FOREWORD

VIDURAVA, the science magazine of the NSF (formerly NARESA) has been published since 1996 as an important activity under its science dissemination programme. Already 31 issues have been published on various topics in science that are of interest to school children and general public. The decision of the Working Committee on Science Education and Popularisation to publish a volume on the theme "Projects for Learning" is indeed a timely exercise. It should prove to be useful tool for many a teacher and a student in the teaching and learning process.

Since the recent introduction of project work at various levels of school curriculum, I understand that there is a need to create some awareness about its proper implementation. I am confident that this issue of VIDURAVA will help to throw light on aspects which may have given rise to any confusion and misgivings about the feasibility of project work.

The NSF appreciates the efforts of the Working Committee members and others who have contributed by providing articles to this volume to popularise project concept. I hope that this volume would be used by students and teachers alike to supplement their work in formulating projects as part of their new school curriculum.

Professor Kapila Dahanayake
Chairman
National Science Foundation

PREFACE

Project work as part of the school curriculum is an accepted feature of current educational programmes, both in Sri Lanka and abroad, and has its origins in the American and German educational systems.

The reforms in education in Sri Lanka - in 1975, and the more recent one, have emphasised the important role project work has in the school curriculum. Indeed, project work of a kind was carried out in some schools in the early 1950's as a part of social studies. So it is not something entirely new.

In this issue of VIDURAVA we have endeavoured to focus the attention of our readers on different aspects of Project Work. Basnayake answering the question 'Why project work?' emphasises that it is an activity 'over and above' routine classroom work, and is 'complement to text book learning', which is a part of the class room scene. Project work enhances the learning process and makes the student an 'active' rather than a 'passive' learner. Premasiri examines in some detail how information can be obtained for a project. This is an important aspect of a project and merits careful reading. Karunaratne and Edirisinghe in their essays show how to carry out a project from its inception to the final presentation, detailing out the various stages, and how to present these stages in the generally accepted format of the written paper. The well presented paper is a useful exercise for the writer as well as the community of learners who can examine the presentation critically as part of the learning process. Finally Karunasinghe gives a comprehensive review of the types of projects and the usefulness of projects . This should draw the attention of students to the important role project work has in their educational development in school, and in their future careers.

Project work is welcomed by students and should promote their enthusiasm for learning more about the world we live in. We hope this issue of VIDURAVA will serve as a useful guide for project work as well as stimulating a greater interest in this aspect of their education.

Dr W.R. Breckenridge
Chairman
Working Committee on Science Education & Popularization

VIDU20-1-3

WHY PROJECT WORK

Prof V Basnayake

"Project work" in science, as seen by the present author, denotes work done outside the confines of the textbook and seeking to show something "new" (which, in the present context, denotes something, however slight, is not in the textbook). Its purpose is to serve as a complement to textbook learning. The nature of the work would usually be scientific, but there is room also for other kinds of work such as aesthetic compositions on a topic related to the science syllabus. The work must also be written up and sent up for possible publication. There is a need to produce journals for the publication of project work reports.

1. The textbook is necessary

Learning what is in the text book is essential in order to learn the principles pertaining to the subject. The proper use of the textbook includes supplementary activities such as prescribed practical exercises and field visits to verify what has been learnt from the textbook.

2. The textbook is, however, not sufficient

a. Wholeness

We all dream of wholeness in our lives. We tell ourselves that we should be not only 'head' (intellectual), as in learning by reading the textbook, but also 'heart' (feelings) and 'hand' (doing things). We should eat not merely to supply ourselves with the textbook's list of aliments and nutricnts, but also to enjoy eating. We should like our health to be not merely the absence of the illnesses listed in the medical textbook but also the enjoyment of physical, mental and spiritual well-being. We should like our relationship to Nature to be not merely that of using natural resources but also living in accordance with the noble rule "May all beings be happy!". We should like to cultivate our sense-perceptions so that it is not merely a matter of listing the various physiological sensations but also using them to enjoy the fine arts. We should like to find our work not merely a matter of the physics of energy but also something which brings us deep satisfaction.

b. Complements to textbook learning

School often provides us with many opportunities to serve as complements to textbook learning. There may be school clubs for aesthetic activities, for the cultivation of hobbies such as photography, and for nature conservation. These are all complements to textbook learning, to prevent a student from becoming a mere bookworm. **"Project work" is an important form of complement to textbook learning.**

c. Project work

I see "project work" in the present context of science learning as work done by the student in science which is not a mere repetition of material which is already in the prescribed textbook, practical manual and field work guide which he uses. It is an activity over and above the classroom activity that is common to all students. In this sense it is "new" work, although it may not be new to world science. It

is an activity in which the student, working singly or in a group, produces an output through processes which enlarge his experience by doing something with thinking and feeling. Furthermore, the work must be written up, so that the work is open to scrutiny by others. The work would usually take the form of a scientific study, but it could also take the form of aesthetic compositions such as poems or playlets based on topics in the science syllabus.

d. Written up

A scientific report of the work should be written up in a format which conforms to the ethos of science. A typical format for such a report is that of a "scientific paper". The typical scientific paper has a title, name of author, abstract, introduction, method used, results and conclusions, discussion, acknowledgements, and references to books and papers consulted. If the project work has taken the form of an aesthetic piece such as a poem or drama, it should be written up in that form.

3. Who should do project work?

The answer is: Every student. Every student in primary school, secondary school and in tertiary educational institutions such as technical colleges and universities. In the universities it has always been a rule that every honours student must do a project and submit a dissertation thereon. Many (but not yet all) university departments require project work from their students. Among them are the Computer Science Departments, and the Department of Physiology in the Faculty of Medicine, Peradeniya. The current educational changes have introduced project work in primary schools and secondary schools, and it is hoped that the same would apply to all tertiary educational institutions including universities.

4. Journals

Journals to publish student project work reports would be an important stimulus for such work. At present there is no such journal. The Natural Resources, Energy & Science Authority of Sri Lanka (NARESA), which was the predecessor of the National Science Foundation (NSF), once published a journal called "Science investigations" for such project work, and six issues of the journal appeared before it ceased. The Sri Lanka Association for Science & Mathematics Education (SLASME) has published a series of school project work journals for primary and secondary schools, but their effort too is not an adequately continuing one.

VIDU 20-1-5

COLLECTION OF INFORMATION REQUIRED FOR A PROJECT

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One of the most important aspects of a project is the collection of data. It is no secret that the success of a project depends on the authenticity and accuracy of the information, data etc. collected for the project. Therefore it is extremely important to carry out the collection of information required for a project, in an organized manner.

Identification of information required for a project

The information required varies from project to project. Therefore when a topic is selected, the information available with regard to the project should be gathered. This means the reading of any books, publications reports etc., written in relation to the topic and gaining a basic understanding of the topic. Where such literature is not available, it is important to identify why information is required, in view of the objectives and the process of the project.

For example, if the project is on a topic related to study investigation, a preliminary knowledge could be acquired by examining a parallel investigation or literature on similar topics. Where an invention is selected as a project, information on similar or parallel inventions would provide an understanding of the subject. However it might be difficult to obtain such information with regard to all topics. In such instances it would be important to obtain the advice of a resource person in the relevant field. The process of the project should be prepared step by step in the form of a flow chart. From the inception of the project the information and data that can be gathered should be noted down. Accordingly, the additional data required to reach the intended goal could be identified.

A description of such data should first be prepared. Also the time periods during which the data will be required according to the time schedule of the project should also be noted down. The sources and methods, institutions and resource persons from whom data can be gathered should then be listed out. It is necessary to be very attentive in selecting institutions persons, organizations for the collection of information. It is important to find out whether the expected information could be obtained from the institutions identified. It is often easier to obtain information from state sector institutions than from those in the public sector. Therefore it is preferable to make contacts with public sector as far as possible for the collection of information. It should be stressed that this does not mean that it is difficult to obtain information from the private sector, as there are many instances where the private sector has provided such information. It is necessary to have a specific form to obtain information and to record the information when it is collected.

Some projects require information based on results of experiments/investigations carried out by the project. To collect such data too, the relevant tables should be prepared systematically. Further, it is necessary to develop a method of checking the accuracy of the information collected. Information collected from the results of experiments could be verified by comparing with the results obtained by repeating the experiments. Where information is gathered from the environment too, it is preferable to take two readings.

Directories of sources, such as places, organizations etc. from where information on different areas could be obtained have also been published. Such directories or manuals of instruction are often found in libraries. For instance, a directory containing complete details about institutions related to environmental protection programmes has been prepared by the NIE and sent to school libraries. This index becomes useful for projects related environmental programmes. The telephone directory too could be used to find out details about places from where certain information could be obtained.

Steps required to collect information

There is a process to be followed in order to obtain information, after having identified the necessary information as indicated in the above section.

Where information is to be obtained from an external institution

A brief introduction to the project and a clear and brief description of what is to be done under the project should be submitted to the Head of the institution concerned.

In the next paragraph, a clear description of the information to be obtained from that institution should be submitted. A table or a format prepared for the provision of information to suit your purposes would make the work easier for the institution. Further, it is essential to mention that the information thus obtained would be used only for this purpose. A letter complete in all the above aspects should be submitted with the signature of the Principle of the school to the Head of the Organizations, placing a copy in the project file.

For some projects where it is not possible to obtain information through a letter, it might be necessary to go to the institution concerned. Often the practice is to visit institutions and obtain the information required. In such instances, it should be indicated in the letter, that you will be coming to the institution to obtain such information, give a description of the information required and request that a suitable date and time be granted.

There are instances where some institutions do not give certain information. For instance certain financial institutions, and commercial establishments retain certain information as confidential. Where there are difficulties in obtaining such information, amendments in the projects have to be made in consultation with the project Consultation Committee. In instances where satisfactory responses to letters are not forthcoming it might be possible to arrange to obtain such information on the telephone.

When information has to be obtained from an individual / individuals

Initially a letter that indicates clearly the nature of the project, the information required and the reason for selecting the individual/individuals concerned should be sent. These letters too should be sent through the Principal of the

school. It is also important to ask in this letter, how this information could be obtained. Inquiries such as whether the relevant information could be obtained through letters or through an interview could also be made in the first letter itself. It is essential to design a form, which is suitable for the extraction of the required data. The design of the form should also facilitate the analysis of the data obtained.

Sometimes it might be necessary to obtain information on several occasions. On each of these occasions, your requirements should be indicated and forwarded by letters. Similarly on every occasion that information is obtained in this manner, the correct practice is to send a letter thanking the individual/individuals concerned through the Principal of the school. Copies of all this correspondence should be placed in the file.

When information is to be retrieved from literature

Information obtained from newspapers books and journals also could be very important. Further it is important to pay great attention to how the information obtained in this way, is used for the project and how it is entered in the project report. If a section is extracted from a book and included in the project report in the same form, it should be found out whether it is necessary to obtain the author's permission to do so. This will be indicated in the front pages of the book. Such extractions could be done from some book. In the case of some books, the author's permission is required to do so. On such occasion it is appropriate to obtain the advice of the Advisory Board. Further when the relevant information is being included in the report, the institutions, newspapers, journals etc. from which the information was obtained should be mentioned.

Figure 1: A group of students who are involved in a bio-gas project obtaining some information from a teacher

VIDYA 20-1-8

WAYS OF PRESENTING A PROJECT

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From the articles that you have read so far in this magazine, you may have understood that you could do different types of projects to improve your learning. Also, it tells you about the selection of a project, collecting information, methods to follow and the characteristics of a project. It is also important to let the others know about your project. This will help you to receive feed-back from others to conduct further studies. To make others aware of your project you may present it in written form, orally or as a poster.

In presenting a project report you should consider the following:

- The background in selecting the project
- Your expectations in doing the project
- Steps taken in doing the project
- Collection of information
- Results
- Discussion and Conclusions

Background

Everyday we see our environment, notice changes around us, see how people involve themselves in various types of activities and the problems that they encounter in doing those. By doing careful and organized observations, we may be able to find solutions for those problems, why the changes have occurred in the environment and so forth. **The long term or the short term organized activity that you undertake to find solutions to a problem is a *project*.** Hence, you need to describe the situation critically to inform the reader about the necessity of doing your project. For this purpose you should cite the other articles that you have used in stating the problem. Then write down the problem in the question form. This might be a very big question which you cannot answer without breaking into subsidiary questions. This type of breakdown into subsidiary questions will help you in achieving what you expect and, also for the readers to make a critique on your project.

Expectations in doing the project

Your effort is to find solutions to your questions. You should write down as objectives, what you expect as answers to your subsidiary questions.

Methodology in doing the project

You may have not used the same plan that you had at the beginning, in doing the project. In your report you should indicate what things you were able/not able to do and, the strategies that you have taken to overcome the things you were unable to do. Methods that you carried out should be written in the past tense.

Negotiations

In doing your project you may have stayed in one place/institution or you may have collected information by interviewing people. Then you should indicate that you have obtained permission from the institution/s and the people involved.

Collection of information

In doing a project, information could be collected in multiple ways. The information collected in a scientific manner are called **data**. It could be done by observations, interviews check-lists, questionnaires and surveys. Hence, you need to indicate how you have collected the data. If your have collected data through observations, then it is necessary to indicate how, when and where you made those observations. If you want to use a part of a conversation that you had with an interviewee in your report, then you may include it in her/his own words. It is also necessary to state when you had the interview as follows:

.....
.....
.....
(Interview, 01/10/1999)

Results

In your project you may have obtained results that you have expected or not expected. Scientists and researchers present the expected and unexpected results without any bias. In presenting your results you will not be able to use all data that you have gathered. You should be able to present those in an organised way to help in answering questions. You may present your data in tables, various kinds of graphs (use metric units), pictures, figures and photographs. Numbering of those figures and tables will help you in presenting your report and also for the reader to follow your report. If you are using a photograph which contains figures of a person/persons that could be identified, it is ethical to obtain permission from those people or to blacken the identifying features such as eyes, nose and ears. If the project outcome is a model or any other construction, then you should present it. (In your written report you should indicate about the construction). In presenting your results it is not necessary to put your information in numbers. If you have collected your data through observations and interviews then you should present those in words, not in numbers.

In presenting your results you may be thinking to include some important information which may not fit nicely in the results section. You may include those as appendices.

Discussion and Conclusions

This is the most important section in your report. In this section you have to discuss your results referring to similarities and contradictions with other studies. This discussion will help you to draw conclusions from the project. Please note that in this section, you do not have to repeat your results, but to give and interpretation of your results.

Implications

From your conclusions you may suggest further studies and any other actions that are needed to be done.

Acknowledgements

There may be so many people who helped you in doing your project. It is necessary that you should thank those people and institutions.

References

The articles and books that you have used in doing your project should be mentioned under

references. There are several ways to list references. The following gives an examples of citing an article and a book in the reference list:

Article

Soysa, P E (1994). *Self help in family health.* VIDURAVA,16, 1/2, 2 - 5

Book

Clark, J V (1996). *Redirecting Science Education: Reform for culturally diverse classroom.* California: Sage Publications

So far we have discussed how to present a project. Let us summarise the steps to be included in a project report as follows:

1. Title of the project, Name of the author/s and the institution/s
2. Abstract (summary of the project including findings
3. Background
4. Objectives
5. Methods- Selection of the project
   - Negotiations
   - Data collection
6. Data analysis and Results
7. Discussion and Conclusions
8. Acknowledgements
9. References
10. Appendices

BASIC FEATURES OF A STUDENT PROJECT

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Student projects are carried out either to fulfil an examination requirement or when it forms a part of a subject syllabus or when given as a assignment by the teacher. Whatever the purpose, certain criteria have to be fulfilled by a student project. It is important that the student has a clear understanding of these criteria before he or she embarks on a project. The important criteria that characterises most types of student projects are outlined below.

1. A project is carried out to find out (or to gather) specific information about an activity (process), an event, a place, about our surroundings, about an individual or groups of individuals (animal, plant or person) etc. This forms the aim(s) of the project. The **Title** of the project is based on this broad aim and is worded in such a way to give an idea of what the project is about.

2. Once you have decided on a project you may have a preconceived idea of the end result of the project. Such preconceived ideas come from reading books, by talking to people or even by intelligent guessing. This allows you to find out what information is already available on the subject. This aspect is emphasised in the **Introduction** to the project. In the Introduction you should justify (or give reasons for) what you are going to do.

3. From the start one must be quite clear about what specific information is to be found out by doing the project. This forms the **Objective(s)** (set of questions) of the project. The objectives have to be simple and achievable within the specified time and with the available resources. Once the objectives are known, how you set about finding the information to fulfil these objectives (find answers to the questions) has to be worked out. This becomes the **Method(s)** of your project.

4. The method would involve stepwise listing of the procedure that you hope to follow. Resources that are needed to carry out the work form the **Materials**. Thus, the section on "**Materials and Methods**" of the project comes into form. By now you are aware of what things are needed to carry out the work and how you would carry out the work in order to achieve the objectives. If the methodology involves animals, plants and people it is necessary to ensure that the method is ethical, socially acceptable, and environmentally friendly and is within the law of the country.

5. The work that need to be carried out most often take the form of either (a) collecting information (b) studying the distribution (c) making counts (d) making measurements of either time/size (height)/space (length and breadth) (e) sorting, grading or grouping (put into pre decided groups) or even making regular observations. This activity is referred to as gathering **Data.** The data collected has to be entered in a proper book (data book) and not on scraps of paper. Data has to be gathered as correctly and precisely as possible. Therefore, all the necessary details have to be obtained by discussing with parents, teachers or seniors, prior to the start of a project.

6. The data or the information gathered has to be then presented in a form that can be easily understood. Use of either (i) Charts, (ii) Tables (iii) Drawings of sketches (iv) Graphs (v) Histograms forms an important part of a project report and project presentation.

7. The data (information) gathered becomes the **Results** of your study.

8. So, the results (information) you obtained by carrying out the project then needs to be discussed to see whether you have achieved the objectives listed at the beginning of the project. The **Discussion** therefore becomes the most important and interesting part of a project. This section also brings together all aspects of the project in the light of prior information. It also includes any shortcomings and problems encountered when carrying out the project. Any speculations and improvements you would like to make in the light of your findings also become an important part of the discussion.

9. Finally one must end by stating very briefly the important **Conclusions** or findings of your project.

10. The final outcome of the project is the writing of the **Project Report** on which your work would be assessed and marked. This has to be done carefully, paying attention to the proper use of

words and tense (Methodology needs to be written in the past tense) and has to be correctly and neatly presented. Although there is no specific format for writing the report, specific information has to come in a project. This information is best given under the bold, subtitles that appear in this article.

11. The books and other periodicals or articles from which information was collected have to be duly acknowledged. The alphabetical listing of this information under the authors' surname forms the **References**.

12. All those people who helped you in various ways have to be thanked and this forms the **Acknowledgement**.

13. A well planned and correctly carried out project that has been written up well becomes a useful document not only to you but to all others who read it after you.

Figure 2: Students at Vidyakara Vidyalaya, Maharagama collecting garbage under the work of a project

VIDU 20-1-13

PROJECT TYPES AND USEFULNESS OF PROJECT WORK FOR YOUR FUTURE

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A project may be viewed as a set of activities carried out to complete specified work within a given period of time. Based on the nature of the activities projects could be of the following types,

a) ***Study type projects***: In this a suitable topic is identified, data collected and analysed. Conclusions are based on the results of the data analysed. A report on a study of this type usually includes a discussion with data interpretation and a comparison of data obtained with already available data. The results obtained from the study could generate new knowledge in the field of study which in turn promotes further research activities and also giving intellectual satisfaction. Examples for study type projects are as follows: study on various birds in the home garden, investigation of the relationship between income and consumption of a family unit of the community.

b) ***Problem solving type projects***: Here a problem is identified, a hypothesis is formulated and tested through observations or experiments. It is important to identify the problem accurately and interpret it properly. Few examples for projects of this type are Problem of school dropouts, the reasons for brain-drain in Sri Lanka, utilisation of the changes of behaviour of animals to forecast weather,

c) *i.* ***Creative type projects***: Presentation of the project findings may be in the form of a poem, drama, short revision or collection of material e.g. a stamp collection on a theme, wall decoration

ii. ***Technology based projects*** can be development of an instrument, plan for a instrument, construction of a device. These projects could be self creations and new planning efforts.

iii. ***Economically viable projects***: Some of the projects could be economically viable. Involvement with these type of projects would not only develop skills but also provide economic benefits. e.g. running a flower plantation, planting mushrooms or medicinal plants at schools or home gardens, rearing ornamental fish.

The above project types have been identified under the new educational reforms as suitable to be carried out at school level.

d) ***Research and development projects***: In general research and development is defined as any creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications. It includes usually basic, applied research and experimental development. These projects primarily consist of investigative activities undertaken to acquire new knowledge. The novelty and originality of the investigation are the key factors that separate research

and development from non- research and development activities.

In Sri Lanka, projects of this type are carried out by researchers mainly in the Universities and Research Institutes. The National Science Foundation(NSF) awards grants to researchers to conduct research in various fields such as Agricultural Sciences and Forestry, Biological Sciences, Biotechnology, Chemical and Earth Sciences, Energy, Physical Sciences and Mathematics, Engineering and Built Environment, Health Sciences, Natural Resources, Science Education, Social Sciences, Science and Technology Information and Traditional Medicine. Examples of projects funded by NSF are

- Development of solar cells based on dye-sensitised titanium dioxide with solid electrolytes,
- Analysis of pesticide residues in vegetables and urine of pesticide sprayers,
- Development of swinging lugs reversible cage wheels for small and medium power tractors
- Implementation of school based assessment(SBA) in environmental studies in sixth grade classrooms in nine selected schools

Uses of project work are numerous. Engaging in project work would help develop and sharpen latent skills. It also help to develop creative abilities while taking corrective decisions which are required for leaders with independent thinking. In addition to the above, the following features would develop in a project worker too.

- Abilities to grasp concepts and reason analytically
- Motivation and perseverance in achieving objectives
- Capacity for independent thought
- Organisational skills
- Independence as a learner
- Self-confidence
- Establish a good working relationship with the allocated teachers, members of the team and others working in the related areas
- Language skills which are particularly important for report writing and presenting of project

The activities under the project work which lead to develop the above features in a project worker are described below in detail.

Developing Skills for Creative Thinking

Originality in some form is a crucial component of research type projects, however it is good to have this feature in all types of projects. The development of original ideas required for project work can be enhanced through the use of different techniques to support creative thinking. It is necessary to understand how creative thinking works for the project worker and which techniques suits for him or her. Several techniques are given as follows, talking things over with experienced people like teachers, researchers or university academics, keeping an open mind, brainstorming, concentration on anomalies, viewing the problems from imaginative perspectives etc. It will be seen that many of the so-called techniques in project work are actually based on the use of common sense.

Planning Skills

Irrespective of the field of study, a project worker needs to map out some sort of plan for the programme of work ahead. Such a plan can benefit the project worker as follows,

♦ Prevent the worker from spending too much time on certain activities because he or she enjoys the particular activities while not attending to others which are unappealing

♦ Gives a sense of direction in the execution of the project

♦ Provide basis for reflection

♦ To plan more effectively the next time if previous plans prove to be unrealistic

Much of project work is routine and straightforward and it can be most efficiently carried out by careful planning. So it is clear that project work would increase good planning skills of a person. The training obtained by doing project work at school level would strengthen the planning capabilities expected of students in their future programmes especially studying at University level.

Management of Time

It is a common experience that time seems to disappear and one wonders where it has gone and what has been achieved. Some students keep a diary over a period of time, logging the various activities in that day. There are no precise rules on how to spend the time on a project. The student has to be satisfied with his own management of time. It should be realised that time spent on leisure activities or talking to people is not necessarily time wasted. It will help to maintain physical and mental health. However as 99% of project work is routine with field or laboratory work, lectures, library reference, meetings, reporting, vacation and other, it is important to manage time more effectively. Thus one benefit which can be received from project work is the skill in time management.

Develop Reading habits

Reading makes a complete man'. The project student will have to read more to collect information for his work Hence the project work develops the reading habits of students which in turn helps to increase their awareness on social, environmental and financial issues and other matters not directly related to the project work.

Co-operating with others for mutual support

A successful project-student relies heavily on the support of others, mainly to suggest leads, to give informed judgements, to boost motivation and to provide constructive criticism. The project student must work closely and collaboratively with other students, teachers, instructors, family members and friends. This is a good attitude which should be developed by a person throughout the life. Then others of the society would definitely benefit from a person of this calibre.

Report Writing

As report writing is an essential part of project work where the student learns to present his or her findings and observations in a written ordered pattern which makes sense to the reader.

Presentation Skills

It is important for students to be able to give confident and effective presentations on their completed work This would help the student to

- structure and evaluate the work, which in turn enables his or her to spot any flaws in the arguments, and to identify new ways to move forward
- to get feedback from others on what has been done so far and to benefit from their advice on what might be done in the future

Experience in making presentations would help develop self-confidence and the project work

provides the suitable environment for that opportunity.

Increasing Skills for Employment:

The project work would make a significant contribution towards improving the skills required for varieties of employment opportunities as clearly outlined in an earlier part of this essay. This would be particularly beneficial for students who may not wish to pursue further education at tertiary level. But all students would assuredly benefit from this aspect of this educational programme at school level.

References:

1. *Teachers Hand Book on 'Skills Development Projects for Life' (1998), for G C E Advanced level- projects, published by* National Institute of Education, Maharagama

2. *The Research Student's Guide to Success (1997), by* Pat Cryer

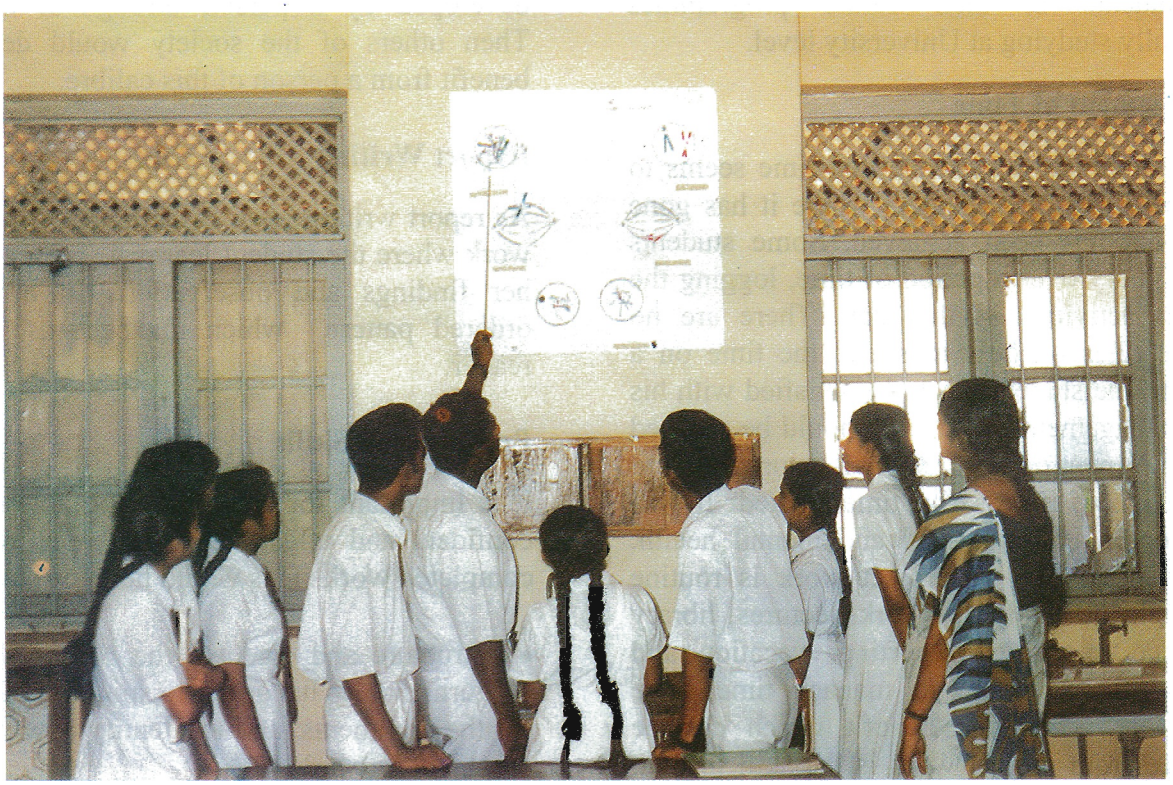

Figure 3: Project work helps develop presentation skills of students

VIDU 20-1-17

SUGARCANE CULTIVATION FOR SUGAR INDUSTRY AT SEVENAGALA

Summarised and translated from the report of a project carried out by K T Dilan, a student in Grade 13 at D S Senanayake College, Colombo

This study was performed on sugarcane cultivation in Kovulara farmer village in relation with sugar factory at Sevenagala and Sevanagala Sugar manufacture. *The report of the project is comprehensive and it consists 14 A4 size pages and six photographs showing various activities of sugar cultivation.*

Introduction and Climatic factors

Sugarcane is a useful plant which belongs to the family *Graminiae*. Its botanical name is *Saccharaum officinarum. The details on climatic factors which suit to sugar cultivation such as soil, temperature and rainfall have been reported in detail.* The common soil type in this area is Reddish Brown Earth and its pH varies between 6.0 and 7.5. As the temperature prevails between 28 - 32^{0}C, a dry climate exists in the area. A rainfall of 50" - 75" is obtained distributed throughout the year, which is quite sufficient for sugarcane cultivation. The sugarcane variety which has been selected as suitable for cultivation in this area is mainly C. O. 775 in addition S. L. 8306 and S. L. 121 have also been identified as suitable. The damage to sugarcane cultivation by insects is at a minimum but a considerable damage is caused to the cultivation by wild elephants and wild boar.

Land preparation

Methods of land preparation for sugarcane cultivation have been indicated together with the details of assistance received by farmers from the factory. The factory has given 0.75 hectare of land to each farmer who cultivates with the support of irrigation systems, 1/2 acre of muddy land for paddy cultivation and 1/2 acre of land for building a house.

Before cultivation activities are started, deforestation is being done by farmers by cutting and burning the forests and also by clearing the land using heavy vehicles like bulldozers.

The farmers who have engaged in cultivating with the aid of irrigation systems generally level the lands. But other farmers take water to a higher elevated place of the land and allow water to uniformly spread throughout the land. One strategy which is practised in this cultivation is the planting on the contour which helps to minimise the soil erosion from rain.

To facilitate the water drain off, a drain is built everytime. Once the land is prepared in this way, the loosening of soil is done upto a depth of 18" by a process unique to this cultivation. Once the soil is eased in this way, it is then broken up. After this, the farmers prepare the land by the building of drains and bunds on the contour in order to minimise soil erosion.

Planting of seed sugarcane

The sugarcane seeds(pieces) which are used for normal planting are taken from 7 to 8 months old sticks. Only recommended sugar varieties for the area are selected. The farmer also gives attention to other important factors related to selecting of seeds. Farmers usually say that about 37000 - 39000 pieces of sugarcane are required to cultivate a extent of one hectare. When planting, sugarcane sticks are spread over the land and a soil layer is spread over it

and pressed down by foot. During sprouting, the first shoot emerges within a period of 7-21 days after burying. Farmers expect that about 7- 8 plants are arised from one clump.

Water Supply

The water is received for sugar cultivation in this area by rain and irrigated water. Watering of the plants during the first 11 months is essential and a water supply of 3' is required per week during this period. The irrigated water is received from the left canal of the Walawe reservoir. When the plant is 11 months old it is well grown and water will not be required as maturation starts from this period.

Manure and use of weedicides

The cultivation should be maintained without weeds. To achieve this, weeds are controlled by mammotting. Diuron is sprayed as a weedicide at the age of 11/2 - 3 months of the cultivation. Before planting sticks 'Basela' manure mixture is applied. After 11/2 months of planting, first surface application of manure is done using Ammonium sulphate and a second application of Ammonium sulphate manure to the plantation is done before completion of 3 1/2 months.

Diseases

Grassy shoot disease, Smut disease and damages to shoot and leaf are the main diseases which have affected the plant population. *The details of symptoms, control of the diseases, spread, and disease causing insects have been studied and reported.*

Harvesting

Farmers are aware that the right time for harvesting is reached when the sugarcane is 12-14 months old. The maturity is confirmed by a test. The sugarcane is cut as sticks from the ground level using a knife of a special type. Human labour is used for cutting of sugarcane. Afterwards the cut pieces are transported to the factory within a period of 24 hours.

The problems faced by farmers, the main partners, of the industry have been identified by this study. They are summarised below:

- The farmers have been exploited by sugarcane cutters
- Farmers cannot afford the high costs charged for sugarcane cutting
- Loss of large quantity of sugarcane due to irregular cutting of sugarcane sticks at a height of about 6-8" from the ground level. This has affected the income of farmers
- Not cutting the sugarcane according to the standards required by the factory
- Rejection of sugarcane by the factory due to presence of wastes in the sugarcane has caused a another loss for the farmers since farmers will have to bear the cost for cleaning of harvest
- It is necessary to take care to minimise the unnecessary profits made by external people apart from farmers

As the cultivation is based purely on the farmer, the sugar production varies with the productivity of the cultivation. It is important to note that a good harvest could be obtained from sugar cultivation that would help to increase the sugar production. The economy of the country could be enhanced by increasing sugar production while decreasing imports of sugar.