondary stage and in the college course.

The Madras State even as early as the first decade of this century took special steps not only to introduce science as a subject of study in the secondary education stage, but also to improve the teaching of Science. The study of Science subjects became elective. A good number of pupils took to Physics or Chemistry or Botany. The study of Elementary Science was not an examination subject, though a required subject, and hence both the teachers and pupils neglected it. To remedy this defect Elementary Science was made an examination subject; the syllabus included Physics, Chemistry and Natural Science. The aim was to give information about the discoveries made and their applications to daily life. But in practice scientific study and scientific approach were neglected, and the emphasis was more on the acquisition of dry facts than on stirring the curiosity. Even the revision of the syllabus in 1957 stresses more upon 'gathering facts' than upon kindling the curiosity of pupils to find out for themselves scientific truths. During the Second Five Year Plan period, improved facilities were provided for the teaching of science subjects in 40 schools. In the Third Five Year Plan provision

of 70.38 lakhs of rupees has been made for the improvement of teaching of science in another 40 schools. This touches only the fringe of the problem. At present there are nearly 1,500 secondary schools and nearly 90% of them have no reasonable provision for the teaching of Science. From a statistical enquiry made, though limited, by the S.I.T.U. Council of Educational Research, the following defects have been found : (i) There is no separate laboratory. (ii) There are no benches and no demonstration tables. (iii) There are no apparatuses for demonstration of experiments. (iv) Students have no opportunity to do practical work, (v) A good number of the teachers have no special training for teaching General Science and in a number of cases unqualified men teach science ; and (vi) Instead of teaching, coaching is resorted to.

To inculcate in the pupils scientific approach and to rouse their curiosity, ample opportunities must be given to them to go and work either in the workshop or laboratories, which means, both should be fully equipped. We are told that in all the advanced countries secondary schools are provided with well equipped laboratories and workshops with ample facilities for practical work of individual pupils.

In this age of science and technology we have to give serious consideration to giving our young boys and girls a strong foundation in Mathematics and Science particularly at the Secondary stage. We are planning our future as a nation towards industrialization. In this we have to face keen competition not only from the advanced industrialized countries but from many rapidly advancing countries. Our success in our plans based on industrial economy, nay, our very survival will depend upon an effective and dynamic programme of Mathematics and Science Education in our Schools and Colleges.

Perhaps it will be good if the South India Teachers' Union Council of Educational Research in co-operation with others interested in the subject like Teacher-Organizations, University, and Industrialists gives careful consideration to the problems involved and secure public support for a vigorous programme for improved Mathematics and Science Teaching.

AN ENQUIRY INTO THE CONDITIONS OF TEACHING SCIENCE IN SECONDARY SCHOOLS

INTRODUCTION

The place of science in the secondary school curriculum may be briefly reviewed thus :

In the 1911 scheme of the Secondary School Leaving Certificate Course, Elementary Science was one of the B-group subjects. Its study was compulsory but it was a non-examination subject. This scheme was introduced in 1909 and it was called 1911 scheme because the first public examination according to it was held in that year.

No definite syllabus in Elementary Science was prescribed by the Department of Education, but the Teachers' College, Saidapet, prepared 5 or 6 alternative syllabuses for use by schools with different emphasis.

Neglect of science in this scheme became so apparent that in 1929 it was made an examination subject and included in the A-group. A new syllabus applicable to all schools was introduced.

Again in 1937 the syllabus was revised so as to relate General Science to life. There was a certain emphasis on exploring the environment and harnessing the forces of nature. From 1909 to 1938 provision was made for the study of Physics, Chemistry and Biology as an elective subject under the 'C' group of the scheme of studies for the S.S.L.C. Till 1929, they were required to study two elective subjects but from 1929 to 1948 they had to study only one elective subject.

In 1948, from a realisation that too early specialisation was educationally unsound, the elective science was abolished, and the science syllabus for the last two years of the secondary school course was modified so as to include elements of Physics, Chemistry and Natural Science.

In 1958 there was a further revision of the syllabus so that the last two year work might be in accord with the syllabus in Elective Science of the Higher Secondary pattern.

This Report refers to 1958 scheme of General Science which is in vogue.

The aims as stated in the scheme are as follows :—

“The purpose of the syllabus in general science is to aid in developing a science programme which would help each pupil to search for cause and relationship, to form habits of accurate observation and accurate statement and to give each pupil an intelligent

understanding of the phenomena of nature and the inventions and discoveries of man and come to a better understanding of his environment and the utilisation of the forces of nature and the products of inventions and discoveries for better living. The course should gradually lead to a development of 'a scientific attitude' to all problems of life."

It will be agreed that these aims are well conceived. Enough experience with the working of the syllabus has been gained by all those interested in the development of a sound system of science education to raise the question, "To what extent have the aims been realised?"

It is a matter of common knowledge that college teachers have been complaining, more loudly than ever before, that students who pass out of secondary schools do not satisfy the requirements of entrance to the university in their knowledge of content. They further say that students have shown no sign of having been trained for practical work in the laboratory. Statesmen point out that a scientific attitude towards life and its problems has not been developed properly in the students. High school teachers readily agree that standards of attainment in science have steeply fallen in recent years.

In such circumstances, the S.I.T.U. Council of Educational Research thought that an enquiry into the conditions of teaching science might be made as the first step necessary for diagnosis, with a view to exploring possible ways of arresting falling standards. For this purpose a Science Committee was appointed (vide Appendix A). This Committee resolved upon studying the problem with special reference to the following heads:—

1. Accommodation.
2. Equipment.
3. Facilities for practical work by pupils.
4. Teaching personnel.

A questionnaire (vide Appendix B) was framed and issued to heads of secondary schools and members of the teaching faculty to elicit information. Sri Vincent Simon as the convener of the Committee was chiefly responsible for the preparation of the questionnaire.

Details relating to the nature and scope of the questions will be found mentioned later. But the main purpose of the questionnaire should be stated here.

It is well known that the teaching of science requires special facilities such as space for science instruction, adequate furniture, equipment, apparatus, chemicals, supply of water and electricity, books, charts, models, slides, films, filmstrips, etc.

These facilities are of paramount importance to the effective teaching of science. One of the main purposes of the enquiry is to survey the

facilities actually available and find out the needs of schools so that ways and means of ensuring necessary facilities may be found.

Another purpose, no less important, is to know exactly how near to or far away from modern trends in teaching science our teaching here is. Among the most important trends in science teaching which affect facilities and equipment are the following:—

- "1. **A movement away from** teacher demonstration **and toward** pupil experimentation and problem-solving.
2. **A trend away from** simple manipulations directed by detailed instructions and occupying a single class period **and toward** pupil-teacher planned experiments, the performances of which may require several days or weeks and for which apparatus must be left in position for the duration of the experiment.
3. **A trend away from** the requirement that all pupils in a science class perform the same experiments in the same period **and toward** the practice of using a variety of experiments and projects performed at the same time by individuals and small groups.
4. **Increased use** of science clubs, science fairs, and other supplementary activities to challenge and encourage the talented in science, and to provide opportunities for all interested students to perform experiments and carry on projects which cannot be done effectively during regular class time.
5. **A trend toward** flexibility in design and construction of science facilities to permit change in room size and in the location of work surfaces, storage spaces, and teaching aids.
6. **Increased use** of audio-visual aids by small groups of pupils or even by individuals engaged in special projects rather than by entire classes at the same time."

India today, is planning a technological and industrial programme of development. These programmes require technical personnel, trained in scientific method and with sound knowledge of science. Hence the importance of affording facilities for effective science teaching cannot be over-estimated.

A word is needed about the method adopted for the study of the problem. The Questionnaire method is the one most commonly in use. But when our study began it was felt that mere 'yes' or 'no' or figures as answers to certain questions required elucidation. It was further thought that if information by personal observation of practical work of pupils and discussion with practising teachers could be had, it would be helpful for the study. So Kumari V. S. Bhooma Devi, B.Sc., M.Ed., Research Assistant of the Council, was deputed for this purpose. In her early visits to schools she was assisted by Sri M. Vincent Simon, B.Sc., B.T., M.Ed., who had had the privilege of studying the conditions of

science teaching in Washington D.C. under the Teacher-Exchange programme. Twelve Boys Schools and Nine Girls Schools located in different areas of the City of Madras were visited. This report is based on information so gained and on a study of answers to the Questionnaire.

One hundred and seventy-one schools run by different agencies (Aided Mission, Aided Non-Mission, Municipal and Government) responded to the questionnaire. This works out to 21% of the total number of recognised schools to which the questionnaire was sent. The causes of lack of response from 79% of the schools which were addressed on the matter may be one or more of the following :—

- (i) Indifference born of scepticism about any enquiry of this kind,
- (ii) reluctance on the part of science teachers to give information not altogether favourable to the schools in which they serve,
- (iii) and fear of incurring the displeasure of managements in the event of reporting unfavourable conditions.

We had response from all the thirteen districts in the State of Madras. There is a fair proportion of schools in urban and rural areas and of schools for boys and girls. In every school the questionnaire was answered conjointly by the head of the institution and the members of the science teaching faculty.

For our study therefore we had evidence from 518 science teachers and heads of institutions numbering 171, scattered all over the State.

The sections in this report are so arranged as to facilitate easy linkage of thought.

SECTION I

THE SCOPE OF THE ENQUIRY

To begin with it must be clearly stated that this questionnaire does not concern itself with the content of science study at the secondary level (Standards VIII, IX and X). Nor does it concern itself with the methods of teaching science. Its primary aim is to evaluate the facilities offered for science teaching and find out the extent to which they meet the demands of the science syllabus in the reorganised scheme of secondary education, in terms of space, equipment, services, learning aids, teacher equipment and teaching load.

The order of questions may seem to lack proper sequence. For example, questions 5, 6, 10, 11, 12, 31, 47, 48 and 55 are all intimately related to one another, though they lie scattered. In this group will be found cross-check questions for securing authentic information on the prevailing conditions of pupils' laboratory work and teacher demonstration, with reference to experiments and practical work, and their adequacy or inadequacy in number and variety. Information is also sought on difficulties experienced in organising practical work. There are also

questions eliciting information on how the lower standards of the secondary schools are allowed to share laboratory facilities. Questions 15 to 21 contain lists of materials and aids regarded as minimum essentials for teaching Physics, Chemistry and Biology in the high school standards. They are designed to know how many schools possess the minimum essentials.

Some questions relate to behaviour patterns inculcated through laboratory work, and science fairs. The assistance of Extension Services for activity programmes in science, the work of Science Clubs, the interest of pupils in learning science and using their scientific knowledge in out-of-school hours and the factors that influence the promotion of scientific attitude in pupils are all included in this study. Opportunity is given for practising teachers to state their opinions on the syllabus and communicate their experiences in working it. It will thus be seen that the questionnaire is as comprehensive as possible for the study of physical conditions of teaching science in secondary schools. (Vide Appendix C for classification of questions under various heads.)

SECTION II

LABORATORY — SPACE — FITTINGS — FIXTURES

(a) Space

Of the 171 schools that have responded to the questionnaire, 35 schools (City 2, Municipal 9, Non-Municipal 24) report having no laboratory accommodation at all. Eleven schools out of these 35 indicate that practical work for pupils is managed in the classroom. But they have no special fittings for practical work. The other 24 schools are silent about provision for practical work of any kind.

During the last five years a good number of new secondary schools have been opened and an equal, if not greater, number of middle schools up-graded into High Schools, thanks to the policy of Secondary Education in our State; but the inadequacy of financial resources of the management and the Government may be one of the contributing factors to this. It is to be hoped that this state of affairs will soon be remedied.

Out of 136 schools having space for laboratory, 11 have separate classrooms furnished for teaching science, but only 7 of them utilise the rooms for teaching science. The rest use the science-rooms for ordinary class-room purposes due to lack of accommodation.

The Fiftieth Year Book of the National Society for the Study of Education (1960) states "A minimum of 30 to 35 square feet of class-room area per student (exclusive of storage facilities) is recommended. An additional fifteen square feet per student is recommended for storage facilities." (Page 237, **Rethinking Science Education**.) But situated as we are, we have to be less ambitious. "The size of the labo-

ratory is adequate if to the floor area occupied by teacher, benches, tables, cupboards and shelves is added 25 to 30 square feet for each pupil in the class." (Page 178, *Teachng of General Science in Tropical Secondary Schools* — Oxford University Press.)

Judged by the standard fixed for tropical countries only two out of 171 schools can be said to have adequate space facilities for laboratory. In others space is below the minimum standard normally fixed.

(b) Work-Tables

Out of 136 schools having laboratory, 123 (City 42, Municipal 31, Non-Municipal 63) have separate work-benches or tables for practical work. The following table gives figures relating to work-tables and the number of pupils using them at a time :

Minimum & Maximum of each section of the schools as given in the replies are taken for fixing range.	Work-Table accommodation available for number of pupils.	Number of pupils actually working at a time.	Number of schools that have this accommo- dation.
42-48	48	24	2
32-36	24	Half the strength of class	16
38-40	20	40	59
40-42	12	42	36
36-42	16	Whole class	23
			136

Studies reveal that only in 18 schools or roughly 13% of the schools that have laboratories, and furniture equipment for practical work may be considered as adequate for the strength of the high school standards. Even here for lack of apparatus pupils perform experiments in cycles.

In the remaining 87% of the schools having laboratories, fixtures and fittings for practical work of pupils are woefully lacking.

Note : In this study, schools in Madras City irrespective of the agencies under which they are run, are all grouped together and called 'city schools'. Schools in municipal areas with a population of over 60,000, irrespective of management are called 'municipal schools'. Schools in non-municipal areas are called 'non-municipal schools'. In a broad manner of saying, these three categories correspond respectively to the terms **urban**, **semi-urban** and **rural**.

(c) Teacher Demonstration Tables

The following table shows the position in respect of demonstration tables :

	City	Municipal	Non-Municipal
Number of schools that have demonstration tables	40	32	33
Number not having them	2	6	58

Inadequacy of furniture fittings for laboratory is keenly felt in municipal schools. In non-municipal schools more than 60% lack furniture fittings for demonstration.

(d) Water Supply

There is running water supply to the laboratory in 31 out of 42 city schools, 26 out of 38 municipal schools and 21 of 91 non-municipal schools. In about 40% of the schools that have given evidence no means of water supply to the school is reported. Probably they get water for drinking and washing purposes, from neighbouring wells and tanks or from wells in the school compound. Schools that have laboratories but no running water supply in the laboratory are as follows :

City	Municipal	Non-Municipal
21%	19%	46%

In 12 schools out of twenty schools visited, there are water taps above the sinks in the pupils' work-tables in the laboratory. Some of them have fallen into disuse.

(e) Electricity Supply

	City	Municipal	Non-Municipal
Schools having electric supply to the building	38	29	13
Schools having electric supply to the laboratory	38	26	3

Seventy-three schools have no supply of electricity. In 16 out of 80 schools that have electricity to the school building, there is no electric connection to the laboratory.

In 52% of the schools under review the laboratory is without the supply of electricity for experimental purposes. The importance of electricity for some experiments in science is too well known to need mention. Out of the schools that have electricity for laboratory use it is not known how many have transformers for low voltage electric current.

(f) Dark Room Facilities

Only 10 city schools, 6 municipal schools and 5 non-municipal schools report having facilities for darkening the room for conducting light experiments. Deficiency in facilities for light experiments, is therefore most pronounced.

SECTION III

APPARATUS AND APPLIANCES

(i) Physical Science Apparatus *

Names of apparatus.	Number of schools that do not have them	Number of schools that have them			
		City	Municipal	Non-Municipal	Total
1. U-Tubes	36	40	25	70	135
2. Physical balances	13	40	38	80	158
3. Prisms (Glass)	17	41	37	76	154
4. Bar Magnets	10	42	36	83	161
5. Thermometers	9	42	38	82	162
6. Pulleys	17	42	31	81	154
7. Concave Mirrors	16	42	30	83	155
8. Convex Lens	19	42	30	80	152
9. Inclined Planes	22	32	33	84	149
10. Stop Clocks	25	40	28	78	146
11. Boyle's Law Apparatus	28	38	34	71	143
12. Sixe's Maximum and Minimum Thermometer	8	41	37	85	163
13. Ammeter	83	36	12	40	88
14. Voltmeter	41	34	27	69	130
15. Electromagnet	19	34	38	80	152
16. Newton's Disc	5	39	38	89	166
17. Archemedes —					
Socket and Cylinder	20	39	38	74	151
18. Aneroid Barometer	52	35	23	61	119
19. Fortin's Barometer	69	31	18	53	102

Number of schools that have all the nineteen

Physical Science Apparatuses ..

27

Number of schools that do not have all the

Physical Science Apparatuses ..

144

[* Note : For the purpose of this study the first nine items in question 17 are added to those in question 15 ; items 10 and 11 are shifted to sub-section (iii) under question 19. Items 12 and 13 will be found mentioned under audio-visual aids. So question 17 is not considered separately in this report.]

As has already been observed the Science Committee considers that the 19 items are minimum essentials for the teaching of the Physical Science portions of the syllabus. Only 19% of the schools under review possess all the nineteen items. 81% do not.

A glance at the table above will show any one interested in the study the number of schools lacking in each of the items in the list. We may, however, point out a few glaring deficiencies. For experiments in density of liquids U-Tubes are necessary. 21 non-municipal schools and 13 municipal schools do not have them. 19 high schools do not possess even convex lens so necessary for the study of light or optical instruments.

The figures show that city schools are comparatively favourably placed with about 75% of the items in their possession. The municipal schools come next with the possession of 50% of the items. The non-municipal schools show the greatest deficiency having only 20% of the items in their possession.

(ii) Chemistry

Things needed for Teaching Chemistry

Names of Chemicals.	Number of schools that do not have them.	Number of schools that have them			
		City	Municipal	Non-Municipal	Total
1. Potassium Chlorate	35	39	38	59	136
2. Phosphorus	6	42	37	86	165
3. Sodium metal	42	42	37	50	129
4. Magnesium ribbon	2	42	38	89	169
5. Manganese dioxide	11	42	38	80	160
6. Iodine crystals	12	42	37	80	159
7. Ammonium Chloride	4	42	37	88	167
8. Sulphur	5	42	38	86	166
9. Ammonia	13	41	36	81	158
10. Nitric Acid	2	42	38	89	169
11. Sulphuric Acid	2	42	38	89	169
12. Hydrochloric Acid	1	42	38	90	171
13. Sodium Hydroxide	4	41	38	88	167
14. Potassium Ferrocyanide	67	23	18	43	84

Number of schools that have

all the 14 items

39

57

38

134

Number of schools that do

not have all the 14 items

3

1

33

37

In 78% of the schools the laboratory contains all the chemicals listed. Deficiency of one or more is found in 22% of the schools. Non-municipal schools have the most deficiency. A few points may be mentioned to show clearly the handicaps of the Chemistry Teacher. In 32 out of 91 non-municipal schools there is no Potassium Chlorate particularly necessary for the preparation of oxygen and in 41 of these schools Sodium metal is not found. In 19 city schools, 20 municipal schools and 48 non-municipal schools there is no potassium ferrocyanide. The absence of this in so many schools is probably because of (a) its poisonous nature, (b) its rare use in experiments and (c) questions at public examinations on the use of this chemical are conspicuously absent. In some schools it is perhaps a legacy of the equipment of optional chemistry. Since all or most of these items can be got by utilising the special fee for Science collected from High School pupils, the absence of many of the items in the Science laboratory of the schools is inexplicable unless it is due to lack of space, storage facilities etc. or perhaps a lack of appreciation of their need by teachers.

(iii) Biology

Accessories to Biology

Models.	Number of schools that do not have them.	Number of schools that have them.			
		City	Municipal	Non-Municipal	Total
1. The Heart	42	32	37	60	129
2. The Lungs	67	25	25	54	104
3. The Kidneys	64	23	24	60	107
4. The Skin	61	26	22	62	110
5. The Eye	31	35	34	71	140
6. The Ear	41	32	29	69	130
7. The Alimentary Canal	64	26	21	60	107
8. The Brain	58	32	24	57	113
Specimen :					
9. The Human Skeleton	76	30	28	37	95
Appliances :					
10. Microscope	36	39	31	65	135
11. Dissection set	74	32	26	39	97
Charts for Physical Science :					
12. Spherical Mirrors and lenses	77	26	25	43	94

(iii) Biology—(Contd.)

Models	Number of schools that do not have them	Number of schools that have them			
		City	Municipal	Non-Municipal	Total
Charts for Biology :					
13. The excretory system	21	35	38	77	150
14. The nervous system	26	35	38	72	145
15. The circulatory system	18	34	38	81	153
16. The sense organs	91	24	21	35	80
17. The skeletal system	17	33	38	83	154
18. The Flower and its parts	46	34	38	53	125
19. The dispersal of seeds	69	30	35	37	102
Schools that have all the					
19 items		18	14	4	36
Number of schools that do					
not have all the 19 items		24	24	87	135

Seventy-nine per cent of the schools lack one or more of the 19 items listed as necessary for the teaching of Biology.

In three city schools, 7 municipal and 26 non-municipal schools there is no microscope in spite of the fact that the tenth standard syllabus in general science requires its frequent use in learning portions in Biology.

SECTION IV AIDS TO TEACHING (1) Audio-Visual Equipment

Name of equipment	Number of schools that do not have them	Number of schools that have them			
		City	Municipal	Non-Municipal	Total
16 mm Cine Projector	55	38	16	62	116
Filmstrip Projector	59	31	20	61	112
Filmstrips	92	35	15	29	79
Number of schools that have all the equipment					54
Number of schools that do not have all the equipment					117

Nearly 67% of the schools own Cine Projectors; and about 65% have filmstrip projectors. Nearly 60% of the schools do not own filmstrips; but they may be borrowed from time to time.

(2) Science Clubs

(a)

		City	Municipal	Non-Municipal
Schools that have a science club	26	27	29	82
Schools that do not have a science club	16	11	62	89
				171

(b) Members of the science clubs.

		City	Municipal	Non-Municipal
Number of science clubs where all the school pupils are members	..	..	2	4
Number of science clubs in which only the high school pupils are members	7	8	12	
Number of science clubs where there are about 80-100 pupils chosen by the science teacher for exhibiting special aptitudes	14	11	8	
Number of science clubs where there are only less than 80 members chosen by the science teacher	5	6	5	
Total	..	26	27	29

(c) Sources of income for the science clubs

		City	Municipal	Non-Municipal
1. Pupils' contribution by subscriptions	12	3	..	
2. School contribution from funds	8	12	2	
3. Management's contribution	2	2	1	
4. Grants from Central Government	4	..	..	
5. No income	..	10	26	
Total	..	26	27	29

(d) Activities.

	City	Municipal	Non-Municipal
1. Preparation of charts and models	26	27	19
2. School or Science Exhibitions	10	6	3
3. Collection of specimens for general science	28	20	24
4. Making picture albums	26	16	12
5. Maintaining vivarium, aquarium	12	2	2
6. Photography	2	..	..
7. Excursions and field trips	26	25	20
8. Poultry keeping	2	2	..
9. Debates and dramas on the life of scientists	10	4	2
10. Preparing science magazine	5	4	1
11. Science quiz	2	1	..
12. Projects like soap making, tooth powder, etc.	10	8	1
13. Improvising aids for classroom work	2	1	1

Science clubs : Nearly 70% of non-municipal schools, 50% of municipal schools and 38% of city schools do not have science clubs..

In 16 schools the strength of the science club is restricted to 50 ; in 33 schools the strength ranges from 80 to 100 ; in the rest all the pupils of the high school and in some cases even all the pupils of the lower school are members of the science club.

Generally the idea that numbers are of less importance than the sharing of a common interest has not sufficiently impressed itself in those responsible for organising science clubs.

The admission of all pupils to membership of the School Science Club may be due to the desire on the part of those in charge of the club to raise funds for the recurring expenditure there being no other source from which money may be raised.

Source of income : Ten municipal and 26 non-municipal schools report having absolutely no sources of income ; 5 schools state receiving contribution from the management ; 15 schools raise subscription from pupils ; 22 schools have provision for expenditure from school funds ; four city schools have received grant from the Central Government. On the whole the financial support to the science clubs is neither adequate nor steady.

Activities : The table 2 (d) shows activities of science clubs as given in the replies.

Excursions and field trips, preparing charts and models, collection of specimens, making picture albums rank high among the activities of science clubs. Sixteen science clubs report debates and discussions among the activities. In projects such as manufacture of tooth powder, 19 science clubs are engaged.

Four science clubs report that they are engaged in improvising aids for class-room work. From this it can hardly be deduced that there is adequate appreciation of the following situation :

"In schools where laboratory accommodation and facilities are limited much of the effective and practical and experimental work may have to be arranged outside normal school hours. In such circumstances the teacher will find that a science club is one of the best means of organising the work and stimulating interest."

(3) Science Museum

	City	Municipal	Non-Municipal
Schools that have a science museum	36	36	39
Schools that do not have a science museum	6	18	36
Science museum that is classified and arranged	4	5	1
Science museum that is not classified and arranged	32	31	38
Number of museums to which recent additions have been made	6	2	2

60 out of 171 schools under review do not have any museum. Only in 10 school museums are the exhibits classified and arranged and it is these ten that report of recent additions to them. Museum as an aid to science teaching has only feebly impressed itself.

Improvised aids : by Teachers : Only four schools give evidence of making improvised apparatus. If ready-made equipment is not available for experiments and demonstration, the making of such items may provide valuable training in science. But there is no evidence to show that lack of equipment in a number of schools has been an incentive to improvise apparatus so as to give that training to pupils.

SECTION V

TEACHER DEMONSTRATION AND PRACTICAL WORK BY PUPILS

(i) Teacher Demonstration 247

The introduction to the high school syllabus clearly states : "Practical work by the pupils forms an integral part of the science course. Each experiment should be an activity set up to find a solution to some particular problem growing out of the questions and activities of the class."

The actual conditions under which science is taught are very far from being conducive to put into practice the suggestion given. It is necessary to recall what the syllabus prescribes for demonstration and practical work, for an understanding of the conditions revealed in our present study.

[**Note :** In the following table teacher demonstrations and pupils' practical work requiring use of apparatus and appliances in the laboratory are listed. Items of practical work such as drawing, diagrams, and sketches, observation of plant growth, or models, and field trips, etc. are not listed.]

Number of Demonstrations and Experiments given in the syllabus

No.	Heading	Number of Teacher Demonstrations	Number of Experiments to be done by pupils
STANDARD VIII			
1.	Measurement, Force and Machines	5	2
2.	Exploring the Environment	12	4
3.	Harnessing Forces of Nature	14	2
4.	Life around us	6	..
		37	8

No.	Heading	Number of Teacher Demonstrations	Number of Experiments to be done by pupils
STANDARD IX			
1. Biology :			
(i) Botany	..	..	
(ii) Zoology	..	..	
2. Physics	8	9	
3. Chemistry	7	6	
	—	—	
	15	15	
	—	—	

STANDARD X			
1. Biology :			
(i) Human Physiology	..	..	
(ii) Botany	3	..	
2. Physics	11	6	
3. Chemistry	..	3	
	—	—	
	14	9	

From the above tables it will be seen that the minimum number of demonstrations prescribed for Standard VIII is 37, for Standard IX is 15 and for Standard X is 14.

Frequency of Teacher Demonstrations as revealed in the replies to the questionnaire

	City	Municipal	Non-Municipal
Number of schools that have done more than the number prescribed	12	7	19
Number of schools that have done less than the number prescribed	19	29	22
Number of schools that have performed all the experiments prescribed	9	13	18
Number of schools that have given nil report	2	9	12

Note :—23 out of 35 schools that have no laboratory or equipment have naturally given a nil report. The remaining 12 schools have no

laboratory but some equipment. These schools have given the number of Teacher Demonstrations.

In all 13% of the schools report not giving Teacher Demonstration due to lack of both laboratory and equipment.

The percentage of schools that fall short of the minimum number of Teacher Demonstration is 41 in the aggregate. In this group the Non-Municipal schools rank high.

Only 46% of the schools under review give the required minimum of Teacher Demonstrations or a little higher.

(ii) Pupils' Practical Work

Here is the tabular analysis of the number of experiments done by pupils as found in the replies studied.

Standard	Minimum No. of experiments prescribed	Number of schools that have done more than the minimum				Number of schools that have done just the number of experiments prescribed				Number of schools that have done less than that prescribed			
		City	Mpl.	Non-Mpl.	Total	City	Mpl.	Non-Mpl.	Total	City	Mpl.	Non-Mpl.	Total
VIII	8	17	13	10	40	7	7	4	18	4	9	5	18
IX	15	12	17	12	41	8	8	9	25	10	6	9	25
X	9	12	18	12	42	10	11	8	29	13	7	12	32

The replies show that the three years' practical work is distributed generally in two years and in some cases done in one year only. The Eighth standard suffers most for lack of practical work. The following table shows standardwar the number of schools that have not given opportunities for pupil's practical work :—

Standard	City	Municipal	Non-Municipal	Total
VIII	12	20	28	60
IX	10	22	20	52
X	5	11	17	33

The following table shows the number of schools that have given opportunities for experiments to all the high school standards :

City	Municipal	Non-Municipal
28	27	19
70%	47%	27%

The study shows that among schools under review 30% of City schools, 53% of Municipal schools and 73% of non-Municipal schools do not provide for practical work for all the three standards, but make provision for one or two standards only.

(iii) Cycles of Experiments

Due to lack of facilities for providing the same kind of practical work for pupils, even in groups, schools adopt a plan called 'cycle of experiments'. According to this plan the experiments to be done are listed and different groups are assigned different experiments. Before the end of the year, however, each group would have performed all the experiments. 22 city schools, 33 municipal schools and 32 non-municipal schools adopt this plan. The number of experiments done in a cycle ranges from 2 to 12 as shown below :—

	City	Municipal	Non-Municipal
2 experiments in a cycle	2	..	..
3 " "	..	..	2
4 " "	8	14	6
5 " "	3	9	8
6 " "	5	3	3
8 " "	4	7	3
10 " "	..	2	6
12 " "	..	1	1

Schools lacking sufficient sets of equipment and service of demonstrators and attenders follow the plan.

Some schools are found to give the same experiment for all the pupils of a section at a time dividing them into as many groups as there are apparatuses.

Nine city schools, eighteen municipal schools and twenty-seven non-municipal schools have not chosen to answer questions relating to cycles of experiments. Nor is there any indication of the manner in which pupils are grouped for practical work in relation to the facilities available to them.

An analysis of the answers to the question "Do you give the same experiment to all?"

	City	Municipal	Non-Municipal	Reasons
Always	11	12	7	Because they do not have cycle of experiments.
Sometimes	4	10	8	If there are enough apparatuses they give the same experiments.
Never	22	28	37	Because they have cycle of experiments. Because of lack of apparatus.

Study of the groupings of pupils for practical work shows that the number in each group varies from as low as 2 to as many as 16. Here is the table relating to it.

Number of pupils in a group	Number of schools that have this group			
	City	Municipal	Non-Municipal	Total
2 pupils	8	2	1	11
4 pupils	18	6	9	33
5 pupils	4	3	5	12
6 pupils	22	10	2	34
8 pupils	8	12	18	38
10 pupils	2	4	6	12
16 pupils	1	2	5	8

(iv) Attenders

A secondary school, however large its strength may be, cannot, according to the rules in operation, have demonstrators to assist science teachers in arranging practical work. An attender may be employed for assistance to assemble or carry required apparatus. The following table shows figures relating to attenders employed :

City	Municipal	Non-Municipal
29	35	36
69%	71%	31%
Schools that do not have attenders for laboratory		
13	23	35
31%	29%	69%

In only two city schools and one municipal school are there two attenders.

(v) Comments

With this section the study of prevailing conditions relating to facilities and equipment for science teaching is complete. The physical conditions under which science is taught are anything but satisfactory.

In general, the three steps of **experiment, observation and inference** are rapidly giving place to the familiar method of 'chalk and talk.' Where facilities are available there is more observation and less experimenting. The most urgent problem is how to provide laboratory work, on a simple scale, for all pupils of Standards VIII, IX and X. It should be clearly recognised that the high school pupil should be given opportunities of experiencing some of the trials and delights of scientific experimenting to be able to understand it when he grows up to be a citizen.

"Laboratory work should be genuine experimenting and not a hurried following of prescribed exercises. Fewer experiments will teach far more, if the student does them himself, as a **scientist for a day.**"

We are aware that appropriate facilities and equipment may not always ensure superior teaching, but we do wish to emphasise that they are very necessary for creditable teaching performance.

SECTION VI

CREDENTIALS OF SCIENCE TEACHERS

(i) Qualifications

There are 518 science teachers in the 171 secondary schools under review. Of them 94% are trained and the rest untrained.

According to departmental regulations those who have taken a science subject as their main in their degree course and hold L.T. or B.T. degree are qualified to teach general science in Standards VIII, IX and X. Those who satisfy this requirement are as shown below :

Physics (Main)	..	..	..	170	—	33%
Chemistry (Main)	..	..	..	127	—	24%
Biology (Main)	..	..	..	147	—	28%
Natural Science (Main) but subsidiary subject not any of the sciences	..	..	..	9	—	less than 2%

(Note : For a detailed analysis of the qualifications of the 518 science teachers please see appendix D).

About 85% of the science teachers of the schools considered in this report satisfy minimum qualifications prescribed ; the other 15% do not.

(ii) Interest in Co-Curricular Activities

Thirteen percent of the city school science teachers, 11% of the Municipal and 7% of the non-Municipal school teachers are trained in museum technique. 20% of the City School Science Teachers, 6% of the Municipal Schools and 6% of the Non-Municipal School teachers sponsor Science Clubs.

13% of the City Schools, 15% of Municipal Schools and 16% of non-Municipal School Science Teachers are in charge of projection of films.

The same science teachers take up two activities. On an aggregate only 26% of the science teachers under review have stated the activities they are engaged in. 74% of them have given no indication of either of their special aptitudes or their active interest in activities. Some of these science teachers are engaged in activities other than those related to science, such as, N.C.C., A.C.C., games, Red Cross, Scouting, Sponsoring dramatic clubs, and organising Literary Association of pupils or manning teachers' associations.

55% of the science teachers have not specified their association with any co-curricular activity.

(iii) Teaching of Science in the Middle Schools

There are two questions relating to the staffing and use of the laboratory of the lower standards of secondary schools. They are meant chiefly to get an idea of the preparation of the pupil entering Standard VIII for the study of science and for work in the laboratory.

In the introductory part of the syllabus for general science is found the following statement defining the relation of the high school work to that of the lower school —

“The teacher should attempt to discover the nature and scope of the science experiences offered in the earlier years of the pupil's schooling. Pupils entering Standard VIII have, to varying degrees, developed abilities to make records, conduct experiments, follow simple directions, make comparisons, use tools, care for pets and provide the minimum essentials for plant life. The Science course should attempt to develop further these skills and abilities and, at the same time, to give pupils a better understanding of their environment. This may be done by providing opportunities for pupils to participate in meaningful experiences through which they can discover scientific principles for themselves.”

This questionnaire has not elicited sufficient information to estimate the nature of preparation that the pupil entering VIII standard has had. However, there are indications about the extent to which the laboratory has been used by the lower school pupils in secondary schools, as also evidence relating to the choice of persons for teaching science.

About 52 schools have reported that all secondary grade teachers employed in their schools are required to teach science. 79 schools report that only teachers who have given evidence of interest in science are given the subject. 8 schools that have given evidence state that secondary grade teachers who offered science in the Intermediate course are entrusted with science work in the middle school standards. 13 institutions distribute the science work of the middle school standards among secondary grade teachers who studied science as an optional subject in the S.S.L.C. course. 4 schools write to say that teachers are allowed freedom to choose science if they feel inclined to do so.

The following table shows the extent to which the equipment and laboratory are put to use by secondary grade teachers.

		City	Municipal	Non-Municipal	Total
All of them	..	32	46	37	115
Few of them	..	6	12	3	21
None of them	..	4	8	23	35

(iv) Comments

Of the 35 schools in which none of the secondary grade teachers use the equipment, 25 schools do not have equipment. But the remaining 10 schools having equipment appear not to use them at all. 12 city schools, 8 municipal schools and 3 non-municipal schools report that the laboratory is accessible to them as and when they want to demonstrate. On the whole we may not be wrong if we deduce that the middle school pupil enters the VIII standard perhaps without having seen a demonstration. We may well imagine how it would be with pupils from Higher Elementary and Senior Basic Schools.

Lack of sufficient preparation for practical work in the lower standards and dismally inadequate facilities in the High Schools for teaching science are urgent problems that should engage the serious attention of all those interested in the promotion of science education in secondary schools, with reference to the present needs of junior leadership or technical personnel.

SECTION VII

GRANTS AND SPECIAL FEES

It is appropriate to describe briefly how secondary schools get grant for improving science teaching.

Fifty per cent of approved expenditure on library, science articles, furniture, teaching appliances, models and charts is the grant given by the State Government, whenever an application for such grant is entertained by Govt. The Director of Public Instruction has the power to sanction grant to a secondary school up to a maximum limit of Rs. 2,500. Any amount more than this should get the sanction of the State Government. Applications for grant should be made a year in advance and purchase should be limited to the items approved by the Director of Public Instruction. In the matter of approval of items the Director of Public Instruction is guided by the experts of his department in the teaching of science.

In recognition of the need of improving facilities for secondary education the Five Year Plans of the Government of India have made provision for grants on expenditure incurred in respect of (1) Improvement of teaching science (The maximum limit of expenditure is Rs. 50,000), (2) improvement of teaching core subjects (maximum limit of expenditure is Rs. 15,000), (3) improvement of libraries (maximum limit Rs. 2,500), and (4) improvement of craft schools (maximum limit Rs. 3,000). This is a fixed grant to be fully utilised. This grant given by the Central Government is called Core Grant. Schools recommended by the Director of Public Instruction through the State Government get this grant from the Central Government. Procedural and other rest-

restrictions in respect of award of Core Grant are fewer than those imposed by the State Government for their grant.

This is mentioned here to indicate the recognition of the need for improving science teaching by the Central Government and the priority given to it.

Towards meeting expenditure on recurring items in teaching science secondary schools are allowed to charge special fees. The rate of fee varies according to the exigencies of the situation from 25 nP. to Re. 1.50 per pupil.

The money collected by way of special fees should be utilised mostly for recurring items of expenditure, but about 20% may be used for non-recurring items with previous approval. Suppose a school needs test tubes and wants to use a part of the special fees for their purchase, an application should be made to the District Educational Officer, and his permission should be obtained. This takes time and the school has to get on without them for a distressingly long time. The difficulty experienced in respect of getting applications for grants for non-recurring items entertained by the Department, makes science teachers use the special fee fund available for immediate needs. But even here the teacher's hands are tied by hard and fast rules.

Information gathered from the replies received regarding special fees is tabulated hereunder :—

	City	Muni- cipal	Non-Muni- cipal
Schools that collect Re. 1 per year ..	11	9	27
Schools that have added non-recurring items — 1958-60 ..	11	5	11
Schools that have collected Re. 0.75 per term ..	1	..	2
Schools that have added non-recurring item ..	1	..	2
Schools that have collected Re. 0.50 per year ..	6	18	11
Schools that have added non-recurring items ..	5	8	5
Schools that have charged Re. 0.25 only ..	3	..	..
Schools that have not charged laboratory fees ..	8	1	12
Of Core Grant ..	..	..	5
Schools that do not state anything ..	13	10	39
Total ..	42	38	91

21 schools do not charge special fees for the laboratory. 5 schools out of these 21 do not collect special fees for they have got core grant.

62 schools have left the column blank, evidently they do not charge special fees.

Comments

(1) A good number of schools do not spend the full or do not spend a large part of the special fees on recurring items owing to the smallness of the number of experiments.

(2) Only a very few schools have received core grant.

(3) Additions to the equipment of the laboratory are not easy to make under existing rules and regulations of the State Government in respect of award of grants.

(4) The State has to be urged to give more liberal grants for the improvement of teaching science.

(5) There is need to liberalise the rules governing science special fees to permit schools to acquire so-called non-recurring items of expenditure so as to help in building up equipment and allow for use in practical work by pupils.

SECTION VIII

THE NEED FOR COORDINATION

The situation as it is

The VI section shows that this enquiry, without attempting a direct appraisal of the teacher and his role in the science education of the secondary school, has obtained information about the question whether science is assigned to a teacher who has a good science background, is interested in teaching and wants to be a good teacher.

Section VII shows the interest of the Central Government in the promotion of science education by the provision of grants for the improvement of teaching science and for science clubs. The proper utilization of this subsidy may be regarded as a measure of teacher's interest and pupil's curiosity.

In this section the matter will be further elucidated so that the situation may be properly appreciated and its demands clearly understood.

What is the situation like? In the majority of schools science teaching in middle school standards is assigned to all secondary grade teachers on the staff with absolutely no regard for their equipment, tastes and inclinations. This circumstance is no doubt a sequence of the exigencies of the time-table. But the fact that forces itself on us is that the middle school teacher's equipment for science teaching is not satisfactory. Nearly 26% of high school teachers under consideration do not

satisfy the minimum academic qualifications required for teaching general science in high schools.

So far then about credentials for teaching. Let us now look at teacher's interest in teaching science as judged by the enthusiasm and team spirit evinced in the science committee, the science club, science fairs, the museum and the improvisation of apparatus.

The Science Committee

Out of the 171 schools studied, 91 report to have science committees while 60 say that they do not have science committees. We were more interested in the nature of work done by the science committees than in their number. Only ten schools have detailed the problems tackled by the committees. The work mostly relates to arrangement for practical work, maintenance of bulletin boards and projection of films and filmstrips. There is no evidence to show any in-service training for the junior members of the staff nor active interest in forming and running science clubs. We looked for evidence of co-operative effort of the science faculty in utilising their combined knowledge and experience for the effective teaching of science. We must confess to a feeling of disappointment.

The fact that 81 of the schools that have science committees have not cared to state the nature of the business transacted by them is disconcerting. Is it that the Science Committee is only a paper committee for satisfying the Departmental suggestions?

Only 48% of the schools under review report to have formed science clubs. The activities already referred to indicate lack of proper direction. They are mostly sporadic. These science clubs must be under the direction of science teachers. The evidence of co-operative, sustained work in satisfying the curiosity of the members of the science club and of harnessing their services for curricular and co-curricular activities in science is not all encouraging. Only 11% of the schools under review state to have organised exhibition in science.*

Science Museum

61% of the schools have science museums. The question in which we were most interested was if there were additions to the museum. Very few report to have made additions in recent years. The extent to which museum serves as an agency in stimulating the interests of pupils and cultivating their organisational ability is not all that it ought to be.

* The S. I. T. U. Council of Educational Research sponsored a science fair in the City of Madras from 29th January to 5th February 1961. The organisers were given a small grant for initial expenses in that connection. The purpose of the fair was to have first-hand information about the tangible proof of the results of activities of science clubs in the City of Madras.

Improvised Apparatus

Only 4 schools state to have improvised apparatuses for laboratory use. We took specific schools which lack some kind of apparatus or other to see if there was any attempt at improvisation. We were disappointed to find that there was no effort. For example, a school that has no apparatus for illustrating the principle of Archimedes may improvise it. To demonstrate the principle, instead of a metallic socket and cylinder that have to be brought two small tins of equal size can make an effective substitute. One can be filled with molten wax which can be allowed to set. They can be then attached to one another by means of thin rod and may be suspended in water from a balance in the usual way.

What the situation demands

The demands of the situation as we understand them are as follows:

- (1) Creating and sustaining the enthusiasm of teachers for co-operative work in the improvement of teaching science.
- (2) To encourage senior members of the staff to give inservice training particularly for the science teachers of the middle school standards.
- (3) To provide opportunities for the science committees of different schools in a locality to meet periodically to discuss common problems and find ways and means of promoting scientific attitude among pupils.

Need for Co-ordination

There is on the whole a great need for co-ordination of different agencies serving the cause of the promotion of science education. Something has to be done to rouse science teachers to a sense of awareness of the possibilities of improving science teaching by greater and more frequent responses to the call of Extension Services that are doing some good work.

Institutions situated in four different areas of the City were requested to organise exhibitions in co-operation with the science clubs of the schools in their locality. The number of science clubs that participated fell far short of our expectations. The exhibits put up by those that participated did not satisfy the Council's expectations both in number and variety.

Nevertheless the exhibitions were very successful chiefly because of the wealth of the material that the organising institutions had and of their facilities for getting up attractive demonstrations.

The S.I.T.U. Council of Educational Research sponsored the Association for the Promotion of Science Education and gave a subsidy for the initial expenses. This Association has been registered under the Societies Registration Act.

SECTION IX

OBJECTIVES OF GENERAL SCIENCE — POINTS OF VIEW

In view of the importance that is likely to be attached to this section, we think it necessary to describe briefly the procedure adopted to ascertain the views of science teachers in high schools and lecturers in colleges.

High School teachers were required to answer the following questions :—

(a) **Question No. 40 :** Do you feel that science attitude can be inculcated by the teacher (i) in the context of the curriculum, (ii) in the context of physical facilities and (iii) in the context of facilities or opportunities for practical work? Please give reasons for your statement.

(b) **Question No. 56 :** Please give your opinion about the present science syllabus in its adequacy, its satisfying the needs of the pupils for developing the interest in science and promoting the scientific attitude and your suggestions for improvement.

To ascertain the views of college teachers a separate questionnaire was issued. (vide Appendix E). It will be found that questions 4, 5, 6 and 10 to 15 (both inclusive) seek to elicit opinions on the content and the specific objectives of General Science in Secondary Education as mentioned in the introductory part of the syllabus.

Before proceeding to analyse the answers of teachers at secondary and collegiate levels, we should like to state broadly the way in which we propose to study the evidence gathered. The answers will be examined under the following two general headings :—

- (i) General objectives of Science Education in Secondary Schools ;
- (ii) Specific objectives sought to be achieved by means of the curriculum.

General Aims

It will be agreed that science education in secondary schools has mainly to be viewed as

1. an integral part of general education,
2. a preparatory course to college science,
3. a preparation for technical and technological courses of study and careers that require a basic knowledge of science.

To us the first is of paramount importance. The other two general objectives are only of secondary importance. It is necessary to state clearly what exactly is meant by an integral part of general education. A secondary school leaver must have certain concepts and skills deve-

loped through a course in science which is a wholesome combination of Physics, Chemistry and Natural Science. Without claiming to prepare him for anything specific in later life, this course must ensure that knowledge of science that is necessary for understanding the significance of scientific inventions and discoveries in modern life and appreciate scientific pursuits. It is also expected that the secondary school leaver will bring to bear a scientific attitude on the study of social problems with which the nation is confronted. At all events the secondary school course of science should create an interest in its votary in further studies on scientific matters. That is why we say that General Science is an integral part of Secondary Education.

When we say that preparation for college course is only of secondary importance, it does not at all mean that the same may in any way be neglected, but that secondary school science should not be made merely an antechamber to the university, in consideration of the present need of the average citizen for scientific knowledge.

The third objective of preparing the pupils for technological courses and careers is to some extent fulfilled by the first aim. The diversified courses in secondary education are calculated to serve the interests of those who leave the secondary school for higher technical courses or directly into careers. In this report therefore we will not have to say much about the third aim. In the light of the above statement of general objectives we shall now examine the views elicited by the questionnaire.

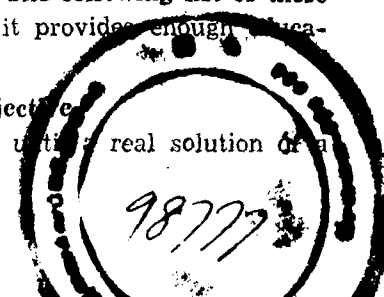
The question No. 43 referred to above presumes an understanding of what is meant by 'scientific attitude'. The authors of the syllabus state, "the course should gradually lead to a development of 'a scientific attitude' to all problems of life."

Here the presumption is that scientific attitude is too well-known to need definition. The skills and abilities listed in the statement of purpose are according to the authors to lead pupils **gradually** to the development of scientific attitude to all problems of life. We confess that it is impossible to draw up an exhaustive list of the characteristic features of scientific attitude. But we think that those characteristic features which distinguish scientific attitude from other attitudes should in a broad manner at least be stated. We therefore embrace this occasion to quote from "The Content of Education", University of London Press, 1946, the following :

"The scientific attitude has a number of characteristic features which distinguish it from other attitudes. The following list of these features is probably not exhaustive but it provides enough educational material to make a start :

1. The scientific attitude is above all objective.
2. It is active in the sense of persisting until a real solution of a problem is found.

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3. It is **systematic**.
4. It is **bold** in the sense of being undeterred by mere magnitude, by tradition, by authority, by unfamiliarity, by verbal quibbles.
5. It recognises individual limitations and is thus disposed to be **co-operative**.
6. It is scrupulously and consistently **critical**.
7. It is **dynamic** in the sense that it recognises the time factor in events and embodies this recognition in its approach to problems of change.
8. It is **flexible** in the sense of adapting its particular methods to particular materials and problems.
9. Its range of application is unlimited."

"**Re thinking Science Education**" published by the National Society of the Study of Education, 1960, states more concisely :

"Open-mindedness, a desire for accurate knowledge, confidence in the procedures for seeking knowledge and the expectation that the solution of problems will come through the use of verified knowledge, these are among the scientific attitudes."

We agree with the framers of the syllabus that the general science course should aim at developing in pupils characteristics that ultimately lead to a scientific attitude towards life and its problems. Question No. 43 seeks to know from teachers if through curriculum, physical facilities and practical work, **scientific attitude** could be developed.

145 institutions have reported to say that the teachers can inculcate scientific attitude through one or more of the three sub-divisions given. Taking the question to mean that teachers are required to state their preferences, 72 schools say that scientific attitude can be inculcated by means of the curriculum. 20 schools state that it is by physical facilities that scientific attitudes can be developed. 53 schools state that facilities or opportunities for practical work can inculcate scientific attitude. The remaining 26 schools have not answered this question. These answers reveal the importance attached to each of the three aspects of science teaching mentioned. A large majority seem to believe that an enthusiastic teacher can manipulate the curriculum to instil in pupils the characteristic features of scientific attitude. We are happy to note this. There is perhaps also a tacit acceptance of the soundness of the curriculum, in balancing the claims of Physics, Chemistry and Biology.

20 institutions have given evidence that by an assurance of satisfactory physical conditions, the curriculum could be manipulated to instil the characteristic features of scientific attitude. On closer examination we find that in these institutions the physical conditions are anything but satisfactory. Presumably, therefore, the feeling of frustration due to their absence has made these institutions prefer physical conditions as necessary media for the development of scientific attitude.

53 institutions have opted for systematic laboratory work as effective means for the cultivation of scientific attitude. Most of these are among the schools that do provide opportunities for practical work to their pupils, if not individually, at least in groups. Their preference for practical work should be the result of their experience in noting the expression of the characteristics of scientific attitude, as a result of practical work. There are 25 institutions which lay equal emphasis on curriculum and opportunities for practical work. There are eleven institutions that hold all the three in equal importance.

Comments

Here, we have to state plainly that it is difficult for us to assess the evidence offered. Characteristics of scientific attitude are necessarily intangible. They do not admit of easy assessment as does the knowledge of curriculum content. We are not aware of any satisfactory tests calculated to measure attitudes of pupils having been evolved in the educational world.

An appraisal of attitudes can in the circumstances, be only based on **a priori** principles. The answer to the question, **why do you say such an attitude can be developed**, can only be, **we think so**. We therefore find most institutions not committing themselves to a clear statement of reasons asked for. There is, however, enough evidence to encourage us with the feeling that there is an active desire on the part of teachers to cultivate habits of thought and action that gradually lead to the acquisition of scientific attitude and that they are hopeful of doing so by means of this curriculum, in spite of the heavy handicaps they are experiencing in respect of physical facilities for teaching science.

Evidence of College Teachers

In order to assess the effect of teaching science in secondary schools, college teachers were asked to answer some questions relating to the resultant skills and abilities. We give hereunder the questions and the answers given by twenty-nine college teachers representing thirteen colleges in the State of Madras :

Qn. No. 10. Do you feel that the students who enter the college have at least a little ability to search for cause and relationship ?	Yes	—	8
	No	—	14
Qn. No. 11. Do they have the habit of (1) Accurate observation ? (2) Accurate statement ?	Yes	—	6
	No	—	20
	Yes	—	4
	No	—	2

Qn. No. 12. Do they try to make intelligent understanding of phenomena of nature ?	Yes — 7
	No — 17
Qn. No. 13. Do they try to make intelligent understanding of inventions and discoveries of man ?	Yes — 10
	No — 16
Qn. No. 14. Do they try to make intelligent understanding of their environment ?	Yes — 9
	No. — 17
Qn. No. 15. Do they have the following attitudes and abilities ?	
(i) Making proper generalizations.	Yes — 5 No — 20
(ii) Gathering information from given data and analysing them.	Yes — 3 No — 21
(iii) Deducing inference.	Yes — 2 No — 22
(iv) Not making generalization with insufficient information	Yes — Nil No — 20
(v) Verifying hypothesis	Yes — 3 No — 21
(vi) Applying scientific principles	Yes — Nil No — 21

Comments

College teachers by a majority declare that skills and abilities expected to be cultivated in pupils through general science in secondary education are not found in evidence among the pupils that enter the university. We think that the negative answer to question No. 15, sub-division (iv) means that pupils do not know that they should not make generalisations with insufficient data. Here again it is not possible for us to say how far the evidence is based on a scientific study or accurate observation of pupils' abilities. Mostly they are impressions of lecturers. These impressions are unfavourable to the entrants to the university for science study. As for the teachers of science in secondary schools they feel the possibility of inculcating these qualities, but the results seem to belie their expectations.

SECTION X

THE CONTENT OF GENERAL SCIENCE — CRITICAL REMARKS

In an enquiry primarily related to physical facilities for teaching science the content of general science can only form an incidental study. Question No. 56, already quoted, seeks the opinions of teachers on the adequacy or inadequacy of the syllabus and if it is calculated to develop the pupil's interest in science and promote scientific attitude. Before making an analytical study of the answers given to this question, we should briefly refer to the content of general science in standards VIII, IX and X, for we think it is necessary to evaluate criticisms and suggestions. The major elements of general science are drawn from Physics, Chemistry and Biology. No portion of Astronomy or Geology is included in the course of study of any of three higher standards. In standard VIII, the topics are grouped under the following headings which are self-explanatory :

- (1) Measurement, Force and Machines.
- (2) Exploring the environment.
- (3) Harnessing forces of nature.
- (4) Life around us (plant and animal life).

The major elements in Standards IX and X are drawn from Physics, Chemistry and Biology. Biology in the IX Standard includes topics from Botany, Zoology and Human Physiology, while in the X Standard only Human Physiology and Botany are included to the exclusion of Zoology. Physics and Chemistry are represented in the two standards.

The framers of the syllabus have clearly stated that the purposes of a study of science (already indicated) should be carefully guarded against mere cramming of possible examination questions, with the sole view of meeting the questions in the examination. According to them the approach to the problems of science teaching should be in accordance with the following principles :—

- “1. Mastery of subject matter should not be made an end in itself.
2. Teaching pupils how to think is more important than teaching them what to think.
3. The content that is used in giving pupils experiences in scientific thinking must be interesting, informative and free from inaccuracies or superficiality.
4. Teaching descriptive science from work books and text-books should be avoided.
5. Opportunities should be provided for first hand experience and for application of scientific method as pupils search for solutions to their own problems of daily living.

6. Pupils should be encouraged to appreciate science as a means of understanding nature.

7. The scientific method may be applied as pupils use it in 'finding how and why things work.'

Together with these principles should be mentioned the following observations that they have made :—

"Although for the sake of convenience the topics are listed under various subjects like Botany, Zoology, Physiology, Physics and Chemistry, it has to be constantly borne in mind that topics should not be handled as isolated items needing specialised study, but should be so inter-related and integrated that their interdependence and their usefulness to mankind may be stressed throughout."

The principles on which the syllabus is based are quite sound and are in accordance with the definition of General Science by John Murray in 'The Teaching of General Science — Part I', page 30, 1936.

"General Science is a course of scientific study and investigation which has its roots in the common experiences of children and does not exclude any of the fundamental special sciences. It seeks to elucidate the general principles observable in nature without emphasising the traditional division into specialised subjects until such time as this is warranted by the increasing complexity of the field of investigation by the developing unity of the separate parts of that field and by the intellectual progress of the pupils."

There may be difference of opinion regarding the inclusion or exclusion of some topics in one standard or another but the principles underlying the syllabus must be acceptable to all.

We have to explain our background in getting to know the opinions of the teachers on the syllabus and its flexibility to promote the interests of good and effective science education.

We have very many reports of commissions and committees on Science in secondary education both from the United Kingdom and the United States of America. Among the latest arrivals is "**Rethinking on Science Education**," which contains very useful matter most of which is acceptable to us. But we are concerned with science teaching in relation to our national needs. We are of the view that teaching 'science for its own sake' as arts for arts sake at the secondary school level is pointless. Therefore, we attempted to know if the science teachers were of the view that present syllabus could be taught on the basis of an understanding of the real needs of the high school pupil and the nature of our society. We hoped to gather evidence to help us in an appraisal of the syllabus with this object in view, but unfortunately the answers are vague and unhelpful.

Out of 171 schools, 148 schools have answered this question, some way or other. 23 schools have left this out of consideration. 56 institutions give clear indications of their views regarding the syllabus. They say that the syllabus is adequate. The remaining 92 say nothing explicit about the adequacy or inadequacy of the content. 52 of these institutions state that if they were given one more period a week, the syllabus could be worked out very well. We regard this as an implied acceptance of the adequacy of the syllabus. 36 institutions depose that the syllabus is too heavy and ambitious. They plead for lightening the syllabus by deletion of some topics but fail to specify what to delete. Four institutions of established reputation have unequivocally stated that the external examination powerfully militates against the realisation of the important purposes of the syllabus, namely, giving training in scientific method and promoting the scientific attitude. With regard to the sub-section of this question, whether the syllabus satisfies the needs in developing interests in science, thereby helping the promotion of scientific attitude, we do not find any clear indication of the views of those that have given evidence. Perhaps they thought explicit or implied expression of the view that the syllabus is adequate would be enough for drawing favourable inferences regarding this aspect of the question.

Most of the suggestions offered relate to satisfactory provision for individual work by pupils in a well-equipped laboratory. There are a few who perhaps from the way they themselves learnt science suggest the introduction of optional science to cater to the needs of pupils showing special aptitudes. We are of the view that every pupil throughout the secondary school course should study general science more from its cultural significance in our present day society than from the primary emphasis that is usually laid on exactitude in observation, measurement and thought, which is the characteristic virtue of the trained scientist. Therefore, it is impossible to give up the idea that the approach to science should be wide and unspecialised. The majority of those who have given evidence feel that it is possible to lay the foundation for subsequent specialised work by an effective teaching of general science.

We give hereunder a number of brief observations, arranging them in descending order of frequency :

1. The syllabus leads only to theoretical knowledge. There is no scope for practical work due to over-crowded classes and lack of equipment.
2. Practical work in science should also be assessed in the public examination.
3. Public examination in science should be abolished altogether to develop scientific attitude.
4. Intensive study of topics is not possible as we have to rush through the portions.

5. The syllabus includes a number of topics that overlap. So for pupils it is not interesting.
6. Sequence of topics is not in good order.
7. Personal hygiene and public health should form part of the human physiology syllabus.
8. From the section electricity and magnetism can be excluded such topics as electric induction, wireless and atomic energy.
9. Some topics on astronomy and transport vehicles may be included.
10. Depth in the subject is sacrificed at the expense of vastness of range of topics.
11. Pupils cannot grasp too many minor details that some topics includes. They should be dealt with in a lighter vein.
12. It is better to study a few topics thoroughly than complete so many in a haphazard way. The heavy syllabus compels one to do such work.

Comments

Some of the observations call for comments. The remarks may be broadly classified under the following heads :

- (i) Sequence of topics.
- (ii) Heaviness of the syllabus.
- (iii) Additions suggested.

We have given only random samples of suggestions offered. We are sorry to have to observe that, in a large number of cases, while the remarks of practising teachers have the merit of being true, they do not fit in with the purpose of General Science. The suggestion for intensive study which implies the restoration of the optional system has already been referred to as out of date at the secondary level.

Not an inconsiderable number of teachers point out that the topics of the syllabus are not arranged in proper sequence. But this observation is not supported by examples. The framers of the syllabus have grouped items under Physics, Chemistry and Biology, with a definite suggestion that these subjects are not to be treated in isolation from one another but should be integrated in the process of instruction. Integrated instruction requires adequate preparation during the period of training and careful planning for classroom instruction.

Take for example, **water**. In Physics its properties are dealt with in one way. In Chemistry it is the composition of water that is dealt with. In Botany its work as the carrier of food materials for plants is to be taught. Now it is for the teacher to decide to integrate the knowledge of water under these different sciences and impart it or treat each aspect in isolation. Our point is that there is enough latitude for the teacher to take up topics in that sequential order that suits him best.

We admit there is some point in the criticism that the learning load is heavy. That is because the syllabus is designed more with a view to preparing pupils for the university than for the secondary school leaver as conceived in the objectives set forth. What to delete and how to limit the content in those topics that are sought to be retained should be carefully studied and suggestions offered. Mere expressions of opinion regarding the heaviness of the syllabus will lead us nowhere.

Take for example the suggestion that 'topics should be dealt with in a lighter vein.' To say the least, this is astonishing. Every science topic is for serious study not at all to be treated as suggested.

Again, take the suggestion contained in sub-division 8 above. It is both distressing and amusing that such a suggestion for the exclusion from the section electricity and magnetism of electric induction, wireless and atomic energy should have been seriously made. What then are the boys to learn? No wonder that this suggestion emanates from science teachers whose degree course did not contain Physics even as a subsidiary subject of study.

It should be pointed out that in advanced countries like the U.S.A. there is a proposal to add new units and learning experiences in nuclear Physics to the Chemistry course in secondary schools. When such is the case we have to think very carefully about additions and deletions to our syllabus here and not hazard suggestions merely with a view to escaping from difficulties inherent in the teaching process.

We welcome the view that due importance should be attached to practical work in science. In fact the enquiry itself is designed to rouse people to a sense of awareness of the need for systematic practical work. But we are unable to support the view that it should be made a subject of public examination to require proper attention in school, for the organised teaching profession has been persistently agitating for the abolition of the S.S.L.C. public examination in favour of the recognition of the Certificates awarded by the Headmaster in consultation with the teaching faculty of the school.

A sincere teacher can surely rouse enthusiasm of pupils for practical work. Indeed the pressure for practical work is sure to come with greater intensity from pupils themselves, for the desire for it is natural to them.

Additions suggested are worth considering (Sub-divisions 7 and 9). In respect of personal hygiene we may observe that we as a nation compare very favourably with others. In fact, the custom of having daily baths has gone from India to Western countries. We are not referring to ceremonial baths here. It is in the case of public health that we have to do a lot to form correct habits among our pupils so that they may be better than their predecessors, in caring for public health. The dust and dirt in the streets of towns, the stinking smell in approaches to

villages all point to the need for systematic training and instruction in public health so that civic conscience may be properly developed. Here the Social Studies teacher has to share a part of the burden with the science teacher.

The suggestion that some topics on astronomy and transport vehicles may be included is good. Our syllabus has followed the tradition of giving weightage to theoretical Physics, Chemistry and Biology. But a course in general science should include elements of astronomy and geology. This is a matter for consideration when the syllabus comes up for revision.

College Teachers' Comments on the Content

College teachers were asked to state if the present content of curriculum in schools is sufficient to be a foundation for further learning of the science subjects in the degree classes and if the answers were negative, they were required to mention a few areas.

They were also asked to state if the present science programme in schools needed any change so as to fit in with the university programme and to offer their comments on this. Now let us look at their replies.

16 teachers say the present content of curriculum in schools is sufficient, while 11 state that it is insufficient. Among the areas that need stress according to them are the following: (The number against each signifies the number of college teachers holding the view.)

1. Lack of observation of nature — 10.
2. Lack of scope in practical work — 11.
3. Not enough foundation in botany and zoology — 3.
4. Problem solving not inculcated in pupils — 2.
5. Mathematical concepts in science must be taught — 3.
6. Must be taught valency, symbols and formulae — 2.
7. Training in collecting and observing specimens to be encouraged — 2.
8. Plant phyla must be included in botany — 2. (**Phylum**, in biology, is the name of a great division of the plant or animal kingdom, ranking below a sub-kingdom and above an order. The vegetable kingdom is usually divided into six phyla and the animal kingdom into eight phyla.)
9. Plants of the locality also to be studied in detail — 1.
10. Physical science syllabus must be revised for the high school — 1.

Nine lecturers say that the new entrants to the college are incapable of adjusting themselves for individual practical work while an equal number of teachers say that they are capable.

The view that the present science programme in high schools needs change is held by 11 of the witnesses, while 6 say that no change is needed. Comments offered are indicated briefly hereunder:

1. Training for individual practical work to be given — 11.
2. Concentric syllabus not good — 4.
3. The strength of the classes to be limited — 5.
4. Science to be taught only in English — 3.
5. Optional science of old preferable — 3.
6. More of biology and study of external characters of plants and animals to be included — 2.
7. Practical examination in science to be conducted in the S.S.L.C — 2.

In reviewing the evidence given we have to state that the syllabus on the whole is acceptable to a very large majority of high school science teachers. But a strong minority of college teachers that have given evidence feel inclined to the view that the high school science programme is insufficient, we think that the difficulties of pupils in adjusting themselves to the change in the medium of teaching science, namely, from regional language to English and lack of training for laboratory work have prejudiced the minority against the syllabus as a whole. There is much truth in the complaint that the classes are over-crowded, that the staff is insufficient for any effective programme of practical work and laboratory fittings, fixtures and equipment are also very inadequate to satisfy the needs of the situation.

We hoped that suggestions would be offered for improving the programme of science with reference to the special characteristics of our culture, which has been built on the bedrock of spirituality and reared in an atmosphere of religion and philosophy, but we find that this point of view is missed. Careful consideration is needed to make our pupils easily adjust themselves to the impact of scientific inventions and discoveries and technological developments on our culture. It is hardly recognised that pure science in its higher reaches is not less speculative than philosophy and that therefore there is nothing in our culture that is antithetical to science. Science is only 300 years old. It is comparatively new to us. Science and technology are the warp and woof of the fabric of American Culture. Although it was the Industrial Revolution in Britain that gave science a status in university studies, the emphasis of science in British culture is a shade less than in American culture, whose rapid development is unprecedented in the history of the world. Science is rapidly colouring the fabric of our culture. Whether that colour will be fast and evenly spread over the entire fabric or remain like mere patches of ink on blotting paper is yet to be seen. We want more science, and yet more science for our very existence. But we have to decide in time whether we should woo science or its beautiful

but naughty child, technology, or both in wholesome combination. It is here that the high school science teacher has a great part to play.

Therefore there is a great need to make a more careful study of the needs of our children in relation to the needs of our nation and determine the nature of the science programme that would help our pupils acquire enough competence. This we submit should form a separate area of enquiry by competent educationists.

SECTION XI

SCIENCE EDUCATION IN COLLEGES

We have already referred to a separate questionnaire issued to college teachers relating to conditions of teaching science, not only in secondary school but also in the college. The main purpose of this questionnaire is to get an appraisal of the results of science education in secondary schools and to get from college teachers their appraisal of the results and an estimate of the attitudes and aptitudes of the science students at the university level. They were also requested to comment on the courses of study in science and offer their suggestions for improvement. Portions of evidence relating to secondary school science have been used in Section IX of this report. In this section, therefore, we limit the study to college science.

We have before us the evidence of twenty-nine college teachers from thirteen colleges of the State. Of the twenty-nine college teachers twenty are heads of the different branches of science taught in colleges. Nine are lecturers. All the sciences offered in the college course are represented in the evidence that we have been able to gather. The science subjects offered in the Pre-university course are Physical Science which consists of Physics and Chemistry and Natural Science consisting of Botany and Zoology.

Views and Suggestions on Science Programme

Asked to state their opinion on science programme in colleges, the college teachers who have chosen to answer the questionnaire are mostly silent. They neither express themselves favourably nor unfavourably about the science programme in colleges. We may deduce that the programme offered is very largely acceptable to them. The suggestions offered by them for improvement are listed below in the descending order of frequency :

1. Proper training for individual practical work.
2. Inter-collegiate exhibitions in all branches of science to be attempted at least once in three years where pupils can exhibit their powers of improvisation and invention.

3. Well-equipped laboratory.
4. A good botanical garden and a miniature zoo must be maintained.
5. Useful excursions with a view to collecting specimens.
6. Hobbies in science, to be encouraged.

Proper training for individual practical work gets the highest frequency, thus corroborating the evidence of secondary school science teachers, that the greatest need is for individual practical work. Science Fairs as a stimulating force in the pursuit of scientific knowledge is highly valued by college teachers.

Reasons for not getting competent candidates for the B.Sc and M.Sc. Courses

In recent years principals and professors of science have been constantly complaining that the B.Sc. and M.Sc. courses of study do not draw competent candidates. We thought it worthwhile to enquire into the causes thereof. We mention below briefly the reasons given in the answers to the question. They are arranged in the descending order of frequency.

1. Technical qualification fetches a higher salary than B.Sc. or M.Sc. qualifications. Competent candidates are attracted by technical courses.
2. First class B.Sc.'s get well paid jobs or go for Engineering, Medical or Technological courses and do not go for M.Sc. course.
3. A craze for technical education.
4. Scope for research is very limited for M.Sc.
5. Some pupils join the colleges just to get a degree and so do not have real interest in any subject.
6. Pupils passing B.Sc. without any distinction do not get well paid jobs.

The Purpose and Effect of Learning Science

Among the traits that give proof of science having become functional in the lives of students, the most important is appreciating Science as a means of understanding nature. A majority say that students give expression to this trait. The others say that this is discernable in students. By what criteria this trait in students is assessed we do not know. Here again the cumulative effect of teacher's experience with the pupil should be given credence.

The teachers were asked to state if they found students enjoying the study of science or studying the subject only for the sake of the examination. Twentyfour of those that have given evidence state clearly that science is studied only from the examination point of view, while three, all of whom are women teachers, state that some of their students learn

science for enjoyment. The implication of the affirmative answer is that most of the students do not show enjoyment in learning science. This is perhaps one of the saddest features of teaching not only science but of every subject at the secondary and college level. Some method must be evolved by which teaching-learning process is successfully freed from the incubus of examination.

SECTION XII

MISCELLANEOUS

Teacher-Pupil Ratio

Evidence clearly shows that for any effective practical work in science the number of students in a class should be about 20 to 25. This is impossible in the present state of finances. Teachers have therefore to reconcile themselves to the fact, that for a long time to come, the strength of the class will continue to be 40 at least. From the figures we find that the average for a class in a city school is 41, in the municipal school 38, and in the non-municipal 40.

Time

The number of periods given for science varies from four to five.

Ninety-two schools (city—12, municipal—32, non-municipal—48) have allotted 4 periods of science in all the high school standards according to the number of periods suggested in the syllabus. 79 out of 171 schools under review have allotted 5 periods a week for the X Standard alone. 18 other schools have 5 periods a week even in the IX Standard. 29 out of 171 schools provide two consecutive periods for science in the high school classes to facilitate practical work.

Discipline

Teachers were asked to state if during pupils' practical work they have any discipline problem. 148 institutions say that they have absolutely no problem of discipline, while 21 state that they are experiencing some difficulty in the maintenance of discipline. Discipline is a conception that does not admit of easy definition. The purpose of the question was to get to know if there was orderliness during the time when pupils were allowed to do experimental work. Most of the 21 schools that confess to having some problem of discipline have too many pupils in a group, too few apparatuses and too cramped a space for laboratory work. Naturally there is bound to be restlessness among pupils. This restlessness, in our opinion, may be due to an eagerness on the part of the pupils to handle the materials themselves and do some work.

Age of the school

The age-range of the schools is 4 to 111 years. The number of schools lying between the ages of 4 and 9 is 22. These schools show that they do not have laboratories or are very much ill-equipped for laboratory work. In the past three years a good number of high schools have been started in the districts. Their conditions must be still worse, so none of them has chosen to answer the questionnaire.

Rules governing the sanction of recognition to schools do insist on provision of laboratory with equipment.

We fail to understand why in violation of them these schools should have been recognized. This is enthusiasm for expansion at a heavy cost of efficiency of instruction.

Our evidence shows that 33% or 62 schools of ten years standing are comparatively fairly equipped chiefly because of the fact that they have been recipients of government grants in recent years.

Sixty-four schools lying between the ages of 10 and 40, show some equipment, but not commensurate with the needs of their strength. There are schools that find it difficult to get fresh grants sanctioned for the improvement of the laboratory by virtue of the fact that they have laboratories built during the days when the optionals were in vogue. Schools over the age of 40 that gave us evidence are only 5. These are among the schools that could be said to be equipped fairly satisfactorily for science work. There is no evidence to show that growth in laboratory equipment is in proportion to the rise in strength or in number of years of standing of schools.

SECTION XIII

(I) THE ROLE OF THE SCIENCE TEACHER AND HIS EQUIPMENT

We find that inadequate facilities for a practical approach to the teaching of science, continued failure to recognise and reward merit, and salary scales which always keep teachers below the margin of subsistence have all conspired to bring about a sense of frustration among science teachers. The result is an attitude of indifference towards effective science teaching. The teacher needs to be roused to a sense of awareness of the importance of his work, particularly in a period of transition as the present. The public too require to be informed about the part the science teacher has to play in the building up of a socialist pattern of society which is our nation's goal.

The situation has to be described for a proper appreciation. We have elsewhere in this report observed that science is comparatively new to us. By science here we mean the way of life and the outlook on life fostered by modern means of industry, transportation and communica-

tion. It takes time for such cultural traits to be absorbed. Scientific knowledge is a common heritage, wherever it may have sprung. Its spread is a question of time. In the early decades of the 19th century the question whether science should be taught at all was hotly debated in Britain. Then differences arose about how much of it should be taught. Now we find science occupying a pride of place in elementary, secondary and university curricula of studies in all western countries. Our science programmes have so far been diluted doses. We need scientific knowledge for improving the standard of living of our people. But the appeal of science is not merely economic; it is also cultural. We cannot believe that science is the property of any one nation or a peculiar product of any geographical area. Science has no race or politics. By its objective validity it has a universal range, unlike literature and fine arts which because of their subjective validity, have a limited range of appreciation. In the present situation of our country, development of scientific knowledge and cultural traits that it gives rise to are just the things that can increase the wealth of the nation and promote a healthy international outlook, breaking down the barriers of casteism, lingualism and parochialism.

Swami Vivekananda wanted to combine Western progress with India's spiritual background. He said, "Make a European society with India's religion." "Be an occidental of occidentals in your spirit of equality, freedom, work and energy and at the same time a Hindu to the very backbone in your religious culture and instincts."

If the scheme of free Secondary Education comes into force, 90% of our Secondary School pupils have to leave school with the completion of secondary education course.

They form the majority of the educated section of the community. So we may say that Secondary Education is for providing the junior leadership for the community.

The task of spreading scientific knowledge and building up habits of thought and action in consonance with what Swami Vivekananda has said, devolves upon the secondary school science teacher, more than on anybody else.

Particularly in the context of the Third Five Year Plan the science teacher's part in secondary education assumes an enviable importance. It is hoped that science teachers will shake off their lethargy and bestir themselves in time to play their part with judicious care and informed enthusiasm.

(II) THE EQUIPMENT OF THE TEACHER

The importance of the Science Teacher's role in secondary education raises problems relating to methods of teaching and training of teachers. These are wide areas which deserve a separate comprehensive survey.

Here we can only give certain general principles on which the teaching-learning process should be based. These principles will suggest methods of teaching and the nature of training needed.

(1) A fundamental requisite is that the teacher should have a thorough grasp of the subject matter of science that he is to teach. Of what avail are methods of teaching if the teacher's knowledge is insufficient?

(2) Teaching should be more pupil-centred than subject-centred. Individual differences in pupils' rate of learning should be noted and instruction suitably adjusted.

(3) No subject lends itself more easily for learning by doing than science. Doing implies teacher's demonstrations, pupil's experimental work, recording observations, purposeful field trips, organising science fairs and improvising apparatus, etc.

(4) Activities are the main media for the cultivation of scientific attitude and the pursuit of scientific method. Too much stress cannot be laid on the care and thought needed for planning activities.

(5) From time to time the teacher has to satisfy himself that his teaching is definitely leading to the realisation of the objectives of science instruction. He should be familiar with some valid method of evaluation.

(6) Teaching-learning process should be the co-operative endeavour of the teacher and his pupils.

(7) The teacher should be enabled to have sufficient tools of instruction.

Successful instruction in science depends on judicious application of the above principles which, it should be noted are not exhaustive.

Effective practice in science teaching depends not only on the initiative and resourcefulness of the teacher but on the previous training he has had. Before describing the nature of training needed we have to refer to prevailing conditions for a proper perspective.

There are two factors that cripple the initiative of the classroom teacher. One is the uniform syllabus for the entire State in the framing of which the practising teacher has little or no hand. The other is the prescription of a text book without any reference to the concerned teacher. We wonder if the objectives given at the beginning of the syllabus receive due attention from the teacher. The teaching is mostly textbook centred and text books can only give facts. Mere facts cannot help in the formation of desirable habits and attitudes. Something should be done to make the teacher feel that the syllabus and the text book are his tools and not masters. Only then can freedom and initiative grow in the teacher.

Field trips or excursions are intended to develop powers of observation in pupils and relate science teaching to life around. Often these excursions are no more than pleasure trips for sight seeing.

(III) THE TRAINING OF THE SECONDARY GRADE TEACHER

The Secondary Grade teacher leaves high school and joins a training school for a two year training. Besides general principles of education and psychology, he is taught methods of teaching all the subjects of the curriculum. His first year course contains some elements of content in different subjects. We are inclined to the view that the prospective science teacher of this grade should have much more knowledge of science than what he has learnt in the high school. This may apply to other subject areas also. We have noted that science is taught very indifferently in high schools for reasons which are mostly beyond the control of science teachers. Therefore, there is a great necessity to ensure the prospective teacher's competence in the content of science.

There is no other way of doing this than by increasing the period of training from two years to three years. Instead of making the Secondary Grade teacher a Jack of all trades, it is better to allow him to elect two or at the most three subject areas including a language and provide for an intensive content course in each subject. Instead of awarding him the Training School Leaving Certificate, he may be given a diploma stating the subjects in which he is competent to teach. The training should provide for the prospective science teacher ample opportunities for laboratory work. He must have the experience of performing experiments and demonstrations which he will be called upon to do to his class. He should be given opportunities to study pupils in the practice class assigned to him with special reference to needs and attitudes of pupils. He must be made to acquire the capacity to enlist the co-operation of his pupils in any project that may be decided by teacher-pupil discussion.

The trainee should know clearly the general objectives of science teaching and specific objectives of each of the standards up to VII. He must have practice in designing teacher-learning process with the purpose of realising some specific objective.

(IV) THE TRAINING OF THE B.T. TEACHER

We have pointed out that B.Sc., B.T. Teachers fight shy of teaching subjects which they did not study either as main or subsidiary subjects in their respective colleges. The percentage of such teachers may be small but the number of pupils entrusted to their care should be considered. They run to some thousands. The condition that allows perfunctory teaching to so many should be removed immediately. We understand that many Training College Principals have expressed the

need for a content course during the period of training. They also seem to favour the increase in the period of training from one year to two years. This proposal deserves to be supported and given effect to.

What we have already said in respect of training for laboratory work and planning activities apply to B.T. trainees with greater force.

(V) RECRUITMENT OF STAFF TO TRAINING INSTITUTIONS

It should be laid down as a rule that the first essential qualification for recruitment to the staff of the training college should be ten years of teaching experience in a high school. Efficiency in the training given to prospective teachers depends largely on the teachers' college lecturer's enthusiasm, knowledge, experience and capacity to inspire. Satisfactory personnel can be had only when a post in the training college is made a prize post for approved merit. This means liberal scales of salary.

SECTION XIV

SUMMARY

1. From a study of the conditions of teaching science in secondary schools of strength ranging from 57 to 1282 in the high school department alone, we learn that there is a great need for improving laboratory space, fittings, fixtures, apparatus and appliances, materials and chemicals, to facilitate effective science teaching.
2. There is an inadequate recognition of the value of visits which show science in action.
3. Nearly 40% of the schools under review do not possess audio-visual aids. Even where they are used there is no adequate previous preparation for observation and useful follow-up work for reinforcing the ideas gained.
4. In the teaching of biology, there is no noticeable stress on the place of garden and aquarium.
5. Museums, where they are kept, show no fresh additions. In a good number of schools it is not regarded as an indispensable aid to teaching.
6. In the absence of facilities for individual or group work in the laboratory, frequent teacher demonstrations are indispensable for instilling facts and principles of science. In a large majority of schools even these demonstrations are not adequate in number. Learning science by doing in the present circumstances has become more the exception than the rule.
7. Where there is evidence of experimenting by individuals or groups there is no insistence on the maintenance of records.
8. Lack of money is the root cause for many of the deficiencies in school equipment for teaching science.

9. Science teachers can to a greater extent than now, harness agencies, such as Extensions Services and Science Clubs to improve teaching of science.

10. The competence of science teachers of middle school standards has to be increased so that the entrants to the eighth standard may have adequate preparation for high school science work.

11. To put the matter in a nutshell high schools are having qualified science teachers but they lack the tools of instruction. The situation required the immediate attention of all those interested in the promotion of science education in secondary schools.

12. Science teachers lack confidence to handle elements of those branches of science which they did not study for their degrees.

SECTION XV

CHALLENGING PROBLEMS

The problems that await solution are many. Here are a few that challenge the teacher and the administrator.

The objectives of the curriculum are sound. A large majority of teachers are trained. The average pupil evinces an interest in learning science. The equipment and facilities needed to implement the curriculum are woefully lacking. What can be done to improve the situation immediately? Can the enthusiastic skilful teacher do anything to create and sustain the interest of his pupils in learning science in spite of the inadequacy?

In view of the difficulty of building laboratories for lack of space to suit the growing number of pupils getting into high school, can anything be done to teach science in self-contained class-rooms and provide for effective service of apparatus, materials, and chemicals to the classroom from the place of storage in the school?

As it is impossible to reduce the size of the class, what methods can be adopted to give individual or group work to train pupils to acquire skills and abilities that gradually lead to scientific attitude towards life and its problems?

There is a great need to broaden the interests of pupils and open up new avenues of learning. How can this be done?

Activities have to be varied to suit differences in individual needs, interests and skills. What may be done to provide for a variety of activities intimately related to life around?

Background knowledge in science is more important than the ability to retain and recollect facts and principles, for it is that knowledge that will help the pupil pursue scientific method in his work. What may be done to help pupils acquire this?

The teacher is the key to the learning situation in science. What may be done to increase the competence of the average teacher?

APPENDIX A

MEMBERS OF THE SCIENCE COMMITTEE

1. Sri T. N. Sundaram, Headmaster, Thyagarayanagar High School, Madras-17.
2. Sri M. Vincent Simon, St. Gabriel's High School, Broadway, Madras-1.
3. Sri G. Venkataraman, Professor of Botany, Vivekananda College, Mylapore, Madras-4.
4. Miss E. G. Vedanayagam, Co-ordinator, St. Christopher's Training College, Vepery, Madras-7.
5. Sri V. Narayanaswamy, Hindu High School, Triplicane, Madras-5.
6. Sri S. Swaminathan, Hindu High School, Triplicane, Madras-5.
7. Sri Ramamurthi, A. G. Jain High School, Sowcarpet, G. T., Madras-1.
8. Sri C. S. Venkataraman, A. G. Jain High School, Sowcarpet, Madras-1.
9. Sri A. N. Samaraj, Headmaster, Sir Theagaraya College High School, Washermanpet, Madras-21.
10. Sri T. P. Srinivasavaradan, 10, Kesavaperumal Westward Street, Mylapore, Madras-4.
11. Sri K. Kuruvila Jacob, Headmaster, Christian College High School, Chetpet, Madras-31.
12. Professor K. S. Venkateswaran, Presidency College, Triplicane, Madras-5.
13. Sri R. Mahadevan, Sri Ramakrishna Home Residential High School, Mylapore, Madras-4.

Ex-Officio :

14. Sri V. Natarajan, President, 9, Fourth Main Road, Gandhinagar, Madras-20.
15. Sri S. Natarajan, Director of Projects, 3, Thiruvengadam Street, Raja Annamalaipuram, Madras-28.
16. Sri V. Arunajatai, Secretary-Treasurer, Rajah Muthiah High School, Madras-28.
17. Sri G. Srinivasachari, Co-ordinator, S.I.T.U. Council of Educational Research, Madras-28.

APPENDIX B

CONDITIONS OF TEACHING SCIENCE IN SECONDARY SCHOOLS

A Questionnaire

1. What is the strength of your school?
Lower Forms Higher Forms
No. of Sections No. of Sections
2. How many teachers in your school are engaged in teaching science?
Middle School :
High School :
3. Are all secondary grade teachers required to teach science? If not, why only a few teachers are required to teach science?

4. What are the educational qualifications of science teachers of the higher forms? **Names are not required.** Please specify the special aptitudes, interests, etc. under the last but one column. E.g., Museum technique, sponsoring science club, in charge of projection of films, etc. Under co-curricular activities, please specify NCC work, Drama Club activities, Secretary of teachers' association, Excursion organiser, etc.

S. No.	Qualifications Professional & Academic	Science Subject in the degree class/Main- Subsidiaries	Teaching experience Yrs.	Special aptitudes interests etc.	Co-curricular activities &c.
1.					
2.					
3.					
4.					
5.					
6.					

5. How many practical experiments are done by the pupils in a year?
VIII Standard
IX Standard
VI Form
6. Keeping in mind the demonstrations suggested in the syllabus do you perform all of them?
More than the number prescribed?.....
Less than the number prescribed for lack of adequate number of apparatus?
7. What is the approximate size of your laboratory?
Length
Breadth
8. Do you have a demonstration table?
9. Are there work tables for the pupils?
If so, how many?
10. Do you have cycles of experiments for practical work?
If so, how many experiments in a cycle?
11. Do you give the same experiments for all the pupils of the same class? Please check your answer.
Always
Sometimes
Never
12. How many pupils are grouped together to work with the same apparatus to work on a particular experiment at a time for lack of adequate number of apparatus?
13. Do you have any discipline problem during practical work?
14. Is there an attender to arrange the apparatus for practical work?
15. How many of the following do you have? Do you consider them adequate or inadequate?

Apparatus	No.	Adequate/ Inadequate	Apparatus	No.	Adequate/ Inadequate
(1) U-Tubes			(2) Physical balances		
(3) Prisms (Glass)			(4) Bar Magnets		
(5) Thermometers			(6) Pulleys		
(7) Concave Mirrors			(8) Convex Lens		
(9) Inclined planes			(10) Stop clocks		

16. What do you think would be the optimum number of apparatus required for a class of 40 pupils with respect to the same items?

(1) U-Tubes	(2) Physical balances
(3) Prisms (Glass)	(4) Bar Magnets
(5) Thermometers	(6) Pulleys
(7) Concave Mirrors	(8) Convex Lens
(9) Inclined Planes	(10) Stop clocks

17. Do you have the following in your school?

(1) Boyle's Law Apparatus	(2) Sixe's Max. & Min. Thermometer
(3) Ammeter	(4) Voltmeter
(5) Electromagnet	(6) Newton's Disc
(7) Archemedes — Socket and Cylinder	(8) Aneroid Barometer
(9) Fortin's Barometer ..	(10) Dissection Set
(11) Microscope	(12) 16 mm. Projector — Silent/Sound
(13) Filmstrip Projector ..	

18. Do you have the following substances in your school for experiments in Chemistry?

(1) Potassium chlorate	(2) Phosphorus
(3) Sodium metal	(4) Magnesium ribbon
(5) Manganese dioxide ..	(6) Iodine crystals
(7) Ammonium chloride	(8) Sulphur
(9) Ammonia	(10) Nitric acid
(11) Sulphuric acid	(12) Hydrochloric acid
(13) Sodium hydroxide ..	(14) Potassium ferrocyanide ...

19. Do you have the following models in the school?

(1) The heart	(2) The lungs
(3) The kidneys	(4) The skin
(5) The eye	(6) The ear
(7) The alimentary canal	(8) The brain

20. Do you have a human skeleton in your school?

21. Do you have the following charts in your school ?

- | | |
|----------------------------------|--|
| (1) The excretory system | (2) The nervous system |
| (3) The circulatory system | (4) The sense organs |
| (5) The skeletal system | (6) The flower and its parts ... |
| (7) The dispersal of seeds | (8) Spherical mirrors and lenses |

22. What are the other science charts you have in your school ?

23. Do you have facility for darkening the room for conducting light experiments ?

24. What kind of light sources do you use for light experiments ? Please check (1) Oil lamp. (2) Candle light. (3) Electric light. (4) Any other.

25. Do all the teachers of I, II and III Forms make use of the laboratory and equipment for demonstrations of experiments ? Check to denote the answer :

- All of them
A few of them
None of them

26. Do you have a room in the laboratory or near it exclusively for conducting science classes ?

27. Do you have running water supply and electricity supply in your laboratory ?

28. Do you have supply of electricity in your school ?

29. Does your school own filmstrips pertaining to units in the science curriculum ? If so, how many ?

30. Do you borrow films for teaching science from other sources ? If so, from what sources ?

31. How many records of science experiments are normally expected from the pupils ?

- VIII Standard
IX Standard
VI Form

32. Could you please name the non-recurring items added during

- (1) This year
(2) Last year
(3) The year before last
(4) What was the expenditure incurred
(5) How much is collected by way of special fees

33. Is there a science subject committee in your school ?

34. Please name a few problems considered by the committee ?

35. What are the conditions which militate against pupils evincing interest when experiments are demonstrated ?

36. Do the pupils show sufficient interest in getting the specimens required for class work, for example, collection of botanical specimens required for class ?

37. Could you please suggest reasons for pupils sometimes showing lack of interest in doing practical work ?

38. Do you have a Science Museum in your school ? If so, is it classified and arranged ? Mention a few recent additions.

39. Is there a Science Club in your school ?

40. How many members are there in the club ?

41. Could you please name a few activities and projects of the Science Club ? Mention the sources of income.

42. When was your school started ?

- (1) More than 40 years ago
(2) More than 30 years ago
(3) More than 10 years ago
(4) More than 5 years ago
(5) Less than 5 years ago

43. Do you feel that science attitudes can be inculcated by the teacher ?

- (1) in the context of curriculum ;
(2) in the context of physical facilities ;
(3) in the context of facilities or opportunities for practical work.
Please give reasons for your statement.

44. Are there separate laboratories in your school for physical science and biology ?

45. How many science periods do you have in your school in a week ?

- | | |
|-------------------------|-------------------|
| VIII Standard | IX Standard |
| VI Form/X Standard | XI Standard |

46. Do you have double periods (2 consecutive periods) for practical work ?

47. Do you think that the effective teaching of science requires more practical work than what is contemplated in the present syllabus ?

48. If your answer is in the affirmative could you please name some of the additional experiments ?

- | | |
|-------------------------|-------------------|
| VIII Standard | IX Standard |
| VI Form/X Standard | XI Standard |

49. Could you please name a few activities as group projects or collections, or individual projects, etc. in the following classes in your school ?

Class	Activities
I Form	
II Form	
III Form	
VIII Standard	
IX Standard	
VI Form/X Standard	
XI Standard	

50. Could you please specify experiments which you wished to perform but which you could not for want of apparatus ?
- (1)
 - (2)
 - (3)
 - (4)
51. Have you had any opportunity of improvising any apparatus or appliances which were not available or could not be bought ? If so, could you please name them ?
52. Did your school get any special grant for laboratory equipment ?
53. What is your opinion about the idea that the pupils who show a special aptitude for the study of Physics, Chemistry and Biology should be given an opportunity for studying the subject of their choice intensively during the last two years of their high school course ?
54. In your programme of science teaching and science activities do you get any assistance from the nearest Extension Service Department ? If so, in what way ?
- (1) Science Club
 - (2) Use of Audio-visual equipment
 - (3) Exhibitions
 - (4) Library service
55. Is every pupil of your class given an opportunity to do an experiment individually or has he to do the experiment along with one or more pupils ?
56. Please give your opinion about the present science syllabus in its adequacy, its satisfying the needs of the pupils for developing the interest in science and promoting the scientific attitude and your suggestions for improvement.

School Signature

Place Designation

Date

APPENDIX C

CLASSIFICATION OF THE QUESTIONNAIRE

Headings & Sub-headings	Question Numbers
I. Laboratory :	
(a) Space	7, 44, 26.
(b) Fixtures	8, 9.
(c) Fittings	27, 28, 23, 24.
(d) Apparatuses and appliances	15, 16, 17.
(e) Chemicals	18.
(f) Models and Charts	19, 20, 21, 22.
II. Aids to Science Teaching :	
(1) Audio-Visual equipment	17, 29, 30.
(2) Science Clubs	39, 40, 41.
(3) Science Museum	38.
(4) Improvised aids	51.
(5) Science Committee	33, 34.

III. Teacher Demonstration and Pupils' practical work :

- (1) Teacher demonstration 6.
- (2) Pupils' practical work 5, 31, 10, 11, 12, 55, 14.

IV. Teaching Personnel :

- Qualification, Number 4, 2.

V. Finance :

- Grants and Special Fees 52, 32.

VI. Attitude and Interest and Activities in Science :

- 43, 35, 36, 37, 47, 48, 49, 50, 54.

VII. Content of General Science :

- 53, 56.

VIII. Secondary Grade Teachers Teaching Science :

- 3, 25.

IX. Miscellaneous :

- 13, 45, 46, 42.

(Note :—The questionnaire issued to college teachers is used under headings VI and VII of this Appendix and in Section XI of the Report. The number of the headings in the Appendix does not correspond to the number of section in the body of the report.)

APPENDIX D

QUALIFICATIONS OF TEACHERS — CLASSIFIED

	Science Teachers	
	Trained	Untrained
B.A. or B.Sc. B.T. or L.T.		
1. Physics (Main)	157	5
(Chemistry 81, Mathematics 76) (Subsidiaries)		
2. Chemistry (Main)	117	9
(Physics 65, Mathematics, 48, Natural Science 4) (Subsidiary)		
3. Zoology (Main)	81	3
(Botany 71, Physics 6, Chemistry 3, Geology 1) (Subsidiary)		
4. Botany (Main)	59	3
(Zoology 51, Physics 6, Geology 2) (Subsidiary)		
5. Mathematics (Main)	38	7
(Statistics 5, Physics 21, Chemistry 12) (Subsidiary)		
6. Geology (Main)	4	—
(Botany 3, Natural Science 1) (Subsidiary)		

QUALIFICATIONS OF TEACHERS — CLASSIFIED—(Contd.)

Science Teachers	Trained	Untrained
B.A. or B.Sc. B.T. or L.T.		
7. Natural Science (Main)	8	1
8. Home Science (Main)	3	2
9. Geography (Main)	4	—
(Economics 2, Botany and Zoology 2)		
(Subsidiary)		
10. Agriculture (Main)	1	1
(Chemistry 1) (Subsidiary)		
11. Economics (Main)	2	—
(History 2) (Subsidiary)		
12. History (Hons.)	1	—
13. Tamil (Hons.)	1	—
14. M.A., B.T. or L.T. — Physics	6	—
-do- — Zoology	1	—
M.Sc., B.T. — Physics	1	—
B.A. (Hons.) — Physics	1	—
-do- — Chemistry	1	—
B.E., B.T. (Engineering incomplete)	1	—
	<u>487</u>	<u>31</u>

APPENDIX E

A QUESTIONNAIRE FOR COLLEGE TEACHERS
ON CONDITIONS OF TEACHING SCIENCE

- Name of the person answering the questionnaire :
Asst. Lecturer
Lecturer
Professor
Head of the Dept.
- College
- What are the science subjects offered in your college for the P.U.C. ?
(i) (ii)
(iii) (iv)
- Do you feel that the pupils who join P.U.C. have sufficient knowledge of the fundamentals expected of them ?
in Physical Science
Natural Science
- (a) Do you feel that the present content of curriculum in schools is sufficient to be a foundation for further learning of the science subjects in the degree classes ?
(b) If not, please mention a few areas.

- Do you feel that the new entrants in the college are quite capable of adjusting themselves to the necessity of doing practical work individually ?
- (a) Do you feel that the present science programme in schools needs any change so as to fit in with the present University programme ?
(b) Please comment on this.
- Educators are of opinion that there should be an excellent science programme in schools and colleges. Please give some practical suggestions for improvement.
- Principals and lecturers often complain that they do not get competent candidates in B.Sc. and M.Sc. What in your opinion are the reasons for this ?
- Do you feel that the students who enter the college have at least a little ability to search for cause and relationship ?
- Do they have the habit of
(1) Accurate observation ?
(2) Accurate statement ?
- Do they try to make intelligent understanding of phenomena of nature ?
- Do they try to make intelligent understanding of inventions and discoveries of man ?
- Do they try to make intelligent understanding of their environment ?
- Do they have the following attitudes and abilities ?
(i) Making proper generalizations.
(ii) Gathering information from given data and analysing them.
(iii) Deducing inference.
(iv) Not making generalization with insufficient information.
(v) Verifying hypothesis.
(vi) Applying scientific principles.
- (a) Do the students appreciate science as a means of understanding nature ?
(b) Do they enjoy learning science or do they study only for the sake of examination ?

MAKE YOUR OWN MAPS—I

B. M. THIRUNARANAN

Maps have become quite common place nowadays. They are often employed on posters and charts of many kinds of display to the public. The daily newspapers use them to illustrate news items and current topics. More and more people are evidently realising that maps are quite useful to make many points clearer and more exact. They seem to take it for granted that the public for whom they cater will be able to understand and utilise the maps presented to them. This measure of comprehension of maps will be common only as a result of specific training; in other words, only if pupils in schools are regularly trained to understand and use maps.

It has been said in a lighter vein that History teaches about chaps and Geography about Maps. It is now the job of the Social Studies teachers in our schools to deal with both; and to them the situation outlined above constitutes a challenge. But the enterprising teacher can transform it into his opportunity, to make his lessons on maps more interesting and effective.

Maps are valuable in fact, unique-aids for remembering accurately the relative position of places and of features like mountains, rivers, and routes. When maps have been explained to the pupils and are understood by them, they will become indispensable teaching aids in nearly all geography lessons. A large amount of information can be accurately and clearly shown on a map, in a limited space. Thus maps can help both the teacher and the pupils to compress much factual information into compact and readily remembered visual images. Used properly maps can be very useful time-saving devices, of much value especially when the teacher has to cover a large syllabus. Facts taught and fixed in one's memory with reference to maps will be more vividly and exactly remembered than when they are taught without any such aid.

On account of various restrictions, the imported maps, and atlases on which we have all along been depending are not available just now. The only permanent solution for this problem is to manufacture them in India itself. But this will take some years in any case, and meanwhile teachers will have to find other remedies capable of yielding immediate results.

With a little initiative and self-help, any teacher can successfully cope with the situation, by making use of the small maps available even in old atlases and books. The teacher can trace and enlarge to

the required size, on the blackboard, or on a large sheet of paper, the relevant portions of these maps. The enlargement will provide an out-line containing the salient features; but the teacher who is making his own maps can also combine details from several maps, so as to suit his requirements.

Enlargements are easily and quickly made by what is known as the method of squares, it is best to do it systematically, step by step.

1. The original map must be traced, and the tracing covered with a grid or network of small squares of uniform size. This is done by ruling on it two sets of evenly spaced parallel straight lines, at right angles to each other.

2. On the blackboard, a similar grid with larger squares is drawn next, as the basis for the enlargement. For instance, let us suppose that the original map is 2 inches by 3 inches, and the enlargement has to be 4 feet long. The enlargement will then be sixteen times as long as the original. The width will therefore have to be 32 inches. If the square on the original map has sides one-tenth of an inch long, the enlargement must have squares with sides 1.6 inches long.

3. On this enlarged grid, drawn on the black-board, the details of the original map will have to be drawn, bit by bit, in the corresponding squares.

4. It is advisable to draw the grid lines faintly; they may then be easily rubbed off, when all the details have been incorporated in the enlargement.

5. Use colours sparingly and in keeping with the conventions observed in maps, e.g. **blue** for water, **green** for vegetation, **red** for roads.

Some schools have blackboards with squares ruled on them in red or white paint, for use in drawing graphs. One of these boards may be used for making the enlargements. It is advantageous to have the grid lines ruled in on inconspicuous red or brown colour. It will be even better to have the grid lines slightly incised into the wood, before the board is painted black; then the lines need not be painted in a different colour, because the teacher will be able to see the incised grooves quite clearly. Permanent grids of this sort will be quite helpful, because they would save the time that would otherwise have to be spent on drawing one, every time an enlargement is made.

Usually, two blackboards, about 4 feet into 5 feet each, will be needed for a geography lesson. These should be painted black on both sides, and one side of each may also have squares ruled on, as described above. Instead of keeping them on easels, which take up floor space two grooved wooden bars may be fixed on the wall. So that the blackboards may be slid between them. With this arrangement the blackboard can

be reversed whenever a map drawn on it has to be put out of the way. At a pinch two maps or diagrams may be retained with this arrangement.

Many of my students in the Government Training College at Rajahmundry used to prepare such enlarged maps on blackboards in less than an hour. With a little forethought and planning, an enlargement on the blackboard can be retained and used for several lessons. Sometimes these maps have to be somewhat elaborate, and need more time and labour. Or they may be needed later on. Such maps are best drawn on paper, or on roll up blackboards. Black cartridge paper can be bought in sheets of fairly large size, at a small cost and permits the use of chalk crayons, as on the wooden blackboard. Some charts made in this way for the Adult Night School at Rajahmundry were in daily use for a whole year. Roll-up blackboards are now made in India and may be readily obtained from any firm supplying educational equipment. They may also be made quite easily by any teacher, for less than ten rupees, by fixing a piece of leather-cloth of the required size on wooden battens. The kind that is used for covering the seats and cushions of motor vehicles is best for this purpose. The surface may be given a coat of blackboard paint to make it retain chalk lines satisfactorily.

The pupils must also be provided with similar smaller outlines for their use whenever the teacher uses one. They will then be able to note all details quickly and exactly, and class time will be saved. Small outline maps on paper may be easily prepared by the pupils themselves by using carbon paper to make the required number of copying from the original tracing. When tracing and carbon paper are not readily available, ordinary white sheets may be utilised by smearing them lightly with kerosene or coconut oil to make them translucent. When the excess oil is wiped off, the surface will take pencil marks as well as before. After tracing the outline, etc., on one side of the sheet, its underside—i.e. only those portions which carry writing—must be smeared with black lead to yield visible impressions resembling carbon copies.

Tracings can be made without using tracing paper, by placing the map and the sheet of paper over it—on a sheet of fairly thick glass, with a light below it. A tracing frame of this kind can be made for the school, and will be a very useful item of equipment for the teacher handling Social Studies. It will save him and his pupils much time, and eliminate the extra cost of tracing paper also, whenever they prepare maps for class use. A tracing frame with a glass sheet 18" × 18" will meet most needs, and cost less than an ordinary wooden chair. A window-pane may also be used similarly for making small tracings, when the map is a loose sheet.

Several maps of India will be needed by each pupil, in those classes where they study the History or the Geography of India in detail. In Standards V, VIII and IX each pupil may well need in each class a dozen maps for use during the lessons on Geography and a similar number for History. A class of forty pupils will use over a thousand outlines in a year, and the total number of maps required by the whole school in a year may rise to several thousands. In a single year, 11,000 outline maps of various regions were made in the Geography Section of the Government Training College at Rajahmundry and supplied for the use of the pupils in the Model Secondary School attached to it. Any rapid and cheap mechanical method of producing outline maps will therefore save a great deal of time, labour and money. Neighbouring schools could collectively get most of the printed in one lot, for two or three years' use. Though the individual maps will be cheaper, this will involve drawing on the blocks from which the maps are made. But these blocks can be retained by the schools, and used again in subsequent years.

Instead of printing them, each school may cyclostyle copies of all the maps needed. About 500 copies may be made with each stencil, and retained for use over a few years. A duplicator can be used for copying a large variety of material. Every school must not only possess a duplicator, but should also see that its teachers utilise it fully, to make their teaching more efficient. Cyclostyled and printed outline maps will be quite neat and presentable, and make the pupils aim at higher standards of neatness and appearance when using such maps.

Fairly neat outline maps can also be drawn quickly by the pupils themselves from the templates cut out of the cardboard or plywood. The outline map must first be drawn, or traced carefully, on a piece of plywood, of suitable size. It is then cut out with a fretsaw. These templates can be easily made by the teacher himself, when the outlines are fairly simple. A plywood map of India and Pakistan 18" × 18" made by the author recently, cost less than a rupee. When the outlines are somewhat intricate, the narrow projecting bits in the templates are apt to break when handled. Maps of this type are better made on aluminium sheets or linoleum. The internal boundaries, i.e., of States or of districts, can also be satisfactorily drawn by cutting them out like the pieces in a jigsaw puzzle.

Pupils will find it easier to use these templates, instead of preparing tracings as suggested earlier. The first templates made for their use should be for those maps, e.g. of India, which will be needed in large numbers. These templates will last several years, and hence the teacher will be able to build up a sizeable collection in a few years, even if he prepares only one or two every month.

THE SOUTH INDIA TEACHERS' UNION

EXECUTIVE BOARD MEETING PROCEEDINGS

The second meeting of the Executive Board of the South India Teachers' Union for the year 1961-62 was held at Coimbatore in the premises of P.S.G.R. Krishnammal Girls High School commencing at 11 a.m. on 11th November 1961. The meeting was held in three sessions on both the days 11th and 12th November 1961. Rev. D. Thambusami, President of the Union, took the chair. Dr. Ashby, Deputy General Secretary, National Educational Association, America was present by Special invitation.

The following members were present :—

Messrs. S. Ganapathi, (Tanjore) ; C. M. Fazalur Rahmon, (North Arcot) ; C. Ranganatha Aiyengar, (Journal Secretary, S.I.T.U.) ; J. D. Muthiah, (Treasurer, S.I.T.U.) ; M. S. Rangaswami, (Madurai) ; T. R. Thiruvengataswami, (Coimbatore) ; M. Subramaniam, (Tinnevely) ; V. Mariarathnam, (Madurai) ; D. Sebastian, (Ramnad) ; N. K. Venugopal, (Trichy) ; P. V. Ramaswami, (Addl. Journal Secretary, S.I.T.U.) ; V. Antonysamy, (Vice-President, S.I.T.U.) ; S. D. Krishnamoorthy Rao, (Secretary, S.I.T.U.) ; S. Natarajan, (Ex-officio) ; T. P. Srinivasavaradan, (Ex-officio) ; and G. R. Damodaran, (Coimbatore).

Secretaries and Presidents of the District Teachers' Guide were also invited and the following Districts were duly represented :—

Madras : President — Mr. A. K. Sitaraman. Secretary — Mr. T. Krishnamachari.

North Arcot : President — Mr. K. M. Rajagopalan.

South Arcot : President — Mr. J. R. Chellappa.

Chingleput : Secretary — Mr. L. Srinivasaraghavan.

Coimbatore : President — G. R. Damodaran. Secretary — P. Ramachandran.

Ramnad : Secretary — Mr. S. S. Narayanaswami.

Madurai : Secretary — Mr. V. Mariarathnam (For K. S. Krishnan).

Salem : Secretary — Mr. S. Subba Rao.

Tinnevely : President — Rev. Fr. Arul Joseph. Secretary — A. S. Arulappan.

Trichy : Secretary — Mr. C. Srinivasaraghavan.

The Chairman of the meeting introduced the members to each other.

Sri G. R. Damodaran, President, Coimbatore District Teachers' Guild and Principal, P. S. G. College of Technology, Coimbatore welcomed the gathering.

He said,

"Distinguished President and members of the South India Teachers' Union :

On behalf of the Coimbatore Dist. Teachers' Guild, I am here to welcome you all. We are all very happy and it is a great pleasure for us to welcome the distinguished members of the S.I.T.U., particularly to conduct the Executive Committee meeting here. We are very glad indeed that you have decided to have this meeting and the Seminar at Coimbatore. It is a great privilege and pride for us to be associated with at least one of your meetings. We, in Coimbatore, away from Madras, can meet distinguished persons only in such meetings. I am also very glad to have Dr. Ashby who is participating in the Seminar in our midst. We are very happy that the venue has been selected at Coimbatore and we will be benefited by the Seminar. I am sure you will have a very useful, interesting and valuable time at Coimbatore today and tomorrow and our services particularly the services of the Coimbatore Dist. Teachers' Guild are at your disposal. I will be failing in my duty if I do not make mention of the two distinguished persons, Mr. Natarajan who needs no introduction and Mr. T. P. Srinivasavaradan, both of whom are my colleagues in the Council. I welcome you all.

In the programme I would like you to make a slight alteration. We are conducting a dramatic competition in which five colleges are participating. Today is the final day and there are dramas between 6-30 and 8-30 p.m. I desire that you all witness the dramas."

Rev. Thambuswami then spoke as follows :

Respected President of the Coimbatore Guild and Principal of the P. S. G. College of Technology :

It is with a feeling of profound gratitude I thank you for the generous and benevolent hospitality that you have extended to every one of us in person and to all of us. We should have met here long ago but somehow things turned out otherwise. You were kind enough to keep the invitation pending and to give us the pleasure of meeting here in your very premises for this unique gathering. I say 'unique' because today's meeting consists not only of members of the S.I.T.U., but also Presidents and Secretaries of all the Guilds who have come to participate in this conference. We also feel very happy to be here inspite of the stress and strain because of the hospitality and elaborate kindness for which we are very grateful to you. Today is the 11th of November, the Day of Remembrance and those of us who belong to the old school, remember in gratitude the services of those teachers who have gone away from this world after serving the cause of the Union loyally and faithfully.

Teachers are usually poor and belong to the pitiable lot. Though you, sir belonging to the richer class of people, you have been the President of the Coimbatore Dist. Teachers' Guild and have been directing its activities in spite of the pressure on your time. We are met here today on your cordial invitation. Mr. T. P. Srinivasavaradan and Mr. Natarajan both of them are here to give us the benefit of their long experience and of their profound knowledge and mature experience which they have in the legislatures and have had in the educational field throughout the length and breadth of the country.

We have as the subject of the Seminar, 'How to enrol members'. It has been a happy coincidence that Dr. Ashby who is a Fullbright scholar has chosen to be with us at this time and we are very happy indeed that he should be with us here today. He is one who is likely to appreciate the deliberations of the conference.

The Secretary then read the proceedings of the last meeting.

Sri S. S. Narayanaswami wanted to know whether the convener of the Vigilance Committee was also member of the Executive Board. It was explained by the Secretary that the convener was present by special invitation.

As regards the clarification relating the election of a Director to the S.I.T.U. Publications Limited, Mr. Natarajan said that a member willing to be elected as such should hold the minimum shares as per bye-laws.

Dealing with matters arising out of the proceedings of the lasting meeting, Sri T. P. Srinivasavaradan, said that they waited on the Minister for Education in deputation. The points that were brought to his attention were :

1. The secondary grade teachers who were first given the secondary grade scales of pay, when asked to work as higher grade teachers were not given the secondary grade scales of pay. The Minister agreed to look into the matter and restore the original pay.

2. Mr. Natarajan pointed out that in the Secondary Grade scale the second slab increment was Rs. 3/- and it should also be Rs. 4/-, the same as the first slab.

3. About pension that was recently granted to L.T.'s, it was given effect from 1-6-'60. The minister said that he was considering that. The extra expenditure involved would be Rs. 40 lakhs. Headmasters are getting Rs. 25/- as special pay. Headmasters in aided schools are getting Rs. 495/- all told. It should not be reduced to Rs. 450/-. The Minister said that he would consider that and said that if they were getting Rs. 495/-, under no circumstances, it would be reduced to Rs. 450/-.

As for medical relief, we wanted that at least medical relief that is given to N.G.Os. must be given to teachers. The relief must be on a part with the relief given to Central Government employees. The Management and staff should bear half and half.

Since English is to be introduced from III standard, even for that class, Secondary Grade teachers should be appointed. Higher Grade institutions must be closed and then only Secondary Grade teachers can be appointed.

Mr. Natarajan said :

We took three points in regard to pension, (1) Liberalisation of the pension with reference to the graduate teachers to be given with retrospective effect from 1958. (2) On the same lines, liberalisation to be given to secondary grade teachers. (3) To give token pension to persons who retired before 1955.

The Minister was very sympathetic towards us. If retrospective effect is to be given from 1958, the expenditure would be 40 lakhs of rupees. He said that as regards liberalisation of pension, he would examine the question.

In regard to the third point, to give a token pension to persons who retired before 1955 and are not eligible for pension, he would like to have some information as to the number of people that would be involved. If you can say how many are the persons so affected, he said that he would certainly examine that. He appreciated the point.

Regarding house rent allowance, he said that it might not be possible for Government to consider it for some time to come. That does not mean it has been completely ruled out. It may be taken up after a year or two. At the moment it has been decided not to consider it.

The house rent allowance must be treated as an approved item of expenditure not necessary for purposes of grant. That will strengthen the hands of the Minister for passing orders. The Minister was very sympathetic but he told us about the difficulties which the Government themselves are experiencing on the provision of medical benefit to us. The Minister said that the treatment given in medical relief organisations is said to be not adequate. They are examining the whole question. They would like to examine the whole question and find out a satisfactory method of providing medical relief to their employees. Once they succeed they would extend it further. What we gathered from the Director and Minister is that they are very sympathetic towards the problem. The problem is the manner by which they can give the relief. We suggested an alternative to be tried as an experiment. The Management and Government should come together and develop a scheme of voluntary medical assistance to teachers and the Government should pay 50% grant instead of the present 2/3 grant. The Minister said that the scheme is worth trying. All local board schools should co-operate in voluntary medical assistance and if they succeed, it can be extended to other institutions also. If some managements come forward to provide medical assistance to their employees then Government would certainly consider the question. So far we have not given any constructive suggestion.

Mr. Natarajan then introduced Dr. Ashby to the gathering.

Mr. Ashby made a brief speech in which he thanked Mr. Natarajan and the S.I.T.U., for giving him an opportunity to know the problems facing the teachers in South India. There is more leisure time in the States though they have 50,000 teachers as against 40,000 in South India.

Mr. Srinivasavaradan attended the W.C.O.T.P. Conference as a representative and Mr. Ganapathi as an observer at their own expense in accordance with the resolution.

Mr. Natarajan pointed out that since Mr. Ganapathi has met all expenditure from his pocket and his leave pay was also not paid to him, a sum of Rs. 50/- may be paid to him as allowance.

After some discussion, the matter was deferred to the next meeting.

Mr. T. P. Srinivasavaradan said :

He said that after the formation of Panchayats, elementary education comes under the control of the Panchayats. Before the Panchayat Act was passed, elementary education upto 5th standard was in the hands of three agencies, Government, local bodies and aided institutions. Municipalities have their own institutions. Aided schools are not covered by the Panchayat Act. It covers the schools hitherto run by the District Board. Each village has a Panchayat and a Panchayat President. 50 to 60 such Panchayats join as a Union, and elect a President. The President of the Panchayat Union is entirely different from the President of the Panchayat. Schools which were originally under the District Boards will hereafter be under the control of the Panchayats Union. There will be a Commissioner of the Union, who was hitherto a Block Development Officer. There will also be an educational supervisor. All District Board elementary schools and Panchayat schools are handed over to the Panchayat Union. The Educational Supervisor goes from place to place, looks into the requirements of each school and makes recommendations to the Union. The Union will look after the needs of the schools such as equipment, buildings, teaching aids etc. For appointments they have formed a small committee which consists of non-teaching staff also. The educational supervisor has nothing to do with academic side. That is done by the Inspector of Schools.

As regards finance, educational cess can be levied. Municipal schools are not touched. If Coimbatore was getting 50 lakhs before, the same amount would be given now. The Panchayats can levy educational cess.

Hereafter no aided institutions can be opened. Panchayat Unions have the monopoly to open new schools. Mr. Natarajan pointed out that the responsibility of the State is to provide free and compulsory education to all. Panchayat Unions have been empowered to provide the facilities. Private bodies cannot open schools and only Panchayat Unions can start school. It is a problem to us. We have passed resolu-

tions in the past that the elementary education should be responsibility of the Government. Then we gave it a rider. We wanted that the right of any group of people to provide educational facilities for their children should be considered and the Government should assist that community in the same manner in which it is providing education for the children of the rest of the population.

He suggested the formation of education committees in the Panchayats analogous to the Country Councils in U.K.

Letters expressing inability to attend were received from the following :—

M/s. K. S. Krishnan (Madurai), A. M. Kanniappa Mudaliar (Administrator, S.I.T.U. Benevolent Fund), S. K. Kuppuswami (Madurai), Simpson Rajarathanam (Chingleput) and G. Nagalingam (Tanjore).

Regarding arrears of rent due on the Golden Jubilee Buildings, the Secretary stated that half the arrear was recovered and that steps were being taken for recovering the remainder.

A separate account has been opened in the Bank for depositing the amounts paid by Mr. Natarajan as Defence Fund.

There was a discussion on House Rent Allowance question in which Mr. C. Srinivasaraghavan of Trichy, Mr. C. M. Fazalur Rahmon of North Arcot, Mr. A. K. Sitaraman of Madras, Mr. M. Subramaniam of Tirunelveli and K. M. Rajagopalan of North Arcot participated. The concessions of opinion was that pressure must be brought to bear on the Government to grant House Rent Allowance at once. There was a discussion on the subjects :—XI Standard Course ; Language Study and the following resolutions were passed.

1. The Executive Board of the South India Teachers' Union deeply deplores to note that no action has been as yet for the opening of XI Standard in Secondary Schools according to the phased programme as approved by the Government from the 1962-63. Secondary Schools should prepare students not only for higher education, but also for entering life. It should be a terminal stage. Only about 20% of the pupils go for higher education and the rest are leavers. If the high school stage were to be limited to ten years, it would be detrimental to the leavers, in as much as the standard of attainment would be lower and the leavers would be unable to secure employment or proceed to professional or technical studies. The Board urges on the Government to give effect immediately to the decision already taken to upgrade a certain number of high schools into higher secondary schools from 1962-63.

In the opinion of the Board experienced and competent B.A.L.T.'s, can be adequate enough to teach XI Standard. It will be an advantage if in making fresh appointments, higher academic qualifications are borne in mind.

Such of the private aided secondary schools as are willing to open XI Standard in 1962-63 may be permitted to do so, if conditions for opening are satisfied.

The Board urges the Madras University to make arrangements for taking in more teacher candidates for M.Sc.'s and diploma certificate courses at post-graduate level.

2. Study of language under Part II :

The Board is of opinion that the recent decision of the Syndicate of the Madras University not to take into consideration the marks obtained by candidates in Part II of the language in the year 1962 for eligibility to Pre-Secondary Course will have an adverse effect on the study of languages under Part II. It will result in not only pupils neglecting in schools. The Board fears that a number of teachers teaching Hindi and Sanskrit may be retrenched. The Board therefore urges the University to revise its eligibility rules, fixing a low minimum for the language under Part II and a minimum for language under Part I and II.

3. Pension Rules :

The Executive Board of the South India Teachers' Union reiterates the resolution passed at the last State Educational Conference urging the Government,

- (i) to give effect to the new rates of pension to L.T.'s and Headmasters who retired before 1st July 1960, and
- (ii) to give pension to all living teachers in the Madras State who retired before 1st April 1955.

4.

The Executive Board is strongly of opinion that if in any Panchayat Union area private managements come forward to open elementary schools, they should be permitted to do so, provided conditions for recognition are satisfied. Private managed schools have a place in the implementation of compulsory education of the children of the age-group 5 to 11.

In the matter of disbursing of grants to aided elementary schools in Panchayat area, the Board recommends that the practice of direct disbursements of grants to such schools by the Department of Education be continued until such time that the Panchayat Unions are placed in a sound financial and administrative footing.

The Education Committee of the Panchayat Unions should include experienced educationists of the locality, though they are not members of the Union.

5. District Board Schools :

The Board reiterates its approval of the recommendation of the Education Grants Committee that there should be a High School Board for each Educational District under whose management all the District Board Schools should be placed.

6. Secondary Education Bill :

The Board urges the Government to get the Secondary Education Bill embodying the recommendations of the Education Grants Committee passed by the legislature at an early date.

7. Statutory Negotiating Committee :

The Board recommends to the Government to set up a Statutory Negotiating Committee on the lines of the Burnham Committee, to deal with questions relating to

- (i) pay scales of teachers from time to time,
- (ii) bettering the service conditions of teachers including old-age provisions for retired teachers, and
- (iii) steps to increase the professional competence of teachers.

8. Refresher course and in-service training :

It must be made obligatory on the part of every trained teacher to undergo refresher course and in-service training once in every five years. It is the direct responsibility of the Department of Education and the Universities to organize the Courses. It is suggested that Training Colleges and Arts Colleges may be requested to give help by way of teaching personnel and laboratory and library facilities, when approached by Teachers' Organizations, when they want to organize such courses.

For the successful working of these courses, it is essential that expenses incurred by teachers attending such courses should be met by the Government.

9. House Rent Allowance :

The Board urges once again on the Government the imperative need to grant House Rent Allowance to teachers serving in local bodies and aided institutions.

10. Parent-Teacher Co-operation :

All opportunities should be availed of by the local Teachers' Association to contact the parents and the public of the locality to apprise them of the current trends of education and the work that is done in the schools for the children.

Sri S. D. Krishnamoorthy Rao raised the problem of Housing for Teachers. He suggested that a Central Housing Board should be constituted and all Guilds should constitute Branches of the Board and that the South India Teachers' Union should help the Guilds in obtaining loans from Government.

Mr. C. Ranganatha Aiyengar pointed out that the question was once considered by a sub-committee of the Executive Board with himself as Convener, and the findings of the Committee were that the management with the aid of the Government should provide quarters for the teachers, but this had nothing to do with the question of teachers providing houses individually. Mr. S. Natarajan suggested that the Working Committee should examine plans for starting a Teachers' Co-operative Building Society.

The following amendments to the rules of the South India Teachers' Union were then proposed for circulation among the Guilds for their consideration.

11. The Executive Board of the South India Teachers' Union resolves to propose the following amendments to the Rules of the Union :—

1. (a) Rule Re. President and Residential qualification to be amended.

2. (b) Rule. Re. General Body.

The delegates to the General Body shall be the delegate or delegates designated as representatives. The Representative Assembly shall be the General Body for transaction of the business of the General Body. Every association affiliated to the Union either directly or indirectly be entitled to one delegate with an addition of a delegate when the number of members with every 50 members is in excess of the first 50.

3. Nomination to Office-bearers to be made and published in April and voted by the authorised representative at the date and time of the General Body.

4. Affiliation Fee.

Every member of the Union shall be required to pay membership fee Re. 1/- per annum which amount shall be collected by the local authorities and

remitted to the Union. This amount shall be allocated as follows :

25 nP. as the Membership Fee of the Benevolent Fund of the Union.

25 nP. Union Programme Assistance Fund.

25 nP. Current Funds of the Union.

25 nP. Reserve Fund of the Union.

The following nominations were made to the Presidentship of the ensuing Madras State Educational Conference to be held in Madras.

Mr. C. Subramaniam — Minister for Education.

„ A. Srinivasaraghavan — Principal, V.O.C. College.

„ P. Doraikanoo Mudaliar — Principal, Dr. A. C. Trg. College.

„ S. Govindarajulu — Vice-Chancellor, Sri Venkateswara University.

„ S. Anantharamakrishnan — Madras.

„ V. Subramaniam — Vice-Chancellor, Annamalai University.

The venue of the 52nd Madras State Educational Conference which will be held in May 1962, was accepted by the Madras Teachers' Guild and the venue was unanimously accepted by the Members of the Executive Board.

The following ten members were elected as Council Members to the AIFEA from South India Teachers' Union to attend the 36th All India Educational Conference at Trivandrum. In case they are not able to go from the 27th to 31st December 1961, the President was authorised to fill up vacancies arising from those unwilling to attend.

1. President.
2. Vice-President.
3. Secretary.
4. Journal Secretary.
5. Additional Journal Secretary.
6. Treasurer.
7. Sri S. Natarajan.
8. „ T. P. Srinivasavaradan.
9. „ S. S. Narayanaswami.
10. „ A. K. Sitaraman.

With a vote of thanks by Mr. S. D. K. Rao, Secretary of the Union the meeting came to an end.

FROM OUR ASSOCIATION

THE RAMANATHAPURAM
DISTRICT TEACHERS' GUILD

In collaboration with the Department of Extension Services, Dr. A. C. Training College, Karaikudi, The Ramanathapuram District Teachers' Guild, celebrated the 31st South Indian Education Week and the Teachers' Charter Day at 5 p.m. on Friday the 8th December 1961 in the Assembly Hall of the N.S.M.V.P.S. High School, Devakottai.

Sri P. Doraikannoo Mudaliar, Principal, Dr. A. C. Training College, Karaikudi and President of the Guild presided. After prayer by Sri Vidwan S. Narayanaswami of the N.S.M.V.P.S. High School, Sri D. Sebastian, Vice-President of the Guild welcomed the gathering. Sister Ernest, Headmistress, St. Mary's Girls' High School, Devakottai inaugurated the celebrations. She pointed out how emotional integration could be achieved through the co-curricular activities of the school, without overdoing them.

Rev. Father Diaz, S.J., Headmaster, De Britto High School, Devakottai, who spoke next, said that the teacher, even within the limited sphere of his activity, could be the unifier and could bring about unity in the midst of variety.

Prof. S. Thiruvengkatachari, co-ordinator, Department of Extension Services, Karaikudi, Dr. A. C. Training College addressed the gathering on *A Charter for Teachers*, and said that, of all freedoms, the teacher should have the freedom to teach, unfettered by extraneous influences. Sri M. J. Rengasami Iyengar, Headmaster, N.S.M.V.P.S. High School, Devakottai, said that with the right approach, it was possible for a good teacher to bring about emotional and national integration in spite of the disintegrating forces in society outside the school.

Sri P. Doraikannoo Mudaliar in his concluding address stressed on the need for bringing about such emotional and national integration in the present set up of the country and said that it was the imperative duty of every right-thinking and honest teacher to work wholeheartedly towards that end.

Sri S. S. Narayanaswami, Secretary of the Guild proposed a vote of thanks. The meeting ended with the singing of the National Anthem.

SATHAPPA BOARD HIGH SCHOOL,
NERKUPPAI

Education Week Celebration

The 31st South Indian Education Week was celebrated on 14-11-1961. Sri RM. Karuppan Chettiar hoisted the National Flag. Sri K. R. Ramaswami, Headmaster welcomed the gathering.

Sri S. S. Narayanaswami, Secretary, Ramanathapuram District Teachers' Guild presided over the function. He spoke on the need for emotional and national integration in the present set up of our country and appealed to the teachers and the parents to realise their responsibilities in the matter and act accordingly. Sri R. Singaravadi velan, Lecturer in Tamil, Dr. A. C. Training College, Karaikudi and Sri Vidwan K. N. Balasubramania Iyer Senior Tamil Pandit, St. Mary's Girls' High School, Devakottai addressed the gathering. Sri K. Seetharaman, Secretary of the School Teachers' Association proposed the vote of thanks.

ASSOCIATION FOR THE PROMOTION
OF SCIENCE EDUCATION

An association for the Promotion of Science Education has been formed and registered under the Societies Act of 1860. The objectives of the association are to stimulate, improve and

ordinate science teaching at all levels of instruction and to apprise the general public of how best science teaching can be improved in schools and to encourage and promote in the young people interest in the study of science. To implement these objectives it is proposed to help and foster science clubs for boys and girls so as to develop their initiative and scientific aptitude in them, and also to organise science service for young people. The association will also take steps to increase the knowledge of science among the general public.

Membership is open to all teachers in schools and colleges and others interested in science education and also students in secondary schools and colleges.

The association proposes to publish very shortly a fortnightly journal entitled THE YOUNG SCIENTIST, suited to the needs of pupils of the age group 14 to 17.

The management of the association is vested in a Governing Body of 20 members. The office bearers are :

President :

Sri G. Venkataraman,
Professor of Botany, Vivekananda
College, Madras-4.

Vice-Presidents :

Sri A. N. Samaraj,
Headmaster, Thiagaraja College
High School.

Mrs. Saraswathy Srinivasan,
Headmistress, Raja Muthiah
Girls' High School.

Secretary :

Sri T. N. Sundaram,
Headmaster, T'Nagar High
School.

Joint Secretaries :

Si P. V. Ramasamy,
P. S. High School.

Sri Vincent Simon,
St. Gabriel's High School.

Treasurer :

Sri A. K. Sitaraman,
Headmaster, P. S. High School.

Further details can be had from the Secretary, Sri T. N. Sundaram, Headmaster, T'Nagar High School, Madras-17.

Teacher, Poet Felicitated

Kavignar Somasundaram's two literary works namely "Kavi Arangil ... Kavignar Somasundaram," "Uyar Kalvi Thantha Uthamargal" were released by our Education Minister Hon. Sri C. Subramaniam, B.A., B.L., at a public function held recently in Madras with Dr. Raja Sir Muthiah Chettiar, M.A., D.Litt., MLA in the chair. Then "Ponnadai" was presented to the Kavignar by Sri Muthiah Chettiar and Prof. Dr. A. Chidambaram Nathan Chettiar, Sri K. V. Jagannathan, Sri Thamizhvanan and Pulavar Thanigai Ulaganathan praised the Kavignar for his works.

N. S. M. V. P. S. HIGH SCHOOL,
DEVAKOTTAI

A special meeting of the Staff Association of N.S.M.V.P.S. High School, Devakottai was held at 5 p.m. on 11-12-1961 in order to felicitate Kavignar Somasundaram, a member of the Association. Sri M. J. Rengasami, M.A., L.T., Headmaster and President of the Association presided over the function. Pulavar Shanmugasundaram, Pulavar Narayanasamy, Pulavar Rajendran, Sri Sathya Giri Rajan, M.A., B.T., Sri Veerasamy, B.A., B.T., Sri Kalyanasundaram, B.Sc., B.T., Sri Gopalakrishnan B.A., B.O.L., Sri Somasundaram and Sri Venkatachalam Iyer paid tributes to the Kavignar. Finally Kavignar Somasundaram thanked all the members of the Association and presented two copies of his new books to the school library.

THE MADURAI LABOUR WELFARE
ASSOCIATION HIGH SCHOOL,
MANINAGARAM, MADURAI

A pleasant function was got up on 11-12-1961 by the Madura Labour Welfare Association High and Elementary Schools staff to felicitate Sri S. R. Varadarajulu Naidu, Cer-

respondent of the Schools on the attainment of his 60th birthday. Members of the staff paid tributes to the services rendered by Sri Naidu for the cause of — education.

A silver replica of "Saraswathi" was presented to Sri Naidu on the occasion by Sri A. Srinivasan, M.A., B.T., Headmaster, M.L.W.A. High School, Madurai on behalf of the staff.

Sri Naidu replied suitably. With a vote of thanks by Sri K. Ramakrishnan, B.Sc., B.T., Secretary of the Teachers' Association the function came to a close.

TEACHER PENSIONERS' ASSOCIATION

Resolutions passed at the meeting of the Teacher Pensioners' Association, Madras, held on 3-12-1961 in the P. S. High School, Mylapore.

1. The meeting reiterates its request to the Government to extend the Pension Scheme to all grades of living Teachers who retired from service before 1-4-1955.
2. This meeting reiterates its prayer to Government :—whereas the Government are pleased to sanction pension to B.T.'s and 1st grade Pandits who have retired on or after 1-7-1960 at N/120 of the average emoluments drawn during the last three years of service subject to a minimum of Rs. 60/- for B.T.'s and Rs. 75/- for Headmasters as per G.O. MGS 909 dated 24-4-1961, this Association requests that the same principle of N/120 of average emoluments be made applicable with effect from 1-7-1960 to this category of Teachers also who retired prior to 1-7-1960.
3. This meeting reiterates its prayer to Government to be pleased to sanction as early as possible the temporary increase of Rs. 10/- in pension to teacher pensioners also who retired before 1-7-1960

in view of the high cost of living and the very low pension which the Teacher pensioners are getting and in view of the fact that while calculating pension, only their basic pay alone was taken into account.

4. This meeting reiterates its request to Government that educational concessions given to children of teachers, while they were in service may be continued even after retirement.

J. SESHADRI,
President,
Teacher-Pensioners'
Association, Madras.

THE EAST TANJORE DISTRICT NON-TEACHING STAFF ASSOCIATION, NAGAPATTINAM

To

Sri C. Subramaniam, B.A.B.L.,
Hon'ble Minister for Education and
Finance,
Government of Madras,
Fort St. George, Madras-9.

Sir,

Sub.: Request to extend the Pension Scheme to the Non-Teaching Staff of Aided Secondary Schools in this State.

I beg to bring the following grievances of the Non-Teaching Staff of Aided Secondary Schools and request you to kindly redress them.

There are about 1,500 Secondary Schools in our State and 75% of them is under the control of the District Boards. After the abolition of the District Boards they are now under the control of the Special Officers. Eventually they may become a part of the Block Development Departments or they may come under the direct control of the State Government. In any case Clerks and Peons who permanently worked in the District Boards will come as the regular servants of the Government and will be eligible for pension scheme and

other benefits of the N.G.O's. But in the case of peons and clerks working in Aided Secondary Schools they do not at all enjoy any of the benefits particularly the clerk enter the schools as clerk and retire as clerk without being able to become an Upper Division Clerk but in the case of District Board and (Local Fund) Municipalities they have got promotion facilities. But in the case of Non-teaching staff of Aided Secondary Schools, they are deprived of the promotion facilities.

You have been very sympathetic toward us and you have allowed us to enjoy the privileges of the Provident Fund Scheme Fee Concession. So once again I request you Sir, to kindly extend to us also the pension scheme and promotion facilities.

With kind regards,

Yours faithfully,
N. VAIDYANATHAN,
Joint Secretary,
The East Tanjore District
Non-Teaching Staff Association.

OUR LETTER BOX

Sir,

Sub.: No provision in the University Regulations to allow Physical Trained teachers to take Diploma in Physical Education.

Please permit me to the attention of the concerned authorities through the columns of yours esteemed monthly.

The Madras University is kind enough to allow teachers after three years of service after training to appear privately for certain degree examinations. But there is no such provision in the University regulations to grant exemption to appear privately for the diploma in physical education especially for those Higher Grade Physical Trained teachers if they pass any degree examination in this University. It is a well-known fact that there is a great dearth for the Physical Education Diploma holders for appointment as Physical Education Directors in high schools or in colleges. Although there are a few colleges in our State for the physical education they are not able to meet the growing demands. The number of high schools and colleges in fast increasing beyond imagination. So the gap between supply and demand is too wide.

The pity is that the Y.M.C.A. College of Physical Education in Saidapet, training students both for higher and lower grades for physical education teachers which are recognised certificates, also gives training by conducting short-term courses for the graduate P.T. masters but this diploma is not recognised by the department for appointment as physical directors in high schools. Therefore I like to suggest that the University should amend the regulation by making a provision to allow any physical education teacher if he is a graduate and put in not less than three years of service in any recognised high school in the State, to appear privately for the diploma examination.

Same is the case regarding the commercial instructors in high schools who have no chance to appear privately for the B.Com. Examination although their technical knowledge in commercial subjects is for more better than the ordinary B.Com.'s. In this case any technical trained teacher with not less than three years of service in any high school or in any approved institute may be straight away allowed to appear privately for the B.Com. examination. Such generous provision in the university regulations will cer-

tainly relieve the dearth of the technically qualified personnels, and induce such teachers to qualify themselves better and thereby they could raise their status.

I earnestly hope the University authorities will give due consideration

Thanking you,

D. SESHADRI

OUR BOOKSHELF

A COURSE IN JUNIOR SCIENCE : EDUCATIONAL IDEAS AND IDEALS
By H. Greaser. Price 3s. 6d. (Orient Longmans Ltd., 36-A, Mount Road, Madras-2.)

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for the above points raised and do the needful for the cause of education in general and for the teaching profession in particular.

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Receipt of the following publications is the thankfully acknowledged :—

1. Commonwealth Today, No. 87 (BIS).
2. Directory of Institutions for Higher Education—1962. (Government of India, Ministry of Education, New Delhi).
3. Education in Universities of India, 1957-58. (Government of India, Ministry of Education, New Delhi).

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A CORRECTION

The Seminar on "Service to the Teachers' Union" and Meeting of the Executive Board was held on 11th and 12th November 1961 at P.S.G.R. Krishnammal Girls' High School, Peelamedu, Coimbatore and not at R. K. Rangammal Girls' High School, Coimbatore as reported in *The South Indian Teacher* Vol. XXXV, No. 1, January 1962 issue. The error is regretted.

— Editor.

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