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Course evaluation at a distance teaching university.

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Course Evaluation at a
Distance Teaching University

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Abstract

Distance education is a relatively new field in the South Asian region compared with developed world. It is still in its development stages. The Open University of Sri Lanka (OUSL) which was established in 1980, is the only university in Sri Lanka which offers study programmes in distance mode. Most of its courses have been offered for a number of years and therefore need to be developed and improved.

At OUSL, very few course evaluation studies had been conducted. The development of a course evaluation model for OUSL courses was one objective of this particular study. Foundation level one Mathematics courses of the Diploma in Technology programme of the OUSL were the subject of this evaluation study. The samples were selected from the course participants to obtain feedback through a postal questionnaire. In addition, group discussions were conducted with number of small student groups. Information was also obtained from a sample of Day School lecturers. Their suggestions were also obtained for improving course components. Findings reveal a number of weaknesses, particularly in the two components, course materials and Day Schools. Most of them were not satisfied with the way of conducting Day Schools and expect class room style teaching. Some of the weaknesses in course material, if examined in the light of suggestions made by students, are not difficult to remove. For example : not providing the answers for the self assessment questions, insufficient worked examples in some subject areas and printing mistakes.

Majority of the respondents who followed the foundation level Mathematics courses were in 18 -24 age group. Most of them were unemployed. Around 90% were males. In both courses nearly half of the registered students had never participated in the academic activities. Almost all had passed the G.C.E. (O/L) Mathematics and Science subjects, which was considered as an advantage in following the foundation programme although no educational qualifications are requested. However, in both courses students who had followed G.C.E (A/L) in Maths stream had performed significantly better than the others. Among the participants only 35 - 40% had got the eligibility to sit the final examination. Although the final examination pass rates were good, the success rates were very low which were only 17% in Applied Mathematics and 11% in Pure Mathematics. None of the respondents who had not followed G.C.E.(A/L) in Maths stream failed to complete the Pure Mathematics course successfully.

Course evaluation studies are conducted for number of purposes. A number of course evaluation studies are discussed in the light of developing a suitable model for OUSL courses. Basically, attention is drawn to the following issues.

*   identifying the areas to be investigated

*   identifying the categories to obtain information

*   selecting an appropriate data collection method

Several factors are to be considered under each issue. Availability of time and resources are the main factors.

Out of the data collection methods discussed postal questionnaire / discussion method which was used for this particular study is recommended as the most appropriate method in the Sri Lankan context. The importance of reminders is stressed as they doubled the initial response rates of this study.

The implementation of recommendations and suggestions is another vital stage in the evaluation process. A quick response from authorities is sought for the recommendations and suggestions to win student confidence. This may also influence future studies.

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CHAPTER 01

INTRODUCTION

At the beginning of this introductory chapter, the background of the research and its aims are introduced. As this study was conducted at the Open University of Sri Lanka (OUSL), a short section describes some geographical and social aspects of Sri Lanka. The rest of the chapter describes the educational system of Sri Lanka and then focuses on the OUSL and its study programmes. Finally, it discusses the key issues to be considered in a course evaluation study.

1.0 Background and aim of the research

The Open University of Sri Lanka (OUSL) is the only recognised university in Sri Lanka which offers study programmes in distance mode. It was established in 1980. International organizations/ Foreign funding bodies have supported OUSL from the time of its inauguration. As Kotelawela and Samarasundara (1986) mention,"UNESCO funding is mainly utilised for the purchase of laboratory and workshop equipment, audio visual equipment, printing machinery, foreign and local consultancies. SIDA (Swedish International Development Agency) support has been mainly utilised to support the teaching of basic Science and some Technological study programmes". More recently a major three year project was granted from the UK Overseas Development Agency (ODA). One of the main objectives of this project was to get consultancy help and support to develop the research and evaluation capability of OUSL staff members. Before the commencement of the ODA / OUSL three year distance education project in 1996, ODA offered training awards for the OUSL staff members during the period of 1992 - 1994. I , the researcher was selected for the long term training award in 1994 which was about evaluation in distance education. After having preliminary discussions with the Dean of the faculty, it was decided to carry out a course evaluation study. Very few course evaluation studies have been conducted previously and a major objective for this study was to develop a course evaluation model to evaluate OUSL courses. As I was attached to the Faculty of Engineering Technology it was decided to consider a course offered by the Faculty for this study. Out of a number of study programmes, the "Diploma in Technology " is the main study programme offered by the faculty. It has four levels of which the first two levels are refered as the "Foundation programme" in which 1300 students were registered in 95/96 academic year. Informal sources reveal that students have encountered many difficulties in following level one courses. So it was decided to select level one "Mathematics" courses for this evaluation study. These "Mathematics" courses contained 100 per cent print media with the additional support of six Day Schools and three tutor clinics.

The aim of this research study was to evaluate the course components in the Foundation level one, Mathematics courses with a view to make recommendation and suggestions for improvements and further developments in both the short term as well as in the long term. (This study was carried out in 1995/96 academic year). This study was also necessary for the following reasons:

*   The Diploma in Technology programme was introduced in the 1985/86 academic year. A curriculum revision was done in the 1990/91 academic year and since then there has been no change in the curriculum and no studies have been conducted to obtain student /staff feed back in order to make further improvements to the courses.

*   The researcher worked as a Day School lecturer in Foundation level one Mathematics courses and also as a marking examiner for the same courses in the 1994/95 academic year and therefore had regular contacts with students.The researcher was able to conduct informal discussions with student groups and noticed that most of them had difficulties in following the Mathematics courses . They were not satisfied with the course material, and pedagogy.

*   Although the Engineering Mathematics division which offered these courses was aware of some problematic areas data had not been obtained systematically.

1.1 Sri Lanka

The Republic of Sri Lanka (known as Ceylon until 1972) is an island located in the Indian Ocean close to the southern part of India. The area of the island is 65,415 square Km which is about half the size of England. The central part of the island consists of mountains rising over 8000 feet. Temperatures varies between 26 - 30 ^{0}C in lower country and between 14 -17 ^{0}C in some of the hill stations. The population of the country is nearly 18 million and consists of three main ethnic groups.

*   Sinhalese   about 74 per cent of the population, speak Sinhala

*   Tamils   about 18 per cent of the population, composed of 'Ceylon' and 'Indian' Tamils and speak Tamil

*   Moslims   Originally of Arab descent, about 7 per cent of the population and speak Tamil

70 per cent of the population is Buddhist and Buddhism has enhanced the cultural and traditional values of Sri Lanka for over twelve centuries. Almost all Sinhalese are Buddhists. Tamils are generally Hindus while few percentage among both ethnic groups are Catholics and Christians. The majority of Tamils live in the Northern province and the Muslim majority in the Eastern province. The population in the Eastern province is fairly evenly split among the three ethnic groups. Since 1983, there have been civil disturbances in the Northern province and in some of the parts in the Eastern province. These disturbances have had a direct impact on development of the country as the war expenditure increases annually and the government is compelled to cut down allocations on

services such as education, health and transport. As a result of these disturbances the Open University Northern regional centre at Jaffna has remained closed for several years and therefore curtailed the opportunity for the civilians who wanted to enrol in distance education programmes.

The economy mainly depend on its agricultural exports especially, tea, rubber and coconut. Due to the recent industrial growth the garment industry has reached a prominent place among the exports. From last decade tourism and employment in the Middle East have also become an important part of the economy. The per capita GNP is US$ 500 which is highest among the south Asian region. But according to the world development report 1991 Sri Lanka is ranked as the thirty sixth among the economically poor countries in the world. (cited by Gandhe 1995). The majority of people live in rural areas, the main occupation being agriculture and allied activities. Sri Lanka has a relatively developed transport system with good network of tarred roads and around 15000 km of railway track connecting the main towns. It has developed postal and broadcasting service. The telecasting system covers most parts of the island. However, in the case of telecommunication, the telephone facility is easily accessible only around the main cities and urban areas.

Sinhala and Tamil are the two official languages in the country while English is considered as the second language. The majority of Degree level courses at the Universities as well as commercial affairs are conducted in English medium. Sri Lanka has a parliamentary form of government with an executive President and is a member of the Commonwealth of Nations. It is one of the seven countries comprising the South Asian region which include Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

1.2   Educational system in Sri Lanka

There are two educational ministries in Sri Lanka which overlook and direct the national educational structure. The Ministry of Education which is in charge of general education and the Ministry of Higher Education which is in charge of universities and other tertiary educational institutions. The formal education system comprises the following three subsystems.

* General education system

* Technical /Vocational education and

* Higher education

The General education system consist of four stages :

(i) Primary education (Years 1 -5, age 5 -10)

(ii) Junior secondary school (Years 6 - 8, age 11 -13)

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(iii)   Senior secondary school (Years 9 -11, age 14 - 16) and

(iv)   Collegiate level (Years 12 - 13, age 17 -18).

Education is compulsory and free between the ages of 5 - 14 years. There are around 10,000 schools and majority of them are state controlled. The national languages, Sinhala and Tamil are used as the medium of instruction in schools. More than 76% of 5 - 10 age group participate in the school system. But the participation is gradually decreased with seniority of the grade. Only about 30% of 14 -18 age population represent the senior secondary / collegiate level of school children. Very little proportion of them, qualify for higher education at the state universities. School leaving begins considerably, at year 8. Poverty, remoteness and lack of encouragement are the main reasons. The highest drop out rate is at year 10, with unsuccessful attempts at G.C.E.(O/L). But compare with the other countries in the South Asian region, literacy is very high in Sri Lanka. Normally, schools are governed and financed by the Ministry of Education. There are few pirivenas (Buddhist schools for primary education) and convents still remain. In addition, fee paying International schools are established mainly in Colombo. Their medium of instruction is English and students sit for the London (O/L) and (A/L) examinations.

Technical education has developed rapidly during the last few decades. There are around 20 Technical Institutions across the country and and number of them have been up graded to Polytechnics which concentrate on craft courses. They also offer diploma level programmes in commerce and business studies. Junior Technical Institutions offer a range of courses at different levels. The newly established Sri Lanka Institute of Advanced Technical Education (SLIATE) conducts higher national diploma programmes in the fields of Engineering, Commerce, Accountancy and Home science. The entry qualification for such programmes is successful completion of the G.C.E.(A/L). In addition a large number of middle level technical and vocational courses are conducted by agencies such as the National Apprenticeship Board, the National Youth Services Council and the Ministry of labour and vocational training.

Due to the lack of campus resources (lecturers, lecture room facilities, laboratory facilities etc..) universities could not enrol all students who passed at the General Certificate of Education Advanced Level [G.C.E.(A/L)], which is considered as the university entrance examination. For each discipline of study, for example Engineering, Medicine, Natural Sciences etc. there is a cut off mark which varies slightly from year to year. Students who have passed the G.C.E (A/L) above the cut off mark are eligible to enter one of the conventional state universities. There are eleven state Universities in Sri Lanka including the Open University. Five of them are located in the Western province and one each in the provinces of Central, Northern, Southern, Eastern, North-central and Sabaragamuwa but none in the two provinces of North-West, and Uva.

There are two distance education institutions in Sri Lanka. The Open University of Sri Lanka (OUSL - since 1980) and the National Institute of Education (NIE - since 1985). Both are state Institutions. Prior to the establishment of these two, the following three institutions had been involved in distance education.

(i)   Ministry of Education's Distance Education Branch for Teacher Education programme (1972)

(ii)   University of Sri Lanka's External Service Agency (ESA -1972) and

(iii)   Sri Lanka Institute of Distance Education (SLIDE-1976)

The first one was absorbed to the NIE and the other two to the OUSL at their inception (Kato, 1992). The National Institute of Education (NIE) mainly focuses on teacher training programmes leading to the Trained Teachers' certificate in the fields of Science, Mathematics and Elementary education, and post graduate certificate in education. The Open University offers a wide range of study programmes in different levels, up to higher degrees in some fields.

1.3   The Open University of Sri Lanka

The Open University of Sri Lanka (OUSL) which was established in 1980 has the same legal and educational status as any other state University in Sri Lanka. It is the only recognised University in Sri Lanka which offers programmes through distance learning techniques.

The aims of setting up the OUSL are to provide opportunities for those,

*   who are unable to study full time due to their employment or for any other reasons,

*   who wish to acquire knowledge in fields other than their own or wish to widen their knowledge in their own field

*   who decide to continue their studies at a later stage,

and thereby helping them to re-enter the education process.

OUSL designs and conducts courses and educational programmes through the use of printed course material, audio-visual material, face to face teaching sessions, tutor clinics, seminars, workshops, laboratory and field work, depending on each programme of study.

Total student numbers in OUSL were around 20,000 in 1995. OUSL offers 30 different study programmes ranging from beginners programmes such as 'a beginners course in Sinhala' and 'a beginners course in Tamil' (which do not need any formal educational qualifications for enrolment) to post graduate level study programmes such as Master of Education (M.Ed) and Master of Technology in Industrial Engineering. The University also awards two higher degrees by research : M.Phil and Ph.D. Each programme of study

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consist of a number of courses. In addition, there are Continuing Education and Awareness courses. In a particular academic year a student is allowed to register for a maximum of two credits from the main study programme and 1/2 credit from continuing education courses. For a one credit course, a student is expected to spend 450 hours (reading of lesson material, discussions with academic staff and fellow students, attendance in seminars, practicals and written work) during the academic year which consists of 30 weeks (i.e. around 15 hours per week). For each study programme a particular number of credits are required for the award. For an example Diploma student should obtain four credits from the main stream courses for a diploma.

The entry qualifications vary with the study programme. Although all who satisfy the entry qualifications are absorbed, selection tests are conducted for the Law degree and Diploma in Management programmes due to the their huge demand.

The academic progress of a student during the year is assessed through Continuous Assessment (CA) which consists of Tutor Marked assignments , Mid Session Tests and laboratory or field work where applicable. Students who have obtain 40 or more marks in overall Continuous Assessment are allowed to sit the final examination. Each course has its own scheme of Continuous Assessment to determine the overall CA mark which is refered as the eligibility criteria.

1.3.1   *The Faculties*

There are three faculties and 16 different academic divisions in the OUSL as listed below.

TABLE 1.1   ACADEMIC DIVISIONS IN THE THREE FACULTIES

Faculty of Natural Sciences	Faculty of Humanities & Social Sciences	Faculty of Engineering Technology
Botany	Education	Agriculture & Plantation Engineering
Chemistry	Language studies	Civil Engineering
Mathematics	Legal studies	Electrical & Computer Engineering
Physics	Management studies	Mathematics & Management of Technology
Zoology	Social studies	Mechanical Engineering
		Textile Technology

Out of the thirty study programmes sixteen (around 50%) are conducted by the Faculty of Humanities and Social Sciences, nine by the Faculty of Engineering Technology and the remaining five by the Faculty of Natural Sciences. Most of the Study programmes conducted by the Engineering and Science Faculties contain laboratory components. Laboratory sessions for the foundation level courses are conducted at the regional centres. But laboratory facilities at the diploma and degree levels are available only at the central campus, Nawala and students are called in small batches to perform laboratory sessions. There are 232 full time academic and academic support staff members in the university. In addition some part time staff are used for the work such as lesson writing, conducting face to face sessions especially at outstation regional/study centres and marking assignments. The faculties have authority to schedule their own academic year.

1.3.2 Regional and study centres

The OUSL has a network of regional and local study centres distributed throughout the country. There are four regional centres and sixteen study centres. Each study centre is attached to a particular regional centre. The central campus and the Colombo regional centre is located at Nawala, Nugegoda 6 km away from the city of Colombo. Around 60 - 70 per cent of students are attached to the Colombo regional centre. Due to the civil disturbances, the Northern regional centre at Jaffna is not operative. Locations of the regional and study centres are shown in APPENDIX I.

The major functions of the regional/study centres are :

* Distribution of course material

* Conducting Day Schools / examinations

* Providing library facilities

* Registration of students (at all three regional centres and selected study centres according to the number)

1.3.3 Student support services

Student support is important for the success of a distance learning course. In addition to the Day Schools, tutor clinics, student counselling service, library facilities are provided as support services. Dormitory style student guest house facilities for both male and female students are available at all three regional centres. This facility is provided for shorter periods especially for the distant students who have come to the regional centres to attend their academic activities such as laboratory sessions and the final examination.

Tutor clinics

In addition to the Day Schools a number of Tutor Clinics (TCs) are conducted. Tutor Clinics were introduced in 1994/95 academic year. The main aim is to support the students who have registered for courses which do not have Day Schools or have only very few. Tutor Clinics are conducted at all three regional centres on weekends. A group of academics representing all the divisions in the faculty take part in these Tutor Clinics. The dates of the Tutor Clinics are given in the weekly minder. Students have opportunity to discuss their difficulties individually with the relevant staff member at any time between 0900 Hrs to 1600 Hrs, if the time is not specified. However, it is noticed that in the Faculty of Engineering Technology, very few students have used this opportunity during the past two academic years..

Student counselling

There is a student counsellor attached to each faculty. Students can discuss their problems, particularly on academic and administrative related matters with their faculty student counsellor or with the chief student counsellor. Students can meet them at the central campus during the normal office hours on weekdays or they can contact the counsellors either by phone or by mail.

Library facilities

The OUSL has a network of libraries at regional and study centres. The main library is located at the central campus , Nawala. It is open on all days from 0830 Hrs to 1900 Hrs except on certain public holidays. It offers reference facilities mainly to students at level three and above.

Other assistance

Apart from the student counsellors and Tutor Clinics, students can also get the assistance from the course co-ordinator, who is the immediate OUSL representative with them through out the academic year. Course co-ordinators work at the central campus in Colombo. Students can call in central campus to contact the course coordinators during the normal office hours on weekdays. They can also contact them over the phone or by mail . However, no personal Tutors are assigned to the students.

1.4   Study programmes at the Faculty of Engineering Technology

The Faculty of Engineering Technology which consists of six academic divisions offers nine different study programmes ranging from elementary certificate (level zero) (level research degrees programmes M.Phil. and Ph.D. An overview of entry points to the programmes offered by the Faculty of Engineering Technology are shown in FIGURE 1.

FIGURE 1   An overview of entry points to the programmes offered by the Faculty of
            Engineering Technology (Source : Student guide book 1995/96, The
            Faculty of Engineering Technology, OUSL).
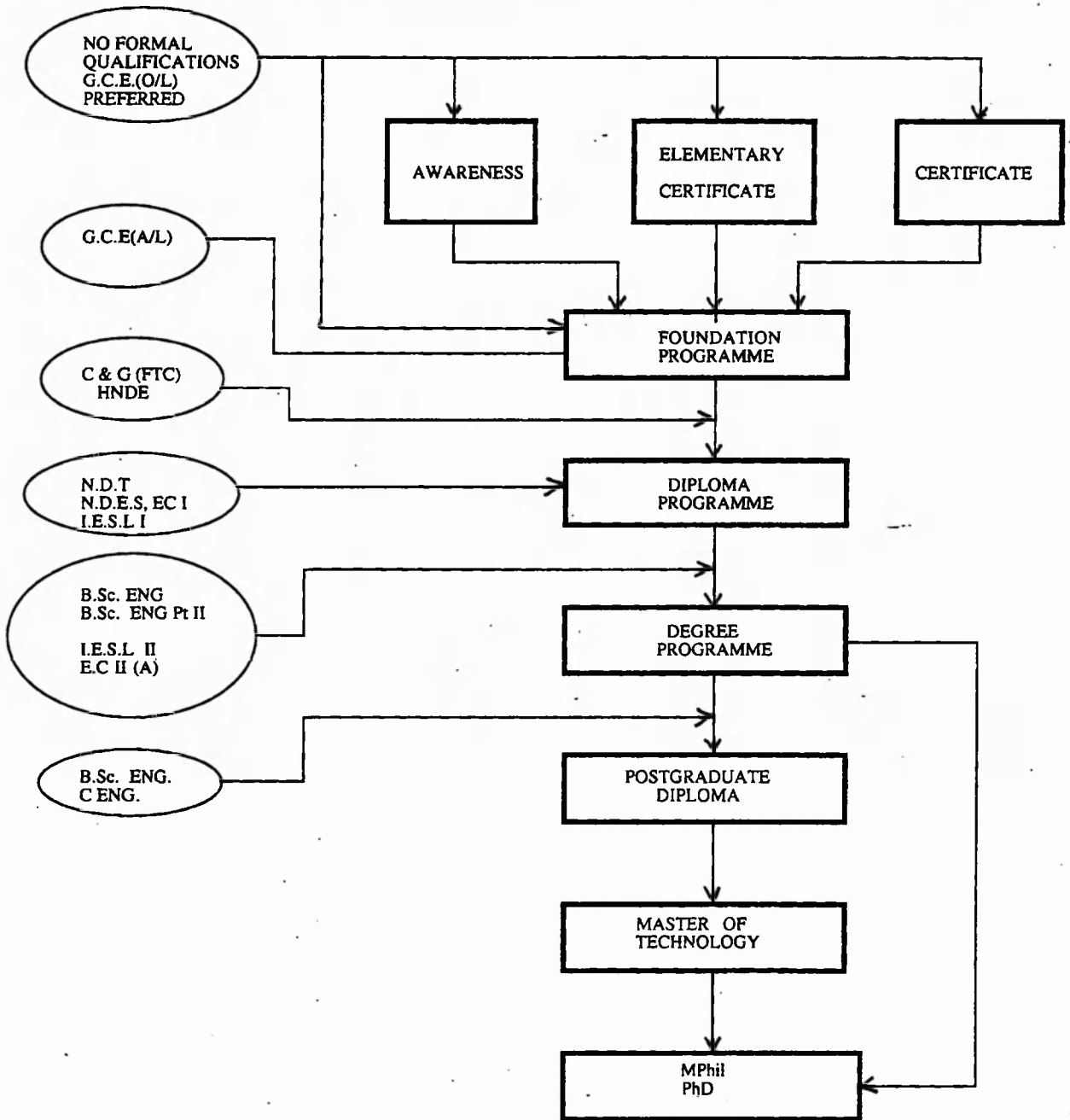
Each programme has different entry requirements. For example, no educational qualifications are required for Awareness, Elementary Certificate, Certificate and Foundation programmes. Students with City and Guilds Full Technological Certificate [C & G (FTC)] or Higher National Diploma in Engineering (HNDE) can directly register for the Diploma in Technology programme which is an entry level for the degree level (B.Tech programme). The academic year in the faculty of Engineering Technology commences in March and the final examinations are conducted in December.

1.4.1   *Diploma in Technology programme*

The Diploma in Technology programme (levels three and four) is one of the nine study programmes conducted by the Faculty of Engineering Technology. It was introduced in 1985/86 academic year. Till 1990/91 academic year all the courses at the Diploma levels were 1/2 credit rating courses. The Foundation programme (levels one and two) consist of both 1/2 and one credit courses. At level one there were two one credit courses and at level two there were two half credit courses and single one credit course. It was noticed that students had many difficulties in following those one credit courses; especially Mathematics which covered both Pure Mathematics and Applied Mathematics at level one and Physical Science for Technology which covered Physics and Chemistry subject areas, offered at level two. Those two courses also recorded very low pass rates of around 20%.

In the 1990/91 academic year major changes were made to the curriculum of both the Diploma and Foundation programmes. The following were the major changes:

*   The one credit courses 'Mathematics' and 'Physical Science for technology' were revised and introduced as new courses.

*   The 'English for Technology' course which was offered at level one was removed from the regular courses and re-introduced as a Continuing Education course.

*   All courses at foundation levels one and two were revised to 1/2 credit rating courses.

*   All Diploma level courses were revised to 1/3 credit rating courses and the new discipline "Computer Technology" was introduced.

The Diploma in Technology programme is available in nine disciplines and they are mutually exclusive. Therefore a student can follow only one discipline at a time. In addition to the successful completion of regular courses, pass in English courses and in Training modules and one credit in computer literacy courses are required for the award of Diploma.

1.4.2 Foundation programme in Technology

One of the pre-requisites for enroling in the Diploma in Technology programme is the Foundation programme. Students with appropriate qualifications can claim exemptions from corresponding courses or level(s) of the foundation programme at the time of registration. For an example as shown in FIGURE 1 students with the National Diploma in Technology (NDT) can claim exemption from the foundation programme and can directly register for the Diploma programme.

The Foundation programme consists of two levels, level one (F1) and level two (F2). Courses at F1 and F2 are 1/2 credit rated [225 hours of study per academic year] and most are common to all disciplines. There are seven main stream courses in the Foundation programme as shown in TABLE 1.2.

TABLE 1.2   COURSES IN THE FOUNDATION PROGRAMME

Level	Course Code	Course Title
01 (F1)	MPF 1301	Pure Mathematics
	MPF 1302	Applied Mathematics
	CEF 1301	Properties of Materials
02 (F2)	MPF 2301	Mathematics
	MEF 2301	Engineering Drawing
	MEF 2302	Heat and Fluids
	ECF 2301	Principles of Electricity

Foundation programme course materials are available in all three languages namely, English, Sinhala and Tamil except for the case of Engineering Drawing (MEF 2301) and the laboratory work book in Principles of Electricity (ECF 2301), which are available only in English language. No entry qualifications are required for the registration at level one (F1). However, passes in six subjects including Mathematics and Science at the G.C.E.(O/L) examination and being employed in a relevant field will be advantageous. The minimum duration of the Foundation programme is two years.

Foundation level one Mathematics courses

There are two Mathematics courses at the Foundation level one namely,

* Pure Mathematics (MPF 1301) and

* Applied Mathematics (MPF 1302).

Both consist of the following course components.

    (i)   Course material

    (ii)   Tutor Marked Assignments (TMAs)

    (iii)   Mid Session Tests (MSTs)

    (iv)   Day Schools (DS)

    (v)   Final Examination (FE)

Number of units in the course material and the frequency of different course components are listed in TABLE 1.3.

TABLE 1.3   COURSE COMPONENTS OF FOUNDATION LEVEL ONE MATHEMATICS COURSES

Component	Course	
	Pure Mathematics	Applied Mathematics
Course material	06 units	05 units
Tutor Marked assignments	04 Nos	04 Nos
Mid Session Tests	02 Nos	02 Nos
Day Schools	06 Nos	06 Nos
Final Examination	02 papers	02 papers

As these two Mathematics courses are common to almost all disciplines in the diploma programme, large numbers of students are enrolled in these courses. In the previous two academic years around 1000 students registered in each course. However, the number registered in 1995/96 year was around 600. The majority of foundation students registered for more than one course in a academic year. In 1995/96, nearly 82% (1076 out of 1298) of Foundation level students had registered to follow more than one course.

Important issues to consider

In a distance education system, the individual learner studies mainly through course materials. These materials can be provided for them in different mode of communication such as, print, radio, television, audio cassettes, video cassettes, audioconferencing and videoconferencing. As Rathore (1994) mentions, " the print media in the form of course reading material dominates the other forms of technological mass communication media and constitutes the mainstay in distance education". In many developed countries, multimedia course presentations are used. However, in the case of OUSL, in most of the courses, the course materials are still being presented only through printed text. In few courses, audio / video cassettes are being used to supplement the printed material. Distance education field is relatively new in Sri Lanka as well as in the South Asian region. It is still at developing stages. Therefore, in a course evaluation study printed text would be the key area to focus in respect to the course material.

Apart from course material, distance education institutions assist students in their studies through support services such as face to face sessions (Day Schools), telephone counselling and tutor clinics. In the Sri Lankan context, telephone counselling is not feasible due to number of reasons. For example, non availability of the facility throughout the country and its expensiveness. Most of the OUSL courses include several Day Schools to assist the students. However, informal sources reveal that in most of the foundation level courses, student participation in Day Schools are not satisfactory. In a course evaluation study, it is necessary to consider Day Schools as a key area because it is the main type of support service provided by the University. It may need to investigate reasons for poor participation, student satisfaction about the way of conducting Day Schools and changes that students would like to have in Day Schools. The findings of such issues may help to make suggestions / recommendations to improve the service of Day Schools. However, support services can be regarded as an important area to conduct a separate research study.

Very few evaluation studies have been conducted at OUSL. The findings of such studies may have been reported only to the respective faculty but not disseminated among the other faculties. Many OUSL course were inaugurated at least five years ago. Therefore, such courses may need further modification / developments. The development of a course evaluation model would be very useful because it can use as a main source to obtain relevant information for above purposes. The following are some key issues to consider in developing a course evaluation model.

      identify the areas to be investigated under each course component

      identify the categories to obtain information

      identify the method of data collection

In a course evaluation study, it is expected to obtain information from a number of course components such as course material, Day Schools, Tutor Marked Assignments, Laboratory sessions, Mid Session Tests, Final examination etc. These components consist different kind of activities. Therefore, it is necessary to identify the specific issues in each and every component which are to be investigated in the study. There are also different groups of people involved in a course. For example, students, coordinator and Day School lecturers. In the case of students, they can be categorised into subgroups such as non starters (who registered and never participated in academic activities), drop-outs, past students and present students. They may have different views about the course. It is important to obtain information from different groups. However, it is necessary to identify the most appropriate group(s) to obtain most important data for the study, within the available time and the resources. There may be number of facts to consider when deciding on the method of data collection. Some important factors like sample size, availability of time, resources and geometrical spread out of students need to be taken into account.

These issues are discussed widely in next two chapters. Chapter two will discuss some of the course evaluation methods used to evaluate distance education course / course component. Chapter three deals with the research design for this course evaluation study.

CHAPTER 02

COURSE EVALUATION IN DISTANCE EDUCATION

2.0 Introduction

This chapter discusses course evaluation in distance education with special reference to developing countries in the South Asian region. Before moving into the discussion on course evaluation, the historical background of distance education is briefly discussed. The field has developed in number of generations. Distance education in the South Asian region has a relatively short history compared to the western world. It is a new field still in its developing stages. The background of distance education in South Asian region with the reasons for its emergence is also discussed. In the final section of this chapter, the background of evaluation is considered together with some of the definitions and approaches in evaluation in literature. Finally it discusses the issues related to course evaluation in distance education and the different stages involved in a evaluation process.

2.1 Distance Education

Distance education leads to an educational process which can be learnt by some one at any time in his own place and at his own pace. The teacher is removed from space and time of the learner. Teaching material is supplied using different types of media in many different ways around the world. This diversity expresses the difference in educational and political principles, availability of technologies and socio economic circumstances etc. Although printed media is the most widely used mode of communication in developing countries, modern technologies are now being used in the developed countries. It is seen that a variety of names such as correspondence study, home study, external studies, independent studies have been used to identify the field from time to time and some still exist. Keegan (1996, p34) mentions "the term distance education subsumes a number of existing terms but not all are synonymous" and explains that "distance education is a generic term that includes the range of teaching/ learning strategies used by correspondence colleges, open universities, distance departments of conventional colleges or universities and distance training units of corporate providers."

2.1.1 Background and three generations of distance education

The present distance education system is the result of a gradual process of evolution over a period of more than hundred years. Originally, it began in the private sector, where postal services were developed, during the 19th century, mainly in Europe and North America. In the U.S.A, by the end of 19th century, the first department of correspondence teaching was established at the university of Chicago to deliver university courses by mail. Moore and Kearsley (1996) mention that "it was the world's first university distance education programme". In Australia, University of Queensland established a department of external studies in 1911. At the early stages of distance education, by the time of 1870s in the United Kingdom, tutorial support by post was available in a wide range of subjects. Initially they were provided by individual teachers and then at institutional level. Most of such correspondence courses focused on students needs to prepare them to enter particular professions mainly in fields such as teaching and the civil service. It was then developed to a stage where some institutions prepared students for university external examinations. Universities did not directly provided courses at a distance for their external students. Such provision was noticed as the primary form of distance teaching leading to a university award for most of the period prior to 1970s (Curran, 1996). The establishment of the Open University in the United Kingdom in 1969, marked an important new era in distance teaching at University level. It is an independent body providing a range of study programmes conducted through distance mode leading to different level of awards. During the last two decades a number of Open Universities were established in many parts of the world.

The teaching media in distance education system have changed with the developments in technology. Thus distance education has evolved through number of different stages. These have been classified in three generations; first generation began in about 1840. It was based on corresponding teaching, but included some broadcasting from about 1920. The second generation, starting in about 1970, was multimedia distance education. The third generation from 1985 onwards was based on computer-mediated communication. (Nipper 1989 quoted in Hawkridge 1996, p18). These generations overlap.

The first generation of distance education was correspondence study. It was single medium. As Moore and Kearsley (1996) mention "the principle media of communication are printed materials, a study guide, with written essays or other assignments being sent by mail". Mostly students studied without tutorial support.

The second generation distance education began with the establishment of the Open Universities in the early 1970s. As Bates (1990) writes for the first time a deliberately integrated multiple media approach was used for distance education, even though the

dominant medium was print. It was hard to notice any two way communication between the tutors and students in the first generation but there were developments in two way communication in the second generation. It was through correspondence tutoring, face to face tutorials and short residential periods. Two kinds of institutions emerged during the second generation. Both teach at a distance using a multiple media approach. Hawkridge (1996, p19) describe them as,

> "Those like the OU, which taught almost entirely at a distance and had no student campus, was labelled 'single mode', but others, particularly in Australia, which taught on campus students the same courses as those taken by students at a distance , were called 'dual mode'."

Third generation distance education emerged with the developments in modern technology based on combination of computers and telecommunication. Developments on two way communication systems is a major feature seen in third generation. Hawkridge (1996, p19) describes,

> "Third generation distance education, so far, seems to be buried within institutions that belong to the second, even the first, generation. Electronic information technology is its basis, offering two way communication in various forms (text, graphics, sound, moving pictures), either synchronous ('at the same time', as in videoconferencing and audiographics, both popular in North American institutions) or asynchronous ('not at the same time', as in electronic mail and computer conferencing)."

2.1.2   Definitions of Distance Education

There are number of definitions [Dohmen (1967), Peters (1973), Moore (1973), Holmberg (1977), quoted in Keegan (1996,p41-42)] of distance education which were presented during the period of late 60s to late 70s.

Early definitions

> Distance education (*Fernstudium*) is a systematically organized form of self-study in which student counselling, the presentation of learning material and the security and supervising of students' success is carried out by a team of teachers, each of whom has responsibilities. It is made possible at a distance by means of media which can cover long distances. The opposite of 'distance education' is 'direct education' or 'face-to-face education': a type of education that takes place with direct contact between lecturers and students.
>
> Dohmen,G (1967)

> Distance teaching/ education (*Fernunterricht*) is a method of imparting knowledge, skills and attitudes which is rationalized by the application of division of labour and organizational principles as well as by the extensive use of technical media, especially for the purpose of reproducing high quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. It is an industrialized form of teaching and learning.
>
> Peters,O (1973)

Distance teaching may be defined as the family of instructional methods in which the teaching behaviours are executed apart from the learning behaviours, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronic, mechanical or other devices.

Moore,M (1973)

The term 'distance education' covers the various forms of study at all levels which are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or on the same premises, but which, nevertheless, benefit from the planning, guidance and tuition of a tutorial organisation.

Holmberg,B (1977)

There are two common features in these definitions. That is about the separateness of the teacher and learner and about the influence of an institute, providing study materials and instructing. In Peters definition he has considered industrial aspects as he mentioned "it is an industrialized form of teaching and learning". Unlike in other conventional institutions distance teaching institutions are involved in both academic work such as preparing study material and some form of industrial work as it involves large scale production and distribution of study materials. Although these definitions were presented in 1970 decade except Peter's all other definitions can cover either second or third generation. In Peter's definition extensive use of technical media is especially seen as for the purpose of reproducing teaching material.

More recent definitions [Garrison and Shale (1987), Baker and others (1989), Moore (1990), Portway and Lane (1990) quoted in Keegan (1996, p42-44)] of distance education were presented during the period of Late 80s to mid 90s.

Recent definitions

Distance education implies that the majority of educational communication between (among) teacher and student(s) occur noncontiguously. It must involve two-way communication between (among) teacher and student(s) for the purpose of facilitating and supporting the educational process. It uses technology to mediate the necessary two-way communication.

Garrison,D and Shale,D (1987)

Telecommunications -based distance education approaches are an extension beyond the limits of correspondence study. The teaching-learning experience for both instructor and student(s) occurs simultaneously - it is contiguous in time. When an audio and / or video communication link is employed, the opportunity for live teacher-student exchanges in real time is possible, thereby permitting immediate response to student inquiries and comments. Much like a traditional classroom setting, students can seek on-the-spot clarification from the speaker.

Baker,B et al. (1989)

Distance education is all arrangements for providing instruction through print or electronic communications media to person engaged in planned learning in a place or time different from that of the instructor or instructors.

Moore,M (1990)

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The term 'distance education' refers to teaching and learning situations in which the instructor and the learner or learners are geographically separated, and therefore, rely on electronic devices and print materials for instructional delivery. Distance education includes distance teaching - the instructor's role in the process - and distance learning - the student's role in the process.

<div align="right">Portway,P and Lane,C (1994)</div>

As seen in early definitions, the separated teacher from learner and an organisation to support the educational process are common factors. However, recent definitions place much more emphasis on two-way communication between the teacher and learner especially in Baker et al.(1989). In their definitions they describe synchronous two-way communication. Considering these definitions in distance education Keegan aims at developing a definition to use it as an instrument to identify forms of educational provisions which falls into distance education and which do not Keegan (1996, p33). He attempted a synthesis of most of the definitions and proposed the following definition for distance education which has five important characteristics.

* the quasi-permanent separation of teacher and learner throughout the length of the learning process

* the influence of an educational organization both in the planning and preparation of learning materials and in the provision of student support services

* the use of technical media- print, audio, video or computer to unite teacher and learner and carry the content of the course

* the provision of two - way communication so that the student may benefit from or even initiate dialogue, and

* the quasi-permanent absence of the learning group through out the length of the learning process so that people are usually taught as individuals rather than in groups, with the possibility of occasional meetings, either face to face or by electronic means, for both didactic and socialization purposes.

The first characteristic, i.e. separateness is accepted in most of the other definitions and is the main characteristic in distance education. This characteristic distinguishes distance education from conventional face to face education. Learner can learns his own and the educational organization do the planning work, i.e. the influence of educational organization. This is the second characteristic in which Keegan distinguishes the distance education from private study and teach - your self programmes.

Separation of teacher and learner pave the way to third and fourth characteristics. In the distance education system it is the technical media such as print, audio, video which unite the teacher and the learner. Keegan mentions the provision of two way communication as the fourth characteristic in distance education. However, there is less chance for the two way communication as the teacher and learner are usually separated in distance education system. This can be done through technical media and the developments in technology facilitate two-way communication.

<div align="center">19</div>

A number of definitions for distance education have been presented during the past period of nearly 35 years. It is seen that developments in technology have influenced many definitions. Most of the recent definitions include the term, 'electronic'. Distance education is a field which is continuing to develop with the developments in technology.

2.1.3   *Background of Distance Education in South Asian region*

South Asian Region

The South Asian region comprise the countries of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The population in the region is estimated as 1187 millions in 1993, almost 20 per cent of the world population but the regional area is only 2.7 per cent of the world's surface area. These facts prove that South Asia is among the most densely populated areas of the world. These countries are among the economically poor countries in the world. According to a World Bank report, 1991, almost 42 per cent of the total population lives below the poverty line (Gandhe 1995). India is the largest country both in population and area. Pakistan and Bangladesh are two larger countries. These three countries together form 97% of the south Asian regional population and 94% of the region's land. The conventional education system faced difficulties with increasing populations. There is a requirement to train more teachers in which distance education system can play a leading role. The governments in the region are suffering from lack of resources and not in a position to bear the expenses for setting up new higher education institutes. The distance education mode is capable of providing formal and non formal education to the disadvantaged groups who could not attend a conventional school or higher education institute.

Distance education has a relatively short history in the South Asian region. Correspondence courses were introduced in the University in Delhi in 1962. All four major countries in the region, India, Pakistan , Bangladesh and Sri Lanka have accepted distance education mode and Open universities have been set up. The first in the region was Allama Iqbal Open University which was established in Pakistan in 1974. The first Open university in India was established by the government of Andhra Pradesh in 1982 and now there are eight Open universities in India. The Open University in Sri Lanka was established in 1980 and in Bangladesh in 1992.
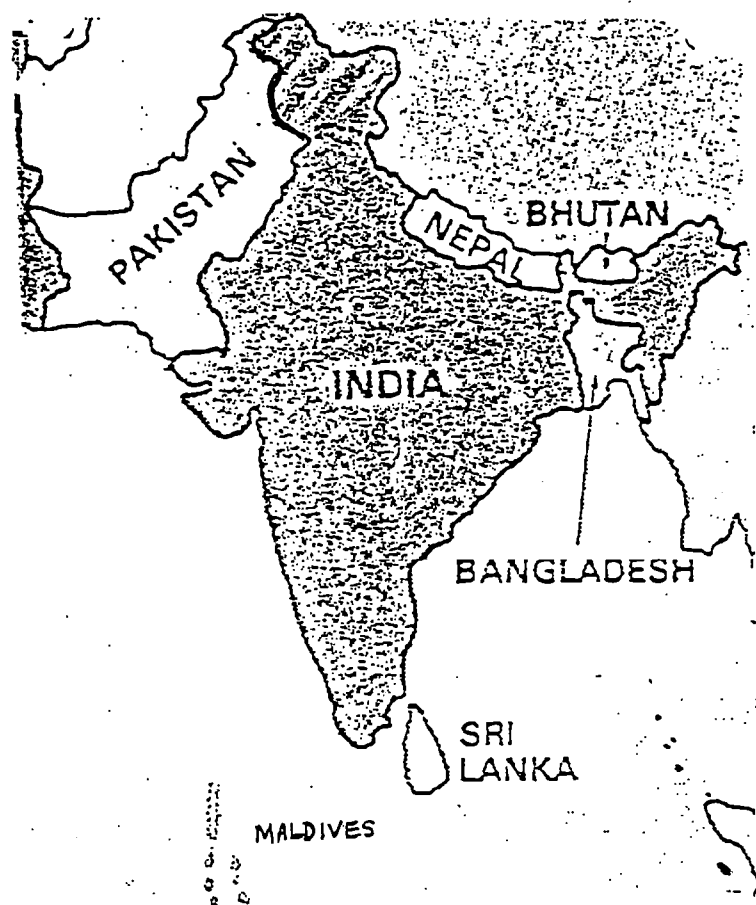
Sri Lanka

Distance education in Sri Lanka at the state level has a history of nearly twenty five years. It was initiated in 1972 with the establishment of the distance education branch of the Ministry of Education. and correspondence teacher education programme was launched aiming to train mature school teachers lacking previous professional training. The External Services Agency (ESA) of the University of Sri Lanka was the second institution association with distance education, which was also established in the same year i.e in 1972. Prior to the initiation of ESA universities did not provide any tuition for the students who have registered for the external degrees. ESA made significant changes to the services by providing correspondence lessons, face to face sessions and residential courses. In 1976 Sri Lanka Institute of Distance Education (SLIDE) was formed. Initially it offered programmes in Mathematics, Science and Management at Diploma levels and later expand its study programmes in the field of technology leading to a award of Higher National Certificate in Technology. Foundation courses were also provided for the students who did not posses required qualification to enrol at higher level courses, (Kotalawala 1993).

Distance education in Sri Lanka became widely accepted at national level with the establishment of Open University of Sri Lanka (OUSL) in 1980. ESA and SLIDE were absorbed in to OUSL in its inception. Trends in the developments in distance education is very positive. OUSL enrollment has expanded from 4000 in 1982 to around 20,000 in 1995. As Kotalawala explains

> "The OUSL was set up to satisfy the need of those who for some some reason or other lost the opportunity to receive higher education. It does not merely cater to those failing to gain admission to the conventional universities but also provides continuing education to those who are already employed".

Following the setting up of OUSL, another institution (with two of its departments associate with distance education) was established in 1985, the National Institute of Education(NIE). However it has a special objective which was to train a backlog of nearly 35,000 untrained school teachers. The programme was funded by the Swedish International Development Association (SIDA). The distance education unit of the Ministry of education which conducted teacher training programmes was absorbed into NIE. NIE mainly focus their distance study programmes in the field of teacher training. At present there are only two institutions in Sri Lanka which offer study programmes in distance mode and both of them are state institutions, i.e the Open University of Sri Lanka (OUSL) and National Institute of Education (NIE).

India

In the Indian context, distance education has a history of nearly 35 years. The University of Delhi was the first to establish a directorate of correspondence courses in 1962. Describing the expansion of distance education in India, Yadav and Panda (1995) mention that there was a large scale expansion of correspondence course to more than 30 universities in the 1970 decade and the trend continued during the 1980s. This period marked a significant development of establishment of Open Universities in India. It is also mentioned that at present there are 55 institutions of university level offering courses through distance education (47 correspondence course institutes and eight open universities). The contribution by the distance education system to the total enrollment at university stage has been increased gradually from 2.58% in 1975/76 to 12.82 per cent in 1991/92.

Reporting from the studies [Gupta (1978), Biswal (1979) and Datt(1985)] conducted with regard to the quality and didactic suitability of the correspondence course material for self learning Rathore (1994) mentions that these materials were mostly written in essay type format and lacking pedagogy for self learning. In addition it is also mention that there were more drop-outs.

Need for distance education

In Sri Lanka, after independence in 1948, major changes took place in the field of education. It was mainly due to the following factors;

opening up of central schools
scheme of granting scholarships
changing the language medium of instruction in all primary schools to the mother tongue

The number of schools were increased gradually from 4537 in 1945 to 8937 in 1963 and to 9494 by 1971,which lead to a phenomenal expansion in educational opportunity. In 1958 mother tongue was introduced as the medium of instruction at grade 11 and 12 and to universities in 1960. Before that, instructions had been carried out in English medium. Enrollment at both levels increased dramatically, (Kotalawala 1993). She further states that it changed dramatically the composition of student population at universities. The population of rural students at universities had increased from 19% in 1950 to 73% by 1967. However, the universities still could not cope with the increase in demand for higher education. On the other hand as a developing country the government was not in a position to spend a large amount of money in setting up universities. As Reddy (1988) mentions "formal education is very costly. As a result, expansion on a large scale becomes very difficult". There was a need for a system to provide education for the students who do not get opportunity to study at a conventional system even being eligible at the entrance examination. In addition there were categories such as those who wish to continue their studies after a lapse, or who wish to study while being employed. Distance education emerged as an alternative because of its capability to cater such different categories and to a large number of students. As Kotalawala (1993) states "distance education, however, became widely accepted at the national level as an important strategy to counteract the inadequacy of the traditional system of education to keep abreast of the new demand".

In India, Reddy (1988) describing the need for distance education identifies three trends which are responsible;

*   Inequalities in education, i.e. the question of access to education

*   quality of education   and

*   relevance to social needs

Reddy describes that there has been a remarkable expansion in education in India after the independence, particularly at the tertiary level. With this expansion, the number of students going to higher education increased. He also describes inequalities of other kinds in education, such as between males and females, rural and urban areas and among different states. It is seen that most are common to all countries in the region. On the second issue he mentions that there is a variation of quality in education in 160 universities

mainly because of proliferation which has taken place without reference to quality, and secondly due to a reduction of resource allocation for education. He further mentions that most student need to have access to good quality education. However, this reason as a need for distance education is questionable. The same problem i.e variation of quality can occur even within different distance education institutions.

The reason for the third trend is mentioned as failure to provide study programmes to meet social needs. On this aspect what Reddy tried to point out was Institutions should be aware what type of manpower that the country needs and provide programmes to fulfil such requirements. However these requirements may vary from time to time. The Need Assessment survey conducted by the Bangladesh Open university is an good example to consider. As Ali, Haque and Rumble (1997) describe, the survey results indicated that there were insufficient demand for seven study programmes which they had intended to introduce and consequently such programmes were dropped. They further mention that "...the survey also led BOU to decide to bring forward the launch date of some of its programmes, in order to respond more quickly to those areas where demand was highest". That is, providing the programmes to fulfil the peoples need , providing programmes to trained and skilled manpower requirements. This is another common fact in the region . Distance education can also provide courses to meet the social needs. As Keegan (1996, p4) mentions " In the late 1990s distance education is a valued component of many education systems and has proved its worth in areas where traditional schools, colleges and universities have difficulties in meeting demand.

In Pakistan, the first vice chancellor of the (then) people's Open University in Pakistan saw the university as

> entrusted with the task of serving the whole country and all categories of people...its clientele are the masses. It rejects the elitist view that only a small selected class of people can benefit from higher education...that for any real learning to take place people have to be secluded behind the walls of educational institutions and pursue a rigidly structured curriculum...education for skilled labour, technicians and other occupations in business, industry and agriculture has mostly been ignored by the formal education system. The People's Open University will give high priority to the occupational education of farmers, industrial workers and craftsmen. [Zaki (1975) quoted in Young et al. (1980)]

These priority areas were again pointed by Siddiqui (1987) broadly. He nominated the following manpower development areas to be given priority treatment: literacy, in service teacher training (especially in industrial arts, agriculture and commerce at the secondary level), technical and vocational education, as well as the provision of professional education in the following sectors: agriculture, law, health including the training of paramedics and the training of distance educational personnel. [Siddiqui (1987) quoted in Taylor (1989)]

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As Ali, Haque and Rumble (1997) mention, the needs assessment survey was undertaken during 1993 before any work began on the the development of BOU's academic programme. It was conducted according to a loan agreement between the government of Bangladesh and Asian Development Bank (ADB). The purpose of the survey was described as to validate the demand for the courses and awards which had already been identified and to identify other possible programmes. Describing the survey findings they mention that,

> "The survey demonstrated that one of the constraints in Bangladesh is the shortage of places in other higher education institutions, leading to considerable levels of frustrated demand, and this explained the expressed demand for university level studies identified by the survey. It was also clear that there were considerable demand for higher level skills and vocationally oriented courses".

Commonly it is seen that in the South Asian region Distance education mode is identified as a education system to provide the chance to seek greater equity in education and to meet needs for trained manpower. The fields specially mentioned are teacher training, technical and vocational education. However it is important to find out how far the institutions are able to achieve this goal. Clearly it is another area which needs further studies.

2.2   Evaluation in Distance Education

2.2.1   Background of evaluation

The term 'evaluation" can be used to describe the assessment of student performances. In the U.K the evaluation of student performance is referred to by the term "assessment". As Calder, J (1994, p20) explains " The term 'evaluation' refers primarily to the evaluation of the teaching and organization activities which support student learning and includes the assessment of student performance as just one aspect or function". In Sri Lanka as well as in the region the term 'evaluation' holds the same meaning and therefore the term 'evaluation' in this study refer to the U.K. meaning.

The theory and practice of evaluation started in the USA earlier than in UK. Evaluation emerged as an important activity during the period of 1960s with the initiation of large scale social programmes in the USA. "In the United States alone, tens of thousands of evaluations of public programmes are conducted annually. Thousands of people are employed in these evaluations, and hundreds of universities and corporations compete for evaluation contracts" (House 1980). A large number of evaluation of public programmes conducted were sponsored by state authorities. The Elementary and Secondary Education Act of 1965 (ESEA) provided billions of dollars to school districts across the USA. The purpose was to improve the total system of elementary and secondary education. It was considered that money invested on such projects might be wasted if appropriate

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accountability requirements were not imposed and therefore specific evaluation requirements were included. One such massive project launched under ESEA act was providing funds for disadvantaged children. These projects use test scores as their evaluation strategy ; as House (1980) describes,

"Thus, these mandated evaluations use test scores as the only measures of success (although duration of services per week, pupil-teacher relation, expenditure per child, and total number of participants are also collected) and are concerned with maximising and aggregating, rather than with distribution".

Standardised test data which was designed to rank order students of average ability were found to be in appropriate in the case of disadvantaged children. It was also found that these tests were unable to differentiate psychometric properties and content coverage of schools and /or programmes. Therefore it urged the need for the development of new methods in evaluation and it further stimulated the developments in the field in mid 60s. Evaluation theories and practices have been developed in western countries especially in USA. and U.K.

2.2.2 Evaluation approaches

Tyler (1949) defined evaluations as ,

"essentially the process of determining to what extent the educational objectives are actually being realised by the programme of curriculum and instruction".

He mentioned that, educational objectives are essentially changes in human beings and explained it further as, the objectives aimed at to produce certain desirable changes in the behaviour patterns of the student. Accordingly he described evaluation as,

"the process for determining the degree to which these changes in behaviour are actually taking place."

Definition of objectives is an important step in this evaluation. The differences between the defined goals in terms of student behaviour and outcomes measures the success of the programme. This approach mainly focused on student achievements in tests although wider range of other activities involved during the study process. Learning experience together with any other events or processes are not taken into account.

Cronbach (1963) defined evaluation broadly as,

"collection and use of information to make decisions about an educational programme "

Compared with Tyler's definition, this was broad in context as it deal with an educational programme. Cronbach explained that educational programme may be a set of instructional materials, or instructional activities of a school or the educational experience of a student.

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Cronbach suggested that evaluation is used for three types of decisions

       (i) decisions about course improvement
       (ii) decisions about individuals and
       (iii) decisions about administrative regulations

Stake (1967) stated that the way we look at educational evaluation appears to be changing, and educational evaluation purposes and procedures will vary from instance to instance. He viewed evaluation as both descriptive and judgemental activity. He distinguishes three elements of evaluation statements: "antecedents", "transactions" and "outcomes". The term "outcomes" seems to be concerned with Tyler definition as he defined it as,

"abilities, achievements, attitudes of students resulting from an educational outcome"

But Stakes model was a developed one as he suggests more observing data with respect to two other elements "antecedents" and "transactions" which he described as,

antecedents -   any condition existing prior to teaching and learning which may relate to outcomes. The status of a student prior to his learning.

transactions -   countless encounters of students with teacher, student with student .

He also introduced a judgemental data matrix.

The data matrix is formed with three statements antecedents, transactions and outcomes. The evaluator has to obtain data for description and judgment for each of these three statements. Descriptive data are categorised into two groups as intents and observations. Judgemental statements are categorised into two groups as standards and judgments.
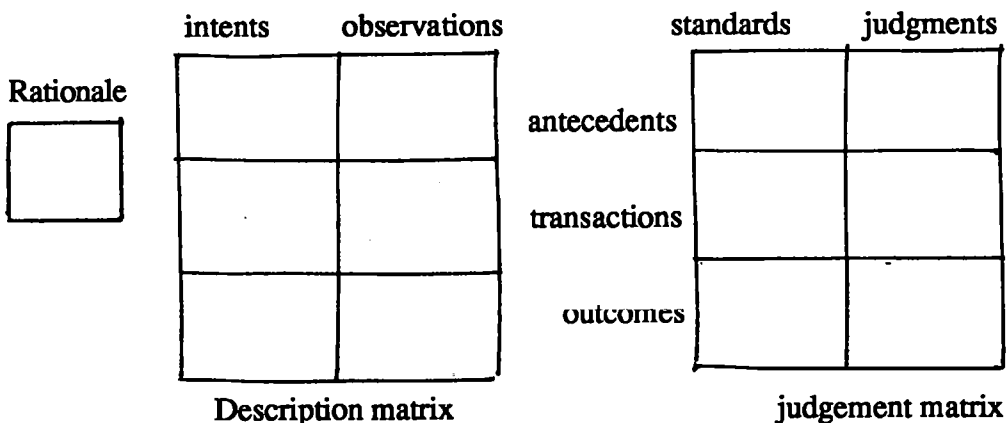
Figure   A layout of statements and data to be collected by the evaluator of an educational programme.

Although it looks into the aspects such as pre-requisite knowledge, encounters of student-teacher, and student -student, rather than only to the outcomes, it is a comprehensive and time consuming approach as it contain many records. In the distance education system, there are few face to face sessions where the learner meets the lecturer. Mostly , learning takes place as a private study. Therefore considering the distance learning students it may be difficult to make the records in respect of transactions which is described as " countless encounters of students with teacher, student with student.". Stakes model is more appropriate in a conventional system as he consider encounters of student with teacher, and student with student as the transactions. But in the distance education system there are teaching materials. Therefore encounters with teaching materials also have to be considered.

Another evaluation approach was developed in the late 60s by Stufflebeam. It is oftenly referred to as the CIPP model. In this approach he sets out four types of evaluation stages. All four types are required for a complete evaluation.

Context evaluation ;   as a mean of servicing planning decisions

Input evaluation   ;   structuring decisions

Process evaluation ;   to guide implementation

Product evaluation ;   to serve recycling decisions

The primary orientation of context evaluation is described as "to identify the strengths and weaknesses of some object, such as an institution, a program, a target population, or a person, and to provide direction for improvement" (Stufflebeam 1988). Interviews are conducted with clients in order to get their perceptions of strengths and weaknesses and problems. Further interviews may also be conducted to form additional hypothesis about the required changes. The main orientation of input evaluation is described as "to help prescribe a program by which to bring about needed changes".

Process evaluation is described as an "on-going check on the implementation of a plan". Its objectives are to provide feed back whether the programme activities are conducted as planned and on schedule, whether using the available resources in an effective manner. In addition, it has another objective to provide guidance for any modification the plan needed which match closely with the term formative evaluation. Process evaluation with respect to a course would be to check the process of the course during its presentation. For this purpose it is necessary to obtain information from students during different stages. To retain student co-operation throughout the course may be a difficulty. There may be limitations in applying modifications in certain areas while the courses are in process. For example, changing activity schedule / test dates.

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Product evaluation: to serve recycling decisions, concerning whether the objectives were achieved. This seems to be match with the "summative evaluation" which usually aimed at effectiveness on completion. But the CIPP model is much more comprehensive. Stufflebeam suggests that the reporting of product evaluation findings may occur at different stages during each programme cycle to indicate to what extent targeted needs are being achieved. Basic use of product evaluation is mentioned as being "to determine whether a given programme is worth continuing, repeating, and / or extending into other settings and to provide direction for modifications.

The term formative evaluation was first defined by Scriven (1967) as ,

> "outcome evaluation of an intermediate stage in the development of a teaching instrument, its role being to discover deficiencies and successes in the intermediate version of a new curriculum".

Formative evaluation collects data which can be used to make any changes to a course/ programme while it is in progress. Its aim is not to measure the effectiveness, but to identify any changes the course requires for improvement. Developmental testing of learning material is a type of formative evaluation, Nathenson and Henderson(1976). They describe the process as follows :

> " a small sample of students work through learning materials to determine their effectiveness. On the basis of student feedback, the material may be accepted as it stands, modified in parts, or in some cases, totally revised before it is produced in its final form and sent to the intended student population".

Summative evaluation, uses evaluation data to sum up the course/programme overall once it is completed, that is, it usually aimed at assessing the effectiveness on completion. The study undertaken for this thesis can be considered as summative as it collects data after a presentation of course to evaluate its components but on the other hand it is formative because same data is used to make improvements in the existing course.

The developments in the field reached to its peak in 1972 with a paper published by Parlett and Hamilton. Before Malcom Parlett and David Hamilton published a paper in 1972, educational evaluation was dominated by a single strategy, which is referred to as the scientific approach which examines whether or not the course has achieved its goals by focusing on outcomes; mainly analysing psychometric test scores. It fails to identify the needs or difficulties that students encountered in studying the course. They described the scientific approach as "agricultural botany" approach where plants were subjected to various experimental treatments and measure their growth after a certain time duration. Illuminative evaluation concern on the process that take place in between input and output. Parlett and Dearden (1977) mention that "Characteristically in illuminative evaluation, there are three stages :

"investigators observe, inquire further and seek to explain"

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Illuminative evaluation has methodological strategies such as , observation (which occupies a central place), interviews with participants (students, instructors, administrators and others), questionnaires and analysis of documents and background information. It concerns gathering more information to help "illuminate" problems, issues and significant program features, (Parlett and Dearden 1977).

These two approaches differ in the way of "kind of data it collects" and "the way it collects data". The scientific approach, which Parlett and Hamilton refer to as the 'agricultural-botany' paradigm, involves student assessment in tests and examinations, statistical analysis of these tests, and questionnaires in particular. The second approach concentrates more on observations, interviews , discussions and informal conversations. In a large scale study consisting of more participants , there may be practical problems such as , lack of trained interviewers, time take to conduct interviews, spread out of the participants in gathering information through observations, interviews, discussions. But feed back through interviews and discussions information can be gathered more quickly than postal questionnaires. It gives first hand information which would help to get an idea about the situation and it might be helpful in the main study conducted through whatever methods. Each of these two approaches ,scientific and illuminative, has its own strategies, foci and assumptions. Evaluators may have personal preferences for one of these two.Thorpe (1988) mentioned that " there is no right model, and that we can and should choose one or a combination of approaches appropriate to the purposes and resources available to us at that time ." Rowntree (1992) refer it as 'applied common sense' , in which the evaluator pragmatically take what he or she needs from both -and from any other approaches that emerge in the years to come."

Scriven (1973) suggested that evaluator should not be informed about the goals as it biases the evaluator. In this approach which is also refered as the goal free approach, the evaluator uses his or her own criteria in the evaluation work. The major drawback in this approach is whether the evaluator will look into the specific aspects wanted by their employer. This approach is not appropriate in most educational evaluations as educational evaluations are usually conducted for a specific goal.

There are large number of evaluation studies conducted in distance education field. Few studies conducted with respect to a course or course relation component are discussed below as such studies had used different approaches, methods. The first three studies have characteristics of illuminative evaluation. All three studies involved group discussions.

(i) Talbot and Bordage (1985)

Talbot and Bordage (1985) describe a method of course evaluation based on directed small group discussions. The object was to get information directly from the students themselves and not from a preplanned questionnaire or by interviews. This was a new method being developed. This method was tried out on three courses at the faculty of medicine of Laval University in Canada in the fall of 1982. The small groups consists of students varying from 10 to 15 people.

The evaluation of a course by "direct small group discussions" proceeds in three steps.

(a)   The formulation of the assessments by each student : writes observations on cards; only one card is used for an observations

(b)   The pooling of the assessments : sort out the observations,   and

(c)   The establishment by the group of a level for agreement for each assessment: make revisions

To obtain the feed back on the course as a whole including the final examination, this evaluation method was conducted four to five weeks after the end of the courses. Small group evaluation took place within one day of each other in order to minimise the possible contamination from group to group. Also they have been asked not to discuss the evaluation with their colleagues. It is mentioned that there were 70% common observations.

This method was developed for students in a conventional Institute. It is easy to implement such a method in a conventional Institute as all students are together. But it is not easy to apply this method in the case of a distance education Institute as their students are widely dispersed.

(ii) Melton and Zimmer(1987)

Melton and Zimmer (1987) describe an approach named "Multi -Perspective illumination" which they used in a project to find out the major concerns and best creative ideas of individuals and groups within the OUUK, during a period which the university compelled to limit the financial allocation as its grant support deteriorate.

They mention that their study approach was clearly builds on the Parlett approach to illuminative evaluation and described it further as a highly qualitative in nature and also suggested it as a natural pre-requisite for a more quantitative form of study rather than as a substitute for such studies. Initial interviews, analysis of the interviews, open ended discussions, involvement of decision-makers were the main features of this approach.

As open ended discussions take an integral part of this approach, a higher percentage attendance of participants of the different groups is necessary for productive discussions. Contributions from all different group members are also an important factor. This approach is based heavily on interviews and discussions and qualitative data. There will be various practical problems such as lack of trained interviewers, time taken to conduct personal interviews of a sample consisting of different groups, participation of all group members for the open ended discussions when following such an approach for course evaluation study at OUSL.

(iii) Beattie (1993)

The aim of Beattie's study was to identify series of issues relating to the interface between students, staff and various systems of the university. He conducted the study with OUUK students and part time tutors. Structured group discussion methods were used. The study was conducted with three groups at three regions. In the first group, they were asked three key questions to allow a variety of views to emerge. A 'Nominal group technique ' was adopted in the first group . For the second group, views obtained from the first group were put forward in the form of a 'sample' of plausible initial statements about quality of OU services. The second group was asked to give their views on that sample, to include additional statements and were also asked the degree of importance. A draft agenda of questions about the quality of OU services was constructed from the outcome of the first two groups. The third group was asked whether they were the most important questions to be asked. By making their amendments /additions they were asked to compile an agreed list.

Beattie's study has characteristics of illuminative evaluation. At the first stage tries to identify the range of issues relating to the study (investigators observe) then the identified issues were further investigated with the other groups to find out the most important issues (inquire further).

The following two studies also used more stages. The initial stage was used to identify the issues and investigate them further in another stage. Kloeden and McDonald use quantitative methods in both stages while Melton uses both qualitative and quantitative methods to collect data.

(iv) Kloeden and McDonald (1981)

Kloeden and McDonald (1981), conducted a study to obtain feedback from the external students who followed the course "Principles of Mathematics", which was the main first year mathematics course at the Murdoch University. Their intention was to review and improve the course notes through the feedback.

The course is offered in each semester. They adopted an 'iterative' approach to focus on areas of difficulty. One Questionnaire for each block was prepared with quite brief questions, including some specific and some general, and sent out to the students in one semester. After identifying major difficult areas, from the information from the first questionnaire, a second questionnaire was prepared with more specific questions related to that particular areas, and given to the students in the other semester.

Kloeden and McDonald suggest it as a continuing process for course improvement. "improving the course by continuing use of short questionnaires; rather than a lengthy one-off questionnaire".

Feed back was obtained only for course materials. This strategy can easily apply for a course, where the student number is small. Therefore selecting a sample for the study does not arises and questionnaires can be sent out to all the students to get the feedback. There may be practical difficulties in applying this method if student numbers are large and if there are number of separate blocks in the course. In such a case a number of questionnaires have to be sent at different stages and it is necessary to retain student co-operation throughout the duration of the course.

(v) Melton (1995)

Melton (1995), who worked in an evaluation team, which worked on setting up of an evaluation system for a newly established Open junior high school system in Indonesia, used the strategy of initial interviews; [as in Melton and Zimmer (1987) study] as the first step towards the further development of their evaluation process. Key issues were identified in these interviews and in most cases more data was needed to be collected for further analysis and it was collected through questionnaires.

They mentioned that if indepth investigations are to be carried out it will require more questionnaires and large number of questions. To tackle this they suggested that to design a system, the broad problem areas should be identified initially and then more detailed feedback. Accordingly, in that project student questionnaires were developed at three levels; "the most general level", "the intermediate level", and "the most specific level".

A single questionnaire was designed to cover all aspects of the study in broad terms at the most general level and more detailed questionnaires focused on the identified problem areas at the intermediate level. Finally at the most specific level, questionnaires focussed on the detailed content of elements highlighted on problem areas by the intermediate survey.

The studies conducted by Kloeden and McDonald (1981) and Melton (1995) have a similarity as both studies consisted of more than one stage: at the initial stage problem areas were identified and then focus upon key issues in more detailed at a latter stage. Kloeden and McDonald used only questionnaires while Melton used both interviews and questionnaires. The initial stage of these studies reflects with Context evaluation in the CIPP model which Stufflebeam described as "to identify the strengths and weakness of some object, such as an institution, a programme, a target population, or a person and to provide direction for improvement"

The following two course evaluation studies used entirely quantitative methods to obtain data.

(vi) Rathore (1994)

Rathore (1994) conducted an evaluation study with respect to printed course material of correspondence institutes in India. It looked into issues such as, the constitution of course materials, media used, size/volume of course materials, didactic suitability for self learning. Out of all 28 correspondence institutes 50% were selected for the study. Factual data about the course material were obtained through a questionnaire which was administered upon 4 staff members including both academic and administrative staff. This was done by visiting to each selected centre. In addition a questionnaire was sent to 200 students in each institute to collect data for the study. The prominent feature in this study was that feed back was obtained purely through questionnaires. Qualitative methodologies such as interviews were not used.

(vii) Khan and Hussain (1986)

In another course evaluation study conducted by Khan and Hussain (1986) at the Allama Iqbal Open University in Pakistan, two questionnaires were used to obtain feedback. One was sent to the selected sample of students and other to the course team members and all tutors involved in the course.

The same approach was used in both of these evaluation studies. That is feedback was obtained only through questionnaires. In the Pakistani case, since the staff members involved in the course were few the relevant questionnaire was sent to all of them. Unlike in the case of students in a conventional university, distance learners are widely spread out in the country. In a large country especially like India, it is not practicable to conduct face to face interviews with student groups in different parts of the country without the assistance of number of interviewers. In such a case the evaluator has to rely on a number of interviewers and sometimes it may not be possible to find out many trained interviewers for the purpose.

Some issues in course evaluation and different stages in evaluation process

In a distance education system there may be number of different areas which may need changes or improvements. As Calder (1994) mentions "Whatever your area of concern, in order to carry out any change, you will have to work through a process which we call evaluation". This process may involve different stages such as gathering information, analysing, interpretation of findings. In this study it mainly concern on course evaluation in distance education and the different approaches used. In a distance education system once the learner is registered for a course/study programme, it is difficult to get hold of information about them and find out their reactions to the course/study programme as the teacher and the learner are being physically separated and mostly learning take place as a private study. As Thorpe (1988) points out "evaluation as a formal activity becomes more important therefore, because it is one of the few ways of finding out learners' reactions in order to tailor provision for a closer fit with their needs."

Evaluation studies can be conducted with respect to different levels of the distance education system such as course, study programme, whole Institute. In this study, it is focused mainly on course evaluation. When the term course is mentioned, most people tend to refer only to the course material even though it involves lot of activities. Thorpe (1979) argues that " A course is not the correspondence units, texts and course related material produced by the course team; it is not a set of products, but a process, which 'happens' every academic year though the interaction of student, tutors and course teams, based on the course materials produced by the centre."

Evaluating merely the course material would help to improve the course only to a certain extent as the success of a distance education course depend on all activities in the course rather than only on course material. In that sense course evaluation should cover number of activities which are monitored either by academic or administrative staff of the institution. Academics are responsible for the issues such as course material, assessment, face to face sessions, counselling, examinations while administers are responsible for activities such as student registration, distribution of course material, and other support services. Failure to satisfy the standards of any one of the activities may affect the smooth running of the course and the success of the course. Therefore proper co-ordination between the two parties is an essential requirement. As identified by Nunan and King (1992) most of these activities fall into the commonly focussed areas in evaluation studies in distance teaching and learning conducted at university level. Areas mentioned by them are as follows :

* learning packages supplied to the students

* support mechanisms employed by the institution and tutor to facilitate learning and

* teaching and assessment arrangements experienced by students through their assignment load

Some of these areas are also seen in Hawkridge's proposed draft agenda for improvement of distance education. Hawkridge (1995) proposed a draft agenda for evaluation of distance education highlighting three priority areas.

* course content
* media choice   and
* student support

In evaluating course content Hawkridge (1995) mentions that "the content of print materials has received most attention. By comparison, very little effort has been put into evaluation of the content of common nonprint media such as television, video, radio and audio". In many developed countries, highly sophisticated multi-media course presentations are used. However, at the OUSL still very few courses are supplemented with audio or video materials. It may be the case for other Institutions in the South Asian region, most course materials consist only of printed text with some support services such as face to face sessions, tutorial sessions, library facilities etc. So in this study it is not expected to look into the issues relating to study materials other than in print form.

Woodley (1995) argues that the context in which the course is being studied must be taken into account to supplement basic course evaluation and monitoring (performance indicators such as student numbers, success rates) for a much broader approach to course evaluation. He suggests that quantitative studies would need to find out who are taking the course (demographic data) and qualitative studies to find out the factors relating to how they study the course, i.e " how people actually interact with and learn from the course, and how this relates to their personal, family and occupational circumstances". Courses studied previously or studying in parallel, and withdrawals are considered as important factors when looking at the performances of a given course.

Evaluation of a course in distance education conducted for number of reasons. For example it helps to,

find out whether the aims have been achieved,

identify the areas where further improvements are required   and

understand how the distance students learns and then to find out how to provide assistance.

The evaluation process may consist of different stages. Calder (1994) mentions the basic stages of evaluations as,

* Identify the area of concern

* Decide whether to proceed

* Investigate identified issues

* Analyse findings

* Interpret findings

* Disseminate findings and recommendations

* Review the response of the findings and recommendations and agree any corrective actions

* Implement agreed actions

As she explains the first stage of the process, i.e to identify an area concern can be achieved in a number of different ways either formal or informal ways, success rates, dropouts, discussions with students staff members would help for such purpose. Once the data is obtained it need to be analysed to identify the major issues. Interpretation of findings is an important phase as she describes " the same set of analyses may well be interpreted in very different ways depending on the particular perspective of the interpreter". To complete the process of evaluation it needs to consider the last two stages. The purpose of the evaluation study would not be fulfilled if the evaluation findings were not utilised. However, unlike in the conventional system there may some factors which may prevent early implementation. These will be discussed in detail in the last chapter.

A number of practical difficulties emerge in applying the evaluation methods used in evaluation studies discussed above (except Indian and Pakistani cases), for a OUSL course evaluation study. For example, lack of trained interviewers, students at a distance and availability of time and resources for gathering information. However, like many researchers, the OUSL course evaluation study can follow the basic methods, namely, interviews / brief questionnaires to identify the main areas to investigate. Besides, past assignments test results and final examination results, might be very useful. Gathering numerous information, where possible, would be the easiest way to select carefully the priority component among the all course components. It is seen that in most evaluation studies discussed above, once the key areas are identified, questionnaire method or interview method or both had been used to carry out further investigations.

At the OUSL, vast numbers of students enrol in foundation level courses. In order to get information from more students questionnaires would be more appropriate with the available resources. But for the courses where fewer students participate interviews can be used. Even at higher participation, interviews can be conducted with small groups of students to provide additional information. The selection of proper methods to obtain information for the evaluation study depends on many factors. Some of the factors to consider are as follows:

(a)   number of categories of people involved with the course and which categories would be considered for the study

(b)   geographical distribution of the students (as these courses are offered in distance mode students are widely dispersed)

(c)   number of students

(d)   available time   and

(e)   available resources (money, human)

It is clear that current students are the most important group for providing information in a course evaluation study. But past students also can provide some important information through their experience. Even the non starters and drop-outs can provide some useful information. In addition, the staff members who are directly involved with the course activities can play an important role. In an OUSL study, especially, the views of course coordinator's, Day School lecturers' and marking examiners' would be very important. However, researchers need to consider the time factor and the resources granted when identifying the most suitable categories to obtain information for the study.

Once the study is completed analyses of findings is vital. Then making recommendations and suggestions for the developments and improvements of the course is another key process of the evaluation study. After analysing the findings it may be necessary to identify the priority issues. It may also be necessary to consider the factors which may prevent early implementation.

The issues discussed above are considered when planning out the research design for this particular study. The research design for this particular study is discussed in Chapter three.

CHAPTER 03

RESEARCH METHODOLOGY

3.0 Introduction

The research design, the sample, and the data collection methods are discussed in this chapter. Among the number of categories of people involved in the course, present students and Day School lecturers were identified as the most important categories from whom to obtain feed back. Postal questionnaires were used as the main method of obtaining feedback from the students. In addition, group discussion sessions were conducted with students and visiting staff members. The reasons for the selection of such data collection methods in this study and how and when they were conducted are explained in detail. The sampling method used in this study to select the samples of the two courses is also explained.

3.1 The research design and organisation

This study focused on the main course components and the extent of student satisfaction with each course component. [Areas such as tutor clinics, library facilities, delivery of course material will need a separate study]. The study also sought to identify the difficulties which students had in studying the existing course material. Main areas to be investigated were identified through number of ways. For example, at preliminary discussions with coordinators, the researcher's own past experience as a Day School lecturer and a marking examiner and also informal discussions with the students during that period.

There were number of categories of people involved with the Foundation level one Mathematics courses. Some of them are,

* current students

* past students

* non starters

* staff members

* Day School lecturers   and   * marking examiners

However, considering the tough time frame and limited resources it was only feasible to obtain feedback from the most important groups. Current students and the Day School lecturers were identified as such groups as they had been involved with the course very recently.

There were 616 students registered for the Pure Mathematics (MPF 1301) course and 591 for the Applied Mathematics (MPF 1302) in 1995/96 academic year. Because of past experience as a co-ordinator, the researcher was aware at the planning stage of the study that there would students who were non starters (who registered and never participated in the academic activities). They would not be able to provide useful information for a questionnaire which covered all course components. Considering that fact, it was decided to obtain feedback from students excluding the non starters. However, it was not possible to identify the non starters till the end of all academic activities. Records of the previous two academic years showed that they were around 40% - 50% of the registered number. Assuming the same non starters percentage in the academic year 1995/96, it was expected that there would be 300- 350 students eligible for the study in each course. That number was considered as too large to cope with due to various practical problems such as difficulty in handling large amount of data. The best alternative was to select samples from both courses. It was also intended to identify specific issues related to a particular regional centre and also to compare feedback by regional centre. Therefore, it was decided to select samples of students which would represent all three regional centres Colombo, Kandy and Matara. Considering the time frame it was also decided that data from around 75 students per a course could be handled without difficulties.

As the samples were to represent all three regional centres, students would be widely dispersed. Postal questionnaires were identified as the most appropriate data collection method because of its ability to reach a greater numbers of students within a short time duration. Normally mail reaches any part of the country within three days except the civil disturbance areas. Since it was expected to obtain feedback about all course components including the final examination it was decided that the best period to send the postal questionnaire would be two or three weeks after the final examination.

Foundation level one Mathematics courses are conducted in all three language media, Sinhala, English and Tamil. Therefore, the language medium of the questionnaire had become an important matter in preparing the questionnaires. The following two alternatives were considered.

(i)   Preparing the questionnaire in all three language media and printing them separately. In this case particular questionnaires would have to be sent to the students according to their medium.

(ii)   Preparing one questionnaire, giving the translations underneath each and every question. With this option, the language medium could be ignored during the process of despatching the questionnaire.

These alternatives were discussed with staff members including the course co-ordinator. Most of them were in favour of the first method. If one questionnaire was prepared including the translations, it would include many pages, and also the questions would appear too long and complex. These factors might affect the response rate as these students were new to questionnaires. Therefore, the first alternative was selected, i.e. to prepare the separate questionnaires in each language media.

According to the time and resources available, studies of Rathore (1994) and Khan & Hussain (1986) discussed in chapter two can be developed as the most appropriate application for this study. In addition to the postal questionnaires they used, another decision was made to conduct group discussions with students at the three regional centres. The purpose was two fold. First, as a pilot to the final questionnaire in order to identify any other important areas which were to be included in the final questionnaire. Secondly, as it provides an opportunity to obtain information in more detail and to check the validity of questionnaire feedback. The last two months of the academic year (September - October) was identified as the most suitable period to conduct group discussions as most of the academic activities would be completed by that time. It was also decided to gather assessment and final examination results of the students.

There were two alternative methods for conducting the discussion sessions with students. The first method was to select students from the mailing lists and invite them to come to the relevant regional centre to participate in the discussion session. The other was to conduct the discussion sessions on Day School dates. Although the first method seemed to be more appropriate because it used random selection there were practical problems such as the difficulty in finding a free weekend for students, and students who lived far away from the centre would have to come to the centre solely for this purpose. Therefore, it was decided to conduct the discussion sessions on Day School dates. There were only two Day Schools scheduled during the period of September - November so those dates were selected to conduct the group discussions with students at Kandy and Matara. In Colombo it was decided to conducted these sessions on weekdays.

3.2   The sample

3.2.1.   Introduction

The samples for the study were selected from the students registered in the 1995/96 academic year to follow the foundation level one Mathematics courses of the Diploma in Technology programme, which was conducted by the Faculty of Engineering Technology at the Open University of Sri Lanka (OUSL). The number of students registered for Pure Mathematics and Applied Mathematics were 616 and 591 respectively. It was expected to cover the areas of course material, Tutor Marked Assignments, Day schools , Mid Session Tests and Final examination in the questionnaire. Therefore useful information could not

be obtained from the students who never participated in such course activities (i.e. non starters), and non starters were excluded from the registered number of students when selecting the samples.

It was found that the non starters percentages were significantly higher at level one courses with compared to level two. In Pure mathematics it was 46.75%% and 46.53% in Applied Mathematics in the 1995/96 academic year. In the same academic year this percentage was around 20 -25% for the courses at level two. Non starters were traced from the "eligibility list", which was obtained from the Continuous Assessment unit. It contained the marks of all assignments, tests and the overall Continuous Assessment (CA) mark. The overall CA mark was zero for the non starters. However, careful attention was drawn when tracing those students; as having scored Zero marks for all the participated activities also gave the same result. This task was done manually. There were 288 and 275 non starters in Pure and Applied respectively. TABLE 3.1 shows the number of registered students, number of non starters and number of participants in each course.

TABLE 3.1   STUDENT NUMBERS IN LEVEL ONE MATHEMATICS
             COURSES IN THE 1995/96 ACADEMIC YEAR

Course		No. registered	Non starters	Participants
Pure	N	616	288	328
Mathematics	%	100	46.75	53.25
Applied	N	591	275	316
Mathematics	%	100	46.53	53.47

3.2.2   *Student sample for the questionnaire*

As there were more than 300 participants in each course samples were selected for the purpose of sending the questionnaire. It was decided to take 50 % from the participants for the sample for each course. When deciding on the sample size attention was drawn to the number of responses which could be handled without much more difficulty, during the specified time duration. However, the number of responses should also be reasonable to make analysis and conclusions.The ultimate purpose of sampling as Babbie (1973) described; "is to select a set of elements from a population in such a way that description (statistics) of those elements accurately describe the total population from which they are selected"

Around 50 % response rate was anticipated with two reminders; 75 - 80 responses per a course was considered as the most suitable number to be handled without much more difficulty during the defined time frame for the study. Considering these facts it was noticed that 150 - 175 would be the most appropriate sample size. Sample size of each course could be set with 50 per cent of participants.

Sampling frame

Sampling frame (the list from which the elements of the sample are selected) for this study was the student lists, which were obtained from the Data Processing Unit. Those lists included the student registration number , Name, Regional / study centre and the address of each registered student. The registration numbers were in ascending order.

3.2.2.1   Sampling method

There are two main methods of sampling. Probability sampling which also refered to as random sampling and non probability sampling. Probability sampling is considered as the most appropriate method where statistically valid estimates are required. In probability sampling every element in the population of interest has a known chance of being selected. The number of students at the three regional centres were very much different form each other (see TABLES 3.2 and 3.3 below). Matara student numbers were 16 and 10. The student lists were in ascending order of the registration numbers. Therefore if random sampling was used to select the samples there might be a possibility for not representing Matara students adequately in the final sample. To avoid such situation and to ensure that all centres are represented in the final sample, the best was to use stratified random sampling to select the samples.

"To draw a stratified random sample , the elements of a population are divided into non overlapping groups(strata). Simple random samples are drawn from each of these and together they form the total sample" Schofield (1996, p32). There are two categories namely, proportionate and disproportionate. In proportionate stratified random sampling, the same proportion of the sub groups in the population, was considered when selecting the allocation for each sub group in the sample. In this study the sub groups were the three regional centres, Colombo , Kandy and Matara.

In proportionate stratified random sampling there can be one disadvantage.That is, in some instances there may be a possibility of small sub groups (Strata) of interest not being represented adequately in the final sample. In such cases, the sample size in all such strata can be increased, but not for the other strata and still with random selection. This procedure is refered as the disproportionate stratified random sampling. That fact was noticed in the Matara sub group, where the percentages represented were 4.88% and 3.16% respectively. Since the number of participants attached to the Matara centre were so small, the disproportionate stratified random sampling method was followed in selecting the samples.The entire Matara group was selected for the final sample as the number involved in that group was very low with compared to the other two sub groups. This procedure was followed for both courses. Stratified random sampling for the two courses are shown in TABLES 3.2 & 3.3.

TABLE 3.2   STRATIFIED RANDOM SAMPLING FOR PURE MATHEMATICS

Sub group	No reg.	No.of partici -pants	% total in each stratum	Proportionate Stratification		Disproportionate Stratification	
				Sampl -ing fraction	Sample size	Sampl -ing fraction	Sample size
COLOMBO	426	203	61.89	1/2	103	1/2	103
KANDY	159	109	33.23	1/2	55	1/2	55
MATARA	31	16	4.88	1/2	8	1	16
TOTAL	616	328	100	1/2	166		174

TABLE 3.3   STRATIFIED RANDOM SAMPLING FOR APPLIED MATHEMATICS

Sub group	No reg.	No.of partici -pants	% total in each stratum	Proportionate Stratification		Disproportionate Stratification	
				Sampl -ing fraction	Sample size	Sampl -ing fraction	Sample size
COLOMBO	413	201	63.61	1/2	100	1/2	100
KANDY	155	105	33.23	1/2	52	1/2	52
MATARA	23	10	3.16	1/2	5	1	10
TOTAL	591	316	100	1/2	157		162

When selecting the samples for Colombo and Kandy sub groups, systematic sampling was followed. Since 50 % from each sub group has been selected for the final sample, the first number was randomly selected from the first two registration numbers and then every other registration number was selected. Pure Mathematics sample selection was done initially and then did the sampling for Applied Mathematics. It was noticed that there were some students who have been selected for both samples. 13 such cases were found from the Kandy list and 19 from the Colombo list.

If a student received two questionnaires (both questionnaires have almost the same questions) he may not pay full attention in completing the second, or he may respond to a one and skip the other one or he may send both just answering them without properly going through them. Based on these assumptions, it was decided not to send two questionnaires to a same student as it was expected to obtain feedback from many different students as far as possible (Matara case was exceptional and there were seven students in both samples). Therefore for the course Applied Mathematics common 19 at Colombo and 13 at Kandy were replaced. That is, for the Applied mathematics course disproportionate stratified random sampling was done with replacement.

Once the samples were selected, their study medium was noted down as questionnaires were planned to sent in all three language media. The medium wise distribution of the samples are given in TABLES 3.4 and 3.5.

TABLE 3.4   PURE MATHEMATICS (MPF 1301) SAMPLE BY MEDIUM OF STUDY

Language medium	No.reg	Non starters	Participants	Sample
SINHALA	378	159	219	123
ENGLISH	207	119	88	43
TAMIL	31	10	21	8
TOTAL	616	288	328	174

TABLE 3.5   APPLIED MATHEMATICS (MPF 1302) SAMPLE BY MEDIUM OF STUDY

Language medium	No.reg	Non starters	Participants	Sample
SINHALA	357	155	202	104
ENGLISH	200	107	93	49
TAMIL	34	13	21	9
TOTAL	591	275	316	162

3.2.3   *Sample for the group discussions - students*

Group discussions with students were conducted at all three regional centres Colombo, Kandy and Matara. At Kandy and Matara, discussion sessions were conducted on the fifth and sixth Day School dates. Therefore, the sample frame was the Day School participants. A group of five - six students was expected to select on the basis of their willingness to participate in discussion sessions. A different selection method was used at Colombo in which course co-ordinator's assistance was obtained in selecting the student samples. Most of the students who come to study at the Colombo centre had met the co-ordinator on number of occasions to discuss their difficulties. It was decided to select the samples from such students because of easy access to them. (They had come to the centre regularly). Initially, a date was fixed to have a preliminary discussion. Co-ordinator had informed such students to participate in the preliminary discussion if they wish to take part in group discussions. They had been also informed to pass the message to their friends who were following the Mathematics courses. Accordingly, twelve students were present for the preliminary discussion in which the purpose of the study was briefed. In addition they were grouped into four ; two groups for Pure Mathematics and two for Applied Mathematics. Dates for the discussion sessions were also fixed. Each sub group undertook the responsibility to contact few more students and come on the discussion dates making total number in each group of five.

3.2.4   *Sample for the discussion sessions - Day School lecturers*

There were around fifteen Day School lecturers involved in the academic year 1995/96. Day Schools were conducted at all three regional centres and five other study centres. The easiest way to conduct the discussion sessions was to visit to the centres on a Day School day. Due to some practical problems such as limited number of Day Schools, difficulty of conducting more than one discussion session on a Day School day, it was decided to conduct discussions only at all three regional centres, Colombo, Kandy and Matara. There were two lecturers at Kandy and one at Matara. Therefore, the issue of selecting a sample did not arise for those two regional centres.At Colombo, Day Schools were conducted by the OUSL staff members as well as outsiders. As in the case of Colombo students, because of the easy access OUSL staff members were selected as the sample for Colombo. Another reason for selecting them was the possibility of conducting the discussions at the OUSL.Three staff members were identified to represent them as they had more than three years experience in conducting the Mathematics Day Schools.

3.3   *Methods of data collection*

There are a wide range of social science data collection methods such as, questionnaires, telephone interviews , face to face interviews , observations and using documents. In modern developed countries electronic facilities such as internet, electronic mail and fax are also used as channels to collect data. A combination of any of these methods are also possible. There is no one 'best' method of data collection; each method has its strengths and weaknesses. Czaja and Blair (1996, p31-32) suggest following three broad categories of factors, with many sub categories to be considered, when selecting a method of data collection.

* administrative or resource factors :   sub categories such as cost, length of data collection period, geographic distribution of sample

* questionnaire issues :   sub categories such as complexity of questions, length of   questions

* data-quality issues :   sub categories such as sampling frame bias, response rate

3.3.1   *Questionnaires*

Data collection using a questionnaire can be conducted in several ways. For example by mail, by face to face and by phone. Another kind is group administered method in which the questionnaires are given to a group of respondents who are gathered together; for an example students present in a class room, invited audiences. A person will administer the work and collect the completed questionnaires. Postal questionnaires can also be group administered.

Oppenheim (1992, p100) describes a questionnaire in the following manner :

> " A questionnaire is not some sort of official form, nor is it a set of questions which have been casually jotted down without much thought. We should think of the questionnaire as an instrument of research, a tool for data collection "

Mainly there are two types of questions. 'closed' questions and 'open' or 'free response' questions. Fowler (1993, p82) describes the two types as: "those for which a list of acceptable responses is provided to the respondent (closed questions), and those for which the acceptable responses are not provided exactly to the respondent (open question)." Each category has advantages and disadvantages. In 'open' questions; the main advantage is the freedom given to the respondents to answer the questions. Some of the disadvantages are; it takes time to process, may have to be recoded again during the analysis process and by doing that there may be a chance to lose some useful information. Because of these facts Oppenheim (1992, p113) mentions that 'open' questions are easy to ask, difficult to answer and still more difficult to analyse". Open questions are also

appropriate when the list of possible answers is too long to present. 'Closed' questions require little time to answer and they are easy to process with compared to 'open' questions. Loss of spontaneous answers is the main disadvantage in this category. Another disadvantage of 'closed' questions is respondents have to select their answer within the given alternatives.

3.3.1.1   *Postal questionnaires*

Postal questionnaires are sent to the selected sample with a covering letter, which explains the purpose of the study, who is to complete the questionnaire, who is conducting the study, an assurance of confidentiality and the deadline of the submission date for the questionnaire. Most postal questionnaires include a postage paid return envelope to send back the answered questionnaire.

Generally, a contact telephone number is also mentioned in the cover letter. The purpose is to assist the students who want clarification or have any other difficulties in answering the questions. Commenting on the issue of giving a contact telephone number, Czaja and Blair (1996, p34) state that "Our experience, however, indicates that very few respondents call, probably fewer than 1 %, even if the survey contains controversial or personal items". They further mention that respondents are more likely to skip the unclear questions rather than calling for assistance. To avoid such situations as far as possible, postal questionnaires require clear instructions and simple and clear questions. Another important fact is that the questions and instructions must be uniformly understood by the respondents. As Fowler (1993, p87) mentions "If respondents do not all have the same understanding of what the questions ask for, error is certain to result". When preparing the questionnaire careful attention should be drawn in preparing and designing the instructions and questions. In most questionnaires different type face is used for instructions, simply to differentiate the instructions from the questions.

There are advantages as well as disadvantages with postal questionnaires. Main advantages are;

* it can be relatively cheap than the other methods of data collection.

* respondents have their own time to answer, they are able to read all questions before answering them.

* feasibility of reaching widely dispersed respondents.

Generally low response rates and unsuitability for respondents of poor literacy are some of the disadvantages. Another disadvantage being there is no opportunity to clarify the difficulties / misunderstandings. Unlike in the interviews it is easy to skip the questions or answer them out of order. Therefore, questions should not be very long and appear as complex or difficult to answer.

Response rate

It is important to obtain a good response rate such as 40% - 60% (more than 60 % would be very satisfactory) for the questionnaires. Data analysis and making conclusions would be not possible or accurate with a low response rate. Oppenheim (1992, p104) mentions the following as some factors which influence the response rate. However, these cannot be regarded as hard and fast rules.

* Advance notice (i.e. informing the respondents in advance about the study and inviting them to participate)

* Explanation of selection (method of sample used, how the respondents have been selected)

* Incentives (It is mentioned that small incentives are generally helpful)

* Confidentiality (giving an assurance about the confidentiality of the respondents)

* Reminders (Generally use two reminders, second one with a fresh copy of the questionnaire)

* Appearance (General lay out, using different type face , clear instructions etc..)

* Length (size of the questionnaire, number of pages, time taken to complete the questionnaire)

* Topic and its degree of interest to the respondent (This relate to the length, if the topic is of intrinsic interest or if the respondents believe that their responses will have a direct impact on some changes then long questionnaires may also get a good response rate)

* Return envelopes (providing a stamped envelope to send back the questionnaire)

Reminders

It is important to obtain a reasonable response rate from the sample, in order to do the statistical analysis and make conclusions. In most postal surveys, it is strongly suggested that sending follow-ups or reminders is an effective method for increasing the response rate. Scott (1961) mentions that, "The use of follow-ups or reminders, is certainly the most potent technique yet discovered for increasing the response rate"

Although Scott has described it in 1961, it is the most effective method still in use to maximise the response rate. In general, two reminders are used. The first consists a short letter which will be normally send when the response rate is gradually dropping down, may be two weeks after the deadline or sometimes even later than that. The second one

also consists of a short letter and the original covering letter plus a copy of the questionnaire and a return envelope. This will be send two weeks after the deadline of the first reminder. The reason for sending another copy with the second reminder is to give them another opportunity to respond if they had lost or misplaced the original questionnaire.

Social and Community Planning Research (SCPR) postal survey methods technical manual (1977) describe the first and second reminders as follows:

"The first follow-up as a reminder and the second follow-up as a fresh attempt to obtain co-operation "

Effect of the reminders can be noticed by comparing the response rates of two parallel surveys which are conducted with and without reminders. Scott (1961), describes two such cases, one being; survey of telephone service. A pilot study which was conducted for a sample of 278 two months before the main study. The final response rate was 74.8%, no reminders were used. In the main study with a sample of 1050 and with two reminders, the response rate was 95.6%, nearly 20% increase in the response rate due to the two reminders.

SCPR, through their experience of postal surveys shows us how the response rates are at the three stages for different anticipated final response rates. This is given in TABLE 3.6.

TABLE 3.6   PATTERN OF RESPONSE RATES

Anticipated final response	50%	60%	70%	80%	90%
% replying to initial letter	30%	36%	42%	48%	54%
% replying to 1st reminder	13%	16%	19%	21%	24%
% replying to 2nd reminder	07%	08%	09%	11%	12%

(Source - SCPR postal survey methods technical manual 01,1977,London)

TABLE 3.8 reveals that percentage replying to the first reminder is around 50% of the initial response percentage. It is also noticed that nearly another 50% of the first reminder response rate can be obtained by sending the second reminder. However, this is not a general formulae for response rates of every postal surveys. It is the response pattern noted by SCPR through their experience in postal surveys.

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In a course evaluation study conducted by Khan and Hussain (1986), at the Allama Iqbal Open University in Pakistan, they used two different questionnaires. One was sent to the students and the other to the staff. The Students' questionnaire was sent to 1329 students who were enroled for the course in 1982 April and 1983 October. The Sample of the staff members which included course co-ordinator, course team members, writers/tutors was 32. Only 27% of the students returned the questionnaire and the response rate was 31% for the staff questionnaire. There was no mention of the reminders and those rates may be without sending any reminders. It was also not mentioned whether a stamped envelope was provided to sent back the questionnaires. This low response rate again showed us the importance of the reminders.

In India , Rathore (1994), conducted a study to evaluate printed course materials of correspondence Institutes. For his study 2800 students were randomly selected from 14 Institutes which were also selected randomly. A questionnaire was sent to the sample to get their feed back. A postage paid envelope was provided. 1059 (37.82%) students initially responded, while another 309 (11.03%) responded after a reminder. In this case only one reminder was used and the final responses were 1200 (42.8%), as 168 were not usable. That response rate was much better than the Pakistani study. The reason may be due to the reminder and it also reveals the importance of the reminders.

OUUK, in their annual survey of new courses (which is done annually to get the student feedback for the new courses through questionnaires) uses two reminders. It is mentioned that the general response rate is around 70% with these two reminders, which is considered as a very good response rate.

3.3.2   Face to face interviews

In face to face interviews, either an interview schedule or free format is used. For 'in depth' interviews, a topic outline may be used. The interview schedule is a standard one for each respondent. Questions have the same wording and are asked in the same order. Face to face interviews which are in a free format are conducted approximately like natural conversations between two people. They do not use a standard schedule, but the interviewer will use a list of topics as a guide. They can be highly structured or less structured. In highly structured type interviews an interview schedule and questions are pre-determined. The questions are asked in an invariant order and responses will be noted down. Less structured types include the naturalistic or unstructured interview. Here the questions are not asked in an invariant order but some agenda of questions or topic is determined. Normally the face to face interviews are conducted at a location which is convenient to the respondent, such as their own home.

With face to face interviews, complex tasks or questions can be asked and this is best for open questions since it allows a more free environment. Opportunity to use visual aids such as cards , maps, drawings can also be considered as an advantage. Another advantage in face to face interviews is, it gives the opportunity to correct any misunderstanding of questions. The main disadvantages are the cost and the timing factors, for an example due to interview location (normally interviews are conducted at a place convenient to the respondent and as respondents are widely dispersed interviewer may have to travel to many different locations widely apart), due to availability of date / time of the respondents to participate in the interviews. Therefore, it may be difficult to conduct many interviews within a short period. Obtaining the service of more trained interviewers may be a solution.

3.3.3   *Other data collection methods*

Telephone interviews

As in face to face interviews a schedule is used to conduct interviews on telephone. This method of data collection is feasible in developed countries as telephone facilities are easily accessible throughout the country. It is an increasingly common method in developed countries because of its speediness and cheapness.

Observations

Observation as a research method has clear benefits. One major advantage is information about the physical environment and about the human behaviour can be recorded directly by the researcher without rely on others. Observations may also be employed to identify an area for further investigations. It can also provide information about the categories who can not participate in interviews or complete questionnaires such as babies, very young children. Though this can be a useful check on, and supplement to information obtained from other sources, it will be a very time consuming task. Change in behaviour of the participants as they are being observed, is another disadvantage.

Existing sources

Existing sources in different type such as in documentary form , electronic form etc. can also be used as a method of data collection. Annual reports, diaries, news papers, films, tape recorded interviews, statistical records stored in computer data base are some of the examples. As Finnegan (1996,p138) describes, "They can function both as the main source for the researcher's conclusions and to supplement information from other sources."

3.3.4   *Data collection methods used in this study*

The following data collection methods were used in this study.

* Postal questionnaire

* Group discussions with students   and

* Discussions with Day School lecturers

Assessment and final examination results were also obtained to compare them with the questionnaire results and to analyse whether there are any significant differences between assessment / final exam results and variables such as age, gender, educational background, employment etc. In addition non starters demographic data was recorded to find out whether there is a link between educational background and non participation.

Data collection process of the study was conducted through a period of twelve months. Overall work schedule was as follows :

| Period | Questionnaire | Discussion sessions | | Assess. & final |
		with students	with DS lecturers	exam. results non starters
May 96 to Aug.96	prepared the outline conducted discussions studied sample questionnaires Commenced the work on first draft of the pilot study	prepared the outline		identified non starters of the previous 2 years gathered assessment and final exam records of previous 2 years
Sep.96	completed the first draft (English)	conducted at Colombo		
Oct.96	distributed for comments suggestions	Conducted at Kandy	Conducted at Kandy	
Nov.96	conducted the pilot study received comments suggestions Commenced work on Sinhala medium questionnaire	Conducted at Matara	Conducted at Colombo	
Dec.96	Finalised the work			identified non starters entered data
Jan.97	conducted the main study worked on code sheet			
Feb.97 to Mar.97	sent the reminders			gathered Assignment and final exam marks entered marks
Apr.97 to May 97	data entering work			

In this study, face to face interviews were not conducted with individual students. Lack of trained interviewers, cost and time taken to conduct the interviews were the main reasons. Telephone interviews were not conducted due to a number of practical problems such as , telephones are not easily accessible through out the country, lack of trained interviewers and difficulty of selecting an unbiased sample. In the case of observation; to note down the observations, researcher has to attend a Day School session as an observer. Day Schools are conducted at eight centres simultaneously. If it is to cover more classes, during a short period then more observers were to be occupied. However, in a Day School matters relating to all course components can not be observed, for example issues in Mid Session tests. In a distance education system there are also limitations to observation as students do their learning as a private study. Therefore, this method was not used as a data collection method in this study.

3.3.4.1   *Postal questionnaire*

In July 96 a preliminary discussion sessions were conducted with the co-ordinators who were involved with foundation level one courses. Three courses are offered at level one (Two Mathematics courses and Properties of Materials course). The main purpose was to identify the most important areas to be included in the questionnaire and the areas to be discussed during the discussion sessions. The researcher's own experience as a Day School lecturer and a marking examiner in the Mathematics courses was also advantageous in identifying such areas. Once the main areas were decided the researcher commenced the work on the questionnaire for the pilot study. A sample of questionnaires used for the OU courses survey, student feedback 1995 by the student research centre , IET, OUUK were also studied.

Originally it was planned to consider all level one courses. Therefore a common questionnaire was drafted. It contained eight parts as shown below.

PART A   General information (demographic data)
PART B   Course material
PART C   Day school
PART D   Tutor marked assignments
PART E   Mid session tests
PART F   Laboratory sessions
PART G   Final examination
PART H   other

The first draft consisted of 68 questions including 'open' questions. After preparing the first draft it was distributed among four staff members (including the course co-ordinators) and also sent a copy to the supervisor of the project, to get their views and suggestions. In addition, a pilot study was conducted with eight students. During that period only the English medium questionnaire was available. Therefore the pilot study was

conducted with English medium students (students who followed the course in English medium). A sample of eight was selected from the students who came to study at the Colombo regional centre during the last week in October 96. They were asked to hand over the completed questionnaire either to the researcher or to the co-ordinator within two weeks time. Only three were responded.

Staff members and the supervisor have given their comments / suggestions for many questions. General comments / suggestions given by the four staff members are as follows :

* the questionnaire is too long. Make it short as far as possible

* prepare the questionnaire in all three language media

* limit totally open questions

* use very simple words/ language every where possible

* use three point scales up to possible extent

Questionnaires were modified considering those useful comments and suggestions. All four staff members have suggested that three point scale would be more appropriate rather than the five point scale used in some questions. The reasons for that suggestion are;

* Since this is to be sent to the Foundation level one students, questionnaires should be in a very simple format.

* Foundation level one students may find it difficult to distinguish the meaning between first and second answers , fourth and fifth answers.

* Questionnaires are new to them.They were not used to questionnaires, Therefore if five point scale is used sometimes from the appearance of questions, they might feel that answering the questions would be a difficult task.

All these were assumptions and there was no proof to support them. In the draft questionnaire there were 15 closed questions which consisted five point scale. It was also noticed that different scales such as 3, 4 and 5 were used in sample of OU courses survey student feedback questionnaires. But in general more categories will provide more information. Describing about this issue Fowler (1995, p53) mentions,

"There are at least two limiting factors to the principle that using more categories produces better measurement. First, there appear to be real limits in the extent to which people can use scales to provide meaningful information. A second issue has to do with the ease of administration".

It is also stated that 5 - 7 categories is probably as many categories as most respondents can use meaningfully for most rating tasks. However, the number may vary in the case of questionnaires conducted by phone because it may difficult to retain more categories in memory.

Although 5 point scale give more information, considering the reasons (especially the last one) made by the staff members in favour of three point scale, it was decided to use three point scales as far as possible. It was later decided to focus the study only to the Mathematics courses because it would not possible to handle three courses and large amount of data within the time frame. Since the study was limited to Mathematics courses, part F of the questionnaire, which was about practical and laboratory sessions was dropped as it was irrelevant.

Regarding the language media, it was already decided to send the questionnaire in all three language media. Sinhala medium translation work was done by the researcher with the assistance of the course co-ordinator. A staff member in the Mechanical Engineering division of the Engineering Faculty offered to undertake the Tamil translation work. But unfortunately, she left the university in end of December without doing any. However, it was already planned to send the questionnaires to the sample of students in first week of January. Due to lack of time to assign the work to another staff member the idea of a Tamil medium questionnaire was given up. So the questionnaires were printed only in English and Sinhala language media. It was decided to send the English version to the Tamil medium students, if they have been selected in the samples. Both English medium questionnaires were word processed by the researcher himself. Sinhala medium questionnaires were done by a data entry operator in the Mechanical Engineering division. Some of the factors which influence the response rate were mentioned in section 3.3.1.1. Among them, the following were used in this study.

* *confidentiality* (assurance was given about the confidentiality of the respondents)

* *return envelopes* (a stamp was affixed on the last page of the questionnaire, where the return address was printed)

* *reminders* (two reminders were used. First was sent two weeks after the initial deadline and the second one with a fresh questionnaire, was sent two weeks after the deadline of the first reminder)

The number of questions could not be reduced as it was expected to gather information from all course components. The final questionnaire ended up with 60 questions over ten pages. A sample of the English medium questionnaire together with a sample page of a Sinhala medium questionnaire is shown in APPENDIX II. Two reminders are given in APPENDIX III. The work schedule of preparing and handling the questionnaires is shown below.

July 96   Conducted preliminary discussions with the co-ordinators. Commence the work on the pilot questionnaire

Aug - Sep 96 Completed the work on first draft of the English medium questionnaire for the pilot study

End Sep. 96 Completed the word processing work

Early Oct 96	Distributed the questionnaire among four staff members for their views and suggestions.		
End Oct 96	Received the questionnaire with their views Pilot study was conducted with 8 students		
Early Nov 96	Received the comments of the supervisor.		
Mid Nov 96	Received three questionnaires from the students Made modifications and started the translation work		
Early Dec 96	Completed the work of the second draft		
Mid Dec 96	Sent the second draft to the supervisor Completed the word processing work of the Sinhala medium questionnaire. Gave the questionnaire for Tamil translation Selected the samples.		
End Dec 96	Received supervisors comments. Made modifications Checked the final print outs		
Early Jan 97	Handed over the English and Sinhala media questionnaires to the press Collected the printed copies		
6/7 Jan 97	Despatched the questionnaires.		
End Jan 97	Identified the non respondents		
6 Feb 97	Sent the first reminder		
Mid Feb 97	Identified the non respondents for the first reminder		
28th Feb 97	Sent the second reminder with another copy of the questionnaire		

3.3.4.2   Group discussions with students

Group discussion sessions with students were conducted at all three regional centres. Kandy and Matara discussion sessions were conducted on the fifth and sixth Day school dates as scheduled. (i.e. on 26.10.96 and 3.11.96). At Kandy only six students were attended for the Day Schools and all of them took part in the discussion sessions. In the case of Matara only two students were present for the Day Schools and both of them participated in the group discussion session. Discussion sessions at Colombo were conducted on weekdays. Overall 25 students took part in the group discussions. The schedule is as follows:

Centre	Group	Date	No. of participants
Colombo	A	19. 9.96	4
	B	30. 9.96	5
	C	9.10.96	4
	D	15.10.96	4
Kandy		26.10.96	6
Matara		3.11.96	2
Total			25

At the Kandy centre, researcher met the students and the morning Day School lecturer before the commencement of the Day School, in order to prepare a rough time schedule for the discussion sessions. Following decisions were taken.

to conduct the group discussion session after the first Day School
(roughly 105 minutes were allocated)

to allocate some time from the morning Day School for the discussion session
(roughly 30 minutes from the end)

to shorten the one hour lunch break by 30 minutes

Accordingly, it was seen that there would be nearly one hour delay the start of the afternoon Day School. Since the afternoon Day School lecturer was not available at that time researcher under took the responsibility to inform him about the new schedule. At Matara the same lecturer conducted both Day School sessions. Therefore with his consent Matara discussion session conducted prior to the morning Day School. The discussion session lasted nearly 75 minutes. Following figure illustrate how the normal schedule was amended in order to conduct the discussion sessions.

At Kandy

Normal Schedule

```
         MDS                LI             ADS
|<------------------------>| |<-------->| |<------------------------>|
```

Amended schedule

```
         MDS                 GDS          LI            ADS
|<-------------------->| |<-------------->| |<---->| |<----------------------->|
                                         DSS1                          DSS2
                                       |<------>|                   |<------>|
```
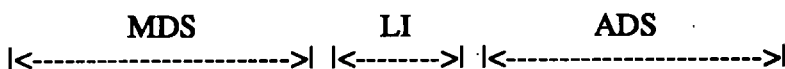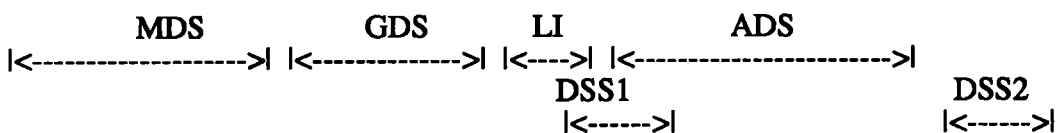
At Matara

Normal schedule

```
         MDS                LI             ADS
|<------------------------>| |<-------->| |<------------------------>|
```

Amended schedule

```
  GDS              MDS              LI            ADS
|<------>| |<------------------------>| |<---->| |<------------------------>|
```
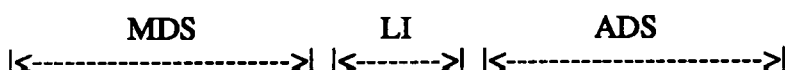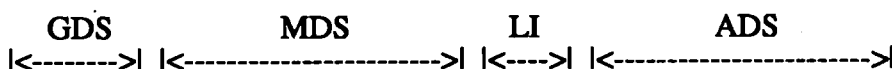

MDS   Morning Day School   GDS   Group discussion session
LI   Lunch interval   DSS1 Discussion session with first DS lecturer
ADS   Afternoon Day School   DSS2 Discussion session with second DS lecturer

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The group discussions were conducted in following manner. Initially, the purpose of the study was explained in briefly. It was also mentioned that the feedback would only use for the statistical analyses purposes. Their demographic data such as age, educational background, employment were noted down. Then the discussion was conducted according to the pre-determined questionnaire outline which was focused on four course components; Course material, Day Schools, Tutor marked assignments and Mid session tests. There were several questions under each main component. Mostly they were asked in the same order as in the questionnaire outline. Students' responses were noted down under each question. Whenever possible it was tried to note down the responses according to their A/L maths background. At Kandy and Matara, the researcher had to pay more attention in covering all areas in the pre determined schedule because of the time factor. But in the case of Colombo, students were not involved with any other academic activities on the discussion dates.They solely attended to participate in group discussion session. Therefore, Colombo discussion sessions were not affected by the time factor. Most of the sessions conducted at Colombo lasted around 2 1/2 hours. An out line for the discussion sessions which was prepared with the assistance of course co-ordinator is given in APPENDIX IV.

3.3.4.3   *Discussion sessions with Day School lecturers*

Discussion sessions with the two Kandy Day School lecturers were conducted on 26.10.96. It was the fifth Day School session. Two separate discussion sessions were conducted with each. The Matara Day School lecturer was not present on that day. (Course co-ordinator conducted the sessions). In Colombo with the assistance of the course co-ordinator three OUSL staff members were identified to participate in the discussion sessions. Researcher met them personally at the OUSL and briefed them about the study.They all agreed to participate and it was conducted on 06.11.96. Two of them were involved in conducting Day Schools 1995/96 academic year and the other in the previous year. Initially they were asked to give their views about Day schools, Course material and Tutor marked assignments. These issues were discussed one at a time. As they were involved in Day Schools most of the time devoted to discuss the issues related that particular activity. Their responses were noted down under each component. Then their comments/ suggestions were obtained. A detailed description of the results of the discussion sessions is given in APPENDIX V.

3.3.4.4 Assessment and final examination records

During this data collection period, existing data, which seem to be relevant to this study were obtained. Last year students' records such as number registered, number participated, number eligible to sit the Final Examination, and their performances in Continuous Assessment components (Tutor Marked Assignments and Mid Session tests) and Final examination were recorded manually. These data were obtained from the Student Affairs Division , CA unit and from the Examination Division. Details about the non starters in all seven Foundation level courses in the previous two academic years (1994/95 and 1993/94) were also gathered. They were traced from the relevant eligibility lists. This work was carried out during the period of May -August 1996. Continuous Assessment and Final examination results of the 95/96 students were obtained during the period in February - March 1996. The demographic data of 1995/96 non starters were extracted from the Student Affairs Division. It was done manually because such data was not available in the computer by the time of the study. This work was conducted during the month of December 1996.

Data about non starters

Recording of non starters demographic data was a laborious work. They were not stored on computer and therefore had to be noted down from their personal files. Students' personal files are maintained by the Students affairs division. The files were stored according to the registration year. In the academic year 1995/96, there were 565 Foundation level one and two students, who had not participated at least in one course out of the total courses they had registered. Among them there were also continuing students. Their original registration year was prior to 95/96. For an example, 1994/95, 1993/94 etc. But the majority (464) were new students (who were originally registered in the 95/96). As their files were easily accessible that group was considered as a sample of the 95/96 non starters and their demographic data were recorded. This was done to get an idea about the non starters. One main purpose was to check whether there is a significant difference between non participation and A/L maths background. It was noticed that only the G.C.E.(A/L) results were asked in the application. The A/L stream was not asked in the application. The reason may be A/L stream is not an important issue for the registration purpose. Therefore it was not possible to record their A/L stream from the files unless they had indicated their A/L results with subjects or a copy of the A/L certificate included in the personal file. Accordingly, it was possible to identify the A/L stream in 191 cases.

3.4   Outcomes

3.4.1   Responses

The initial response rates were 27.58% and 30.25% for the two courses and the final response rates with two reminders were 52.29% and 56.17% respectively. The reminders worked very effectively (almost doubled the initial response rates) in this study.

The response rates for the questionnaires in this study are as follows :

TABLE 3.7   RESPONSE RATES

Description	Pure Mathematics			Applied Mathematics		
	N	%	cumula-tive %	N	%	cumula-tive %
Sample size	174			162		
No. received initially	48	27.6	27.6	49	30.3	30.3
No. received for the first reminder	26	14.9	42.5	23	14.2	44.5
No. received for the second reminder	17	9.8	52.3	19	11.7	56.2
Total received	91	52.3	52.3	91	56.2	56.2

The final figures, i.e. 52.3% and 56.2% can be considered as reasonable response rates compared to the Rathore (1994) and Khan & Hussain(1986) studies mentioned in section 3.3.1.1.

Reliability and validity of data

As the results of a study are based on the collected data, researchers are concerned about the validity and reliability of their data. "Valid" means what is expected to be measured is being measured and "reliable" means whether the similar results are obtained under different data collection methods or from the same method conducted at a different stage. In this study data were obtained from different methods such as questionnaires , group discussions and Assessment results. Therefore, for similar issues findings from the questionnaire data can be cross checked with the group discussion results for its validity, i.e, triangulation: comparing data produced by different methods. As Foster (1996, p91) mentions, "If a researcher's conclusion is supported by data from other sources, then we can be more confident of its validity.

CHAPTER 4

RESULTS AND ANALYSIS OF FEED BACK

4.0 Introduction

In this study questionnaires were used as the main instrument of obtaining feedback from the students. There were two questionnaires prepared for the two courses. But they were almost similar in structure. Each questionnaire contains six parts (Part A to F) as described below:

Part A   General Information

Consisted seven questions seeking information on demographic data such as age, gender, medium of study, regional centre, educational background and employment status.

Part B Course material

This part had 15 questions focusing on issues such as, amount studied in each unit, difficulties in understanding course material, subject areas in which spent relatively more time, presentation (readability, level of language, size of figures, placing of figures etc..) subject content, preference for av material and availability of av facilities at home.

Part C   Day Schools

There were 14 questions which were asked about number of Day Schools, way of conducting Day Schools, if attended less than 50% of Day Schools the most relevant reasons for it, group studies, frequency of study group meetings, help from another teacher and the frequency of meeting with the other teacher.

Part D   Tutor Marked Assignments

This part contained nine questions to reveal details about number of TMAs, time duration for submitting of TMAs, receiving of marked TMAs, marking examiner's comments and model answers.

Part E Mid Session Tests

Consisted of six questions focused on number of tests, time duration and type of questions

Part F Final examination

The last part was about the final examination. There were nine questions regarding amount studied for the final examination, attempting of past papers, representation of course content, time duration and facilities at the examination centre.

Overall there were 60 questions. One or two open ended questions were included in all parts except in part A.

In addition, group discussions with students were conducted at the three regional centres. Overall 25 students took part in group discussions. Relevant staff members views were also obtained through discussions. Five day school lecturers participated in those discussion sessions which were conducted at the central campus, Nawala and at the Kandy regional centre.

Questionnaires were sent to the two samples of students , selected from each course. As described in chapter 3, 50 % sample was selected for each course from the relevant participants. The sample size in Pure mathematics (MPF 1301) was 174 and the final response rate was 52%. The respective figures in Applied Mathematics (MPF 1302) were 162 and 56%.

The responses received for the two questionnaires were entered into spread sheets using the code sheets prepared for the questionnaires. The statistical package for social sciences (SPSS) was used for the analysis. A descriptive analysis of responses was done on the basis of the frequencies of the responses. Frequencies were recorded as percentages. Important variables were cross tabulated with a number of other variables in order to find out the significant differences. Chi-square test and t- test at $p = 0.05$ were used for such purposes. Whenever possible relevant questionnaire data were compared with the result of the group discussions. To pay more attention to specific issues related to each component, feed back which was obtained through the questionnaires and group discussions will be analysed as follows:

* General information about the students
* Course material
* Day schools
* Tutor marked assignments (TMAs)
* Mid session tests (MSTs)
* Overall performances

In addition, Tutor marked assignment, Mid session test and Final examination marks were also cross tabulated with a number of variables such as educational background and help from another teacher to find out the link between them. These comparisons would be useful to identify specific category of respondents who had more difficulties related to that particular component.

4.1   General information about respondents

In this section, respondents demographic data such as age group, gender, educational background and employment status, are analysed in order to get an idea about them.

4.1.1 Age and gender distribution

Respondents by age

Educational Technology Division in the OUSL uses following age groups for the purpose of statistical analysis of their studies: 18-24, 25-29, 30-34, 35-44, 45-54 and 55 or more. Same six age groups are used in this study because it would be easy to make any comparison with the other studies. Age distribution of the respondents and the whole Technology programme is given in TABLE 4.1.

TABLE 4.1   AGE DISTRIBUTION

Age group	Pure Maths		Applied Maths		Tech. Pro.	
	N	%	N	%	N	%
18 - 24	56	61.5	61	67.0	676	37.1
25 - 29	18	19.8	18	19.8	601	32.9
30 - 34	5	5.5	8	8.8	203	11.1
35 - 44	11	12.1	3	3.3	273	15.0
45 - 54	1	1.1	1	1.1	71	3.9
>= 55	---	----	---	---	----	----
Total	91	100	91	100	1824	100

The majority of respondents were in the 18 - 24 age group, and almost all were below 44 years of age. The average age of the respondents in Pure Maths was 25 years and 4 months while it was 24 years in Applied Maths and 28 years in the whole Technology programme, which was higher than the average age of the level one students. At the time of the study personal information such as age of students was not available on the computer and therefore it is not possible to compare the age distribution of respondents with the course participants.

The age distribution of the whole technology programme was obtained from the Educational Technology division. 1824 students were enroled in the whole technology programme (i.e. in Foundation, Diploma and in B.Tech programmes) during the 1995/96 academic year. It is clear from the data in TABLE 4.1 that the age group distribution of the whole technology programme is different from the Foundation level one (F1) respondents. The majority of F1 students were in the 18 - 24 age group.

In Sri Lanka, children are admitted to the schools at the age of five years. They sit for the General Certificate of Education Ordinary Level [G.C.E.(O/L)] examination in Year 11 class, at the minimum age of 16 and G.C.E.(A/L) examination in Year 13 class, at the minimum age of 18. Considering the fact that students are given three attempts in these examinations, it can be assumed that the normal age limit of the school leavers would be around 18 - 22.years. Many school leavers, who do not possess the required qualifications to enter the conventional universities, enter into the other educational institutes including the Open University, mainly to get a qualification for a better job. It may be a reason for the very high percentage of 18 -24 age groups respondents in the Foundation level one courses.

Number of registered students by gender

As mentioned earlier at the time of the study there was no computerised data base of the personal details of OUSL students. Therefore the gender of the students who were registered in the Foundation programme were recorded manually using the mailing lists. This was done to compare it with the gender distributions of the registered students in the two courses. (see TABLE 4.2A).

TABLE 4.2A   GENDER DISTRIBUTION OF THE REGISTERED STUDENTS

Gender	Pure Maths		Applied Maths		Foun. pro.	
	N	%	N	%	N	%
Male	553	89.8	529	89.5	1177	90.7
Female	63	10.2	62	10.5	121	9.3
Total registered	616	100	591	100	1298	100

It is seen that in both courses around 90% of the registered students were males and it reflects very closely with the gender distribution of the Foundation programme.

Course participation by gender

As a considerable percentage of non starters were recorded in Foundation level one, students' participation in the course was compared with gender to find out in which category there were more non starters.The participation rates by gender are shown in TABLE 4.2B.

TABLE 4.2B   GENDER-WISE PARTICIPATION RATES

Participation		Pure Maths			Applied Maths		
		Male	Female	Total	Male	Female	Total
Yes	N	286	42	328	277	39	316
	%	(51.7)	(66.7)	(53.2)	(52.4)	(62.9)	(53.5)
No	N	267	21	288	252	23	275
	%	(48.3)	(33.3)	(46.8)	(47.6)	(37.1)	(46.5)
Total	N	553	63	616	529	62	591
	%	(100)	(100)	(100)	(100)	(100)	(100)

Participation rates compared with the gender shows that in both courses, female students' participation percentage was higher than the male students. However Chi square test values reveal that the difference is significant only in Pure Mathematics , where $X^2 = 4.554$, at $p = 0.05$, df = 1.

In this study, as described in Chapter 3, when selecting the samples, non starters were excluded from the registered students and the samples were drawn only from the participants. Therefore, through out this chapter the term population refers to all the participants in the course and not to the all registered students.

Respondents and populations by gender

The gender distributions of the respondents and the populations are shown in TABLE 4.2C.

TABLE 4.2C   GENDER DISTRIBUTION OF THE RESPONDENTS AND THE POPULATIONS

Gender	Pure Maths				Applied Maths			
	Population		Respondents		Population		Respondents	
	N	%	N	%	N	%	N	%
Male	286	87.2	81	89.0	277	87.7	84	92.3
Female	42	12.8	10	11.0	39	12.3	7	7.7
Total	328	100	91	100	316	100	91	100

According to the data in TABLE 4.2C, nearly the same distribution was noticed in between respondents and the population in Pure Mathematics. But in Applied mathematics female representation of the respondents was slightly less compared with the population.

Age distribution by gender

Age distribution was also examined with gender to find out who were the younger students.This is given in TABLE 4.2D

TABLE 4.2D   AGE DISTRIBUTION * GENDER OF RESPONDENTS

Age		Pure Mathematics			Applied Mathematics		
		Male	Female	Total	Male	Female	Total
18-24	N	48	8	56	56	5	61
	%	(59.2)	(80.0)	(61.5)	(66.7)	(71.4)	(67.0)
25-29	N	16	2	18	16	2	18
	%	(19.8)	(20.0)	(19.8)	(19.0)	(28.6)	(19.8)
30-34	N	5	–	5	8	–	8
	%	(6.2)		(5.5)	(9.5)		(8.8)
35-44	N	11	–	11	3	–	3
	%	(13.6)		(12.1)	(3.6)		(3.3)
45-54	N	1	–	1	1	–	1
	%	(1.2)		(1.1)	(1.2)		(1.1)
>55	N	–	–	–	–	–	–
	%						
Tot	N	81	10	91	84	07	91
	%	(100)	(100)	(100)	(100)	(100)	(100)
Av.age		25y 8m	22y 2m	25y 4m	24y 2m	22y 8m	24y

It is obvious from the TABLE 4.2D that in both courses all the female respondents were below 30 years of age. It is also reveals that in both courses the average age of the female students is less than the average age of the male students. It may be due to low sample sizes for females.

4.1.2   Regional centre - wise distribution

Number of registered students by regional centre

616 students were registered in Pure Mathematics and 591 in Applied Mathematics. Regional centre-wise distribution of the registered students is shown in TABLE 4.3A

TABLE 4.3A REGIONAL CENTRE-WISE DISTRIBUTION OF THE REGISTERED STUDENTS

Regional centre	Pure Maths		Applied Maths		Foundation programme	
	N	%	N	%	N	%
Colombo	426	69.2	413	69.9	928	71.5
Kandy	159	25.8	155	26.2	307	23.6
Matara	31	5.0	23	3.9	63	4.9
Total	616	100	591	100	1298	100

Roughly, the same distribution is seen among the two courses and in the Foundation programme. In general the distribution pattern is seems to be around 70 % in Colombo, 25% in Kandy and 5% in Matara.

Course participation by regional centre

TABLE 4.3B gives the regional centre-wise participation rates and response rates. It is seen that the overall participation rates of the two courses are almost similar.

TABLE 4.3B REGIONAL CENTRE-WISE PARTICIPATION RATES AND RESPONSE RATES

Regional centre	Pure Mathematics		Applied Mathematics	
	Participation percentage	Response percentage	Participation percentage	Response percentage
Colombo	47.7 (203/426)	41.7 (43/103)	48.7 (201/413)	45.0 (45/100)
Kandy	68.6 (109/159)	70.9 (39/55)	67.7 (105/155)	76.9 (40/52)
Matara	51.6 (16/31)	56.3 (09/16)	43.5 (10/23)	60.0 (06/10)
Total	53.2 (328/616)	52.3 (91/174)	53.5 (316/591)	56.2 (91/162)

Participation rates and response rates with respect to the three regional centres reveals that in both courses, considerable higher participation rate was recorded in Kandy regional centre compared to the other two centres. It is also noticed that in both courses, there is a significant difference in the participation rates with respect to the regional centre. $X^2 = 19.990$, at $p = 0.05$, df = 2 for Pure mathematics and $X^2 = 17.143$, at $p = 0.05$, df = 2 for Applied Mathematics .

4.1.3   *Educational background*

Respondents by A/L background

In Pure Mathematics , out of 91 respondents, only one student had failed in both subjects Mathematics and Science, at the G.C.E.(O/L) examination. In Applied Mathematics all the respondents had passed in Mathematics and only one had not followed the subject Science.These results reveal that almost all the respondents had obtained passes in Mathematics and Science subjects at the G.C.E.(O/L) examination.This fact was considered as an advantage for following the Foundation programme although no educational qualifications are requested for registering for the Foundation programme.

In Sri Lanka, students follow G.C.E.(A/L) in three main disciplines namely,

* Science (Consisting of two streams, Mathematics and Biology)
* Commerce and
* Arts

There are four subjects in each discipline /stream.These disciplines /streams are mutually exclusive and therefore following combination of subjects from different disciplines/streams is not possible. The subjects in Maths and Bio streams at the G.C.E.(A/L) are as follows :

Maths stream

Pure Mathematics
Applied Mathematics
Physics
Chemistry

Bio stream

Zoology
Botany
Physics
Chemistry

TABLE 4.4A gives the G.C.E.(A/L) background of the respondents.

TABLE 4.4A   A/L BACKGROUND OF THE RESPONDENTS

A/L back-ground	Pure Mathematics			Applied Mathematics		
	N	%		N	%	
Maths	49	53.8		55	60.4	
Bio	24	26.4		30	33.0	
(Sub total)	(73)	(80.2)		(85)	(93.4)	
Arts	3	3.3		1	1.1	
Commerce	6	6.6	19.8	2	2.2	6.6
Did not follow	9	9.9		3	3.3	
TOTAL	91	100		91	100	

It is clear from TABLE 4.4A that 80.2% of the respondents in Pure Mathematics and 93.4% in Applied mathematics had followed G.C.E.(A/L) in Science discipline (either in Maths stream or in Bio stream).

Arts and Commerce subjects do not involve A/L Mathematics, but Physics involves a little. The respondents can be categorised into following three groups.

Maths	Have a pre-requisite knowledge, as they followed A/L in maths stream.
Bio	Do not have a pre-requisite knowledge. But had a slight advantage over the "other group" because they have followed A/L in Science stream and also followed the subject Physics.
Other (Arts/Commerce & did not follow A/L)	Do not have a pre-requisite knowledge.

Since there were very few respondents in "Arts", "Commerce" and "Did not follow" groups in Applied mathematics (MPF 1302), it is difficult to compare the responses /results of such groups with the other course. Therefore those three groups were combined together and named it as "Other ". Accordingly, there are three categories namely, 'Maths', 'Bio' and 'Other'.

In both courses a clear majority of respondents, i.e. 53.8% (49 out of 91) in Pure Mathematics and 60.4% (55 out of 91) in Applied Mathematics, had followed G.C.E.(A/L) in Maths stream. It was also found that there is a significant difference between the respondents in the two courses with respect to the A/L category.
$X^2 = 7.000$, at $p = 0.05$, df = 2.

At the time of registration, students with no Maths background are encouraged to register for only one Mathematics course. Most probably for Pure Mathematics course because it is a pre-requisite for three courses at Foundation level two(F2) while Applied Mathematics is a prerequisite only for one course.This fact may be a reason for the higher percentage of "Other" group respondents in Pure Mathematics with compared to Applied Mathematics.

A/L category by gender

A/L background was compared with gender. As there were few female respondents the comparison was made in between two A/L categories "Maths" and "Non maths", which includes both "Bio" and "other" groups. This is shown in TABLE 4.4B.

TABLE 4.4B   A/L CATEGORY * GENDER

A/L Category		Pure Maths			Applied Maths		
		M	F	Tot	M	F	Tot
Maths	N	46	3	49	53	2	55
	%	57	30	54	63	29	60
Non maths	N	35	7	42	31	5	36
	%	43	70	46	37	71	40
Total	N	81	10	91	84	7	91

In both courses the majority of male students had followed A/L in Maths stream. But it was other way round in the case of females, where around 70% had not followed A/L in Maths. However, t values indicate that there are no significant differences between the two gender proportions with respect to the A/L category. $t = 1.79$, at $p = 0.05$, df $= 79$ and $t = 1.62$, at $p= 0.05$, df $= 82$ for Pure Maths and Applied Maths respectively.

4.1.4   Employment

Employment status by age

In both courses the majority of respondents were unemployed. It was nearly 50% in Pure Mathematics and 60% in Applied Mathematics. There were 12.1% (11 out of 91) part time employees and 11% (10 out of 91) self employed respondents in Pure Mathematics . But in Applied Mathematics the respective percentage was 4 .4% (4 out of 91) in each case.

From the questionnaire information, it is not possible to find out how many self employed respondents were engaged in full time work. However, assuming the fact that the self employed respondents may have a little more spare time than the full time employed respondents, self employed respondents were combined with the part time employed respondents for the analysis purpose. This was done as the relevant numbers in Applied Mathematics were too small. Three new categories consider are as follows:

Category	Employment status
A	Employed (Full Time)
B	Employed (Part Time) AND Self employed
C	Unemployed

Employment status was compared with the age group to examine the link between the unemployment and age and it is given in TABLE 4.5.

TABLE 4.5   EMPLOYMENT STATUS * AGE GROUP

Age Group	Pure Maths.				Applied Maths			
	EMP.CATEGORY			TO	EMP.CATEGORY			TO
	FT (A)	PT/SE (B)	UN (C)		FT (A)	PT/SE (B)	UN (C)	
18-24	5	12	39	56	9	4	48	61
%	8.9	21.4	69.7	100	14.8	06.5	78.7	100
25-29	8	4	6	18	9	3	6	18
%	44.5	22.2	33.3	100	50.0	16.7	33.3	100
30-34	4	1	--	5	7	--	1	8
%	80.0	20.0	–	100	87.5	–	12.5	100
35-44	7	4	--	11	2	1	--	3
%	63.6	36.7	–	100	66.7	33.3	–	100
45-54	1	--	--	1	1	--	--	1
%	100	-	-	100	100	–	–	100
To	25	21	45	91	28	8	55	91
%	27.5	23.0	49.5	100	30.8	8.8	60.4	100

There were more unemployed respondents (60.4%) in Applied Maths, compared with Pure Maths (49.5%). The percentages of full time employees were nearly the same. But there is a considerable difference in the category B, which included the part time employees and self employed respondents. It is found that there is a significant difference between the two samples with respect to the employment category. $X^2 = 7.85$, at p = 0.05, df = 2. In both courses, a clear majority of unemployed respondents were in the 18 - 24 age group. It is noticed that in both courses, almost all unemployed respondents were below 30 years of age.

Another noticeable fact is that more younger respondents (i.e. who were in the 18-24 age group) were unemployed in Applied Maths compared with Pure maths.The relevant percentages were 78.7% (48 out of 61) in Applied Maths and 69.7% (39 out of 56) in Pure Maths. This result caused for the higher overall unemployed percentage in Applied Maths compared with Pure Maths. However, the number of respondents in the 18-24 age group were roughly the same in the two courses.

Summary

It is revealed that in both courses the majority of respondents were below 30 years of age. The percentages were 81.3% and 86.8% in Pure Maths and Applied Maths respectively. Very few number female students were registered in both courses and among the respondents it was only one in ten. However, gender wise participation rates reveal that female participation rates were better than the male participation rates. It is noticed that in both courses there was a considerable higher participation rate at Kandy centre. (Which

means non starters percentage was considerably low at Kandy, which was around 30%. In other two centres it was nearly 50%). In addition, highest response rates were also reported from the Kandy centre. Which suggests that Kandy students were more enthusiastic. Almost all respondents had passed in G.C.E.(O/L) Mathematics and Science subjects, which is considered as an advantage for following Foundation level one courses. However, their G.C.E.(A/L) stream indicated that a considerable percentage had followed A/L in other than Maths stream. It was around 46% in Pure Maths and 40% in Applied Maths. Crosstabulation of (A/L) stream and gender reveals that in both courses nearly 70% female respondents had followed A/L in other than 'Maths' stream. But the majority (60%) of male students had followed A/L in 'Maths'. Around 50% respondents in Pure Maths and 60% in Applied Maths were unemployed. Almost all the unemployed respondents were below 30 years of age. The majority of respondents had followed the courses in Sinhala language medium.

4.2 Course material

In this section it is intended to analyse issues such as amount of course content studied in each unit, difficulties in understanding course material, difficult subject areas, reasons for the difficulties and satisfaction with the number of worked examples/self assessment questions with respect to the different A/L categories of respondents.

4.2.1 Amount studied

Amount of course content studied by A/L category

The responses to Q8 (in which students were asked to indicate the amount of course content they had studied in each unit) were compared with their A/L group to find out which group had studied less amount of course material and in which units.Three groups were considered separately and results of the Pure mathematics respondents are given in TABLES 4.6A, B and C respectively.

The six units in Pure Mathematics are as follows;

B1U1 Algebra I	B2U1 Geometry	B3U1 Differentiation
B1U2 Algebra II	B2U2 Trigonometry	B3U2 Integration

TABLE 4.6A   AMOUNT STUDIED IN PURE MATHEMATICS (MPF 1301) * G.C.E.(A/L) MATHS GROUP

Amo. studied	B1U1 N	%	B1U2 N	%	B2U1 N	%	B2U2 N	%	B3U1 N	%	B3U2 N	%
100%	12	24.5	10	20.4	1	2.1	10	20.9	7	14.6	3	6.2
75%	20	40.8	19	38.8	12	25.0	13	27.1	11	22.8	10	20.9
50%	12	24.5	13	26.5	21	43.7	15	31.2	13	27.1	11	22.9
25%	2	4.1	4	8.2	10	21.0	5	10.4	9	18.8	13	27.1
<25%	3	6.1	3	6.1	4	8.2	5	10.4	8	16.7	11	22.9
Tot.	49	100	49	100	48	100	48	100	48	100	48	100

With compared to the first three units, a greater percentage of respondents had studied less than 25% amount from the last three units. It is also noticed that half of the "Maths" respondents had studied less than 50% amount in the subject area of Integration (B3U2) and 35.5% had studied less than 50% in Differentiation (B3U1) subject area.

TABLE 4.6B   AMOUNT STUDIED IN PURE MATHEMATICS (MPF 1301) * G.C.E.(A/L) BIO GROUP

Amo. studied	B1U1 N	%	B1U2 N	%	B2U1 N	%	B2U2 N	%	B3U1 N	%	B3U2 N	%
100%	7	29.2	4	16.7	3	13.0	1	4.3	–	–	–	--
75%	7	29.2	7	29.2	5	21.7	3	13.0	1	4.3	1	04.3
50%	7	29.2	7	29.2	5	21.7	10	43.5	7	30.4	5	21.7
25%	3	12.5	4	16.7	8	34.8	4	17.4	4	17.4	5	21.7
<25%	–	—	2	8.3	2	8.7	5	21.7	11	47.8	12	52.2
Tot.	24	100	24	100	23	100	23	100	23	100	23	100

In the "Bio" group, the percentages of respondents who had studied less than 25% in the last three units were very much higher than the relevant percentages of the first three units. Nearly half had studied less than 25 % in Integration (B3U2) and Differentiation (B3U1) units. It is also noticed that, the percentages of respondents who had studied less than 50% were much more higher compared with the relevant percentages of the "Maths" group (73.9% in Integration, 65.2% in Differentiation and around 40% in Geometry and Trigonometry units).

TABLE 4.6C AMOUNT STUDIED IN PURE MATHEMATICS (MPF 1301)
* G.C.E.(A/L) OTHER GROUP

Amo. studied	B1U1 N	%	B1U2 N	%	B2U1 N	%	B2U2 N	%	B3U1 N	%	B3U2 N	%
100%	1	5.6	–	–	2	11.0	1	5.6	1	5.6	1	05.6
75%	5	27.8	5	27.8	1	5.6	1	5.6	–	–	1	05.6
50%	6	33.3	5	27.8	6	33.3	3	16.7	4	22.2	3	16.7
25%	4	22.2	6	33.3	6	33.3	9	50.0	5	27.8	5	27.8
<25%	2	11.0	2	11.0	3	16.7	4	22.2	8	44.4	8	44.4
Tot.	18	100	18	100	18	100	18	100	18	100	18	100

A noticeable fact about the "Other" group is that in each unit there were more than 1/3 respondents who had studied less than 50% of it. It is also noticed that the percentage of respondents who had studied less than half amount in course content was around 70% in the last three units.

It is clear from the data in TABLES 4.6A,B and C that irrespective of their A/L group, Integration (B3U2) and Differentiation (B3U1) are the units where respondents had studied least course material. However it is also seen that "Bio" and "Other" groups had studied the least amount from those two units compared with the "Maths" group.

Amount studied in Applied Mathematics compared with A/L groups are shown in TABLES 4.6D, E and F.

The five units in Applied Mathematics (MPF 1302) are as follows :

B1U1 Statics I   B2U1 Dynamics   B3U2 Hydrostatics II

B1U2 Statics II   B3U1 Hydrostatics I

TABLE 4.6D   AMOUNT STUDIED IN APPLIED MATHEMATICS (MPF 1302)
* G.C.E.(A/L) MATHS GROUP

Amo. studied	B1U1 N	%	B1U2 N	%	B2U1 N	%	B3U1 N	%	B3U2 N	%
100%	13	24.1	12	22.6	8	14.8	13	24.5	10	18.9
75%	27	50.0	21	39.6	21	38.9	4	7.5	14	26.4
50%	9	16.7	14	26.4	18	33.3	20	37.7	14	26.4
25%	5	9.2	5	9.4	5	9.2	11	20.8	10	18.9
<25%	–	–	1	1.9	2	3.7	5	9.4	5	9.4
Tot.	54	100	53	100	54	100	53	100	53	100

Compared with the "Maths" group in Pure Mathematics, there were fewer respondents who had studied less than 30% amount of course material. There were around 25% of respondents who had studied less than half amount of course material in Hydrostatics (B3U1 and B3U2).

TABLE 4.6E   AMOUNT STUDIED IN APPLIED MATHEMATICS (MPF 1302)
* G.C.E.(A/L) BIO GROUP

Amo. studied	B1U1 N	%	B1U2 N	%	B2U1 N	%	B3U1 N	%	B3U2 N	%
100%	6	20.7	2	6.9	2	7.1	–	–	1	3.8
75%	8	27.6	8	27.6	8	28.6	5	18.5	3	11.5
50%	9	31.0	8	27.6	13	46.4	8	29.6	11	42.3
25%	5	17.2	8	27.6	4	14.3	9	33.3	6	23.1
<25%	1	3.4	3	10.3	1	3.6	5	18.5	5	19.2
Tot.	29	100	29	100	28	100	27	100	26	100

As seen in the "Maths" group, respondents were less likely to study Hydrostatics. 51.8% respondents had studied less than half amount in B3U1 and 42.3% in B3U2. It is also noticed that 37.9% had studied less than half amount in Statics II (B1U2).

TABLE 4.6F   AMOUNT STUDIED IN APPLIED MATHEMATICS (MPF 1302)
* G.C.E.(A/L) OTHER GROUP

Amo. studied	B1U1 N	%	B1U2 N	%	B2U1 N	%	B3U1 N	%	B3U2 N	%
100%	3	50.0	1	16.7	1	16.7	1	16.7	1	16.7
75%	–	–	2	33.3	1	16.7	1	16.7	1	16.7
50%	1	16.7	–	–	1	16.7	1	16.7	–	–
25%	1	16.7	2	33.3	2	33.3	1	16.7	2	33.3
<25%	1	16.7	1	16.7	1	16.7	2	33.3	1	16.7
Tot.	6	100	6	100	6	100	6	100	6	100

Except in B1U1, in all other units half of the "Other" group respondents had studied less than 50% of the course material. Unlike in Pure Mathematics, it is difficult to compare the percentages of the three groups as there were very few respondents in the "Other" group. Overall, Hydrostatics is the subject area where respondents had studied least. "Bio" group respondents had studied less of those two units compared with the "Maths" group. Some useful information would have been obtained if there were follow up questions to find out the reasons for studying less of course material.

4.2.2   Difficulties in understanding the course material

Difficulties in understanding the course material by A/L category

Course components in the two courses are almost same except in the case of number of units. In Pure Mathematics there are six units while in Applied Mathematics there are only five. Responses were compared by A/L category to find out which category had the difficulties in understanding the course material in many occasions. The results of this comparison is given in TABLE 4.7.

TABLE 4.7   DIFFICULTIES IN COURSE MATERIAL * A/L CATEGORY

Difficulties		Pure Mathematics				Applied Mathematics			
		M	B	O	TO	M	B	O	TO
In many	N	6	10	10	26	2	14	5	21
occasions	%	12.3	41.7	55.6	28.6	3.7	46.7	83.3	23.2
In some	N	32	14	8	54	33	16	1	50
occasions	%	65.3	58.3	44.4	59.3	61.1	53.3	16.7	55.6
In very few	N	11	--	--	11	19	--	--	19
occasions/	%	22.4			12.1	35.2			21.1
not at all									
Total	N	49	24	18	91	55	30	6	91
	%	100	100	100	100	100	100	100	100

Nearly 90% respondents in Pure mathematics mentioned that they had difficulties in understanding the course material in many occasions or in some occasions. It was around 80% in Applied Mathematics. In both courses around 25% of the respondents had difficulties in understanding the course material in many occasions. Although comparatively higher percentage of respondents had difficulties in very few occasions or not at all in Applied Mathematics, it is found that there is no significant difference between the respondents in the two courses with respect to "difficulties in understanding the course material". $X^2 = 2.372$, at $p = 0.05$, df = 2.

From the data in TABLE 4.7 it reveals that in both courses, all the respondents who had difficulties in very few occasions or had none, were from the "Maths" category.

From the "Maths" category students 12% in Pure maths and only 4% in Applied Maths had difficulties in many occasions. These percentages are very much less with compared to the relevant percentages of the other two categories. Their pre-requisite knowledge and the familiarity with the terminology may be the reasons.

4.2.3   Difficult subject areas / subject areas in which spent more time

In the questionnaire students were asked to indicate the subject areas in which they had difficulties. 61 answered in Pure Maths and 66 in Applied Maths. The responses were compared with their A/L categories and are shown in TABLES 4.8A and 4.8B.

TABLE 4.8A   UNITS WHICH WERE DIFFICULT TO UNDERSTAND
             IN PURE MATHEMATICS (MPF 1301)
             * A/L CATEGORY

Unit	A/L CATEGORY						Tot % (N =61)	
	Maths % (N = 34)		Bio % (N = 17)		Other % (N = 10)			
Algebra I	6	17.6	1	5.9	2	20.0	9	16.4
Algebra II	15	44.1	8	47.0	5	50.0	28	45.9
Geometry	11	32.4	4	23.5	3	30.0	18	29.5
Trigonometry	16	47.1	11	64.7	5	50.0	32	52.5
Differentiation	21	61.8	12	70.6	8	80.0	41	67.2
Integration	25	73.5	13	76.5	8	80.0	46	75.4

Instead of subject areas respondents mentioned the unit numbers. Therefore, only the
"difficult units" were able to identified from the questionnaire feed back. However, in the
group discussions, participants mentioned the subject areas in which they had encountered
difficulties.

The data in TABLE 4.8A reveal that except in Algebra I (B1U1) and Geometry (B2U1)
units, all other units were mentioned as difficult to understand by most of the respondents
irrespective of their G.C.E.(A/L) background. The unit on Integration (B3U2) is seems to
be the most difficult unit, as around 75% respondents in each group had indicated it as
difficult to understand. Differentiation (B3U1) and Trigonometry (B2U2) were also
mentioned as difficult to understand by 67.2% and 52.5% of the respondents.

Another noticeable fact is that with compared to the "Maths" group respondents a higher
percentage of "Bio" and "Other" group respondents had difficulties in Integration,
Differentiation, Trigonometry and Algebra II units. But surprisingly, compared with the
"Bio" respondents more "Maths" respondents had treated Algebra I and Geometry units as
difficult to understand.

TABLE 4.8B   UNITS WHICH WERE DIFFICULT TO UNDERSTAND IN APPLIED MATHEMATICS (MPF 1302) * A/L CATEGORY

Unit	A/L CATEGORY						Tot % (N =66)	
	Maths % (N = 35)		Bio % (N = 26)		Other % (N = 05)			
Statics I	9	25.7	12	46.2	3	60	24	36.4
Statics II	21	60.0	18	69.2	4	80	43	65.2
Dynamics	16	45.7	17.	65.4	5	100	38	57.6
Hydrostatics I	15	42.9	18	69.2	2	40	35	53.0
Hydrostatics II	10	28.6	6	23.1	2	40	18	27.3

In Applied Mathematics , Statics II (B1U2) can be considered as the most difficult unit as 65.2% respondents had mentioned it as difficult to understand. 46% of the "Maths" group, 65% of "Bio" group and all in "Other" group respondents had indicated that B2U1, (Dynamics) was difficult to understand. Hydrostatics I (B3U1), which covered the subject areas of pressure and thrust was mentioned as difficult to understand by 53 % of the respondents. Compared to those three units, the remaining two units, i.e. Statics I (B1U1) and Hydrostatics II (B3U2) were mentioned as the areas with understanding difficulties by fewer respondents.

During the discussion sessions the following subject areas were mentioned as difficult areas to understand by most of the participants.

Pure Mathematics		Applied Mathematics	
Subject area	Unit	Subject area	Unit
maxima,minima differentiation of trigonometric functions most of the areas in the latter part of Differen -tiation unit	B3U1	relative velocity, motion under impulse	B2U1
		framed structures equilibrium under coplanar forces	B1U2
Methods of integration areas and volumes	B3U2		
		pressure centre, resultant thrust	B3U1
sum of the series	B1U2		
		meta - centre stability of floating bodies	B3U2
solution of triangles trigonometric equations	B2U2		

Most of the difficult subject areas mentioned by the participants in the group discussions were also from the same units identified as difficult to understand by the questionnaire feed back. The main reasons given for the difficulties are:

* Explanation not clear
* Insufficient explanations   and
* Lack of worked examples.

In addition,

* Too many equations
* Too much subject content and
* New subject area   are the other given reasons.

From the questionnaire feed back it is found that a clear majority of respondents were satisfied with the level of language, clarity of figures, placing of figures, and letter size in the course material. Participants in the group discussions also had the same views over such issues. However, most participants had not considered such issues seriously. They had paid more attention on the issues dealing with the subject matter rather than with the presentation.

Subject areas in which spent more time

Students were asked to indicate the subject areas on which they had spent relatively more time with compared to the other areas, 70.3%   (64 out of 91) had replied in Pure Mathematics and 80.2% (73 out of 91) in Applied Mathematics . TABLE 4.8C shows the responses to Q 9.

TABLE 4.8C   UNITS IN WHICH SPENT RELATIVELY MORE TIME

Pure Mathematics (64)			Applied Mathematics (73)		
Relatively spent more time on	N	%	Relatively spent more time on	N	%
Algebra I (B1U1)	7	10.9	Statics I B1U1)	26	35.6
Algebra II (B1U2)	13	20.3	Statics II B1U2)	36	49.3
Geometry (B2U1)	20	31.2	Dynamics (B2U1)	28	38.4
Trigonometry (B2U2)	36	56.3	Hydrostatics I(B3U1)	35	47.9
Differentiation (B3U1)	44	68.8	Hydrostatics II (B3U2)	24	32.9
Integration (B3U2)	46	71.9			

Instead of the subject areas or lesson numbers respondents had written the unit number(s). From the results it is clear that in Pure Mathematics (MPF 1301) most of the respondents mentioned the last three units as the areas for which they had spent more time.

Reasons for spending more time

Students were also asked to give their reasons for spending more time on such units. A wide range of answers were given. They were grouped into six sets as follows :

Reason no.	Reason
1	explanation not clear/lack of explanation/latter part not clear/ not clear/ printing errors/lack of worked examples/ lack of SAQs/ language not simple
2	Difficult to understand/ difficult worked examples
3	new subject area/ previously followed very little
4	to study it well/ to get a better knowledge
5	too much subject content/ too many theorems/ too many formulae
6	other, such as not guided/ had to study it alone

TABLE 4.8D shows the distribution of the given reasons according to the above six sets.

TABLE 4.8D REASONS FOR SPENDING MORE TIME

Reason no.	Pure Mathematics						Applied Mathematics				
	B1U1	B1U2	B2U1	B2U2	B3U1	B3U2	B1U1	B1U2	B2U1	B3U1	B3U2
	N	N	N	N	N	N	N	N	N	N	N
1	3	6	11	15	18	18	10	14	7	8	5
2	1	3	2	3	3	3	4	4	8	5	3
3	1	3	3	4	8	8	6	7	4	11	6
4	1	–	–	2	3	3	2	4	2	2	2
5	–	–	4	11	10	12	–	–	–	2	1
6	1	1	–	1	2	2	4	7	7	7	7
TO	7	13	20	36	44	46	26	36	28	35	24

TABLE 4.8D reveals that in Pure Mathematics reason number one and five were mentioned by most of the respondents for the last three units. Reason number three was also mentioned by eight respondents for the last two units. In Applied Mathematics reason number one and three were mentioned by more respondents. Another noticeable fact is that although a considerable number of respondents mentioned reason number five for the last three units in Pure Mathematics, it was not considered as a main reason in Applied Mathematics.

4.2.4   *Worked examples and SAQs*

Questionnaire data reveals that, in both courses around 50% were satisfied with the existing number of SAQS but with respect to the number of worked examples it was only around 25%. The responses are shown in TABLE 4.9.

TABLE 4.9   SATISFACTION WITH THE NUMBER OF
                   WORKED EXAMPLES AND SAQS

Satisfaction with the number		Pure Mathematics			Applied Mathematics		
		Yes	No	Total	Yes	No	Total
worked examples	N	24	65	89	22	68	90
	%	(27)	(73)	(100)	(24.4)	(75.6)	(100)
SAQs	N	53	36	89	45	44	89
	%	(59.5)	(40.5)	(100)	(50.5)	(49.5)	(100)

It is noticed that in both courses there is a significant difference between the satisfaction with the existing number of worked examples and SAQs. $X^2 = 20.6$, at p = 0.05, df = 1 for Pure Maths and $X^2 = 13.74$, at p = 0.05, df = 1 for Applied Maths.

In both methods of feed back, it is found that the majority of students were not satisfied with the existing number of worked examples. In group discussions students mentioned that they need more difficult worked examples. Another common view was that TMA questions were much more difficult than the worked examples. Students also mentioned that in some worked examples, solutions were not step by step and therefore they had to spend more time on understanding such worked examples. In Pure Mathematics, the majority of respondents who were not satisfied with the existing number of worked examples said that they want more in Trigonometry, Differentiation and Integration units compared to other units. In the case of Applied Mathematics it was the two units on Statics.

With respect to the SAQs, in group discussions most participants were satisfied with the number but they stressed that the answers of the SAQs should be given. It is noticed that except in lesson number one and two in Hydrostatics II (B3U2) in Applied Mathematics, in all other units answers for the SAQs were not given. However, some SAQs were in the form of "Prove that..." or Show that...", which contained the final answer itself. Most "Non maths" category students mentioned that for difficult SAQs they need hints. Among the respondents who were not satisfied with the existing number of SAQs, nearly 70 % and 50 % stated that they need more in Integration and Trigonometry units. In Applied Mathematics as seen in worked examples, the majority indicated the two units in Statics. As noticed earlier instead of the specific subject areas respondents had indicated the unit numbers.

Average number of worked examples and SAQs in a lesson in each unit of the two courses are shown in TABLE 4.10.

TABLE 4.10   AVERAGE NUMBER OF WORKED EXAMPLES /SAQs
                    IN THE COURSE MATERIAL

Unit	Pure Mathematics		Applied Mathematics	
	Av. no. of worked ex. in a lesson	Av. no. of SAQs in a lesson	Av. no. of worked ex. in a lesson	Av. no. of SAQs in a lesson
B1U1	9	5	7	5
B1U2	7	4	5	5
B2U1	7	5	7	4
B2U2	10	5	--	--
B3U1	8	3 *	7	5
B3U2	6	5 *	5	4

* - Contained more parts

Any other comments / suggestions on course material

Very few had responded to Q22, in which they were asked to give their comments/ suggestions about the course material. Only 19.8% (18 out of 91) have replied in Pure Mathematics and 17.5% (15 out of 91)) in Applied Mathematics. Variety of comments/suggestions were given and similar comments/suggestions were combined. Results are shown below.

COMMENTS / SUGGESTIONS ON PURE MATHEMATICS COURSE MATERIAL

Comments		**N**
1	Printing errors in the lessons	5
2	Explanations are not step by step	2
3	Presentation not attractive	2
4	Level of language not simple	4
Suggestions		
5	Use different type face in the lessons	1
6	Include more difficult worked examples	2
7	Provide all course material together	1
8	Provide course material in smaller books	1
Total		**18**

COMMENTS /SUGGESTIONS ON APPLIED MATHEMATICS COURSE MATERIAL

Comment		**N**
1	only very simple and very difficult worked examples	2
Suggestions		
2	provide small blocks	1
3	provide a glossary	1
4	Give practical application questions	1
5	Explain subject matter simply/ explain step by step/ present subject matter with more examples	4
6	include the "vectors" subject area	6
Total		**15**

Summary

Questionnaire feed back and group discussion results reveal that in both courses the majority were satisfied with the issues relating to the presentation of course material such as, level of language, clarity, size and placing of diagrams , letter size and size of the course units. 75 % respondents in Pure Mathematics and 66% in Applied Mathematics would like to have audio-visual material in the course. Questionnaire feedback shows that in both courses nearly 85 % had the audio facilities at home but it was only 40 % in the case of video facilities.

Irrespective of their A/L background 'Differentiation' and 'Integration' in Pure Mathematics were mentioned as the units they had studied less amount of content. In the case of Applied Mathematics it was the 'Hydrostatics' area. A noticeable fact is that in general in both courses, when compared to the 'Maths' group, 'Bio' and "Other' groups had studied less amount of content in each unit. In Pure Mathematics, half of the 'Bio' group and nearly 45% in 'Other' group had studied less than quarter of the course content in Integration and Differentiation units. In Applied Maths, nearly 40% of 'Bio' group and 50% of 'Other' group had studied less than half of the course content in two Hydrostatics units and in Statics II unit. Integration, Differentiation,Trigonometry, Hydrostatics I and Statics II were the units in which respondents had spent relatively more time than the other units. "Explanation not clear", "lack of explanations" and "lack of worked examples" were the most common reasons given for spending more time. But in the case of Pure Mathematics reasons such as "too much subject content", "too many theorems" and "too many formulae" were also mentioned by a considerable amount of respondents.

As expected a small percentage of "Maths" category respondents had difficulties in understanding the course material in many occasions. But it was around 40% in 'Bio" category and more than 50% in 'Other" category. Instead of difficult subject areas respondents mentioned the unit numbers. Accordingly, in Pure mathematics out of the 61 who responded to that particular question, irrespective of their A/L category around 75% stated 'Integration' as the difficult unit. 'Differentiation' and 'Trigonometry' are the next two units mentioned by more percentage of respondents. In the case of Applied mathematics, out of 66, more than 60% had mentioned 'Statics II' as the difficult unit. 'Dynamics' and 'Hydrostatics I' were also mentioned. However, some specific subject areas were explored in group discussions. "Explanation not clear", "insufficient explanations" and "lack of worked examples" were the most common reasons given for the difficulties. It was also found that nearly 75% of the respondents were not satisfied with the number of worked examples in the course material. But it was only around 45% in the case of SAQs. Students also commented that answers for the SAQs were not given.

4.3   Day Schools

In this section issues such as attendance in Day Schools, satisfaction with the number of Day Schools, way of conducting Day Schools, usefulness of Day Schools are compared with different variables. In addition, it is also examined the link between respondents age group, A/L category and employment with the two factors; "help from another teacher" and "study in a group". Type of changes that respondents would like to have in Day Schools are also examined.

4.3.1   Attendance in Day Schools

Day School attendance by A/L background

There are six Day Schools in each course which are conducted on public holidays. The time duration of a Day School is three hours. The purpose of having Day Schools is to assist the students who have difficulties in understanding the course material. However, attendance in Day Schools are not a compulsory requirement. Day Schools are conducted at all three regional centres and five other study centres. Attendance in Day Schools are shown in TABLE 4.11A.

TABLE 4.11A   ATTENDANCE IN DAY SCHOOLS
                     * A/L BACKGROUND

No. of Day Schools attended		Pure Mathematics				Applied Mathematics			
		Maths	Bio	Other	Tot	Maths	Bio	Other	Tot.
0 - 1	N	10	4	3	17	24	8	1	33
	%	20.4	16.7	16.7	18.7	44.4	27.6	16.7	37.0
2 - 3	N	17	12	10	39	19	7	2	28
	%	34.7	50.0	55.5	42.8	35.2	24.1	33.3	31.5
> 3	N	22	8	5	35	11	14	3	28
	%	44.9	33.3	27.8	38.5	20.4	48.3	50.0	31.5
Total	N	49	24	18	91	54	29	6	89
	%	100	100	100	100	100	100	100	100

The data in TABLE 4.11A shows that 38.5% (35 out of 91), had participated in three or more Day Schools in Pure Mathematics. It was and 31.5% (28 out of 89) in the case of Applied Mathematics.

It is noticed that in both courses, especially in Applied mathematics, compared with "Bio" and "Other" group respondents, a greater percentage of "Maths" group respondents had attended only one Day School or not at all. It is also seen that compared with Pure maths, more percentage of respondents had attended less number of Day Schools in Applied Maths. It is found that there is a significant difference between the overall attendance pattern of the respondents with respect to the course. $X^2 = 7.18$, at $p = 0.05$, $df = 2$.

Day School attendance by employment

Day School attendance were compared with employment category to find out whether employed students had participated in less Day Schools.The results are shown in TABLE 4.11B.

TABLE 4.11B   ATTENDANCE IN DAY SCHOOLS * EMPLOYMENT

No.of Day Schools attended		Pure Mathematics				Applied Mathematics			
		FT	PT/ SE	UN	To	FT	PT/ SE	UN	To
0 - 1	N	8	5	4	17	12	4	17	33
	%	32.0	23.8	08.9	18.7	42.9	50	32.1	37.0
2 - 3	N	6	9	24	39	6	2	20	28
	%	24.0	42.9	53.3	42.8	21.4	25	37.7	31.5
> 3	N	11	7	17	35	10	2	16	28
	%	44.0	33.3	37.8	38.5	35.7	25	30.2	31.5
Total	N	25	21	45	91	28	8	53	89
	%	100	100	100	100	100	100	100	100

In both courses, compared with the unemployed respondents, a greater percentage of full time employed respondents had attended only one or none Day Schools. But on the other hand in both courses among the three categories highest percentage of respondents who had attended three or more Day Schools were also recorded from the full time employed category.

A common pattern of attendance was noticed among the full time employed respondents. That is, a small group attended 2-3 Day Schools and the rest roughly split evenly among the two groups who had attended less and more than that number of Day Schools.

It is also noticed that the unemployed respondents participation in Pure Maths Day Schools is much better compared with Applied Maths. In Pure Maths, only 8.9% (4 out of 45) had attended less number of Day Schools. In Applied Maths respondents were fairly evenly split among the three attendance groups.

Day School attendance by regional centre

As mentioned earlier Day Schools are conducted at all three regional centres and five other study centres. Each study centre is attached to a one of the three regional centres as shown below.

Study centre	Regional centre
Ratnapura	Colombo
Kurunegala Anuradhapura Batticaloa	Kandy
Ambalangoda	Matara

In the questionnaire students were asked to indicate only their regional centre. Therefore Day School attendance at a particular regional centre actually means the attendance at that regional centre together with attendance at all other study centres which are attached to that particular regional centre. For an example, Day School attendance at Kandy regional centre includes the Day School attendance at Kurunegala, Anuradhapura, and Batticaloa study centres. Day School attendance at the three regional centres are shown in TABLES 4.11C.

TABLE 4.11C   ATTENDANCE IN DAY SCHOOLS
* REGIONAL CENTRE

No.of Day Schools attended		Pure Mathematics				Applied Mathematics			
		Col.	Kan.	Mat.	To	Col.	Kan.	Mat.	To
0-1	N	10	6	1	17	13	18	2	33
	%	23.3	15.4	11.1	18.7	29.5	46.2	33.3	37.0
2-3	N	20	16	3	39	19	9	--	28
	%	46.5	41.0	33.3	42.8	43.2	23.0		31.5
>3	N	13	17	5	35	12	12	4	28
	%	30.2	43.6	55.6	38.5	27.3	30.8	66.7	31.5
Total	N	43	39	9	91	44	39	6	89
	%	100	100	100	100	100	100	100	100

In both courses, compared to the other two regional centres a greater percentage of Matara respondents had attended more than 50% of Day Schools.

Reasons for poor attendance

Students who attended fewer than 50% of Day schools (i.e. less than three Day Schools) were asked to indicate the reason. There were 56 respondents who had attended less than 50% of Day Schools in Pure Maths but 63 had given answers. In Applied Maths, 60 out of 61 relevant respondents had answered. The most common answers are as follows:

No.	Reason for the poor participation at Day Schools	Pure Maths		Applied Maths	
		N	%	N	%
A	Not satisfied with the way of conducting Day Schools	15	23.8	18	30.0
B	Family commitments / Change in personal life pattern	12	19.8	7	11.7
C	Travel difficulties	7	11.1	5	8.3
D	Able to find solutions	6	9.5	10	16.7

Difficult to follow the course and ill health were also mentioned as the reasons. Some of them had mentioned combination of above common reasons. It is found that only one respondent in Pure Maths and two in Applied Maths had mentioned their employment as the barrier to attend Day Schools. Dissatisfaction with the way of conducting Day Schools was the most common reason in both courses. Around 10% had mentioned that their poor participation was due to the travel difficulties.

4.3.2 Usefulness of Day Schools

Usefulness of Day Schools by A/L category

As there were very few responses of the A/L "Other" group in Applied Maths, "Bio" and "Other" groups were combined together and named it as "Non maths" category. Then the comparisons were made in between "Maths" and "Non maths" categories and the results are shown in TABLE 4.12.

TABLE 4.12 USEFULNESS OF DAY SCHOOLS * A/L CATEGORY

Usefulness of Day Schools		Pure Mathematics			Applied Mathematics		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Very useful	N	6	6	12	3	6	9
	%	15.4	15.8	15.6	9.7	21.4	15.3
Useful	N	24	23	47	21	14	35
	%	61.5	60.5	61.0	67.7	50.0	59.3
Not useful	N	9	9	18	7	8	15
	%	23.1	23.7	23.4	22.6	28.6	25.4
Total	N	39	38	77	31	28	59
	%	100	100	100	100	100	100

In Pure Mathematics almost similar response pattern was noticed among the two A/L categories of "Maths" and "Non maths'. But in Applied Mathematics compared with "Maths" category, a much higher percentage of "Non maths" category respondents had treated Day Schools as very useful. In both courses around 25% in each category had mentioned that the Day Schools were not useful. However, some useful information were missed as there was no follow up question to find out their attitudes about the usefulness of Day Schools.

4.3.3   Number of Day Schools

Satisfaction with the Number of Day Schools by A/L category

Regarding the issue of satisfaction with the existing number of Day Schools. 75 had responded in Pure Mathematics but only 57 in Applied Mathematics. Responses by two A/L categories are shown in TABLE 4.13.

TABLE 4.13   SATISFACTION WITH THE NUMBER OF DAY SCHOOLS
* A/L CATEGORY

Satisfaction with the existing number		Pure mathematics			Applied Mathematics		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Yes	N	10	16	26	15	9	24
	%	25.6	44.4	34.7	51.7	32.1	42.1
No	N	29	20	49	14	19	33
	%	74.6	55.6	65.3	48.3	67.9	57.9
Total	N	39	36	75	29	28	57
	%	100	100	100	100	100	100

Nearly 1/3 of the total respondents (i.e. 34 out of 91) did not answer to this question in Applied Maths. It is clear from the data in TABLE 4.13 that compared with the "Non maths" category, a greater percentage of "Maths" category respondents were not satisfied with the existing number of Day Schools in Pure Mathematics. But it was the other way round in Applied Mathematics, where a greater percentage of "Non maths" category were not satisfied with the existing number.

Overall, 65.3% of the respondents (49 out of 75) in Pure Maths and 57.9% (33 out of 57) in Applied maths were not satisfied with the existing number of day schools. In both courses, there is no significant difference between the two A/L categories with respect to the satisfaction with the number of Day Schools. $X^2 = 3.77$, at p = 0.05, df = 2 and $X^2 = 2.592$, at p = 0.05, df = 2 for Pure Maths and Applied Maths respectively. However, it is noticed that the X^2 value in Pure Maths is closer to the critical value of 3.841.

Students were asked to indicate their suggested number if they were not satisfied with the existing number of Day Schools. All who answered had suggested more than the existing number of Day Schools, which was also the view of the participants in group discussions.

4.3.4 *Way of conducting Day Schools*

Way of conducting Day Schools by A/L category

Students opinion about the way of conducting Day Schools according to the two A/L categories are shown in TABLE 4.14.

TABLE 4.14   SATISFACTION WITH THE WAY OF CONDUCTING DAY SCHOOLS * A/L CATEGORY

Satisfaction with the way of conducting Day Schools		Pure Mathematics			Applied Mathematics		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Yes	N	13	15	28	13	7	20
	%	32.5	43.0	37.3	42.0	25.0	33.9
No	N	27	20	47	18	21	39
	%	67.5	57.0	62.7	58.0	75.0	66.1
Total	N	40	35	75	31	28	59
	%	100	100	100	100	100	100

Overall, in both courses around 60 % of the respondents were not satisfied with the way of conducting Day Schools. Another noticeable fact is that in both courses there is no significant difference between the two A/L categories with respect to the satisfaction with the pattern of conducting Day Schools. $X^2 = 0.876$, at $p = 0.05$, df = 1 for Pure Maths and $X^2 = 1.219$, $p = 0.05$, df = 1 for Applied Maths.

It is clear from the data in TABLES 4.13 and 4.14 that in both courses, irrespective of their A/L category, the majority of the respondents were not satisfied with the existing number of Day Schools and also with the way of conducting Day Schools. It is already noticed in section 4.3.1 that the majority of respondents who had attended less number of Day Schools were given the reason "not satisfied with the way of conducting Day Schools" for their poor participation.

In both courses, nearly 25% of the respondents indicated that Day Schools were not useful. The time duration of a Day School is three hours and within that time duration students are expected to discuss their difficulties in the course material relevant to the subsequent TMA with the Day School lecturer.

Participants in the group discussions also mentioned the same views with respect to the "number of Day Schools" and " way of conducting Day Schools". It was especially the 'Non maths' category who were not satisfied with the number and with the pattern of conducting Day Schools.They said that the number of Day Schools should be increased in order to discuss all the subject areas in the course material and also to discuss the subject matter from basics. These two facts were also mentioned by the majority of respondents who responded to the question, in which they were asked to indicate the changes that they would like to have in Day Schools. Day School lecturers pointed out that students do not come prepared for the day schools and they expect Day School lecturer to discuss the entire material, which was not possible during the given time schedule. They agreed with the fact that the number of Day Schools should be increased in order to discuss subject matter in more detail. They said that at present , within the limited time frame it was not possible even to discuss the more important areas adequately. In both Colombo and in Kandy centres, it was mentioned that around 50 -60% attended initially and then the attendance in the Day Schools were dropped gradually. Day school lecturers mentioned that students expect all the areas to be discussed and when they realise that it was not possible according to the existing pattern, they dropped from attending the Day schools. Day School lecturers also mentioned that there were some students who participated in fewer Day Schools because they had followed A/L in Maths. This fact was also noticed from the data in TABLE 4.11A.

Changes in Day Schools

Respondents had given a number of suggestions. In both courses especially in Pure Maths, there were two main common suggestions mentioned by the "Maths" category, i.e. "discuss all subject matter from basics" and "do more questions". But in both courses, a clear majority of "Non maths" category had suggested that all subject areas should be discussed from basics in the Day Schools. Succinctly, the majority of respondents who were not satisfied with the existing way of conducting day Schools would like Day School lecturer to "discuss all subject areas from basic" in the Day Schools.

4.3.5   Help from another teacher

Help from another teacher by A/L category

As a clear majority of respondents had obtained help from another teacher, the responses were compared with their A/L category and age to identify which type of respondents had obtained help from another teacher. Help from another teacher compared with A/L category is shown in TABLE 4.15A.

TABLE 4.15A   HELP FROM ANOTHER TEACHER * A/L CATEGORY

Help from another teacher		Pure Mathematics			Applied Mathematics		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Yes	N	34	34	68	37	29	66
	%	69.4	81.0	74.7	68.5	80.5	73.3
No	N	15	8	23	17	7	24
	%	30.6	19.0	25.3	31.5	19.5	26.7
Total	N	49	42	91	54	36	90
	%	100	100	100	100	100	100

Almost same response pattern is seen in between the two courses. Around 80% "Non maths" category respondents and around 70% "Maths" category respondents had obtained help from another teacher. There is no significant difference between the students A/L maths background and obtaining help from another teacher. $X^2 = 2.101$, at $p = 0.05$, df = 1 for Pure Maths and $X^2 = 2.114$, $p = 0.05$, df =1 for Applied Maths.

Overall, in both courses around 75% had obtained help from another teacher. It was seen in TABLES 4.13A and 4.14 that most of the respondents were not satisfied with the number of Day Schools and way of conducting Day Schools, which may be reasons for obtaining help from another teacher. However, there may be many other reasons. But unfortunately this useful information could not obtained as students were not asked further questions such as reasons for obtaining help from another teacher or what type of help they needed.

In both courses, around 70% had obtained help from another student. In Pure Maths 36.7% who obtained help from another teacher, had met him at least once a week, while it was 48.5% in Applied Maths.

Help from another teacher by age

Help from another teacher compared with age is shown in TABLE 4.15B.

TABLE 4.15B HELP FROM ANOTHER TEACHER * AGE GROUP

Age group		Pure Mathematics			Applied Mathematics		
		Help from another teacher			Help from another teacher		
		Yes	No	Tot	Yes	No	Tot
18-24	N	44	12	56	44	16	60
	%	(78.6)	(21.4)	(100)	(73.3)	(26.7)	(100)
25-29	N	13	5	18	12	6	18
	%	(72.2)	(27.8)	(100)	(66.7)	(33.3)	(100)
>=30	N	11	6	17	10	2	12
	%	(64.7)	(35.3)	(100)	(83.3)	(16.7)	(100)
Total	N	68	23	91	66	24	90
	%	(74.7)	(25.3)	(100)	(73.3)	(26.7)	(100)

In Pure Maths, a greater percentage of youngest respondents had obtained help from another teacher. But in the case of Applied Maths, it was the oldest group.

4.3.6 Study in a group

Study in a group by regional centre

The responses for 'study in a group' were compared with the regional centre to examine whether there is a link between them.

TABLE 4.16A STUDIED IN A GROUP * REGIONAL CENTRE

Studied in a group		Pure Mathematics				Applied mathematics			
		C	K	M	Tot	C	K	M	Tot
Yes	N	22	23	1	46	24	24	--	48
	%	(51.2)	(58.9)	(11.1)	(50.5)	(53.3)	(63.8)		(53.9)
No	N	21	16	8	45	21	14	6	41
	%	(48.8)	(41.1)	(88.9)	(49.5)	(46.7)	(36.2)	(100)	(46.1)
Total	N	43	39	9	91	45	38	6	89
	%	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

In Colombo, one in two mentioned that they studied in a group. In both courses, with compared to the other two centres, a greater percentage of Kandy respondents were involved in group studies. A noticeable fact is that in Matara centre, in Pure Mathematics, only one respondent mentioned that he was involved in group studies and none in Applied Mathematics. In Matara only 16 and 12 were participated in the courses respectively.

Fewer participants, Geographical spread out of participants, and travel difficulties may have effected for the non participation in group in studies. Overall, 50.5% (46 out of 91) respondents in Pure Maths and 53.4% (48 out of 89) respondents in Applied Maths were involved in group studies.

Study in a group by age

TABLE 4.16B   STUDIED IN A GROUP * AGE GROUP

Studied in a group		Pure Mathematics				Applied Mathematics			
		Age group				Age group			
		18-24	25-29	>=30	Tot	18-24	25-29	>=30	Tot
Yes	N	34	7	5	46	33	10	5	48
	%	(60.7)	(38.8)	(29.0)	(50.5)	(56.0)	(55.0)	(41.7)	(53.9)
No	N	22	11	12	45	26	8	7	41
	%	(39.3)	(61.2)	(71.0)	(49.5)	(44.0)	(45.0)	(58.3)	(46.1)
Total	N	56	18	17	91	59	18	12	89
	%	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

The data in TABLE 4.16B disclose that in both courses a higher percentage of respondents in the 18 -24 age group had studied in a group with compared to the other two age groups. It is also noticed that in Pure Mathematics there is a significant difference between the age group with respect to group studies ($X^2 = 7.238$, at $p = 0.05$, df = 2) but not in Applied Mathematics ($X^2 = 0.1010$, at $p = 0.05$, df = 2)

Study in a group by employment

TABLE 4.16C   STUDIED IN A GROUP * EMPLOYMENT CATEGORY

Studied in a group		Pure Mathematics			Applied Mathematics		
		Employment			Employment		
		FT/ PT/SE	UNE	Tot	FT PT/SE	UNE	Tot
Yes	N	16	30	46	16	32	48
	%	(34.8)	(66.7)	(50.5)	(45.7)	(59.0)	(53.9)
No	N	30	15	45	19	22	41
	%	(65.2)	(33.3)	(49.5)	(54.3)	(41.0)	(46.1)
Total	N	46	45	91	35	54	89
	%	(100)	(100)	(100)	(100)	(100)	(100)

As expected, it shows that in both courses a higher percentage of unemployed respondents studied in a group with compared to the other category which involved full time employees, part time employees and self employees. The reason for this higher percentage is clear as they had more spare time than the other category to involve in group studies. In Pure Maths 66.7% of the unemployed respondents had studied in a group while it was only 34.8% for the employed respondents. It is also seen that there is a significant difference between the two variables, i.e. "employment status " and "studied in a group" $(X^2 = 8.618$, at p = 0.05, df = 1).

In Applied Maths, 59.2% unemployed respondents were involved in group studies and it was 45.7% for the employed category. But in this course, there is no significant difference between the two variables. $(X^2 = 1.795$, at p = 0.05, df = 1)

Summary

There are six Day Schools in each course. Nearly 20% in Pure Mathematics and 37% in Applied Mathematics had attended either only one Day School or none. It seems that employment did not affect attendance at Day Schools as 44% full time employed respondents in Pure maths and 36% in Applied Maths had attended more than three Day Schools. Most of the respondents who had attended less than 50% mentioned "not satisfied with the way of conducting Day Schools" as the reason for their poor participation. However, in both courses three in four respondents who had attended Day Schools stated that they were either useful or very useful. But the majority of respondents were not satisfied with the number of Day Schools and the way of conducting Day Schools. Most of the respondents and participants in group discussions suggested that in the Day schools subject matter should be discussed in more detail. In addition, it is noticed that irrespective of respondents A/L background, age group and employment the majority of respondents had obtained help from another teacher. Among the respondents who had obtained help from another teacher; 36% in Pure Mathematics and 48% in Applied Mathematics had met their other teacher at least once a week. Overall, in both courses around 85% had met their other teacher at least once a month. In both courses around 50% were involved in group studies. A noticeable fact is that almost all in Matara were not involved in group studies. As expected a greater percentage of unemployed respondents were involved in group studies.

4.4 Tutor Marked Assignments (TMAs)

This section looks into the issues of number of Tutor Marked Assignments (TMAs), understandability of TMA questions, representation of subject matter in TMAs. In addition submission pattern and pass rates are analysed with respect to the two A/L categories 'Maths' and "Non maths'.

4.4.1 Number of TMAs

There are four TMAs in each course. The first two TMAs are given at the time of registration and the remaining two are sent by post during the middle part of the academic year. The first two TMA s covers the areas of the first two units. The 3rd and 4th TMAs in Pure Maths cover 4 units, while in Applied Maths last two TMAs cover 3 units.

Questionnaire feed back reveals that 85.7% of the respondents in Pure Maths and 87.6% in Applied Maths were satisfied with the existing number of TMAs. Similar view was mentioned in group discussions. A very few participants who had followed A/L in maths stream said that they wanted to have more TMAs, preferably one TMA per unit.

4.4.2 Understandability of TMA questions

Understandability by A/L category

Responses for the understanding of TMA questions were compared with their A/L background and is given in TABLE 4.17.

TABLE 4.17   UNDERSTANDABILITY OF TMA QUESTIONS
* A/L CATEGORY

Understanda-bility of TMA questions		Pure Mathematics				Applied Mathematics			
		Maths	Bio	Other	Tot.	Maths	Bio	Other	Tot.
Yes	N	46	21	12	79	47	16	3	66
	%	(93.9)	(87.5)	(66.7)	(86.8)	(92.2)	(53.3)	(50.0)	(75.8)
No	N	2	3	6	11	4	13	3	20
	%	(4.1)	(12.5)	(33.3)	(12.1)	(7.8)	(43.3)	(50.0)	(23.0)
Some-times	N	1	--	--	1	--	1	--	1
	%	(2.0)			(1.1)		(3.4)		(1.1)
Total	N	49	24	18	91	51	30	6	87
	%	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Nearly one in four respondents had difficulties in understanding the TMAs in Applied mathematics. It is also noticed that in both courses compared with the "Bio" and "Other" group respondents a very low percentage of "Maths" group respondents had difficulties in understanding the TMA questions. The reason is quite clear as they were familiar with the questions and terminology.

Reasons for the difficulty

With respect to the reasons for the difficulty in understanding TMA questions, in Pure Maths 20 had responded although only 11 were stated that they had difficulties. The main reasons given by the respondents are:

* Some questions were complicated/ Difficult questions in   (40%)
  Trigonometry and Integration areas

* Due to printing errors   (25%)

Other reasons mentioned by the remaining respondents were difficulty to read due to the poor quality of printing and language used was not simple.

In Applied mathematics, although there were 20 respondents who had difficulties in understanding the TMA questions 23 had replied. The main reason given was

* TMA questions were difficult than the worked examples (30.4%)

Other reasons given were

* Difficult to read due to poor print

* Difficult to understand the questions in relative velocity, projectiles subject
  areas   and

* Haven't followed A/L in maths

4.4.3   *Representation of subject matter in TMAs*

During the group discussions it was found that most of the students were satisfied with the number of questions in a TMA. Most of them mentioned that Geometry subject area in Pure Mathematics was not adequately represented in TMAs. It is found that Geometry and Trigonometry were covered in TMA number three and out of five questions there was only one from Geometry. Unfortunately in the questionnaires, there was no question about the representation of subject matter in TMAs. A noticeable fact is that TMA 3 & 4 in Pure Maths and TMA 4 in Applied Maths covers subject areas of two units. It may be a reason for students requesting more time duration for such TMAs and also may be a reason for the poor submission rate with compared to the other TMAs. The number of questions from each unit in the TMAs is shown in TABLE 4.18.

TABLE 4.18 REPRESENTATION OF SUBJECT AREAS IN TMAs

TMA no.	Pure Maths		Applied Maths	
	No. of questions	Relevant unit	No. of questions	Relevant unit
1	5	Algebra I	5	Statics I
2	5	Algebra II	5	Statics II
3	1 4	Geometry Trigonometry	5	Dynamics
4	3 2	Differentiation Integration	2 3	Hydrostatics I Hydrostatics II

4.4.4   Comments on TMAs

Students were satisfied with the number of questions in a TMA. But a common view was that TMA questions were much more difficult than the worked examples. TMA number one and two were given at the time of registration which took place during the period of mid February to early March. At the time of group discussions which were conducted in September and October, it was noticed that students had received only one marked TMA and all of them were not satisfied with the time taken to sent back that marked TMA. They stressed that marked TMA should be send before the deadline of the subsequent TMA, in order to identify their weaknesses. Almost all participants mentioned that marking examiners had not made any comments on their answer scripts.

In the questionnaire feed back 38.9% (35 out of 90) respondents in Pure Mathematics mentioned that marking examiners had never made comments on their answer scripts and it was 39.3% (33 out of 84) in Applied Mathematics.

Errors in some Sinhala medium TMA questions and poor quality of printing were mentioned as the other common views about the TMAs in both methods of feed back. In group discussions most students suggested that English medium TMAs should be provided to the other medium students. "To cross check the accuracy of equations and figures in the questions" and " to get familiar with the English terminology " were the given reasons for that suggestion. In Mid Session Tests English translation was printed on the reverse side of the Sinhala and Tamil question papers. Most of the students mentioned that TMAs should not be roneoed and should be printed in good quality papers.

Regarding the issue on usefulness of model answers, the majority of respondents in Pure Mathematics i.e. 43.3% (13 out of 30) indicated that the model answers should be prepared in a simple way. This was also pointed out in the group discussions. In Applied Mathematics, out of the 30 respondents, 30% had mentioned that explanations were not sufficient. 13.3% had mentioned that model answers were not clear enough and another 13.3% mentioned that they had not received some of the model answers before the final examination.

4.4.5   Submission pattern of TMAs

Submission of TMAs - respondents

Submission pattern of TMAs of the two sets of respondents are given in TABLE 4.19A.

TABLE 4.19A   SUBMISSION PATTERN OF TMAs
                   OF THE RESPONDENTS

Submission of TMA		Pure Mathematics				Applied Mathematics			
			TMA number				TMA number		
		1	2	3	4	1	2	3	4
Yes	N	75	65	67	50	74	66	62	50
	%	(82.4)	(71.4)	(73.6)	(55.0)	(81.3)	(72.5)	(68.0)	(55.0)
No	N	16	26	24	41	17	25	29	41
	%	(17.6)	(28.6)	(26.4)	(45.0)	(18.7)	(27.5)	(32.0)	(45.0)
Total	N	91	91	91	91	91	91	91	91
	%	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Almost similar submission pattern is seen in the two courses. The submission ratio decreases gradually, except in one occasion in Pure Maths, where there was a slight increase for the 3 rd TMA. In both courses around 80% of the respondents had submitted the first TMA and the lowest submission rate, which was 55% was recorded for the last TMA. In both courses, there is a significant difference between the submission rate and different TMAs. X^2 =17.222, at p = 0.05, df =3 for Pure Maths and X^2 = 15.472, at p = 0.05, df = 3 for Applied Maths.

Submission of TMAs - populations

TMA submission pattern of the two populations were also examined to find out whether it is different from the respondents.

**TABLE 4.19B   SUBMISSION PATTERN OF TMAs
OF THE POPULATIONS**

Submission of TMA		Pure Mathematics				Applied Mathematics			
		TMA number				TMA number			
		1	2	3	4	1	2	3	4
Sub	N	259	202	180	131	234	179	189	111
	%	(79.0)	(61.6)	(54.5)	(39.9)	(74.0)	(56.6)	(59.8)	(35.1)
Not sub	N	69	126	148	197	82	137	127	205
	%	(21.0)	(38.4)	(45.5)	(60.1)	(26.0)	(43.4)	(40.2)	(64.9)
Total	N	328	328	328	328	316	316	316	316
	%	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Almost the same submission pattern was found in the two populations. Submission rates dropped gradually as seen in the respondents submission rates (except in TMA 3 in Applied Maths, where there was a slight increase). It is also noticed that in both courses the submission rate of the last TMA was nearly half of the 1st TMA. It is clear from the data in TABLES 4.19A and 4.19B that in both courses the respondents submission rate was higher than the population submission rate in each TMA, which suggests that the respondents may be a set of active participants in the population. A common fact about the submission rates of the respondents is that the highest difference between the two consecutive TMAs was recorded in between TMA 3 and TMA 4 (the last). This is also noticed in the population submission rates.

According to the eligibility criteria, only the best 3 marks of the TMAs are considered when determining the overall Continuous Assessment (CA) mark. Therefore, students who have submitted the first 3 TMAs and satisfied with their performance in those 3 may take little interest to submit the last TMA.

Submission pattern by A/L category

Submission pattern of the two sets of respondents were compared with their A/L category as shown in TABLE 4.19C.

TABLE 4.19C   SUBMISSION PATTERN OF TMAs OF THE
                     RESPONDENTS * A/L CATEGORY

TMA number		Pure Mathematics		Applied Mathematics	
		Number submitted		Number submitted	
		Maths N=49 (100)	Non maths N=42 (100)	Maths N=55 (100)	Non maths N=36 (100)
1	N	42	33	47	27
	%	(85.7)	(78.6)	(85.5)	(75.0)
2	N	34	31	41	25
	%	(69.4)	(73.8)	(74.5)	(69.4)
3	N	39	28	37	25
	%	(79.6)	(66.7)	(67.3)	(69.4)
4	N	30	20	33	17
	%	(54.5)	(47.6)	(60.0)	(47.2)

In both courses, the "Maths" respondents submission rate was higher than the "Non maths" category in three TMAs. However, it is found that in both courses, there is no significant difference in the submission pattern with respect to the A/L category. $X^2 = 0.949$, at p = 0.05, df = 3 for Pure Maths and $X^2 = 0.675$, at p = 0.05, df = 3 for Applied Maths.

4.4.6   Performances in TMAs

TMA performances by A/L category

TMA performances of the respondents were compared with their A/L category to find out which category had performed well in TMAs. The results are shown in TABLES 4.20A. and 4.20B.

TABLE 4.20A   TMA PERFORMANCES OF THE
                          PURE MATHEMATICS RESPONDENTS * A/L CATEGORY

TMA no.	Maths			Non maths			Total		
	Pass	Fail	Total	Pass	Fail	Total	Pass	Fail	Total
1	35	7	42	28	5	33	63	12	75
%	(83.3)	(16.7)	(100)	(84.8)	(15.2)	(100)	(84.0)	(16.0)	(100)
2	29	5	34	25	6	31	54	11	65
%	(85.3)	(14.7)	(100)	(80.6)	(19.4)	(100)	(83.1)	(16.9)	(100)
3	29	10	39	23	5	28	52	15	67
%	(74.4)	(25.6)	(100)	(82.1)	(17.9)	(100)	(77.6)	(22.4)	(100)
4	26	4	30	19	1	20	45	5	50
%	(86.7)	(13.3)	(100)	(95.0)	(05.0)	(100)	(90.0)	(10.0)	(100)

TABLE 4.20B TMA PERFORMANCES OF THE
APPLIED MATHEMATICS RESPONDENTS * A/L CATEGORY

TMA no.	Maths			Non maths			Total		
	Pass	Fail	Total	Pass	Fail	Total	Pass	Fail	Total
1	42	5	47	17	10	27	59	15	74
%	(89.4)	(10.6)	(100)	(63.0)	(37.0)	(100)	(79.7)	(20.3)	(100)
2	36	5	41	17	8	25	53	13	66
%	(87.8)	(12.2)	(100)	(68.0)	(32.0)	(100)	(80.3)	(19.7	(100))
3	29	8	37	20	5	25	49	13	62
%	(78.4)	(21.6)	(100)	(80.0)	(20.0)	(100)	(79.0)	(21.0)	(100)
4	30	3	33	15	2	17	45	5	50
%	(90.9)	(09.1)	(100)	(88.2)	(11.8)	(100)	(90.0)	(10.0)	(100)

A noticeable fact is that in both courses and in each category the pass rates of TMAs were above 75% except in three occasions. However, overall pass percentages were over 75% in each TMA in both courses. Another distinguished fact is that although TMA 4 had the lowest submission rate, it recorded the highest pass rate in both A/L categories in both courses. Pass rates of the two A/L categories were compared for each TMA in both courses and it is noticed that except in TMA 1 in Applied Mathematics (MPF 1302) where $X^2 = 9.32$, at $p = 0.05$, df = 1, in all other cases, no significant difference was found between the two A/L categories with respect to the pass rates at $p = 0.05$. However, it is noticed that in TMA 2 in Applied Maths where $X^2 = 3.648$, at $p = 0.05$, df = 1, the X^2 value is closer to the critical value, which is 3.841.

Mean values of the TMAs by A/L category

In addition t -test was also used to compare the mean values of TMA marks of the respondents with respect to their A/L category to find out whether there is a significant difference between the mean values of the two categories.The results are given in TABLE 4.20C.

TABLE 4.20C   t -TEST FOR EQUALITY OF MEANS IN TMAs

TMA no.	A/L cat.	N	Mean	Std.de.	t (two tailed test)
MPF 1301 Pure Mathematics					
1	Maths	42	59.71	19.46	0.796, at p = 0.05, df = 73
	Non maths	33	56.12	19.35	
2	Maths	34	64.74	20.31	1.449, at p = 0.05, df = 63
	Non maths	31	57.52	19.80	
3	Maths	39	55.38	20.94	-0.396, at p = 0.05, df = 65
	Non maths	28	57.43	20.67	
4	Maths	30	59.50	20.69	-1.126, at p = 0.05, df = 48
	Non maths	20	66.15	20.10	
MPF 1302 Applied Mathematics					
1	Maths	47	61.09	17.02	3.438, at p = 0.05, df = 72
	Non maths	27	45.41	21.79	
2	Maths	41	60.05	21.43	2.261, at p = 0.05, df = 64
	Non maths	25	48.40	18.27	
3	Maths	37	52.84	17.38	-0.523, at p = 0.05, df = 60
	Non maths	25	55.16	16.83	
4	Maths	33	56.91	11.16	-.021, at p = 0.05, df = 48
	Non maths	17	57.00	20.24	

From the t test values it is found that there is a significant difference between the two mean values in the first two TMAs in Applied Mathematics. In all other TMAs no significant difference was found in mean values with respect to the two A/L categories. The reason for the significant difference may be due to the low pass percentages of the "Non maths" category students with compared to the "Maths" category.

Although most of the "Non maths" category students, who had participated in group discussions mentioned that the last two TMAs were difficult with compared to the other TMAs, the results of the Chi square test and t test for comparison of means, show that there is no significant difference between the performance of the two categories in those TMAs. Surprisingly, the "Non maths" category mean values of TMA 3 and 4 in both courses were better than the "Maths" category mean values. These statistical data and what most of the "Non maths" category participants mentioned about the TMA 3 and 4 , in group discussions does not seem to tally and it is questionable whether they had done the last two TMAs soley by themselves. It may be a a group effort or perhaps done by some one else for them or they may have copied. However, it may be extremely difficult to find evidence to prove occurrence of such things as relevant information had to be obtained also from the students.

TMA performances of the populations

TMA performances of the two populations were also examined to find out whether the performances of the respondents were differ from the populations. These results are shown in TABLE 4.20D.

TABLE 4.20D TMA PASS RATES OF THE POPULATIONS

TMA no.		Pure Mathematics				Applied Mathematics		
		Pass	Fail	Total		Pass	Fail	Total
1	N	201	58	259		165	69	234
	%	(77.6)	(22.4)	(100)		(70.5)	(29.5)	(100)
2	N	169	33	202		141	38	179
	%	(83.7)	(16.3)	(100)		(78.8)	(21.2)	(100)
3	N	135	45	180		142	47	189
	%	(75.0)	(25.0)	(100)		(75.1)	(24.9)	(100)
4	N	112	19	131		097	14	111
	%	(85.5)	(14.5)	(100)		(87.4)	(12.6)	(100)

Except TMA 2 in Pure Mathematics, all other TMAs in both courses pass rates of the respondents were slightly higher compared with the relevant pass rates of the population.

Summary

There are four TMAs in each course. The majority of respondents were satisfied with that number. A common view about the TMAs was that TMA questions were much more difficult than the worked examples in the text. 'Printing errors in some TMAs' and 'inadequate representation of the Geometry subject area ' were also other common views. Students were not happy with the time taken to sent back the marked TMAs. In both courses nearly 40% mentioned that marking examiners had never made comments. In Applied Mathematics more than 40% of "Non maths' category respondents had difficulties in understanding the TMA questions. In both courses submission rates of the TMAs dropped gradually. It is noticed that there is no significant difference between the two A/L categories with respect to the submission rates and surprisingly in pass rates except in TMA 2 in Applied Maths.

4.5 Mid Session Tests

There are two Mid Session tests (MSTs) in each course. The first one is conducted at the middle part of the academic year, which covers the subject areas of the first two units and the second one at the latter part, which covers the subject areas of the remaining units (i.e. four units in Pure Maths and three units in Applied Maths). The time duration of a MST is 90 minutes and students are expected to answer 20 short questions. The participation in MSTs are not mentioned as compulsory. But according to the eligibility criteria it is not possible to get the eligibility without the MST component, which is the best mark of the two MSTs and 60% weightage is given to it when determining the overall Continuous Assessment (CA) mark (i.e. the eligibility mark). Therefore, students have to sit for at least one MST and should obtain good marks in order to get the eligibility. However, it does not mean that students do not need to sit for the second MST if they had performed well in the first one.

4.5.1 Number and time duration of MSTs

In both courses around 90% of the respondents mentioned that they were satisfied with the existing number of MSTs. In Applied Mathematics 92% of the respondents were satisfied with the existing time duration but it was 80.5% in Pure Mathematics. A considerable percentage (17.2%) of respondents in Pure Maths mentioned that they want more time duration. However, it is not clear from the questionnaire feed back to which MST they refer their response as their views were not obtained separately for the two MSTs. Most of them may have refered their response to the second MST as the majority of participants in the group discussions mentioned that they want more time duration for the second.

4.5.2 Preference type of questions in MSTs

In the questionnaire, students were asked in which type of questions they prefered to have in MSTs from the following three choices.

* choice 1   only multiple choice questions (MCQs)

* choice 2   only short questions

* choice 3   a combination of MCQs and short questions.

Their responses are shown in TABLES 4.21

TABLE 4.21   TYPE OF MST QUESTIONS * A/L CATEGORY

Choice		Pure Mathematics Maths	Non maths	Total	Applied Mathematics Maths	Non maths	Total
Only MCQs	N	5	16	21	6	5	11
	%	(10.6)	(44.4)	(25.3)	(10.6)	(17.9)	(14.5)
Only short questions	N	5	3	8	6	2	8
	%	(10.6)	(8.3)	(09.6)	(10.6)	(7.1)	(10.5)
A combi -nation	N	37	17	54	36	21	57
	%	(78.8)	(47.3)	(65.1)	(78.8)	(75.0)	(75.0)
Total	N	47	36	83	48	28	76
	%	(100)	(100)	(100)	(100)	(100)	(100)

In Pure Maths, 78.8% "Maths" respondents mentioned that they preferred a combination of questions, while in "Non maths" category this percentage was 47.3% . Only 10.6% of "Maths" category respondents prefer for only MCQs compared with 44.4% for the "Non maths" category. It is clear from the data in TABLE 4.21 that "Non maths" category views were mainly divided among two choices, i.e. choice 1 and choice 3. The majority of "Maths " respondents were in favour of choice 3 , i.e. a combination of questions.

There is a noticeable difference in Applied Maths as 75% of the "Non maths" category respondents were in favour of a combination of questions. As in Pure Maths, a clear majority, i.e. 78.8% of "Maths" respondents were prefered to have a combination of questions.

Although the majority of respondents were satisfied with the number of MSTs and the time duration most of the respondents were not satisfied with the existing type of questions. Overall, 65.1% in Pure Maths and 75 % in Applied Maths would prefer to have a combination of questions.

4.5.3　　　*Participation in MSTs*

MST participation by A/L category

TABLE 4.22A　　　PARTICIPATION IN PURE MATHEMATICS MSTs
*A/L CATEGORY

Partici-pation		MST 1			MST 2		
		Maths	Non maths	Tot.	Maths	Non maths	Tot.
Sat	N	44	29	73	41	26	67
	%	(89.8)	(69.0)	(80.2)	(83.7)	(62.0)	(73.6)
Absent	N	5	13	18	8	16	24
	%	(10.2)	(31.0)	(19.8)	(16.3)	(38.0)	(26.4)
TOT	N	49	42	91	49	42	91
	%	(100)	(100)	(100)	(100)	(100)	(100)

TABLE 4.22B　　　PARTICIPATION IN APPLIED MATHEMATICS MSTs
*A/L CATEGORY

Partici-pation		MST 1			MST 2		
		Maths	Non maths	Tot.	Maths	Non maths	Tot.
Sat	N	50	31	81	46	29	75
	%	(91.0)	(86.1)	(89.0)	(83.6)	(80.6)	(82.4)
Absent	N	5	5	10	9	7	16
	%	(9.0)	(13.9)	(11.0)	(16.4)	(19.4)	(17.6)
TOT	N	55	36	91	55	36	91
	%	(100)	(100)	(100)	(100)	(100)	(100)

The data in TABLE 4.22A and 4.22B show that in both tests in Pure Maths, "Non maths" category participation was less with compared to the "Maths" category. But in Applied Maths the participation percentages of the two categories were almost similar. It is also found that in Pure Maths there are significant differences between the two categories with respect to the participation in MSTs [X^2 = 5.5725, at p = 0.05, df = 1 and X^2 = 5.6675 at p = 0.05, df =1　for MST 1 and 2 respectively] but not in Applied Maths, where X^2 = 0.4684 at p = 0.05, df =1 for MST 1 and X^2 = 0.322 at p = 0.05, df =1　for MST 2.

It is also noticed that in both courses there is no significant difference between the "Maths" category participation in MSTs with respect to the different MSTs. $(X^2 = 1.426$ at p = 0.05, df =1 and $X^2 = 1.3096$ at p = 0.05, df =1 for Pure Maths and Applied Maths respectively). The result was same for the "Non maths" category respondents where $X^2 = 0.8434$ at p = 0.05, df =1 and $X^2 = 0.400$ at p = 0.05, df = 1 for Pure Maths and Applied Maths respectively.

MST participation of the populations

TABLE 4.22C   MST PARTICIPATION RATES OF THE POPULATIONS

Partici-pation		Pure Mathematics		Applied Mathematics	
		MST 1	MST 2	MST 1	MST 2
Sat	N	219	177	211	184
	%	66.8	54.0	66.8	58.2
Absent	N	109	151	105	132
	%	33.2	46.0	33.2	41.8
Tot.	N	328	328	316	316
	%	100	100	100	100

Almost similar participation pattern is seen among the two populations. In both courses participation rate in MST one was much more better than MST two and it is found that in both courses there is a significant difference between the participation rates with respect to the different MSTs. $X^2 = 11.23$ at p = 0.05, df =1 and $X^2 = 5.29$ at p = 0.05, df =1 for Pure Maths and Applied Maths respectively. As seen in TMAs, it is noticed that respondents participation percentages were better than that of the population in both tests in both courses.

4.5.4   *Performances in MSTs*

TABLE 4.23A   MST PERFORMANCES OF THE RESPONDENTS

Perfor-mance		Pure Mathematics		Applied Mathematics	
		MST 1	MST 2	MST 1	MST 2
Pass	N	26	17	45	23
	%	35.6	25.4	55.6	30.7
Failed	N	47	50	36	52
	%	64.4	74.6	44.4	69.3
Tot.	N	73	67	81	75
	%	100	100	100	100

In both courses, especially in Applied Mathematics performances in MST one was much better than in MST two. Chi square test values reveal that there is a significant difference between the two pass rates in Applied Mathematics where $X^2 = 10.44$ at $p = 0.05$, df =1 but not in Pure Mathematics in which $X^2 = 2.15$ at $p = 0.05$, df =1.

In group discussions, students who sat for the both tests mentioned that second MST was much more difficult than the first one. It is also noticed that in both courses first MST covers the subject areas of the first two units. In Pure Maths second MST covers four units and in Applied Maths three units. It is clear that students had to study more subject areas for the second MST with compared to the first. On the other hand most of the subject areas which were treated as difficult, were in second MST. They may be reasons for the difficulty and also for the poor performances with compared to the first MST.

MST performances by A/L category

As done in TMAs, performances in MSTs were compared with respondents A/L category to examine whether there is a significant difference between the two A/L categories. The results are shown in TABLES 4.23B and 4.23C.

TABLE 4.23B   PERFORMANCES IN PURE MATHEMATICS MSTs
* A/L CATEGORY

perform -ance	MST 1			MST 2		
	Maths	Non maths	Total	Maths	Non maths	Total
Pass	24	2	26	16	1	17
%	(55)	(7)	(36)	(39)	(4)	(25)
Failed	20	27	47	25	25	50
%	(45)	(93)	(64)	(61)	(96)	(75)
Total	44	29	73	41	26	67

As two cells contained values less than 5 and also the sample sizes were small, t test was used to compare the proportions. t values show that in both tests there are significant differences between the pass proportions with respect to the respondents A/L category. t = 4.21, at $p = 0.05$, df = 71 for MST number one t = 3.21 at $p = 0.05$, df = 65 for MST number two.

TABLE 4.23C   PERFORMANCES IN APPLIED MATHEMATICS MSTs
* A/L CATEGORY

Perform -ance	MST 1			MST 2		
	Maths	Non maths	Total	Maths	Non maths	Total
P	38	7	45	21	2	23
%	(76)	(23)	(56)	(46)	(7)	(31)
F	12	24	36	25	27	52
%	(24)	(77)	(44)	(54)	(93)	(69)
T	50	31	81	46	29	75

As in Pure Mathematics, t test was used to compare the proportions and the result was same as in Pure maths. t = 4.649 at p = 0.05, df = 79 for MST 1 and t = 3.545 at p = 0.05, df = 73 for MST 2. An important finding with the MST performances is that in both courses and in both tests, there are significant differences between the performance in MSTs with respect to the respondents A/L category, i.e."Maths" category respondents had performed significantly better than the "Non maths " category. But in TMAs no significant difference was found in the case of all TMAs in Pure Maths and for the last two TMAs in Applied maths. It is also noticed that in Pure Maths, performance of the "Non maths" category was very poor. Only 7% (2 out of 29) were passed in MST 1 and only 4% (1 out of 26) in MST 2. In Applied Maths, it was slightly better in the case of MST 1 in which 23% (7 out of 31) had obtained passes, but only 7% (2 out of 29) in MST 2.

Mean values of MSTs by A/L category

The t -test was also used to compare the mean values of MST marks between the two A/L categories, i.e. respondents who had followed A/L in Maths stream and those who had not. This is shown in TABLE 4.23D.

TABLE 4.23D   t -TEST FOR EQUALITY OF MEANS IN MSTs

MST no.	A/L cat.	N	Mean	Std dev	t (two tailed test)
MPF 1301	**Pure Mathematics**				
1	Maths	44	41.59	17.64	6.737, at p = 0.05, df =71
	Non maths	29	14.45	15.53	
2	Maths	41	37.73	19.60	5.759, at p = 0.05, df = 65
	Non maths	26	13.00	12.17	
MPF 1302	**Applied Mathematics**				
01	Maths	50	54.56	21.21	7.093, at p = 0.05, df = 79
	Non maths	31	20.77	20.22	
02	Maths	46	40.13	20.66	5.065, at p = 0.05, df = 73
	Non maths	29	18.34	13.10	

As expected, there is a significant difference between the mean MST mark with respect to the students A/L category. The result was same for both MSTs in both courses.

MST performances of the populations

As done in TMAs, MST performances of the two populations were also examined to find out whether the performances of the respondents were differ from the population.

TABLE 4.23E   MST PERFORMANCES OF THE POPULATIONS

Perfor -mance		Pure Mathematics		Applied Mathematics	
		MST 1	MST 2	MST 1	MST 2
Pass	N	54	33	84	51
	%	24.6	18.6	39.8	27.7
Failed	N	165	144	127	133
	%	75.4	81.4	60.2	72.3
Tot.	N	219	177	211	184
	%	100	100	100	100

MST performances in the population show that in Pure Maths, pass percentages were less than 25% in both tests. As seen in the pass rates of the respondents there is a significant difference between the two pass rates in Applied Mathematics at p = 0.05 where X^2 = 6.52 with df = 1 but not in Pure Mathematics in which X^2 = 2.14 at p = 0.05, df =1. Another noticeable fact is that, in both courses and in both MSTs, respondents performances were better than the population performances.

Summary

The majority of students were satisfied with the existing number of MSTs. However, some of the respondents suggested increasing the time duration of the second MST. In both courses, the course content was not equally represented in the two tests. 65% respondents in Pure Mathematics and 75% in Applied Mathematics would prefer to have a combination of MCQs and short questions in MSTs rather than having only short questions. Another notable fact is that in both courses and in both tests "Maths' category pass rates were very much higher than the 'Non maths" category. Except in MST 1 in Applied Mathematics, in all other tests pass rates of the 'Non maths' category were less than 10 per cent.

4.6   Overall performances

Performances in TMAs and in MSTs were analysed in sections 4.4 and in 4.5 respectively. The overall performances in Continuous Assessment (in order to sit the final examination students should obtain 40 or more marks in overall Continuous Assessment (CA) which is refered as the eligibility)and performances in the final examination will be analysed in this section. Eligibility of the respondents are compared with several variables such as A/L category, age group, Day school attendance , help from another teacher and study in a group. In addition final exam results are analysed with respect to the two A/L categories. Overall performances such as pass rates and successful completion rates are examined with number of variables.

4.6.1   Eligibility

Eligibility by A/L category

Students were asked to indicate whether they had got eligibility or not. Each answer was cross checked with the eligibility list and it is found that all the responses were accurate. Eligibility compared with the two A/L categories is given in TABLE 4.24A.

TABLE 4.24A   ELIGIBILITY * A/L CATEGORY

Eligibility		Pure Mathematics			Applied mathematics		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Yes	N	37	9	46	47	16	63
	%	(75.5)	(21.4)	(50.5)	(85.4)	(44.4)	(69.2)
No	N	12	33	45	8	20	28
	%	(24.5)	(78.6)	(49.5)	(14.6)	(55.6)	(30.8)
Tot	N	49	42	91	55	36	91
	%	(100)	(100)	(100)	(100)	(100)	(100)

From the data in TABLE 4.24A it is clear that in both courses, the percentage of eligible students in the "Maths " category was very much higher with compared to the "Non maths" category. In both courses, there is a significant difference between the two A/L categories with respect to the eligibility. $X^2 = 25.47$, at $p = 0.05$, df =1, and $X^2 = 17.49$, at $p = 0.05$, df =1 for Pure Maths and Applied Maths respectively. Another noticeable fact is that in both A/L categories especially among the "Non maths" category, the eligible percentage in Applied Mathematics was much better than in Pure mathematics. Overall, in both courses, more than 50% of the respondents were eligible and it is seen that overall eligibility percentage in Applied Maths was much better than Pure Maths.

Eligibility by "Non maths" A/L category

Eligibility status of the "Non maths" category respondents were examined separately to find out whether there is a significant difference between the "Bio" and "Other" groups.

TABLE 4.24B   ELIGIBILITY * A/L NON MATHS CATEGORY

Eligibility		Pure Mathematics			Applied mathematics		
		Bio	Other	Tot.	Bio	Other	Tot.
Yes	N	7	2	9	15	1	16
	%	(29)	(11)	(21)	(50)	(17)	(44)
No	N	17	16	33	15	5	20
	%	(71)	(89)	(79)	(50)	(83)	(56)
Total	N	24	18	42	30	6	36
	%	(100)	(100)	(100)	(100)	(100)	(100)

It is clear that in both courses more percentage of "Bio" respondents had obtained eligibility compared with the "Other" group respondents. However, t values indicate that in both courses there are no significant differences between the eligibility proportions of the two groups. $t = 1.48$, at $p = 0.05$, df 40 (two tailed test) for Pure Maths and $t = 1.41$, at $p = 0.05$, df = 34 (two tailed test) for Applied Maths.

Eligibility of the populations

TABLE 4.24C   ELIGIBILITY OF THE POPULATIONS

Eligibility	Pure Mathematics		Applied Mathematics	
	N	%	N	%
Yes	112	34.1	126	39.9
No	216	65.9	190	60.1
Total	328	100	316	100

As noticed in respondents, the eligibility percentage in Applied Mathematics was much better than Pure Mathematics. However, there is no significant difference between the eligibility rates of the two courses. $X^2 = 2.16$ at $p = 0.05$, df $=1$. It is clear from the data in TABLES 4.24A and 4.24C that in each course, respondents eligibility percentage was very much better than the population eligibility percentage.

Eligibility by Day School attendance

Eligibility of the two A/L categories were compared with Day school attendance as shown in TABLES 4.24D and 4.24E.

TABLE 4.24D   ELIGIBILITY * DAY SCHOOL ATTENDANCE IN PURE MATHEMATICS

Eligibility		Maths			Non maths		
		Attendance in DS			Attendance in DS		
		0-1 (A)	2-3 (B)	>3 (C)	0-1 (A)	2-3 (B)	>3 (C)
Yes	N	7	15	15	2	3	4
	%	70.0	88.2	68.2	28.6	13.6	30.8
No	N	3	2	7	5	19	9
	%	30.0	11.8	31.8	71.4	86.4	69.2
Tot	N	10	17	22	7	22	13
	%	100	100	100	100	100	100

TABLE 4.24E   ELIGIBILITY * DAY SCHOOL ATTENDANCE IN APPLIED MATHEMATICS

Eligibility		Maths			Non maths		
		Attendance in DS			Attendance in DS		
		0-1 (A)	2-3 (B)	>3 (C)	0-1 (A)	2-3 (B)	>3 (C)
Yes	N	22	17	8	1	4	8
	%	91.7	89.5	72.7	16.7	44.4	47.1
No	N	2	2	3	5	5	9
	%	8.3	10.5	27.3	83.3	55.6	52.9
Tot	N	24	19	11	6	9	17
	%	100	100	100	100	100	100

In both courses, "Non maths" category highest eligibility percentage is seen among the respondents who had attended most number of Day Schools. Within a category, the highest difference between the eligibility percentages is noticed in between groups A and C of the "Non maths" category in Applied Maths. However, t test value indicates that there is no significant difference between those two groups with respect to the eligibility. t = 1.34, at p = 0.05, df = 21 (two tailed test).

Eligibility by help from another teacher and study in a group

The eligibility of the two A/L categories were also compared with following two variables

* Help from another teacher   *   Studied in a group

to find out whether there is a significant difference between the eligibility and such variables. t -test was used to compare the proportions, as numbers in some cases were less than 5 and also the numbers in groups were less than 30.

The results are shown in TABLES 4.24F and 4.24G.

TABLE 4.25F   ELIGIBILITY * HELP FROM ANOTHER TEACHER

Eligibility	Pure Mathematics				Applied Mathematics			
	Maths		Non maths		Maths		Non maths	
	Help from another teacher		Help from another teacher		Help from another teacher		Help from another teacher	
	yes	no	yes	no	yes	no	yes	no
Eligible	27	10	9	--	29	17	15	1
%	(79)	(67)	(26)		(78)	(100)	(51)	(14)
Not Eligible	7	5	25	8	8	--	14	6
%	(21)	(33)	(74)	(100)	(22)		(49)	(86)
Total	34	15	34	8	37	17	29	7
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

N = 49	N =42	N = 54	N = 36
t = 0.896	t = 1.625	t = -2.095 **	t = 1.818
df = 47	df = 40	df = 52	df = 34
at p = 0.05	at p = 0.05	at p = 0.05	at p = 0.05

**   Except in Applied Mathematics "Maths" category in all other cases there is no significant difference between the eligible and not eligible groups with respect to obtained help from another teacher. However in Applied Maths "Maths" category, it is difficult to comment about the difference between the eligible proportions of the two groups because the t value is very closer to the critical value of 2.000.

Another noticeable fact is that in "Non maths" category all nine who were eligible in Pure Maths had obtained help from another teacher and in Applied Maths it was 93.8% (15 out of 16). It is also noticed that in both courses nearly two out of three eligible respondents in "Maths" category had obtained help from another teacher. That is 72.9% (27 out of 37) in Pure Maths and 63.0% (29 out of 46) in Applied Maths.

TABLE 4.24G   ELIGIBILITY * STUDIED IN A GROUP

Eligibility	Pure Mathematics				Applied mathematics			
	Maths		Non maths		Maths		Non maths	
	Studied in a group		Studied in a group		Studied in a group		Studied in a group	
	yes	no	yes	no	yes	no	yes	no
Eligible	23	14	4	5	23	22	11	5
%	(85)	(64)	(21)	(22)	(82)	(88)	(55)	(31)
Not Eligible	4	8	15	18	5	3	9	11
%	(15)	(36)	(79)	(78)	(18)	(12)	(45)	(69)
Total	27	22	19	23	28	25	20	16
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
	N = 49		N = 42		N = 53		N = 36	
	t = 1.707		t = -0.787		t = -0.612		t = 1.437	
	df = 47		df = 40		df = 51		df = 34	
	at p = 0.05		at p = 0.05		at p = 0.05		at p = 0.05	

t - test values reveal that in both courses in both categories, there is no significant difference between the eligibility and "studied in a group". In Pure Maths 62.2% (23 out of the 37) "Maths" category eligible respondents had studied in a group and it was 44.4% (4 out of 9) in "Non maths" category. But in Applied Maths compared with "Maths" category eligible respondents more percentage of "Non maths" eligible respondents were involved in group studies. Relevant percentages were 51.1% (23 out of 45) and 68.6% (11 out of 16) in "Maths" and "Non maths" respectively.

Overall CA grade by A/L category

The Overall Continuous Assessment (CA) grades are given in following manner:

GRADE	MARKS
A	75 - 100
B	65 - 74
C	55 - 64
D	40 - 54

CA grade compared with two A/L categories are shown in TABLE 4.25.

TABLE 4.25   OVERALL CONTINUOUS ASSESSMENT GRADE
* A/L CATEGORY

Eligibility grade	Pure Mathematics				Applied Mathematics			
	Maths		Non maths		Maths		Non maths	
	N	%	N	%	N	%	N	%
A	4	10.8	--		6	12.8	--	
B	5	13.5	--		10	21.3	--	
C	6	16.2	1	11.1	13	27.6	2	12.5
D	22	59.5	8	88.9	18	38.3	14	87.5
Total	37	100	9	100	47	100	16	100

In both courses, "Non maths" category respondents had failed to obtain 'A' or 'B' grades. Around 90% of them had obtained the least grade (i,e, D grade). Their poor performance in MSTs may have directly influenced for the poor overall grades, as 60% weightage is given for MSTs when determining the overall CA mark. (Eligibility mark).

4.6.2   Performances in the final examination

There are two question papers in the Final examination which are conducted on the same day. Paper I consists of short questions and Paper II structured type questions.Time durations of the two Papers are one and three hours respectively. Almost all respondents in Pure Maths and nearly 90% in Applied Maths had studied 50% or more amount of course content and nearly two in three had attempted past exam papers in preparation for the final examination. Among the respondents who sat for the final examination, the majority mentioned that they were satisfied with the representation of course content in the final exam. Around 70% were satisfied with the time durations given for the papers.

Participation in the final examination by A/L category

It is noticed from the questionnaire feed back that even among those eligible to sit the final examination, a considerable percentage of students had not sat for the exam. These percentages were 17.4% in Pure Mathematics and 19% in Applied Mathematics. Final examination participation of the two A/L categories are shown in TABLE 4.26A.

TABLE 4.26A   FINAL EXAMINATION PARTICIPATION RATES OF THE RESPONDENTS * A/L CATEGORY

Partici-pation		Pure Mathematics			Applied mathematics		
		Maths	Non maths	To	Maths	Non maths	To
Sat	N	32	6	38	39	12	51
	%	(86)	(67)	(83)	(83)	(75)	(81)
Ab	N	5	3	8	8	4	12
	%	(14)	(33)	(17)	(17)	(25)	(19)
Total	N	37	9	46	47	16	63
	%	(100)	(100)	(100)	(100)	(100)	(100)

N = 46
t = 1.338
df = 44
at p = 0.05

N = 63
t = 0.702
df = 61
at p = 0.05

In both courses participation percentages of "Maths" category participants were higher with compared to "Non maths" category. However, t -test shows that in both courses there is no significant difference between the participation proportions in the final examination among the two A/L categories.

Participation in the final examination - populations

Final examination statistics about the two courses reveals that, 75% of the eligible students sat the final examination in Pure Mathematics and 67.5% in Applied Mathematics.

TABLE 4.26B   FINAL EXAMINATION PARTICIPATION RATES OF THE POPULATIONS

Partici-pation	Pure Mathematics		Applied mathematics	
	N	%	N	%
Sat	84	75.0	85	67.5
Absent	28	25.0	41	32.5
Total	112	100	126	100

Although the eligible percentage in Applied Maths was much better than in Pure Maths, the final examination participation was better in Pure Maths. It is also noticed that as seen in TMAs and MSTs, in both courses the participation rate of the respondents in the final examination was better than the population.

Performances in the final examination by A/L category

TABLE 4.26C   FINAL EXAMINATION PERFORMANCES IN
PURE MATHEMATICS * A/L CATEGORY

F.E. Performance		Maths		Non maths	
		Paper I	Paper II	Paper I	paper II
Pass	N	25	11	--	--
	%	(78.0)	(34.0)		
Failed	N	7	21	6	6
	%	(22.0)	(66.0)	(100)	(100)
Tot	N	32	32	6	6
	%	(100)	(100)	(100)	(100)

Final examination performances of the two A/L categories were also compared with respect to the question paper as shown below.

F.E. perfor -mance		Paper I			Paper II		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Pass	N	25	--	25	11	--	11
	%	(78)		(66)	(34)		(29)
Failed	N	7	6	13	21	6	27
	%	(22)	(100)	(34)	(66)	(100)	(71)
Total	N	32	6	38	32	6	38
	%	(100)	(100)	(100)	(100)	(100)	(100)

N = 38   N = 38
t = 3.697   t = 1.692
df = 36   df = 36
at p = 0.05   at p = 0.05

In Pure Mathematics, all six "Non maths" category respondents who sat the final examination failed to obtain pass marks in both papers. In the "Maths" category, 78% (25 out of 32) passed in paper I and only 34% (11 out of 32) in paper II. Overall, pass percentages were 65.8% and 28.9% in paper I and paper II respectively. It is also noticed that in the "Maths" category, there is a significant difference between the pass rates with respect to the final exam papers. $X^2 = 12.44$, at p = 0.05, df = 1. t - test was used to compare the passed proportions of the two categories in both papers and there is a significant difference between the two A/L categories with respect to the performance in paper I (t = 3.697, at p = 0.05, df =36) but not in paper II (t = 1.692, at p = 0.05, df =36).

TABLE 4.26D   FINAL EXAMINATION PERFORMANCES IN APPLIED MATHEMATICS * A/L CATEGORY

F.E. performance		Maths		Non maths	
		Paper I	Paper II	Paper I	paper II
Pass	N	32	28	6	4
	%	(82)	(72)	(50)	(33)
Failed	N	7	11	6	8
	%	(18)	(28)	(50)	(67)
Tot.	N	39	39	12	12
	%	(100)	(100)	(100)	(100)

$X^2 = 1.156$
at p = 0.05, df =1

N= 24
t = 0.845
at p = 0.05, df =22

As done in Pure Maths, performances of the two categories were compared with respect to two examination papers and the results are shown below.

F.E. Performance		Paper I			Paper II		
		Maths	Non maths	Tot	Maths	Non maths	Tot
Pass	N	32	6	38	28	4	32
	%	(82)	(50)	(75)	(72)	(33)	(63)
Failed	N	7	6	13	11	8	19
	%	(18)	(50)	(25)	(28)	(67)	(37)
Total	N	39	12	51	39	12	51
	%	(100)	(100)	(100)	(100)	(100)	(100)

N = 51
t = 2.222
df = 49
at p = 0.05

N = 51
t = 2.438
df = 49
at p = 0.05

50% (six out of 12) of "Non maths" category respondents passed in paper I and 33% (four out of 12) in paper II. In "Maths" category pass percentages in paper I and II were 82% (32 out of 39) and 72% (28 out of 39) respectively. Unlike in Pure Mathematics, "Maths" category had performed fairly evenly in both papers. In both categories no significant difference is found between the pass rates of the two examination papers. $X^2 = 1.156$, at p = 0.05, df = 1 for "Maths" category and t = 0.845 , at p = 0.05, df = 22 for "Non maths" category. But t values indicates that in both papers, there is a significant difference between the performances of the two A/L categories t = 2.222 at p = 0.05, df = 49 and t = 2.438 at p = 0.05, df = 49 respectively.

Compare with the performances in Pure Mathematics, in both papers better performances are seen in Applied Mathematics, especially in paper II,where only 28.9% passed in Pure Maths but 62.78% in Applied Maths. When computing the final examination mark, equal weightages of 50% are given for the marks in paper I and II. The overall course mark is computed by giving equal weightages of 50% for the final examination mark and overall Continuous Assessment (CA) mark. In order to obtain a pass in the course, both marks (i.e. the final examination mark and the overall course mark) should be >= 40. Accordingly 21 were passed in Pure mathematics and 36 in Applied Mathematics.

4.6.3   Overall performances

Overall performances by A/L category

Overall performances (Continuous assessment and final examination) of the two sets of respondents were first compared with two A/L categories "Maths" and "Non maths" and then each category was compared with demographic data such as gender, age group and employment to identify the most successful group of respondents. Overall performance of the two categories were also compared with "medium of study", "help from another teacher" and "studied in a group" to find out how such variables had effected in their overall performances. Performances of the two sets of respondents compared with their A/L category is shown in TABLE 4.27A.

TABLE 4.27A   OVERALL PERFORMANCES OF THE RESPONDENTS
* A/L CATEGORY

Description	Pure mathematics			Applied mathematics		
	Maths (49)	Non maths (42)	Tot (91)	Maths (55)	Non maths (36)	Tot (91)
No.Eligible	37	9	46	47	16	63
No.Sat	32	6	38	39	12	51
No.Pass	21	--	21	32	4	36
Eligibility rate	75.5	21.4	50.5	85.4	44.4	69.2
Pass rate	65.6	--	55.3	82.0	33.3	70.6
% success	42.9	--	23.1	58.2	11.1	39.6

In both courses, the pass rates (pass/sat) of the "Maths" category respondents were better than the "Non maths" category. The overall pass rate of the respondents in Applied Mathematics (70.6%) was much better than Pure mathematics pass rate which was only 55.3%. However, there is no significant difference between the overall pass rates of the two courses. $X^2 = 1.791$, at $p = 0.05$, df =1.

In both courses, successful completion rate (pass/total) of the "Maths" category respondents were better than the "Non maths" category. In Pure Maths 42.9% respondents completed the course successfully but none of the 42 "Non maths" respondents were able to pass in the course. In Applied maths, 58.2% "Maths" respondents and 11.1% "Non maths" respondents had completed the course successfully. Overall, successful completion rates of the respondents were 23.1% in Pure Maths and 39.6% in Applied maths.

Overall performances by A/L category and gender

TABLE 4.27B   OVERALL PERFORMANCES OF THE RESPONDENTS
                            * A/L CATEGORY * GENDER

	Pure mathematics					Applied Mathematics				
	Maths		Non maths		Tot	Maths		Non maths		Tot.
	M (46)	F (3)	M (35)	F (7)	(91)	M (53)	F (2)	M (31)	F (5)	(91)
No.El	36	1	6	3	46	46	1	12	4	63
No.Sat	31	1	3	3	38	38	1	9	3	51
No.Pass	20	1	--	--	21	32	--	3	1	36
Eligibility	78.2	66.7	17.1	42.9	50.5	86.8	50.0	38.7	80.0	69.2
Pass rate	64.5	100	–	–	55.3	84.2	–	33.3	33.3	70.6
% success	43.5	33.3	–	–	23.1	60.4	–	9.7	20.0	39.6

In both courses performances of the "Maths" category male students were better than the female students. In "Non maths" category, it is not possible to compare the successful completion rate by gender in the case of Pure Maths as none were passed, but the eligibility rate suggests that female respondents had performed better. However, in 'Non maths' category in Applied Maths, both eligibility rate and the success rate of the female respondents' were better than the male respondents. But in both courses and in both categories female student numbers were too small.

Overall performances by A/L category and age

TABLE 4.27C   OVERALL PERFORMANCES OF THE RESPONDENTS
IN PURE MATHEMATICS * A/L CATEGORY * AGE GROUP

Description	Maths			Non maths			Tot.
	18-24 (32)	25-29 (11)	>30 (6)	18-24 (24)	25-29 (7)	>30 (11)	(91)
No.ELigible	28	5	4	7	--	2	46
No.Sat	25	3	4	4	--	2	38
No.Pass	20	1	--	--	--	--	21
Eligibility	87.5	45.5	66.7	29.2	–	18.2	50.5
Pass rate	80.0	33.3	–	–	–	–	55.3
%success	62.5	9.1	–	–	–	–	23.1

TABLE 4.27D   OVERALL PERFORMANCES OF THE RESPONDENTS IN
APPLIED MATHEMATICS * A/L CATEGORY * AGE GROUP

Description	Maths			Non maths			Tot.
	18-24 (43)	25-29 (6)	>30 (6)	18-24 (18)	25-29 (12)	>30 (6)	(91)
No.ELigible	38	5	4	12	2	2	63
No.Sat	32	4	3	9	1	2	51
No.Pass	27	2	3	4	--	--	36
Eligibility	88.4	83.3	66.7	66.7	16.7	33.3	69.2
Pass rate	84.4	50.0	100	44.4	–	–	70.6
% success	62.8	33.3	50.0	22.2	–	–	39.6

In both courses and in both categories, the highest eligibility rate is noticed among the 18-24 age group. In both courses, in "Non maths" category, lowest eligibility rate is seen in 24-29 age group. Noticeable success rates are found in 18-24 age group which were 62.5% in Pure Maths and 62.8% in Applied Maths.

Overall performances of the respondents were also compared with employment status and medium of study.

In both courses, irrespective of their A/L category unemployed respondents' success rates are very much better than the employed respondents. In Pure Maths out of 14 full time "Maths" category employee respondents no one had completed the course successfully and the respective success rate in Applied Maths was 33.3% (4 out of 12).

Since there were very few Tamil medium respondents it is difficult to compare their results with other two groups. In each category there was no clear difference between the eligibility rates of the respondents who had followed the course in Sinhala and English languages. The highest difference is noticed in "Maths" category in Applied Maths, where all English medium respondents were eligible but only 78.1% (25 out of 32) in Sinhala medium. Eligibility rates suggest that in each category medium of study had not effected to the respondents in following the course. Due to the unavailability of relevant data the above comparisons could not carried out with the populations.

Overall performances of the populations

Overall performances of the two populations are given in TABLE 4.28

TABLE 4.28   OVERALL PERFORMANCES OF THE POPULATIONS

Description	Pure Mathematics (328)	Applied mathematics (316)
No. Eligible	112	126
No. sat	84	85
No. Pass	36	55
Eligibility rate	34.1	39.9
Pass rate (Pass/Sat)	42.9	64.7
% Success (Pass/Total)	10.97	17.40

With compare to Pure Maths, better eligibility rate, pass rate and success rate is seen in Applied Maths. Course pass rates of the populations reveal that 42.9% (36 out of 84) passed in Pure Maths and 64.7% (55 out of 85) in Applied Maths. It is found that there is a significant difference between the two pass rates. $X^2 = 7.715$, at $p = 0.05$, df = 1. Successful completion rate of the Pure Maths population was 10.97% and it was 17.40% in Applied maths.

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Summary

Eligibility results of the respondents were compared with several variables. In both courses the eligible "Non maths" category respondents had attended more than three Day Schools. In addition it was noticed that among the "Non maths" category eligible respondents 100% in Pure Maths and 93% in Applied Maths had obtained help from another teacher. Overall, around 90% of that category had failed to obtain better grade than the least grade 'D' for the overall Continuous Assessment grade. However, there is a significant difference only in one issue, i.e. with the A/L category. As expected Final examination results shows that 'Maths' category had performed better than the 'Non maths' category. Pass rates and success rates of the respondents were compared with number of variables. These findings suggest that the most successful respondent group is the 18-24 age group unemployed male respondents who had followed A/L in Maths. Another noticeable fact is that in both courses respondents pass rates and successful completion rates were much more better with compared to the respective rates of the population. This characteristic was also found in TMA submission rates, TMA pass rates, MST participation rates and MST pass rates which suggests that in both courses the respondents may be a set of active participants in the course.

CHAPTER 05

DISCUSSION AND CONCLUSIONS

5.1 Introduction

Pure Mathematics (MPF 1301) and Applied mathematics (MPF 1302) are level one courses in the Foundation programme, which are offered by the Faculty of Engineering Technology of the Open University of Sri Lanka (OUSL). The Foundation programme is considered as the first two levels of the Diploma in Technology programme.

The main purpose of the study was to develop a course evaluation model for use in OUSL and to identify the difficulties, students had encountered in course components such as course material, Tutor Marked Assignments (TMAs), Mid Session Tests (MSTs) and Day Schools. Short term as well as long term suggestions and recommendations for improvements and developments in the "Mathematics" courses are made.

Questionnaires were used as the main mode of obtaining students feedback. In both courses , non starters were excluded from the list of registered students and the samples were selected only from the participants. Group discussions with students were conducted at the three regional centres Colombo, Kandy and Matara. Overall 25 students were participated in group discussions. These discussion sessions were conducted during the period of September - October 1996. Main areas to be discussed in the group discussions and areas to be questioned in the questionnaire were pre-determined with the assistance of the course co-ordinator and also through the researchers past experience in working as a Day School lecturer and as a marking examiner in the same courses. In addition to the above two methods of data collection feed back was also obtained from five Day School lecturers.

The sample size in Pure Mathematics was 174 and it was 162 in Applied Mathematics. The questionnaires were sent in early January 1997, nearly one month after the final examination. Two reminders were also used. A fresh copy of a questionnaire was sent with the second reminder. Overall response rates were 52.3% (91 out of 174) and 56.2% (91 out of 162) respectively. A noticeable fact about the participants in the group discussions that all were male students. Therefore, views of female students were not represented in the group discussion sessions. However, very few female students participated in these courses (around 13% and 7% respectively).

As mentioned earlier the study focused on the main course components. In the questionnaire, questions were designed to cover each and every component and listed under different parts. Group discussions were also conducted focusing on main components and the results were noted accordingly. The results and analyses of the study in chapter 4 was also done according to each component. Each component was considered separately in order to pay more attention to specific issues related to that particular component and then to make recommendations and suggestions accordingly. Therefore in this chapter discussion and conclusions will be reported under different sections such as course material, Day schools, Tutor marked assignments and Mid session tests. In addition the overall performances of the students will also be discussed and a summary of suggestions and recommendations with priority issues are given.

5.2   *Course material*

In both methods of feed back it was noticed that the majority of students were satisfied about the issues related to the presentation of course material such as letter size, clarity of figures, level of language and size of blocks.

Regarding the worked examples and Self Assessment Questions (SAQs), questionnaire feed back shows that in both courses the majority of students (nearly 75%) want more worked examples ranging from simple ones to more difficult ones. Around 50% of the respondents in both courses were not satisfied with the existing number of SAQs. Similar views were noticed during the group discussions and they also mentioned that answers for the worked examples should be clear and simple. It was noticed that they had difficulties in understanding some worked examples due to the omission of some steps.

A study conducted by Kloeden and McDonald (1981) at the Murdoch University, which was used to revise an external Mathematics course got similar kind of feed back in which they mentioned "the most common problem was concerned with insufficient detail - leave out steps". They also stated that

> "It could of course be argued here that such detail is both unnecessary and undesirable for a university course, being something that students should be able to work out for themselves. However it should be remembered that, we are talking about external students working in isolation, who do not have fellow students around to give them hints. Also many external students were resuming their studies after some absence and had simply forgotten such elementary tricks or lost the habit of looking for them, and needed to have them pointed out."

In the case of OUSL Mathematics courses there were only around 15% of respondents who were over 30 years of age. Which means that only a small percentage of respondents resumed their studies after some absence. The majority were young students. However, a considerable proportion of respondents (around 40% - 50%) had no G.C.E Advanced Level maths background. Therefore it is desirable to give solutions of the worked examples in the simplest way. Another fact which should not be forgotten is that these two courses contained 100% written media for the presentation of subject matter, i.e. only printed blocks with limited support consisting of six Day Schools and three tutor clinics. Telephone counselling service is also not feasible because of the non availability of the facility at the rural areas and its expensiveness. Under these circumstances a student who had difficulties in understanding worked examples or text in the course material and was isolated from fellow students or any other external assistance (from a friend or relative) may get frustrated and may even tend to give up the course. As Kamu (1995) mentions "since the learner is isolated most of the time, the study materials must be interactive, i.e, they must promote participatory learning". Therefore it is very essential to provide good self instructional materials to enhance student's learning in these "Mathematics" courses as it contained only printed material. Rathore (1994) describes in an evaluation study, "The quality and didactic suitability of the materials for independent/self-learning not only enhances student's learning but also determines the academic credibility of distance education".

However, the work examples which need more detailed solutions were not identified through the questionnaires or group discussions as respondents and participants did not specify such work examples. Therefore, initially it will be necessary to identify such work examples in order to provide any assistance. It is also suggested to give a brief questionnaire for each block to obtain the relevant feed back. Once such worked examples are identified a separate booklet containing detailed solutions to such worked examples can be prepared and despatched to the students together with the relevant despatches. As the majority of students requested for more worked examples, it is suggested to provide past Tutor Marked Assignments (TMAs) gathered in booklet form to the regional /study centre libraries for reference. More copies should be made available at the centres in which more students are registered.

Self Assessment Questions (SAQs), are included in each and every lesson in both courses. In average there are five in a lesson. SAQs can also be considered as a method of Assessment. As mentioned by Koul (1991), the purpose of SAQs is two fold.

> " to keep the students on the right track and motivated as he/she work through the study materials, and to provide learning activities of various types"

He further stated that, at IGNOU,"as a rule answers or suggestions leading to answers to SAQs are provided along with the study material"

"Answers to the SAQs should be given with the SAQs" was a common view of the participants in the group discussions. It is noticed that in both courses except in the first two lessons of the last unit in Applied Mathematics (MPF 1302) in all other lessons answers to the SAQs are not given. However there are some SAQs in the form of "Prove that...." or "Show that...." which consist the final answer in the question itself. It is desirable to give the answer with a brief explanation of solving procedure especially if the answer contained several steps. However, it would be helpful for them if the answers are given in more detailed form for the more difficult SAQs. As suggested by some of the "Non maths" category students providing hints /guidance along with the more difficult SAQs would encourage them to work on SAQs. Since it takes time to incorporate such changes and revise the material, as a short term plan a separate booklet can be introduced to provide the answers for the SAQs.

From the questionnaire feed back some units were identified as most difficult to understand with relatively to others. [Respondents mentioned the unit numbers instead of lesson numbers or subject areas]. However, during the group discussions participants mentioned that they had difficulties in following subject areas.

Pure Mathematics (MPF 1301)

Calculus B3U1 (Differentiation)
Maxima. minima,Differentiation of trigonometric functions, most of the areas in the latter part of the unit,

Calculus B3U2 (Integration)
Methods of Integration, areas and volumes

Trigonometry B2U2
Solution of triangles, trigonometric equations

Algebra B1U2
Sum of the series

Applied Mathematics (MPF 1302)

Statics B1U2
Framed structures, equilibrium under coplanar forces

Dynamics B2U1
Relative velocity

Hydrostatics I- B3U1(Pressure and thrust)
Pressure centre, resultant thrust

Hydrostatics II- B3U2 (Archemede's principle and its applications)
Meta- centre , stability of floating bodies

Out of these, Differentiation (B3U1), Integration (B3U2) and Trigonometry (B2U2) in Pure mathematics and Dynamics (B2U1), Statics II (B1U2) and Hydrostatics I (B3U1) in Applied Mathematics were the units mentioned as difficult to understand by more than 50% of the respondents who had answered that particular question and it is also noticed from the questionnaire feed back that compared with the other units a greater percentage of respondents had studied less than 25% of those units. Reasons such as "insufficient explanations", "lack of worked examples" and "explanations not clear" were mentioned as the main reasons for the difficulties.

Although difficult subject areas were identified in group discussions to a certain extend, it failed to identify such areas from the questionnaire feedback because the respondents mentioned only the unit numbers instead of subject areas. It is believed that it need a further study to identify the specific subject areas which they encounter difficulties in order to make revisions in the course material. It is suggested to use a much more detailed questionnaire preferably for each unit for this purpose. Accordingly there would be six questionnaires in Pure Mathematics and five in Applied Mathematics. Findings of this study can be used as a guidance in preparing that detailed questionnaire as in Kloeden and McDonald (1981) and Milton (1985) studies, in which they used questionnaires/ interviews at the initial stage to identify the main problem areas and then used more detailed questionnaires at the second level, focused on the identified problem areas in the first questionnaire. However, there may be possible problems with response rates. There may be also some practical problems such as handling a large number of questionnaires and reminders because there are few staff members in the division and they have to do this with the other academic activities. One alternative would be to conduct such a study in stages. As the initial stage it is suggested to prepare the detailed questionnaires for the two Calculus units in Pure Mathematics and Statics II and Hydrostatics I units in Applied Mathematics because they are the units identified from this study in which most student had difficulties.

Producing audio visual material (audio or video cassettes) for the difficult subject areas would be another way to assist. Questionnaire data revealed that 87% respondents in Pure Mathematics and 82% in Applied Mathematics have the audio facilities at home. But in the case of video facilities it was only around 40%. Therefore the supplementary material would be in the form of audio cassettes as the majority have access to it. But it may need to think about the students who do not have that facility. However, it would not be possible to produce audio materials within a short time period as it involved issues such as "to identify the specific subject areas where it is needed", "lack of trained script writers in the

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division to write of audio scripts", and "availability of resources (money)". As making revisions for the identified difficult areas and producing audio cassettes for the difficult areas are long term alternatives a short term plan is also needed to assist the students especially to overcome the difficulties in the course units which were mentioned as difficult by most of the respondents / participants. Therefore, it is suggested to conduct more Day Schools on such units as a short term plan.

5.3   Day Schools

From both methods of feed back it is clear that the majority of the students were not satisfied with the existing number and the way of conducting Day Schools. They wanted all course material to be discussed from basic in the Day Schools. Students are expected to go through the study materials before attending a Day School and to discuss the difficult areas with their Day School lecturer. By my past experience as a Day School lecturer and also from the views of the Day School lectures it was noticed that students do not come prepared for the Day Schools. They expect Day School lecturer to teach all course material. Only very few students asked questions. On the other hand it is not possible to discuss all subject areas scheduled for a particular Day School during a three hour session. Day School lecturers also mentioned that it was very difficult to maintain one level of teaching as students were from a heterogeneous group. The course co-ordinator mentioned that students were grouped according to their maths knowledge only at the Colombo and Kandy centres. But it was done only in English and Sinhala study media as the student numbers were large enough to be grouped in such manner. However, it is noticed that during the middle part of the academic year such groups had been combined as a result of poor attendance.

The majority of students were in the 18-24 age group who were recent school leavers. They were used to class room learning for nearly 13 years in which the teacher explains all subject matter and they take down notes and study it later. So it could be difficult for them to adjust to the new system in which the materials are given in advance and to do self study with limited assistance. On the other hand there were no preparatory materials to prepare them for distance learning. Watts (1985) [who worked as the chairman in a team which prepared preparatory material for some of the OUUK foundation programmes] commenting on students preparation for the studies mentioned that " It has to be recognised also that vast majority of the university's students has not made use of external preparation provision; for financial, geographical, or personal reasons." In addition the researcher believes that "unawareness of mode of teaching" may be another reason in the case of OUSL foundation students. During involvement in the student registration process

over several years the researcher noticed that a considerable number of students asked the question "When do you start the classes?". Most of such students were recent school leavers and they expected courses to be conducted in class room teaching style. However, 'students preparation for OUSL studies' is an area for further research.

The importance of preparatory materials were seen in the following studies. In a survey conducted with a small sample of students (n =28) at OUUK, Lockwood (1986) reported that nearly two thirds of the sample had not received any advice, help or information about " organising yourself for study". After providing the Facets of Learning Preparatory Material for the same sample from a follow up questionnaire it was noticed that two thirds of the students who responded (n=16) were agreed with the fact that the preparatory material had influenced or changed the study strategies they had previously used. In evaluating the preparatory packages prepared for five foundation courses at the OUUK, Lockwood (1989) reported that they were very successful in " achieving the aim of producing of materials of high academic quality and teaching effectiveness that could be used as a resource for prospective undergraduates in the period between initial registration and the start of the foundation courses". Another study which was conducted by Lockwood, Williams and Roberts (1988) at the University of the South Pacific to improve teaching at a distance identified lack of preparatory materials as one of the factors that appeared to be associated with unusually high student with-drawal and non-completion of some courses. Stressing the importance of preparatory materials they mentioned that, "the provision of preparatory materials, particularly for those enroling for the first time, can be invaluable in helping students to address the academic demands of a subject, to explore different study techniques, to organise their study time, plan assignments and prepare for the examinations".

As there was no preparatory material given at OUSL, to prepare the students for distance learning, it is suggested that material giving guidance on issues such as " organising oneself for study", "reading and note taking", preparing and answering for assignments and tests" for the students should be provided with the application form as there is a six months time duration in between the calling date of applications and the period of registration. (There is a difference between the registration process of the two institutions OUUK and OUSL. At OUSL there is only one registration process). It would be better if such preparatory material contained an Introductory Mathematics unit with 4-5 lessons and one or two assignments. The main purpose would be to prepare them for distance learning. Under these conditions it is not surprising that most of the participants had requested "to conduct more Day Schools" and "to discuss all subject matter from basic in the Day Schools ". They can be considered as reasonable suggestions.

In Pure Mathematics there are six course units while there are only five in Applied Mathematics. There are only six Day Schools to discuss the difficulties in course units, i.e in average one Day School per one course unit. Generally one course unit consists of around 5 - 6 lessons. As Day School lecturers pointed out it may difficult to discuss all difficult areas in the course unit(s) allocated for a particular Day School. Students with no A/L maths background may want to discuss the subject matter in more detail and in a simple way. Most of the students who had participated in less number of Day Schools mentioned the reason for their poor participation as 'not Satisfied with the way of conducting Day Schools'. Questionnaire data reveals that irrespective of their A/L maths background they had obtained help from another teacher. The percentages were around 80% of the "Non maths" respondents and around 70% of "Maths" respondents. It is also noticed that in both courses nearly 50% were involved in group studies irrespective of their A/L Maths background. These facts support the request for more Day Schools to discuss the subject matter in detail.

Colombo students had an advantage over others as they were able to get the assistance from the course co-ordinator or any other staff member in the Maths division. There is also a staff member attached to the Kandy centre to assist the students but only on Fridays. However, it would not be possible to appoint staff members at all other centres for this purpose due to lack of financial resources. On the other hand it is difficult to justify it in some centres due to very small student numbers. At present Day Schools are conducted at all three regional centres and five out of fourteen study centres. The inability to bear the travelling expenses to travel to the study centres situated at distance could cause additional problems for some students. Therefore it is suggested that Day Schools should be conducted at more centres as it is the main support service provided by the university.

However, it is not possible to conduct a large number of Day schools because there would be a problem of allocating days as there are Day Schools in all seven courses at the foundation levels and tutor clinics and Mid session tests are also conducted on weekends and public holidays. Considering those facts and the necessity for more Day Schools, it is suggested to conduct 15 Day Schools hoping it would cope with the faculty activity schedule. However, there may be a possibility to reduce this number once the course materials are improved.

A detailed break down of the Day schools (i.e. the subject areas which will be discussed in each of the Day school) should be given to the students at the time of registration. Then students with some maths background will have the opportunity to decide for which Day schools they really wanted to attend.

It was revealed from the group discussions that the Matara centre Day School lecturer was not punctual. It is noticed that there was no scheme to monitor the service of Day School lecturers or the progress in Day Schools during an academic year. Therefore it is suggested that a member of the Mathematics division (the course co-ordinator would be the ideal choice) should visit to the centres to monitor the progress of the Day Schools sessions, preferably at two stages.

Questionnaire feed back reveals that 75% respondents in Pure Mathematics and 66% in Applied Mathematics would like to have av materials in the course. However, data shows that in both courses around 40% of the respondents have the facility to view the video programmes at their homes. As the facility to view the video programmes is available at all the centres in which Day Schools are conducted, a method used at NKI in Norway is recommended as another alternative to assist the students without conducting more number of Day Schools.

John Haugan (1995), described a study where video cassettes had been used to teach Science for Technology in the NKI distance education programme in Norway. NKI offers a technical college courses in distance mode. Mathematics, Physics, and Chemistry are common subjects for all disciplines. The aim of offering these subjects at the initial level is to enable the students to acquire prerequisite knowledge to learn technical subjects.which is similar to the aim of the OUSL foundation level courses. From their experience of distance students Haugan mentioned that students seem to find difficulties in these three subjects. He mentioned the reasons as lack of prerequisite knowledge and lack of motivation. He further mentioned that it leads to drop outs at the initial stages. To support the students NKI has conducted face to face sessions. But in some areas there were too few students to justify the cost. As one solution to this, they had introduced video cassettes either as a medium for individual learning, for learning in groups or in combination with tutor support guidance.

As a pilot study low cost videos together with teacher support in class had been tried out. For this pilot study they had two sets of students. One set followed the ordinary teaching programme. Ordinary lectures at the NKI College of Engineering were recorded. Then those tapes were edited and instructions were included for the students who were to study those videos. The experimental set of students consisted of groups ranging from 3 to 10 at six different centres. Those students studied the video tapes of the lecture in groups. After completing two such periods they worked with a lecturer in a class.

Two sets of students sat for the same examination. A comparison was made between the average grades achieved in the different subjects. It is mentioned that there were no significant differences except in computer science. They also pointed out that by comparing the cost of producing a video and cost of conducting a face to face lecture, this method was cost effective.

The method used at the NKI, i.e, to study with video lectures together with face to face sessions has some advantages as well as disadvantages. The main disadvantage being, as there is no lecturer it is not possible to ask questions. But on the other hand students can note down the difficulties and ask them from their lecturer in a later face to face session. One advantage is students have the opportunity to study the video programmes at their own time at the centre but before the subsequent session.

To initiate this method of combining video tape lectures with face to face sessions, video cassettes can be prepared for the areas which were identified as the most difficult areas. Another advantage of video tape lectures is the possibility of getting the services of the best lecturers for each area. So, if the co-ordinator can identify the most suitable lecturer for each subject area then it will help to end up with a set of good lecture tapes.

However, it is recommended to study this alternative method in more detail. Especially about such issues as availability of resources, time taken to prepare a video tape lecture, the cost of producing a video tape lecture and cost of conducting Day School sessions at all the centres before considering this proposal of combination of Day Schools and video tape lectures.

5.4   *Tutor Marked Assignments (TMAs)*

The majority of students were satisfied with the existing number of Tutor Marked Assignments. With respect to the time duration given to submit the TMAs, most of them indicated that they needed more for the last two TMAs. A noticeable finding from the TMA data is that there is no significant difference between the performances of "Maths" category and "Non maths" category. This was noticed in both courses.The possibility of obtaining help from fellow students may be a reason.

From both methods of feed back, it is revealed that there were errors in some TMA questions. This was also pointed out by Day school lecturers. It is very important to avoid errors in TMAs and therefore careful attention should be drawn to this issue. It is suggested that the final print outs of the TMAs should be checked by another staff member before sending them to the press and also suggested to provide the English medium TMA

for all students as it would help the students in two ways. To cross check the questions for the correctness and secondly to get familiar with the English terminology. (TMAs are originally prepared in English language and then translated into two other languages Sinhala and Tamil).

As some of the participants pointed out in the discussion sessions, it is noticed that the "Geometry" subject area was not represented adequately in TMAs. TMA no. 3 was covered the subject areas of Geometry and Trigonometry. Out of the five questions there was only one from the subject area of Geometry. Although it is not possible to cover all subject areas in four TMAs, it is important to cover a wide range of course content. In both courses the lowest submission rate was recorded in TMA no.4. It is seen that TMA no.3 and TMA no.4 had covered more subject areas than in the first two TMAs. This may be a reason for requesting more time duration for the last two TMAs. It is also noticed that subject areas in TMA numbers 3 and 4 were the areas that most students had difficulties. It is suggested that there should be one TMA per unit in order to represent all subject areas fairly, i.e, six TMAs in Pure mathematics and five TMAs in Applied Mathematics and recommended to consider the best five out of six and best four out of five when determining the overall CA mark.

Questionnaire data and discussion sessions results reveal that the students were unhappy with the time taken to sent back the marked TMAs. It is desirable that TMAs are marked and sent back to the students preferably with the model answers before the deadline of the subsequent TMA. It will give the opportunity for students to go through their mistakes and correct them in the subsequent TMAs. It is noticed that in both courses TMAs had not been marked and sent back within a reasonable time duration (one to two months) in 1995/96 academic year. To minimise the workload of marking of TMAs and in order to avoid delay in the marking process it is suggested to get the service of at least 8 -10 marking examiners including the staff members from the other divisions in the faculty as there are too few staff members in the Mathematics division. This should be done officially. (Co-ordinator had obtained assistance from few staff members from other divisions through his personal contacts in the 95/96 academic year). Another alternative suggestion is to get the service of the Day school lecturers to mark TMAs. In such case students should be instructed to send the TMAs to their respective regional /study centre. This is in practice in Engineering Drawing course which is offered at Foundation level two. One advantage of this method is that students will get the opportunity to collect their marked TMAs from their centre and they also have the opportunity to discuss their errors in the answer scripts with their lecturer who will also be their marking examiner. On the other hand the Day School lecturer will get an opportunity to get an idea about the knowledge level of the students in his group.

The co-ordinator mentioned that some students had not written the registration number or name or course code in the answer scripts. Some had stapled both TMAs (Pure Maths and Applied Maths) together and the situation was even worse in some cases where the answers for Applied Maths TMA were started from the last page of the Pure Maths answer script. The reasons for these shortcomings may be lack of instructions/ advice given with respect to submitting of TMAs. Therefore it is suggested to prepare a common cover page and also proper guide-lines for submitting TMAs and distribute it to the students at the time of registration. These guide-lines can be explained to them at the orientation programme which is conducted at all three regional centres. In addition, it is recommended that a brief description of the submission method to be mentioned at the end of each TMA just to remind them again about the way of submitting the TMAs.

It is revealed that in most instances the marking examiners had not made any comments on the answer scripts. Commenting this issue Sok-ching and Chi-Fun (1995) mention "Students usually get frustrated if tutors ignore their views and just concentrate on the final answer in marking their assignments". It would be helpful for the students and important to give constructive feed back on their work as it is one form of effective support. Bilham and Gilmour (1995) emphasise effective support is essential to keep students motivated. There may be different methods to solve some TMA questions. In such instances it would be helpful for the students if a short description of other methods were also included in the model answers.

It is noticed that Pure Mathematics co-ordinator had to take the most responsibilities of the two courses as the other member was employed on temporary basis. As the student numbers in these two courses are comparatively large and as there are many activities involved a suggestion made that there should be two permanent staff members to coordinate the two courses and to share the responsibilities.

5.5   *Mid Session Tests (MSTs)*

The majority of students in both courses were satisfied with the number and the time duration of Mid Session Tests but not with the existing pattern of only short questions. In both courses respondents mentioned that they prefer to have a combination of Multiple Choice Questions (MCQs) and short questions in MSTs out of the given three choices.

In both courses, respondents had performed better in the first MST compared with the second. It was also noticed in the populations. Another noticeable fact is that in both courses and in both tests significant differences were found between the pass proportions of the respondents with respect to their A/L maths background.

In both courses more subject areas were covered in the second MST and it included the subject areas in which more students had difficulties. These two reasons may have effected for the poor performances in the second test. The course content is not equally represented in Mid Session Tests. When determining the overall CA mark only the best MST mark is considered. Therefore it would be unfair for the students who missed the first MST and only sat for the second one. On the other hand such situations would not arise if both test marks are considered. But it would not be reasonable to consider both test marks when determining the overall CA mark as some students may not be able to sit for a test due to a genuine reason (eg. due to ill health).

As suggested for Tutor Marked Assignments (TMAs) it would not be possible to conduct Mid Session Tests (MSTs) for each unit, i.e. six tests in Pure mathematics and five in Applied Mathematics . There may be some practical difficulties in conducting more tests such as difficulty of reserving weekends from the activity schedule, the cost involved in conducting a test. By considering these facts suggestion can be made to conduct two MSTs for the subject areas covered by the present MST number two in order to represent the course content fairly evenly in each MST. In both courses there would be no change to MST number one.

Some foundation level courses Properties of materials (CEF 1301) and Heat and Fluids (MEF 2302) use the combination of MCQs and Short questions in MSTs. Such MSTs contained fewer MCQs than Short questions. Also more marks are allocated for a short question than for a MCQ. The method of combination may be better rather than having only MCQs. From the past experience it was seen that in 'only MCQ type' tests, at the last moment, students just tick the answers which they were unable to work out. However, before deciding on the pattern of questions i.e, whether to continue with the existing pattern (only short questions) or to move to the combination pattern (MCQs and short questions) it is recommended to study further about the two patterns.

5.6   *Overall performances*

It is seen that in both courses there is a significant difference in the proportions who achieve eligibility with respect to the two A/L categories i.e, students who had followed A/L in maths and those who had not. The present weightage system of 40% for the TMAs and 60% for the MSTs is desirable.This was introduced in 1994/95 academic year. Prior to that the weightages used were 60% for TMAs and 40% for MSTs. According to that system there was a possibility of obtaining eligibility without attending for MSTs; if a student obtained an average of 67 marks or more for the TMA component. However, according to the present weightages the possibility of obtaining the eligibility without the MST component is very much less. To do so student has to obtain an average of 100 marks for the TMA component which means 100 marks for three TMAs.

In Pure mathematics all the "Non maths" category respondents failed to complete the course successfully. By considering the fact that the respondents were a set of active participants in the course it is very much likely that there may be very few "Non maths" category students in the population who had completed the course successfully. Successful completion rate of the "Maths" category respondents was 42.9% and overall completion rate was 23.1%. In Applied Mathematics the successful completion rate of the "Non maths" and "Maths" categories were 11.1% and 58.2%. The overall completion rate of the respondents was 39.6%. Participants in the group discussions who followed both courses insist that Pure Mathematics was more difficult than Applied Mathematics. This view reflects very closely with the performances data as eligibility percentage, final examination pass rate and successful completion rate were much more better in Applied Mathematics compared with Pure Mathematics.

It is obvious that "Maths" category had performed very much better than the "Non maths" category. Considering the fact that the respondents were a set of active participants in the course and by comparing the other performances of the respondents with the population it suggests that the successful completion rates of the "Maths " and "Non maths" categories in the populations may be less than the relevant percentages of the respondents. (Successful completion rates of the two A/L categories in the populations could not be identified due to the non availability of educational background data of the populations). Overall successful completion rates of the two populations were 11% in Pure Mathematics and 17% in Applied Mathematics respectively.

The course co-ordinator suggested that as there were a large number of non starters and as the performances were not satisfactory the intake should be limited to those who have followed A/L in Maths. In such a case there would not be many different knowledge levels among the students and therefore it would be easier to conduct the Day Schools than present. However, it seems to be contradict with the "Open to all " policy. But on the other hand there are study programmes which used a selection test. What is noticed from the performances is that the gap between the two A/L categories. Clearly the "Maths" category students start the course with slight advantage than the others as they had some sort of pre requisite knowledge. The question is how to minimise this gap? As suggested, conducting more Day Schools, providing audio cassettes for the difficult areas, revising and rewriting the difficult areas in a simple way, and giving more opportunity to meet staff members at the centres to discuss their difficulties would help to a certain extend. But as a long term plan it is suggested to register students who do not have A/L in maths for a Foundation level zero (F0) Mathematics course which should be designed in order to give them the prerequisite knowledge to follow the Pure Mathematics and Applied Mathematics at Foundation level one. Therefore students with G.C.E.(A/L) maths background would be the target group for the original courses.

5.6.1   Non starters

Compared with the Diploma levels at the next stage, more non starters were found in the Foundation levels especially at level one where the courses offered are Pure mathematics (MPF 1301), Applied Mathematics (MPF 1302) and Properties of Materials (CEF 1301) (which consist of subject areas from Physics and Chemistry). Non starters are the students who registered for a course but never participated in academic activities. The non starters percentages in these three courses in the academic year 1995/96 are 46.8%, 46.5% and 50.9% respectively. APPENDIX VI gives the non starters percentages of all Foundation level courses in 1995/96 and previous two academic years.

In 1995/96 academic year there were 565 students at the Foundation levels who had not participated at least in one course out of the courses for which they had registered. The majority of them (464) were new students, i.e they were originally registered with the university in the same academic year. That group was considered as a sample and the researcher gathered some demographic information for them in order to find out whether there is a link between non participation and educational background at the G.C.E.(A/L). By the time of the study the relevant data were not stored in the computer and all such details were manually traced and recorded from their personal files. But unfortunately it was failed to gather the most required data i.e, A/L stream of all 464 students as the A/L stream was not asked in the application form. However it was managed to record A/L stream of 191 students as copies of their A/L certificates were in the files. Out of 191, 65

(34%) have followed A/L in "Maths", 74 (38.7%) in "Bio" and 52 (27.3%) in "Arts or Commerce". It is clear that 66% (126 out of 191) were "Non Maths" students. It is also noticed that 56 "Maths" and 102 "Non maths" students had not participated in all the courses they had registered. It is clear from these data that more percentage of non starters were "Non maths" students. However, it is very important to conduct a further study in this area to identify the most relevant reason for the non participation.

5.7 Comments on design of the study

Questionnaire / interview method was used as the method of data collection in this study. With two reminders satisfactory response rates were obtained. Group discussions were conducted with only 25 students. Therefore in the quantitative sense the results and analysis were dominated by the questionnaire respondents. But there were clear advantages in group discussions. The aim of conducting the group discussions were two folded.

(i)   As a pilot to the questionnaire, to identify the main questions to be included in the questionnaire , and

(ii)   to obtain information in more detail

It was failed to achieve the first purpose as no additional questions which should be raised were identified from the group discussions. The second purpose was achieved to a certain extend as in many similar questions more details were obtained compare to the questionnaire responses. Another advantage of having group discussions is that, for similar issues findings from the questionnaire data can be cross checked with group discussion data for its validity. However, Kandy and Matara discussion sessions were slightly affected by the time factor as they were conducted on a Day School day.

The purpose of conducting the group discussions at a latter stage of the academic year was to obtain more feed back about each and every course component as more than 75% of the activities were completed by that period. Out station discussion sessions were conducted on the 5th and 6th (last) Day school dates. Only six and two students were attended for the Day Schools .They were the active participants and therefore by conducting discussion sessions at this period lost the feed back of the students who had give up the course at early or middle part of the academic year.

Views of different categories of students (students who had followed A/L in different streams, who had not followed A/L, etc..) could be obtained, if group discussions were conducted at an early stage during the academic year. But on the other hand it was not possible to obtain views of all activities at an early stage. Therefore it would be better if group discussions were conducted at two stages. First discussion sessions at an early

stage just after first MST and the second one after the second MST. The proper dates could be selected after, studying the activity schedule. Another advantage of having discussion sessions at two stages is that, the first one can be used as a pilot to the second one and also the short comings could have been identified and it would help to conduct the second stage discussions more effectively.

Although the out station students and the staff co-operate well to reschedule the Day School on the discussion day, it would be better to make such arrangements in advance. It will save time and perhaps give more time for group discussions. (For an example commencing the Day school one hour early). It was the first time that the researcher had conducted group discussion sessions. Therefore the researcher may have failed to obtain all relevant information due to his inexperience in conducting discussion sessions. In most instances the researcher was more concerned about covering the topics in the interview schedule. In addition the limited time duration also affected discussions at Kandy and Matara.

Around 15 Day school lecturers were involved in conducting the Day Schools. Therefore if a questionnaire had been used to obtain feed back from the Day school lecturers in addition to the discussions information from more would have been obtained. The questionnaire data revealed that the respondents were a set of active participants in the course. Therefore all analysis was based on feed back of a particular group. Non starters and past students views would be also useful especially in the case of revising the course material.

5.8 Key issues to consider in a course evaluation study

Attention needs to be drawn to the following key issues when planning for an course evaluation study at OUSL.

* Identification of areas to be investigated

OUSL courses consist of number of components. For example, course materials, Day Schools, assignments, tests, Laboratory sessions and final examination etc. Therefore the specific issues in each component which are to be investigated further needs to be identified. Once the relevant information is gathered the evaluator would be able to identify the most problematic areas / components which should give the priority in a evaluation study. There are number of ways to gather initial information to identify the problematic areas. For example through informal discussions with students and relevant staff members

and past assessment records. In addition, discussions held with the course coordinator gave useful information. As done in some evaluation studies discussed in chapter two, a brief questionnaire can also be used.

* Idenfication of categories to gather information

Once the areas are identified for the study, careful attention should be drawn to select the categories who would be able to provide the most useful information. As discussed earlier, there are number of categories of people involved with a course. Some of them are, students, Course coordinator, Day School lecturers and marking examiners. Undoubtedly, the most important category would be the students who are being studied. However, it needs to be considered whether we could obtain useful information from all the registered students. There are considerable percentage of non starters in OUSL foundation level courses. If we need to obtain information for all course components, then non starters would not be able to provide more information. In this particular study non starters were excluded from the registered students when selecting the samples. In addition, considering the time and resources available one can choose group of students who had completed the course or any other applicable group. But if the population of the concerned group is high, sampling should be done. The aim of the sampling is to save time and effort but also to obtain unbiased estimates of the population.

* Method of data collection

In many course evaluation studies discussed in chapter two, mainly the questionnaire method or interview method or both were adopted as techniques of data collection. Face to face interviews can be conducted in a schedule form. A standard schedule is used for respondents in which the questions have the same wording and asked in in the same order. On the other hand, it can be conducted in a free format, like natural conversations between two people. It would be better if they can be tape recorded for later analysis. If not, note taking must be done. It is rather difficult to do whole concentrating on the management of the interview. In this study, the researcher experienced that difficulty when conducting the group discussions at the Kandy and Matara centres. They were conducted at Day Schools days and therefore had to concerned also on the time factor. It would be better if these interviews are conducted on a activity free date. However, in that case there would be difficulties in getting student participation, if they are to be conducted at outstation. Telephone interviews are widely used in the developed countries. But in the Sri Lankan context there are number of practical difficulties for employing that data collection method. Postal questionnaires are the most familiar method. In this study it was used as the main method of data collection. Considerably high response rates , (52% and 56% for the two course) were gained by sending two reminders and providing a stamp to sent back the

completed questionnaire. Some of the factors which influenced the response rate are discussed in chapter three. It is important to mention that reminders worked very effectively in this study as they almost doubled the initial response rate. So it can be concluded, for a OUSL course evaluation study postal questionnaires are most appropriate. In addition, as done in this study, interviews and discussions with student groups can be conducted to gather descriptive information. It would also used to check the validity of questionnaire feedback. For a course where smaller numbers of students involved interview method can be easily used. However, It may need to consider the factors such as, availability of time, resources and student number when selecting the appropriate data collection method.

* *Implementation of recommendation and suggestions*

It is essential to draw early attention to the priority issues which are identified from the recommendations and suggestions. However, there may be difficulties in implementing them immediately. Students awareness of limited resources is important, but quick response through development and improvements is more important to win students confidence. It is also very much advantageous in future studies. Enlighting each and every section in academic activities at the OUSL, evaluation studies aiming development of courses can be promoted. Recently launched OUSL research journal will be a good media to disseminate evaluation studies.

5.9 A summary of suggestions and recommendations

Pure Mathematics (MPF 1301) and Applied Mathematics (MPF 1302) courses are offered to give the pre-requisite knowledge to study the Foundation level two courses. No formal educational qualifications are required to register for these two courses. 1995/96 and past two academic year student numbers reveal that around 40-50% of the registered students never participate in academic activities. 1995/96 results shows that from the participants only 11% in Pure Mathematics and 17% in Applied Mathematics had completed the course successfully. Clearly these figures do not present a satisfactory picture. This study reveals that most of the students had difficulties in the course material and most of them were not satisfied with the way of conducting Day Schools. On the other hand as Day Schools lecturers pointed out it may be difficult to discuss the difficulties in course material in only six Day Schools and also difficult to maintain one level of teaching as there are different category of students. Mid session test pass rates and eligibility records reveal that there are significant differences between such variables and students G.C.E.(A/L) maths background. These courses contained 100% written media for the presentation of subject matter. Considering the findings of the study it would be the best idea to give priority for

the two components course materials and Day Schools in developing these courses. Also it is suggested to carry out further studies in following areas:

* Non starters   * Student preparation for OUSL studies

* Support services

Suggestions and recommendations were made under each and every component. A summary of them are listed below.

Short term

* Prepare the solutions of the worked examples simply

* Provide past assignment questions in a booklet form with answers and made it available at all regional /study centres.

* Make arrangement to provide an errata page for each unit.

* Provide answers for the Self Assessment Questions in a separate booklet.

* Make arrangements to avoid mistakes in the Tutor Marked Assignments

* Provide six Tutor Marked Assignments in Pure mathematics (MPF 1301)

* Provide five Tutor Marked Assignments in Applied Mathematics (MPF 1302)

* Make arrangements to avoid the delay in marking process

* Provide model answers together with the marked answer scripts and give details about different solving methods,if any

* Provide guide-lines for submitting of Tutor Marked Assignments

* Increase the number of Day Schools to 15 and conduct Day schools at many study centres

* Visit to the regional/study centres to monitor the progress of day school sessions

* Conduct three Mid Session Tests

Long term

* Give a detailed questionnaire together with each unit and conduct more group discussion session at two stages to identify the specific subject areas which need more assistance and revise the course material.

* Prepare audio materials for the difficult subject areas

* Prepare preparatory material in order to prepare students for distance learning containing an Introductory Mathematics unit with 4 - 5 lessons

* Conduct a study to analyse the issues such as availability of resources, cost of producing a video tape lecture, cost of conducting Day Schools at all centres in more detail prior to consider a method of combination of video tape lectures together with Day Schools

* Study the possibilities of providing additional support services

* Appoint permanent staff members to co-ordinate the courses.

5.9.1 Priority issues

Among the above there are number of suggestions which can be implemented during the forthcoming academic year.

* Make arrangements to provide an errata page with the course material

* Make arrangements to avoid mistakes in Tutor marked Assignments

* Make arrangements to avoid the delay in marking process

* Provide model answers together with marked answer scripts and give details about different solving methods, if any

* provide guide-lines for submitting of Tutor Marked Assignments

* Visit to the regional /study centres to monitor the progress of Day School sessions

In addition it is recommended to consider the following suggestions as priority issues in developing the Mathematics courses.

* Give a detailed questionnaire together with each unit and conduct more group discussion session at two stages to identify the specific subject areas which need more assistance and revise the course material.

* Prepare preparatory material in order to prepare students for distance learning

* Prepare the solutions of the worked examples more simply

* Provide past Tutor Marked Assignment questions in a booklet form with answers and made it available at all regional /study centres

* Provide answers for the Self Assessment questions in a separate booklet

* Increase the number of Day Schools to 15 and conduct Day Schools at many study centres

* Study the possibilities of providing additional support services

However, there may be some issues such as availability of course material and availability of resources which prevent early implementation of some suggestions. In general the course material is printed in large numbers (for future students in one, two, academic years) and therefore it may not be possible to incorporate any changes to the text very early. In the case of revising the material, sometimes it may need to rewrite number of lessons which may need additional funds. In addition it may need to find suitable lesson writer(s), translator(s) and editor. These factors may cause delay in implementing the revisions. Regarding the physical resources, reasons such as availability of AV facilities at the regional /study centres , students access to such facilities at home may delay the implementation of providing supplementary AV material. These may be common to the region.

Eventually, this particular study which focused on two Mathematics courses can be used as a model for any OUSL course evaluation study. It can be altered, modified and developed according to the course focused and resources available. Further, it would be applicable at distance teaching institutions in the South Asian region.

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LIST OF APPENDICES

APPENDIX I

Regional and Study Centres of the OUSL

LOCATIONS OF REGIONAL & STUDY CENTRES

▲ REGIONAL CENTRE
● STUDY CENTRE
___ PROVINCE BOUNDARY
.... DISTRICT BOUNDARY

JAFFNA

VAVUNIYA

ANURADHAPURA

POLONNARUWA

KURUNEGALA

KULIYAPITIYA

KANDY

AMPARA

KEGALLA

BADULLA

COLOMBO

BANDARAWELA

RATNAPURA

BUTTALA

KALUTARA

AMBALANGODA

GALLE

MATARA
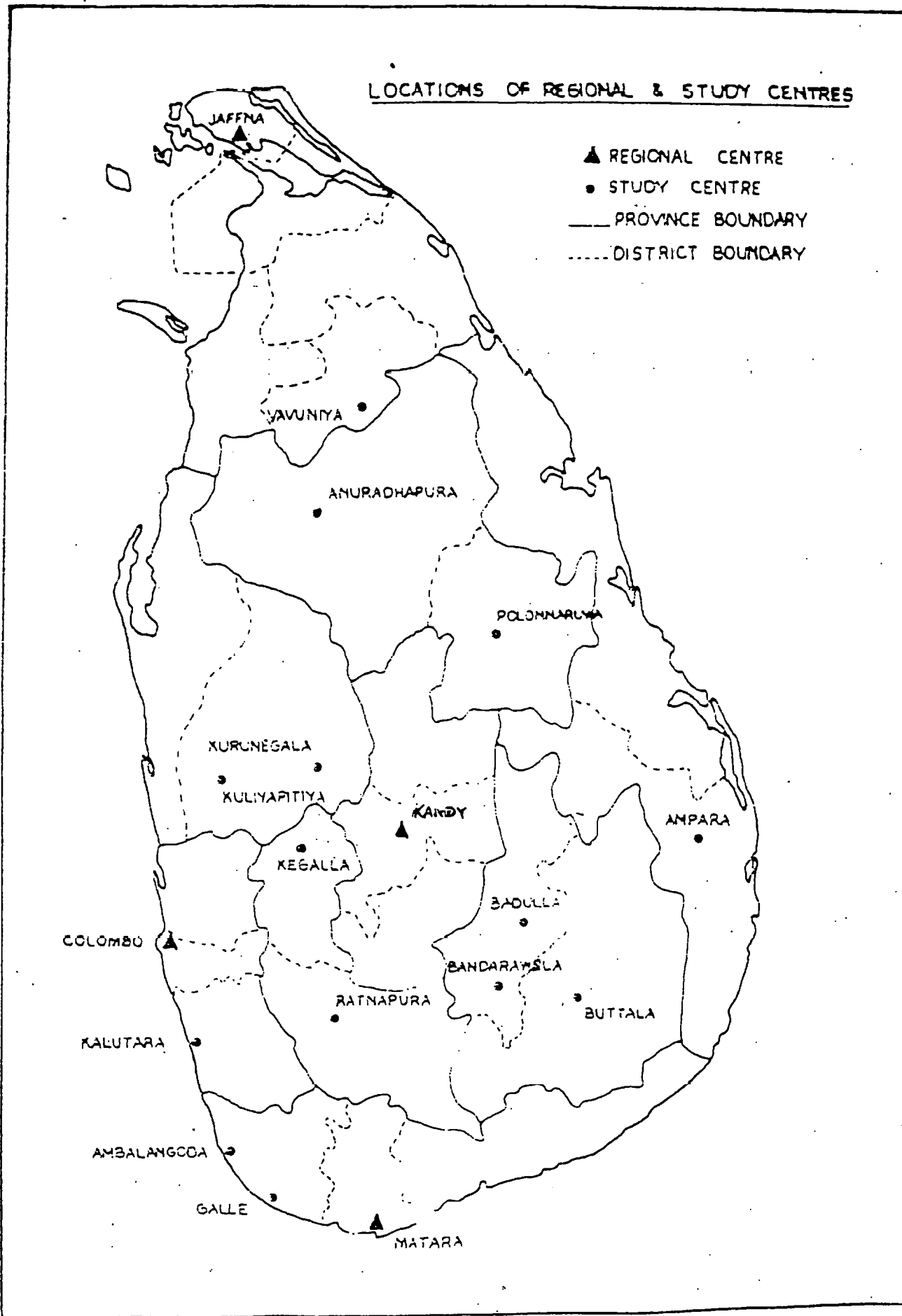
MPF 1301 — PURE MATHEMATICS QUESTIONNAIRE
AND THE COVERING LETTER
AND
A SAMPLE PAGE OF A SINHALA MEDIUM QUESTIONNAIRE

Dear student,

With a hope to improve the existing MPF 1301- Pure Mathematics course, it has been decided to obtain student feed back for the course through questionnaire/interview method.

For this purpose a sample of students has been selected from the participants in the 1995/96 academic year . We are happy to inform you that you have been included in the sample.

We would be very much thankful to you if you could take some time and answer this questionnaire. Please read the instructions very carefully and answer all the questions.

This data will be used only for the statistical purposes and please be assured that your responses would be kept confidential..

Your co-operation would be highly appreciated.

Please send the completed questionnaire to ,

" The Director
Educational Technology Division
The Open University of Sri lanka
Nawala, Nugegoda. "

on or before 24.01.97

THE OPEN UNIVERSITY OF SRI LANKA
SURVEY OF COURSE MATERIAL AND CONTINUOUS ASSESSMENT COMPONENTS IN
MPF 1301 - PURE MATHEMATICS
ACADEMIC YEAR 1995/96

QUESTIONNAIRE

INSTRUCTIONS ;
In all parts of this questionnaire, please answer the questions by ticking (√) the relevant box or writing yo
answer in the space provided, as appropriate.

PART A - GENERAL INFORMATION

Q1   Your registration No. : ....

Q2   Sex :   Male ☐   Female ☐

Q3   What was your age on 31.12.95 ?   .... years   .... months

Q4   What are your results for mathematics and science at G.C.E. (O/L) or N.C.G.E examination ?

Year	G.C.E (O/L)				N.C.G.E				Did not offer
	D	C	S	F	A	B	C	E	
.... Mathematics	☐	☐	☐	☐	☐	☐	☐	☐	☐
.... Science	☐	☐	☐	☐	☐	☐	☐	☐	☐

Q5   Which discipline did you follow in G.C.E.(A/L) or H.N.C.E ?

Year ....   Maths ☐   Commerce ☐
                       Bio ☐   Did not do A/L ☐
                       Arts ☐

Q6.   Which discipline do you intend to follow in Diploma in Technology programme ?

Civil ☐   Electrical ☐   Computer ☐
Manufacturing ☐   Electronics ☐   Textile ☐
Automobile ☐   Communication ☐   Agriculture ☐

Q7.   (a)   Are you ,

employed (full time) ☐
employed (part time basis) ☐
self employed ☐
unemployed ☐
retired ☐

If your answer to Q7(a) is "employed "or "self employed", please answer Q7(b).

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(b)   What is the nature of your employment ?
      (Please tick (√) the most appropriate answer for each part)
               Part I : type of work   Part II : type of field

               Managerial ☐   Educational ☐
               Administrative   Sales related
               Teaching   Service related
               Clerical   (eg. forces, health ..etc)
               Technical   Agricultural
               Minor staff ☐   Production & Transport ☐
               Other(Please write in)   Other (Please write in)
               ....

PART B - COURSE MATERIAL

Q8.   How much of the course material did you study from the following ?
      (select from approximate percentages given)

BLOCK /UNIT	100%	75%	50%	25%	less than 25%
Block 1 unit 1 Algebra	☐	☐	☐	☐	☐
Block 1 unit 2 Algebra	☐	☐	☐	☐	☐
Block 2 unit 1 Geometry	☐	☐	☐	☐	☐
Block 2 unit 2 Trigonometry	☐	☐	☐	☐	☐
Block 3 unit 1 Differentiation	☐	☐	☐	☐	☐
Block 3 unit 2 Integration	☐	☐	☐	☐	☐

Q9.   In studying the MPF 1301 course material, for which parts/subject areas did you spend relatively more
      time ? (with respect to the other parts/subject areas)

      parts / subject areas   reasons for spending more time
      ....
      ....
      ....

Q10. (a)   Have you come accross any difficulties in understanding the MPF 1301 course material ?
            in many occasions ☐   in very few occasions ☐
            in some occasions ☐   not at all ☐

      (b)   Please write in the subject area(s) (if any), you found difficult to understand and reason(s) for th
            difficulty. (you may tick (√) as many as appropriate)

subject area **	language not simple	explanation not clear	insufficient explanation	lack of worked egs.	lack of illustrations	illustrations not clear	other **
....	☐	☐	☐	☐	☐	☐	....
....	☐	☐	☐	☐	☐	☐	....
....							....

** If you have more subject areas or more details to write under the "other" category , please use a separate
sheet and attache it to this questionnaire.

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Q11. Was the print in your material clear and readable ?
very readable ☐   averagely readable ☐   not appealing to read ☐

Q12. Did you find the size and bulk of the blocks convenient to handle ?
very convenient ☐   convenient ☐   not convenient ☐

Q13 were the figures/diagrams in the course material clear ?
often ☐   sometimes ☐   never ☐

Q14. Were the figures/diagrams at the right places in the course material ?
often ☐   sometimes ☐   never ☐

Q15. Were you satisfied with the size of the figures/diagrams in the course material ?
often ☐   sometimes ☐   never ☐

Q16. How did you feel about the level of language used in the course material ?
very simple ☐   simple ☐   not simple ☐

Q17. (a)   Were you satisfied with the number of worked examples /SAQs in MPF 1301 course material ?

yes   no

(i) worked examples ☐ ☐
(ii) SAQs ☐ ☐

If your answer(s) to Q17(a)(i) and /or Q17(a)(ii) is "no", please answer Q17(b).

(b)   In your opinion in which lesson(s) would you need more worked examples/SAQS in the course material ?

Book/Block   unit   lesson title   required more (state whether worked examples or SAQs)
....
....

Q18. How do you feel about the subject content of MPF 1301 ?
too much ☐   about right ☐   too little ☐

Q19. On average, how much time did you spend studying MPF 1301 ?
.... hours per week

Q20. (a)   Would you prefer audio and/or video components to help your studies in MPF 1301 ?
yes ☐   no ☐

If your answer to Q20(a) is "yes", please answer Q20(b).

(b)   In your opinion what subject areas require audio / video supplementary materials ?
subject area   audio   video
....
....
....

3

If you have any other comments regarding audio/video material, please feel free to write them here.

....

....

Q21. (a) If audio/video supplementary materials are provided ,do you have facilities at home to use them?

available   not available

(i) facilities to listen audio study materials   □   □
(ii) facilities to view video study materials   □   □

If your answer(s) to Q21(a)(i) and / or Q 21 (a) (ii) is "not available", please answer Q21(b).

(b) How far do you have to go to find these facilities ?

	distance to travel	time taken	location(eg. study centre etc..)
(i) audio	...........km	..........hours	....
(ii)video	...........km	..........hours	....

Q22. If you have any other comments on course material, please write them in the space provided below.

....

....

....

PART C - DAY SCHOOLS

Q23. How many day schools in MPF 1301 did you attend ? ....

If your answer to Q23 is "none" go straight to Q30.

Q24. How useful were the day schools in your study ?
very useful □   useful □   not useful □

Q25. In which days would you prefer to attend day schools ?
week days □   Saturdays □   Sundays □   anyday □

Q26. (a) Overall, were you satisfied with the amount of day schools in MPF 1301 ?
yes □   no □

If your answer to Q26(a) is "no", please answer Q26(b).

(b) In your opinion, what would be the number of day schools you would want ?
....

Q27. (a) Overall, were you satisfied with the manner in which the day schools were conducted ?
yes □   no □

If your answer to Q27(a) is "no"   please answer Q27(b).

(b) What kind of changes in day schools would you like to suggest ?

....

....

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Q28. (a) Were you satisfied with the time gaps between two day schools ?
           yes ☐   no ☐

If your answer to Q28(a) is "no", please answer Q28(b).

(b) Suggest your choice of the time gap between two day schools : ....

Q29. (a) Were you satisfied with the facilities available at the day school class room ?
           yes ☐   no ☐

If your answer to Q29(a) is "no", please answer Q29(b).

(b) Please list the shortcomings.
     ....
     ....

Q30. If your attendance in day schools was below 50 %, please explain why by ticking the most relevant
     reason.
     ill health   ☐
     not satisfied with the pattern of conducting day schools   ☐
     travel difficulties   ☐
     family commitments/ change in personal life pattern   ☐
     difficult to follow the course   ☐
     able to find solutions to the difficulties   ☐
     other (please write in)
     ....

Q31. (a) Did you discuss your difficulties in course material with another person in addition to your
           course co-ordinator and day school lecturer ?
           yes ☐   no ☐

If your answer to Q31(a) is "yes", please answer Q31(b) and Q31(c).

(b) With whom did you discuss your difficulties ?
     OUSL teacher ☐   non OUSL teacher ☐   a relative ☐   another student ☐

(c) How often did you discuss your difficulties with him /her ?
     more than once a week   ☐
     once a week   ☐
     once in 2 weeks   ☐
     once in 3 weeks   ☐
     once a month   ☐
     other(please write in)   ....

Q32. In general ,do you like to study in groups ?
     yes ☐   no ☐

Q33. (a) Did you study in a group ?
           yes ☐   no ☐

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If your answer to Q33(a) is "yes", please answer Q33(b)

(b) (i) What was the frequency of your group meetings ?
more than once a week ☐
once a week ☐
once in 2 weeks ☐
once in 3 weeks ☐
once a month ☐   other(please write in) ....

(ii) How helpful was group study ?
very helpful ☐   helpful ☐   not helpful ☐

Q34. What was your regular place of study ?
home ☐   other
OUSL regional /study centre ☐   (please write in)
friend's / relative's place. ☐   ....

Q35. Were you satisfied with the study opportunities & facilities available to you at your regular place of study ?
very satisfied ☐   satisfied ☐   not satisfied ☐

Q36. If you have any other comments on day schools, please write them in the space provided below.
....
....
....

PART D - TUTOR MARKED ASSIGNMENTS (TMAs)

Q37 (a). How did you feel about the number of TMAs in MPF 1301?
too many ☐   about right ☐   too few ☐

If your answer to Q37(a) is "too many or too few", please answer Q37(b).

(b) What would be your suggested number of assignments : ....

Q38. (a) In general, were you able to submit TMAs within the given time duration ?
yes ☐   no ☐

If your answer to Q38(a) is "no", please answer Q38(b).

(b) Please give the reasons for failing to submit the TMAs within the given time duration
....
....

Q39 (a) Did you have any problems of receiving the assignments in time ?
yes ☐   no ☐

If your answer to Q39(a) is "yes", please answer Q39(b).

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(b)   Please describe your problem.

....

....

Q40.   Did you receive the marked answer scripts in reasonable time (within 1-2 month period) after the date
of submission ?

often   ☐   sometimes   ☐   never   ☐

If you have any comments please write in : ....

....

Q41.   Did your marking examiner make any comments on your answer scripts ?

often   ☐   sometimes   ☐   never   ☐

Q42.   How did you feel about your marking examiners comments on answer scripts ?

useful   ☐   not useful ☐   not clear ☐   not given at all ☐

Q43.   (a)   Were you able to understand the questions given in TMAs?

yes   ☐   no   ☐

If your answer to Q43(a) is "no", please answer Q43(b).

(b)   Please describe your difficulty :

....

....

Q44.   (a)   In general, how useful were the model answers of the TMAs for your studies ?

very useful ☐   useful ☐   not useful ☐

(b)   If you have any other comments regarding model answers, please write them below.

....

....

Q45.   If you have any other comments on Tutor marked assignments(TMAs), please write them in the space
provided below.

....

....

....

PART E - MID SESSION TESTS (MSTs)

Q46.   (a)   How did you feel about the number of MSTs in MPF 1301 ?

too many   ☐   about right   ☐   too few   ☐

If your answer to Q46(a) is "too many" or "too few", please answer Q46(b).

(b)   What would be your suggested number of MSTs : ....

Q47.   How did you find the time duration of a MST ?

too much ☐   about right ☐   too little ☐

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Q48. How did you feel about the number of questions in a MST ?

too many ☐   about right ☐   too few ☐

Q49. Which type of questions would you like to have in MSTs ?
(Please indicate your suggested number of questions and the time duration also)

		suggested number of questions	Suggested time duration (hours)
MCQs only	☐	....	....
Short questions only	☐	....	....
A combination of MCQs and short questions	☐	MCQs : .... short qns. :	....

Q50. How did you get to know your marks for the MSTs ?

from the co-ordinator ☐
from the notice board
not interested to know the marks
unable to know the marks /other (please explain)

....
....

Q51. If you have any other comments on Mid session tests (MSTs), please write them in the space provided below.

....
....
....

PART F - FINAL EXAMINATION

Q52. Were you eligible to sit the final examination ?

yes ☐   no ☐

If your answer to Q53 is "no" go straight to Q60.

Q53. How much of the course content did you study for the final examination ?
(select from approximate percentages given)

100% ☐   75% ☐   50% ☐   less than 50% ☐

Q54. Did you attempt the past examination papers in preparation ?

yes ☐   no ☐

Q55. (a)   Did you sit for the final examination ?

yes ☐   no ☐

If your answer to Q55(a) is "no", please answer Q55(b) and go to Q60.

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(b)   What was the most relevant reason for not sitting for the examination ?
ill health ☐
family commitments ☐
occupational reasons ☐
not prepared for the examination ☐
other (please write in)

....

Q56. (a)   Did you find the questions in the final examination paper a fair representation of the course content ?
yes ☐   no ☐

If your answer to Q56(a) is "no", please answer Q56(b)

(b)   Give reasons.

....

....

Q57. How did you feel about the choice of questions in paper II ?
too much ☐   about right ☐   too few ☐

Q58. were you satisfied with the time duration given for the final examination papers ?

	satisfied	not satisfied
Paper I	☐	☐
Paper II	☐	☐

Q59. (a)   Were you satisfied with the facilities provided at the examination centre?
yes ☐   no ☐

If your answer to Q59(a) is "no", please answer Q59(b).

(b)   Please describe the shortcomings.

....

....

....

Q60. If you have any other comments on Final examination, please write them in the space provided below.

....

....

....

THANK YOU VERY MUCH FOR SPENDING YOUR VALUABLE TIME AND EFFORT TO COMPLETE THIS QUESTIONNAIRE. PLEASE RETURN THE QUESTIONNAIRE TO :

" THE DIRECTOR
EDUCATIONAL TECHNOLOGY,
THE OPEN UNIVERSITY OF SRI LANKA,
NAWALA,
NUGEGODA.   ON OR BEFORE   24. 01. 1997.
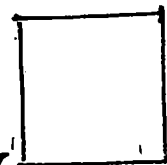
A stamp was affixed here.

QMPFT /

TO :
        THE DIRECTOR
        EDUCATIONAL TECHNOLOGY DIVISION
        THE OPEN UNIVERSITY OF SRT LANKA
        NAWALA,
        NUGEGODA.

මේ සම්බන්දයෙන් කිවයුතු යැයි හැඟෙන තවත් අදහස් තිබේතම් කරුණාකර එවා ලියා දක්වන්න.

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Q41. පැවරුම් පරීක්ෂකතුමා විසින් ඔබගේ පිළිතුරු පත්හි ගුණ දොස් ලියා දැක්වීසක් කර තිබුනේද?

බොහෝ විට ☐   සමහර විට ☐   කිසිවිටෙක නැත ☐

Q42. පැවරුම් පරීක්ෂකතුමා ඔබගේ පිළිතුරු පත්හි දක්වා තිබූ ගුණ දොස් කෙරෙහි ඔබගේ හැඟීම කෙබඳු විද?

ප්‍රයෝජනවත්ය ☐   ප්‍රයෝජනවත් තැත ☐   පැහැදිලි තැත ☐   කිසිවිටෙක ගුණ දොස් දක්වා තිබුනේ තැත ☐

Q43(a) ඔබට පැවරුම්වල අසා තිබූ ප්‍රශ්ණ තේරුම් ගත හැකිවිද?

ඔව් ☐   තැත ☐

Q43(a) සදහා ඔබගේ පිළිතුර " තැත" යන්න තම් ,කරුණාකර Q43 (b) සදහා පිළිතුරු සපයන්න.

(b) කරුණාකර ඔබ මුුහුණ පෑ අපහසුතාවයන් සදහන් කරන්න .

....
....
....

Q44.(a) සාමාන්‍යයෙන් පැවරුම් සදහා දූ ආදර්ශ පිළිතුරු පත් ඔබගේ ඉගෙනීමේ කටයුතු සදහා කොතෙක් ප්‍රයෝජනවත් විද?

බොහෝ ප්‍රයෝජනවත් විය ☐   ප්‍රයෝජනවත් විය ☐   ප්‍රයෝජනවත් නොවිය ☐

(b) ආදර්ශ පිළිතුරු පතු පිළිබදව ඔබගේ වෙනත් අදහස් / යෝජනා ඇත්තම් කරුණාකර ඒවා පහත සදහන් කරන්න.

....
....
....

Q45. ඔබට " පැවරුම් " පිළිබදව කිවයුතු තවත් අදහස්/ යෝජනා ඇත්තම් ඒවා පහත සදහන් කරන්න.

....
....
....

E කොටස – වාරමැද පරීක්ෂණ

Q46(a) MPF 1301 හි පැවතී වාර මැද පරීක්ෂණ සංඛ්‍යාව පිළිබදව ඔබගේ හැඟීම තුමක්ද?

ප්‍රමාණයට වැඩියි ☐   නියමිත ප්‍රමාණයට ☐   ප්‍රමාණයට අඩුයි ☐

Q46 (a) සදහා ඔබගේ පිළිතුර " ප්‍රමාණයට වැඩියි " හෝ " ප්‍රමාණයට අඩුයි "යන්න තම් , කරුණාකර Q46 (b) සදහා පිළිතුරු සපයන්න .

(b) ඔබ යෝජනා කරන වාරමැද පරීක්ෂණ සංඛ්‍යාව:......................

Q47. වාර මැද පරීක්ෂණයක කාලය පිළිබදව ඔබගෙ හැඟීම කෙබඳු විද?

ප්‍රමාණයට වැඩියි ☐   නියමිත ප්‍රමාණයට ☐   ප්‍රමාණයට අඩුයි ☐

REMINDER

Dear student,

SURVEY OF COURSE MATERIAL AND CONTINUOUS ASSESSMENT COMPONENTS IN MPF 1302 - APPLIED MATHEMATICS

With a hope to improve the existing MPF 1302 - APPLIED MATHEMATICS course, recently we sent you a questionnaire to collect student feed back.

We hope that you will help us by sending the completed questionnaire not later than 14th February 1997.

Your cooperation would be highly appreciated.

Director
Educational Technology Division
Open University of Sri Lanka
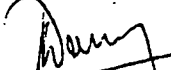Nawala, Nugegoda.
31.01.97

REMINDER

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Your cooperation would be highly appreciated.

Director
Educational Technology Division
Open University of Sri Lanka
Nawala, Nugegoda.
31.01.97

(SECOND REMINDER)

Dear student,

SURVEY OF COURSE MATERIAL AND CONTINUOUS ASSESSMENT COMPONENTS IN MPF 1301 - PURE MATHEMATICS

With a hope to improve the existing MPF 1301 - PURE MATHEMATICS course, about 6 weeks ago we sent you a questionnaire to collect student feed back. So far, we have not received your response, perhaps you may have mislaid it or it may have been lost in mail. For your convenience, herewith we are enclosing another copy of the questionnaire.

Since we would like to get most of the questionnaires back, we hope that you will help us by sending the completed questionnaire not later than **14th MARCH 1997**. If you have already posted it to us, please ignore this reminder.

This data will be used only for the statistical purposes and please assured that your responses would be kept CONFIDENTIAL.

Your cooperation would be highly appreciated.

Director
Educational Technology Division
Open University of Sri Lanka
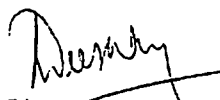Nawala. Nugegoda.
28.02.97

2nd REMINDER

Dear student,

SURVEY OF COURSE MATERIAL AND CONTINUOUS ASSESSMENT COMPONENTS IN MPF 1302 - APPLIED MATHEMATICS

With a hope to improve the existing MPF 1302 - APPLIED MATHEMATICS course, about 6 weeks ago we sent you a questionnaire to collect student feed back. So far, we have not received your response, perhaps you may have mislaid it or it may have been lost in mail. For your convenience, herewith we are enclosing another copy of the questionnaire.

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Director
Educational Technology Division
Open University of Sri Lanka
Nawala. Nugegoda.
28.02.97

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OUTLINE FOR THE INTERVIEW / DISCUSSION SESSIONS WITH THE STUDENT GROUPS

COURSE MATERIAL

Understandability of subject matter
Language style/ level of language
Difficult areas
Worked examples
SAQs
Figures/diagrams
Size of the blocks/ letter size / space provided for notes
Audio and video material
Any other comments

TUTOR MARKED ASSIGNMENTS

Number of TMAs
Number of questions in a TMA
Representation of subject matter
Time duration given to submit the TMAs
Problems relating to receiving of TMAs and marked answer scripts
Marking examiners comments
Any other comments on TMAs

MID SESSION TESTS

Number of MSTs
Representation of subject matter
Time duration
Structure of a MST
(views about the following three types   - Only MCQs
                                           - Only short questions
                                           - A combinations of above two types)

Any other comments and suggestions

DAY SCHOOLS

Number of day schools
Pattern of conducting the day schools
Prefer days to have day schools
Any other comments/suggestions

APPENDIX V

DETAILED DESCRIPTION OF THE RESULTS OF THE DISCUSSION SESSIONS

(A) *Results of the group discussions had with the students*

Introduction

Overall, 25 students took part in the discussion sessions. Some demographic data such as age, A/L background and employment were obtained prior to the discussion sessions.

TABLE A 1   ABOUT THE PARTICIPANTS IN GROUP DISCUSSIONS

RC	No.	Age group			Employment			A/L background	
		18-24	25-29	>=30	UN	FT	PT	Maths	Non maths
C	4	3	1	--	3	--	1	3	1
C	5	5	--	--	5	--	--	3	2
C	4	4	--	--	4	--	--	2	2
C	4	4	--	--	4	--	--	3	1
K	6	4	2	--	4	2	--	3	3
M	2	2	--	--	2	--	--	--	2
Tot	25	22	3	--	22	2	1	14	11

Discussion sessions were mainly focused on the areas related to "Course material", "Day Schools", "Tutor Marked Assignments" and "Mid Session Tests". Therefore the outcome of these interview/discussion sessions are reported under different sections.

Course material

Understandability of subject matter

As expected, it was noticed that "Maths" participants had less difficulties in understanding the course material than the "Non maths" participants. Familiarity with the subject matter was mentioned as the reason. On the other hand, no background knowledge, new subject areas, were mentioned as the main reasons for the difficulty by "Non maths" participants. Some "Maths" students mentioned that they need more detailed explanations in "Differentiation", "Integration", and "Archemede's' law & its application" units. The majority of "Non maths" participants mentioned that they found many difficulties especially in Trigonometry , Calculus

and the Hydrostatics, subject areas. Too much subject content, too many equations and theorems to keep in mind were the given reasons for the difficulties in Trigonometry and Calculus, while involvement of Integration as mentioned as the difficulty in Hydrostatics.

Printing mistakes in course material emerged as a common view. They mentioned that mistakes were mainly found in equations and solutions of worked examples. It was also mentioned that the missing of symbols and characters were the most common types of mistakes.

Language style / level of language

The majority of participants were satisfied with the level of language used in the course material. Four students who were following the course in English medium said that although they understood the subject matter as they had followed Maths in A/L, there were some difficulties with English terminology. However, there were no English medium "Non maths" participants to obtain their views.

Difficult areas

Maxima and Minima in Differentiation , Methods of Integration, Areas and volumes in Integration unit, Sum of the series, Solution of triangles were the mostly mentioned areas in Pure Mathematics (MPF 1301). However, the majority of "Non maths" participants mentioned that almost all in Differentiation and Integration units and latter part of the Trigonometry unit were the most difficult areas. Most of the "Non maths" participants stated that such areas were difficult because it contained a lot of equations and theorems. Some of them said that they needed simple explanations and more worked examples for the difficult areas. Relative velocity, Pressure centre, Stability of floating bodies, Framed structures, Motion under impulse, Resultant thrust, Meta centre, Equilibrium under coplanar forces were mentioned as difficult areas in Applied Mathematics (MPF 1302). The majority of participants mentioned that they discussed their difficulties with another student or with a relative.

Worked examples

"Solutions were not presented in a simple way in some worked examples" was a common view about the worked examples. Missing of subsequent steps was another problem. Especially, "Non maths" participants emphasised that solutions of the worked examples should be presented in a simple way with all steps. They also mentioned that they had difficulties in understanding some worked examples due to some printing errors. Another common view was to include more worked examples in the difficult areas. Most of participants mentioned that assignment questions were much more difficult than the worked examples and therefore suggested to include much more difficult worked examples similar to assignment questions.

Self Assessment Questions (SAQs)

Almost all were satisfied with the number but stressed the necessity of the answers. Especially, "Non Maths" participants suggested that hints or some guide lines should be provided for the difficult SAQs.

Diagrams

Almost all were satisfied with the number of the diagrams, size and their clarity.

Size of the course material Units

The majority were satisfied with the existing size of the course material. However, it was noticed that some of the participants not considered it as an important issue. The majority suggested to print course material unit wise, i.e. not to combine units.

Letter size / Space for notes

All were generally satisfied with the letter size. Almost all had not used the space provided in the lessons to make notes. They had used separate books for such purposes. One suggested to add two or three blank pages at the end of each lesson to write down the short notes. Some of them suggested that different letter sizes, symbols or cages should be used to highlight the important equations. It was also pointed out that the tables given at the end of the second unit (B1U2) in Pure Mathematics (MPF 1301) were congested and difficult to read.

About AV material

This idea was welcomed by the majority of participants. However, some of them mentioned that they would prefer to have more Day Schools rather than having AV material. Audio cassettes were mentioned as more suitable because the majority had the facilities to use them at home. However, some participants suggested that it would be better to produce videos, to explain the different methods of solving problems, Discuss more practical problems, Focus on practical problems which are difficult to explain in text especially in Hydrostatics. In addition, some prefer to have lecture type videos.

Any other comments / suggestions

A common view was that "all units should be given at the time of registration". Only one participant suggested posting the second despatch to the home address. Among the other views, print them in unit-wise, provide an errata page, provide more English medium copies to the libraries for reference, unsatisfactory print quality of the last block in Pure Mathematics were prominent.

Day Schools

Number of Day Schools

During the time of the discussion sessions at Colombo and Kandy four Day Schools had already been conducted. Matara discussion session was conducted on the last Day School day.(sixth Day School). Day Schools attendance of the participants is shown below.

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TABLE A 2   DAY SCHOOL ATTENDANCE OF THE PARTICIPANTS

No.of DS Attended	Regional Centre			Total
	Colombo	Kandy	Matara	
None	2	--	--	2
One	7	--	--	7
Two	6	1	--	7
Three	2	3	--	5
Four	--	2	2	4
Total	17	6	2	25

Only two participants had not attended Day Schools at all. "Able to find solutions for the difficulties" was stated as the reason for their non participation. Both of them had followed A/L in "Maths" stream. The majority of other participants mentioned that the existing number of Day Schools were not adequate. However, they made different suggestions such as

three Day Schools per unit
four Day Schools per unit
around 15   and
around 20   regarding the required number of Day Schools.

Way of conducting Day Schools

It was noticed that a higher number of participants were not satisfied with the way of conducting Day Schools. Their common view was that all subject areas should be discussed from basic. Some of them suggested that questions similar to subsequent assignment should also be discussed at the Day Schools.

Prefer days to have day Schools

Almost all would prefer to have Day Schools on weekends. Four participants who were unemployed prefer for any day. Another view was, not to conduct both Day Schools (Pure and Applied) on the same day morning and afternoon. But it was noticed that most of the outstation participants who followed both courses were willing to have both Day Schools on the same day. Travel difficulties was mentioned as the main reason.

Any other comments / suggestions

Common suggestions made by the participants are follows:

want more Day Schools
discuss more subject matter
discuss subject matter from basic
want special Day School prior to the Final Examination to discuss the past exam paper questions.

Kandy participants also suggested that a permanent staff member should be available at the centre to discuss their difficulties. Although a member was available only one session per week is allocated for Foundation level one students. Some Colombo participants stated that they would prefer to have the same lecturer in all six Day schools. One "Non maths" participant was totally unhappy about the Day Schools and said that "the faculty should not register Bio and other students if it cannot provide more Day Schools". Matara participants were unhappy with the Day School lecturer. They said he was not punctual. They would prefer to have a OUSL staff member as he would have more responsibility than the outside lecturer.

Tutor Marked Assignments

Number of Tutor Marked Assignments

Most of the participants were generally satisfied with the existing number. But few "Maths" participants mentioned that they prefer to have one or two additional TMAS.

Number of questions in a TMA

Almost all were satisfied with the number of questions. But some of the participants mentioned that there were too many parts in the first TMA in Pure Mathematics (MPF 1301).

Representation of subject matter

They pointed out that in TMA number three, there were more questions from Trigonometry but less from Geometry. Some "Maths" participants suggested that instead of combined TMA, two TMAs should be given for the last block in Pure Mathematics which covered the subject areas in Differentiation and Integration.

Time duration

Almost all were generally satisfied. However, some participants suggested that more time duration should be given for the last two TMAs in both courses. It was noticed that although the last two TMAs were given together majority of them work on the fourth TMA after submitting the third TMA.

Receiving of TMAs / Marked TMAs

They had no problems regarding receiving of TMAs. (First two TMAs were given at the time of registration and last two were posted to their home address). It was noticed that they had received only one marked TMA during the time of discussion sessions. All participants were really unhappy about the time taken to received the marked TMA.

Marking examiner's comments

Participants were unable to comment on this issue as they had received only one marked TMA. However, the majority of participants mentioned that the marking examiner had not made any comments on their script. They said that they prefer to have examiners comments to improve their work on subsequent TMAs.

Any other comments

"Send marked TMAs as early as possible with the model answers"was a common view. They were not satisfied with the roneoed TMAs as some parts were illegible due to blotted letters. Therefore they suggested using quality papers to print TMAs. Another suggestion made by most of the participants was to provide English medium TMAs to all students. The reasons for such a suggestion were to cross check the accuracy of equations and figures of the questions and also to get familiar with the English terminology. "Make maximum effort to avoid errors in TMAs" was also suggested by some participants.

Mid Session Tests

Number of Mid Session Tests

17 participants had sat for both tests. Four had sat only for the first test and the remaining four only for the second test. Majority of participants were satisfied with the existing number. However, few "Maths" participants said that they prefer to have another one or two MSTs.

Representation of subject matter

Most of the participants who sat for both tests stated that the second test was much more difficult than the first one as it covered more subject areas. Some of them pointed out that it was unfair for the students who have missed the first one because only one test mark was considered in determining the overall Continuous Assessment (CA) mark.

Time duration

Almost all who sat for the first test were satisfied with the time duration. But the majority of participants who sat for the second test, mentioned that the time duration for not sufficient. and suggested to increase it by another 30 minutes.

Structure of a Mid Session Test

Participants were asked which type of questions they would like to have in Mid Session Tests out of the following three choices.

Choice 1	Only MCQ type questions
Choice 2	Only short questions
Choice 3	A combination of MCQs and short questions.

Their answers are as follows;

Choice 1	7
Choice 2	7
Choice 3	10
Did not comment	1

There was no common view. There were same number of participants who prefered for first two choices but the mode was choice three.

Any other comments / suggestions

A variety of suggestions were made by the participants. The common suggestions are;

Discuss the Mid Session Test type questions in the Day Schools
Provide model answers for tests
Discuss answers of the test papers at Day Schools
Send the marks of the tests by post

It was also suggested that past Mid Session Test papers should be available at the regional/study centre libraries.

(B)   Results of the discussions had with the Day School lecturers

Discussion sessions conducted at the Kandy centre

Separate discussion sessions were conducted with the two Day School lecturers.. Their comments were mainly focused on Day schools and are given below ;

*   Most of the students do not come prepared for the Day School.

*   Students expect day School lecturer to teach all the course material.

*   It is not possible to cover all subject areas assigned for a particular Day School during the limited time period.

*   Normally it would selected the subject area to be discussed by the past experience if students did not mention particular subject area.

*   Students are from different knowledge levels and therefore it is very difficult to maintain a level of teaching.

It is noticed that there were two groups according to students' maths knowledge at the beginning of the academic year. However, those classes were combined after two sessions due to poor attendance.

*   Students attendance decreases gradually. Students expect day school lecturer to discuss the whole course material and when they realise that it was not the way of conducting Day Schools most of them gave up attending the day schools.

*   Students with lack of pre-requisite knowledge find it difficult to follow.

Other comments / suggestions

Both lecturers mentioned that the number of Day School sessions are not sufficient even to discuss the difficult areas. Therefore they suggested increasing the number. They said that three Day Schools per unit would be reasonable.

Pure Mathematics lecturer suggested making 50 -75 % attendance compulsory. But the other lecturer had a different view. He mentioned that some of them may not want to attend as they do not encounter any difficulties or have other sources to find solutions to their difficulties and therefore it may be unfair for such students, if attendance is made compulsory.

Both lecturers were generally satisfied about the course material, subject areas covered and about the presentation. But mentioned the mistakes in the course material such as Printing mistakes, omission of steps in worked examples and omission of operational symbols in solutions.

With respect to Tutor Marked Assignments, both of them mentioned that a good standard had been maintained and main subject areas are covered. However, Pure Mathematics lecturer pointed out that the subject area of "Geometry" was not adequately represented in TMAs. They also pointed out that there were a few errors in some Sinhala medium TMA questions. They suggested not to roneo TMAs as some mathematical expressions were blotted and therefore difficult to read.

Discussion session conducted at the Colombo regional centre

Three Day School lecturers were involved in this discussion session, which was conducted on 06.11.96. By that time all the Day Schools scheduled for the academic year 95/96 had been conducted. All of them are staff members of the OUSL. Two of them had conducted the classes in 1995/96 academic year and the other had conducted the classes in the previous year (1994/95). As in Kandy discussion sessions, their views were mainly focused on Day Schools. Their views /suggestions are as follows:

*   Students do not study the material before attending the Day Schools.

*   Students expect Day School lecture to cover the entire subject area. Attendance in Day Schools drops gradually.

*   Difficult to maintain one level of teaching as they form a heterogeneous group.

*   Difficult to conduct Day Schools according to the given schedule. Normally students are not used to self study and expect class room style teaching as in A/L. Main reason may be they are recent school leavers. As they are new to the system it is better to conduct some lecture type Day Schools initially.

*   It would be helpful for the students if three day Schools per unit are conducted. However, units such as Differentiation, Integration, Dynamics and Hydrostatics may require even more than three as they are the most difficult subject areas to the students.

*   More attention should be drawn to the students who had not followed A/L in Maths.

*   Issue a Day School request form and ask students to indicate the areas which they want to discuss in the subsequent Day School.

*   Course material generally covers all the important areas

*   There are some printing mistakes in the course material and also in some of the TMA questions

*   Introduced one TMA per unit to assess students more frequently.

APPENDIX VI

NON STARTERS IN FOUNDATION LEVEL COURSES

TABLE A 3   NON STARTERS IN FOUNDATION LEVEL COURSES

Level	Course	Academic year					
		1995/96		1994/95		1993/94	
		No. reg.	Non starters	No. reg.	Non starters	No. reg.	Non starters
One	MPF 1301	616	288 (47%)	1036	440 (43%)	972	365 (38%)
	MPF 1302	591	275 (47%)	963	417 (43%)	955	440 (46%)
	CEF 1301	408	208 (51%)	714	342 (48%)	724	376 (52%)
Two	MPF 2301	248	42 (17%)	231	41 (18%)	223	31 (14%)
	MEF 2301	474	99 (21%)	751	206 (27%)	969	286 (30%)
	MEF 2302	463	84 (18%)	657	137 (21%)	617	125 (20%)
	ECF 2301	462	99 (21%)	646	181 (28%)	662	243 (37%)

MPF 1301 - Pure Mathematics
MPF 1302 - Applied Mathematics
CEF 1301 - Properties of Materials

MPF 2301 - Mathematics
MEF 2301 - Enfineering Drawing
MEF 2302 - Heat and Fluids
ECF 2301 - Principles of Electricity