FITMAST: A case study of one programme
of inservice training for science teachers (Biology).

By

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We accept this thesis as conforming
to the required standard

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Abstract

A case study was made of FITMAST (Formal Inservice Training of Mathematics and Science Teachers.), an inservice education programme for science teachers in South Africa. The objectives of FITMAST are:

a) to upgrade the academic qualifications of teachers and,

b) to improve the teaching competence of the teachers.

In the case of FITMAST, equal emphasis was initially placed on the acquisition of both the above aims. However, the recognition that teachers wanted from attending the FITMAST courses, was first-year university credits. Such wishes necessitated an emphasis towards more academic content in order for the University of the Western Cape to grant such credits. Consequently less time was devoted to improving the teaching competencies for the participants; a move that the teachers were critical of for they continued expressing the desire to have their teaching competencies improved. FITMAST is thus caught up in a "Catch 22" situation: an emphasis shift in either direction will have to be made each at the expense of the other.

Faced with an apparently unresolvable position, a tension is created insofar as the devotion of time to either of the objectives is concerned. This study, in accepting that the above-mentioned tension exists, will seek to:

a) find how this tension and other problems that surrounds FITMAST manifest themselves in the teachers' perceptions and course experiences, as well as within the views of the administrators and,

b) provide in the form of recommendations, a direction for change based on the teachers' course experiences.
Four modes of data collection were employed:

a) Interviews were conducted with the Biology teachers that attended FITMAST in June 1987. The administrators were also interviewed during that period.

b) A questionnaire, constructed from the interview data obtained from the teachers, was mailed to all the Biology teachers that had participated in FITMAST since its inception in 1983.

c) Field notes were recorded during the researcher's attendance of the FITMAST session in June 1987.

d) Documents with regard to FITMAST were also consulted.

The major findings that emanated from this study were:

1) The teachers' expectations of FITMAST were not met by the programme.

2) The amount of course work encountered during a residential session of FITMAST is too much.

3) A sizeable amount of the course work covered in FITMAST might be familiar to the teachers.

4) The distance teaching component merely evaluates the teachers' understanding of the work covered in the residential component.

5) Teachers believe that didactics should form a major part of the FITMAST programme.
The following recommendations were made:

1) Prospective participants should be informed about the exact nature of the FITMAST courses primarily through an orientation session in which former participants can share their experiences with the new recruits.

2) The amount of course work covered during the residential session should be reduced.

3) The distance teaching component should become part of the instructional process.

4) The time devoted to didactics should be extended as an urgent response to a strongly expressed need of the teachers to enrich their didactic experiences.

The researcher further recommends that a feasibility study be undertaken of an alternative format that is proposed should the distance teaching component become part of the instructional process.
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The respondents for the time taken to answer the questionnaire.

Finally, World University Services of Canada who provided the opportunity to study here.
DEDICATION

This thesis is dedicated to my parents, John and Lettie Harris, who have opened the doors of learning for me.
Chapter 1

Explanation of the study

1.1 Introduction

Science educators and others concerned with the status of science education world-wide have acknowledged the existence of a crisis in this field of study. While numerous aspects of this crisis have been elucidated, the most emphasised aspect, in both the developed and developing countries, appears to be the shortage of qualified science teachers (Education Week, 1983; Johnston & Aldridge, 1984; and Ogunniyi, 1986).

Numerous recommendations have been put forward with respect to the shortage of science teachers. Amongst others, The National Science Board in the United States suggested that top priority be placed on the recruitment of new science teachers, as well as the retention of currently serving teachers. A further drastic recommendation by the above-mentioned body probably underwrites the severity of the problem of teacher shortage. They have recommended that attention be paid to the retraining of interested teachers from other disciplines!

Inservice education for teachers is another such important recommendation. However, as several authors caution, (Editorial in IBE, 1985; Bolam, 1983) the term inservice education takes on different meanings within different realities. It is thus against the background of a given situation that the weight of such a recommendation be judged.

South Africa, like most other countries in this world has not escaped this general crisis in science education, with her biggest problem also being a severe shortage of qualified science teachers. In 1981 an
investigation into the state of education in South Africa by the Human Sciences Research Council (HSRC) confirmed the existence of the above problem. It found that approximately 70-90% of science teachers in Black schools are grossly underqualified and were even in critically short supply.

Thus, the reality of a shortage of science teachers in South Africa is, like in many other developing countries, compounded by the fact that most of the presently-serving teachers are not properly qualified for their positions. It within such a context that, as earlier alluded to, the difference in the nature of inservice education in developing countries when compared to developed countries should be seen. In the developed countries, "...teacher's inservice education is a continuation of initial or basic training which under normal conditions should take place before active service and through which the trainee acquires the required qualifications" (IBE Editorial, 1981, p.1), while teachers in developing countries are normally lacking in preservice education so that inservice education essentially takes on a role of upgrading academic qualifications.

It is therefore not surprising to note that the HSRC, on putting forward their recommendations to solve the crisis in science education in South Africa, had called for an immediate national effort to be launched with respect to inservice education. The Commission urged that all institutions that train teachers participate in establishing, as their top priority, an inservice education programme for non-qualified and under-qualified teachers to improve their academic qualifications.
1.2 FITMAST (Formal Inservice Training of Mathematics and Science Teachers): the programme under investigation

Amongst others, the University of the Western Cape, in collaboration with one of the national departments of education, has heeded the call to improve the academic qualifications of teachers by designing an inservice training course for this purpose. This programme is called FITMAST (Formal Inservice Training of Mathematics and Science Teachers) with a residential-cum-distance teaching approach. The aims of FITMAST in a nutshell are:

a) to improve the qualifications of those who currently teach either Mathematics or Science or Biology and,

b) to improve the competence and confidence of course participants in the teaching of one or more of these subjects. (Nel, Finnemore & Rhodes, 1987).

The administrators of the programme also admit that they "...were aware of an element of DUALITY being built into them [i.e. the objectives]..." (Nel, Finnemore & Rhodes 1987, p.108) but that they are working towards the realisation of these two aims.

1.3 Background to the study

That the programme is beset by problems is probably most evident in the estimated annual drop-out and/or failure rate of 30% of the teachers that register at the start of each year (Davis, 1987). Various opinions exist on the reasons for such a high proportion of teachers

1 At the time of delivering this paper to a conference in South Africa, these three gentlemen occupied the following positions in the FITMAST programme:

a) Dr. J.H. Nel was the Co-Director of FITMAST.

b) Messrs D. Finnemore and S. Rhodes were employed as the two full-time tutors of FITMAST.
not making the grade. From personal interviews conducted with both teachers and administrators, these reasons ranged from general dissatisfaction and disillusionment with the programme by the former, to overall administrative problems and the tension created by the pursuit of the programme's dual aims in the latter's opinion.

In a recent paper to a conference in South Africa on distance education, one of the directors of FITMAST alluded to exactly what this tension might be:

Some of our course participants are urgently in need of improved qualifications (degrees and diplomas) for salary purposes. Their courses have to match the standard university undergraduate courses. Approved combinations and constellations of such courses may earn them enough credits for a diploma or degree to be awarded. But this could mean that their CLASSROOM TEACHING of Maths or Science gets VERY LIMITED ATTENTION during their course. (Nel, Finnemore & Rhodes, 1987, p.108-109)

The tension between academic content and didactic teaching as faced by FITMAST is, of course, not unique to South Africa. It is a characteristic feature of inservice education programmes in developing countries that attempt to improve both the academic qualifications as well as the professional competence of their teachers. Especially in the areas such as science and mathematics where there are often great shortages, inservice teacher education has become the popular tool with which to simultaneously address the academic and professional deficiencies in the qualifications of teachers in developing countries. Davis views the appropriateness of inservice teacher education as "...a highly strategic initiative : where teachers are already scarce, they can hardly be taken out of school for lengthy residential courses" (1987, p.3).

In most developing countries, programmes of inservice teacher education has been designed according to Aleyideino and Hawes, to meet "...an emergency situation [whereby] a government feels able to raise the basic educational and professional standards of its teachers" (Aleyideino & Hawes, 1971, p.19). Similar trends for
inservice education programmes in the developed countries were noticeable in the early sixties (Yarger, 1985).

Since government policy-makers perceive inservice education to be capable of addressing both the academic and the professional shortcomings of the teachers, programmes such as FITMAST needed to give appropriate consideration to both the concepts of "what" (=content) and "how to" (=teaching methodologies) in their courses. Consequently the issue of academic content versus teaching methodology featured prominently in the early planning of inservice education programmes.

However, while in the earlier years equal consideration might have been given to both academic content and teaching methods, recent studies of inservice education programmes in developing countries (Greenland, 1983 and Nel, Finnemore & Rhodes, 1987) have indicated a heavier lean towards improving the academic content knowledge of teachers. This shift in emphasis has primarily been brought on by the teachers seeking recognition from the educational authorities for the courses taken at these inservice education programmes. From his survey of Anglophone African countries, Greenland cites two examples where the matter of accreditation has surfaced:

...courses for unqualified teachers in Sierra Leone were allowed to go ahead with the contentious issue of accreditation still unresolved. Similarly in Swaziland there was misunderstanding over whether successful applicants... would receive the Primary or Lower Primary Teacher's Certificate, a decision with considerable financial repercussions for both Government and individual teachers.
(1983, p.98: author's emphasis)

Loading an inservice course with academic content did not, however, mean that the teachers have forsaken their wish to improve their professional competence. The table on the following page lists the teachers' responses, averaged across all thirteen African countries surveyed by Greenland, as to topics they prefer for an inservice education course.
Table 1. Teachers' preferences with regard to topics for inservice education in Anglophone Africa.

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<thead>
<tr>
<th>Topic</th>
<th>Strongly like</th>
<th>Like</th>
<th>Unsure</th>
<th>Dislike</th>
<th>Strongly dislike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Content</td>
<td>70%</td>
<td>26%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Subject Methodology</td>
<td>61%</td>
<td>30%</td>
<td>5%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: Adapted from 'The in-service training of primary school teachers in English-speaking Africa' by J. Greenland (Ed) (1983), London: Macmillan Education. (p98)

From the above table it is clear that the teachers want an equal emphasis placed on improving both their academic and professional qualifications. In an interview with one of the Directors of the FITMAST programme, it emerged that the administrators of this programme are aware that the teachers in the FITMAST programme do want a substantial focus placed on didactics (teaching methodologies).

Thus the issue of accreditation, together with the teachers' continued desire to enhance their didactic capabilities, has placed inservice education activities in an unenviable position. Considerations given to the activities at FITMAST, as mentioned before, can be regarded as exemplifying this position. Because teachers wanted accreditation for the FITMAST courses, a heavy shift towards academic content was necessary for them to be recognised as university credits. Consequently, as Nel, et al. stated...
before, the "...classroom teaching of Mathematics or Science gets VERY LIMITED ATTENTION during the course" (1987, p.109); an issue that, in the opinion of a FITMAST Director, teachers want to be addressed more extensively. Tension thus arises over how much emphasis should be placed on the academic and didactic aspects respectively of an inservice teacher education course.

1.4 Focus of the study

There appears to be consensus amongst government educational authorities, participants and administrators of inservice education programmes as to the broad goals for inservice teacher education. However, the means to achieve such goals seems to be hampered by the issue of accreditation of inservice courses.

In the case of FITMAST, it was shown what the impact and consequences of the teachers' demands for accreditation had been on the programme. It appears therefore that the FITMAST programme is caught up in a "Catch-22" situation: an emphasis shift either towards academic content or didactics will be made each at the expense of the other. Faced with an apparently unresolvable situation, a tension is created insofar as the devotion of time to either of the objectives is concerned. This assertion is revealed in the perception of a Director of the FITMAST programme. On questioning him about the tension created by the duality of the objectives aimed for by FITMAST, he revealed an idea of the extent of this tension:

"Uh, always a tension... from day one there was this tension. It's a difficult one to reconcile..."

This study, in accepting that the above-mentioned tension exists, will seek to:

a) find how this tension and other problems that surrounds FITMAST manifest themselves in the teachers' perceptions and
course experiences, as well as within the views of the administrators and,

b) provide in the form of recommendations, a direction for change based on the teachers' course experiences.

To this end the study will examine the following issues:

a) the socio-political context of the programme,

b) the needs and expectations of Biology teachers upon entering the programme,

c) the extent of the participants' satisfaction with the programme with regard to their initial needs and expectations,

d) the teachers' views on the course structure, its content and the presentation of lectures, laboratory sessions, etc.

e) the administrators' views on the overall running of FITMAST

f) and thus to suggest changes based on the information gathered from the above issues.

1.5 Significance of the study

The inservice teacher education programme which is reviewed in this study, is an attempt at improving the poor qualifications held by science teachers in the Black Schools in South Africa. It is an effort at breaking the vicious, destructive cycle of the "bad teacher - bad pupil" phenomenon which perpetuates the crisis in science education in South Africa.

Like so many other similar programmes in developing countries, FITMAST is burdened by the need to upgrade the very poor and
sometimes non-existent qualifications of mathematics and science teachers while at the same time having to attend to the professional development of such teachers. Faced with this dual task, it is therefore not surprising that the programme has run into many difficulties.

In an attempt to eradicate the problems that besiege FITMAST whilst operating within the tension created by the duality of its aims, the purpose of this study takes on a significant meaning. It is hoped that by looking at the course experiences of the participants, course designers will still be able to come up with a suitable programme even under the difficult circumstances that are facing inservice teacher education in developing countries in general and South Africa in particular.

1.6 Methodology

The case study method will be employed for it is felt that such an approach to research is best suited to get an overall view of the programme, because as Adelman, Jenkins & Kemmis noted, "...case study research ... is rooted in the practicalities and politics of real-life situations..."(1980, p.53).

Also, because this study is aimed at addressing policy-makers, the insights rendered by a case study can be directly interpreted and put to immediate use (Adelman, Jenkins & Kemmis, 1980).

1.7 Limitations of the study

As illuminative as a case study can be, it is recognised that it is affected by several limitations and delimitations that are common to case study research in general and specific to the situation to be
investigated. The limitations and delimitations of this particular study are listed below:

a) the study is confined to the Biology component of FITMAST which is run for teachers with inadequate or no qualification to teach Biology. Since this study will focus on only one component of this programme, its results will, therefore, have only immediate practical implications for this specific component of FITMAST.

b) as is common to all case studies, the reader will be presented with the researcher's construction and interpretation of the collected data.

Finally, any attempts at drawing inferences from this case study will still mainly depend on understanding its context and the ways in which it may resemble or approximate conditions elsewhere (Rogan & McDonald, 1985).
Chapter 2

Review of relevant literature

This chapter will set out a brief review of the literature on inservice teacher education in both developed and developing countries so as to bring out the difference in orientation that such countries have towards this concept, and thereby hoping to place the present study within the appropriate context.

Following that, a short historical perspective leading to the formation of FITMAST(Formal Inservice Training of Mathematics and Science Teachers), the inservice training programme under study, will be presented. Finally, the programme itself will be described as one example of an inservice teacher education programme in a developing country such as South Africa.

2.1 Definition of terms

2.11 Inservice Teacher Education

Inservice teacher education has taken on numerous definitions within different countries. Several authors are in agreement that the term, inservice teacher education, is a complex one very often having broad and vague meanings (Yarger, 1985; IBE Editorial, 1981; Reynold & Clark, 1982; Yarger & Galluzzo, 1983). In numerous studies, Bolam has referred to inservice teacher education as INSET (inservice education and training of teachers) and this acronym has been adopted by the European community at large.

A North American perspective is offered by Yarger who, in describing the attempts at defining inservice teacher education as a fashionable activity, states that "...several new labels have been introduced to the game: 'staff development', 'continuing teacher education' and
'continuous education professional development'..." (1985, p.213). African countries have virtually adopted the acronym, INSET to describe activities pertaining to inservice teacher education on that continent. There appears to be consensus that the language used to describe inservice teacher education has been vague.

Bearing in mind that an attempt will be made to show the difference in orientation towards the matter of inservice teacher education between developing and developed countries, the author proffers the following definition, with a slight modification, as furnished in an editorial on inservice teacher education in The Bulletin of the International Bureau of Education of 1981. It stated that:

"Inservice education" designates the sum of the diverse processes in which the...[practising teacher] becomes the object of the educational process. The various aspects of the process are described using the terms 'perfecting', 'raising qualifications', 'further education', 'post-diploma and post-graduate studies', etc. (Editorial, 1981, p.1).

It is hoped that with this definition the reader will, after scrutinizing the discussion on inservice teacher education, be able to extract a meaning from it that he or she can relate to.

2.12 Developed countries

Other terms such as 'advanced countries' and 'industrialised countries' are often used interchangeably to describe the countries falling under this group. The World Bank Report of 1988 uses Gross National Product (GNP)\(^2\) as its criterion to classify the nations of the world into developed and developing countries. All developed or industrial countries, except for the non-reporting countries such as the Soviet Union, belong to the Organisation for Economic Co-operation and Development (OECD). Canada, Italy, France and the

---

\(^2\) The World Bank defines Gross National Product as a measure of the total domestic and foreign output claimed by a country without making deductions for depreciation.
United States are examples of countries falling under this group. Table 2 following below, will summarise some differences between Italy, a developed country and The Phillipines, a developing country.

### 2.13 Developing countries

The United Nations' system of classification define developing countries as those in which large segments of a country's economy are still underdeveloped and in which the majority of people are very poor. The basic infrastructures (educational systems, social services, transportation, etc.) of these countries such as Brazil, The Phillipines and Zambia for example, are inadequate for their needs. Other characteristics that are common to developing countries include: high rates of illiteracy, infant mortality and fertility, low life-expectancy for their citizens and mainly agricultural economies.

Table 2. A comparison of some indicators that sets a developed country (Italy) apart from those of a developing one (The Phillipines).

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (millions)</th>
<th>GNP (US dollar)</th>
<th>Life expectancy</th>
<th>% of illiterates over age 15</th>
<th>% of school-age pop. at 2nd level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>57.2</td>
<td>8,550</td>
<td>77</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>Phillipines</td>
<td>57.3</td>
<td>560</td>
<td>63</td>
<td>16.7</td>
<td>65</td>
</tr>
</tbody>
</table>

### 2.14 The South African context

Based on its gross national product, The World Bank classifies South Africa as a developing country. However, such a classification does not truly reflect the living conditions of the people of South Africa under its abhorrent system of government, called apartheid.
The standards of living of the Black and White people differ so dramatically that the author deemed it necessary to explain these differences so as to provide the reader with a framework within which to interpret the existence of FITMAST.

Under the ideology of apartheid, Whites in South Africa enjoy a standard of living comparable to that of people in developed countries, while the majority of Blacks in South Africa lives under conditions similar to those in developing nations. The following statistical figures with regard to the differences between Whites and Blacks will serve as indicators of the different standards of living enjoyed by the two groups:

a) In 1985 Whites, who make up 14.7% of the population, had an average monthly income four times higher than Blacks who constitute 85.3% of South Africa's 33 million people.

b) For the fiscal year 1985/1986, per capita expenditure on the education for Whites was nine times higher than that for Blacks.

c) Taking grade 5 as a criterion for literacy, it was established that, while 97% of Whites over the age of 20 were literate, only 45% of Blacks above age 20 have attained literacy.

d) Approximately 45% of the welfare budget for 1985/1986 was allocated to Whites (Race Relations Survey, 1986).

The above figures cannot even begin to explain the numerous other inequalities experienced by Black people in South Africa. For example, while excellent health care facilities exist for Whites, such facilities for the Black people, when existing, are subjected to mass underfunding, overcrowded conditions and severe shortages of medical personnel.
In short, health care facilities, social services and the provision of education for Whites in South Africa are comparable to those in most developed nations, and these people co-exist in a "cheek-by-jowl" fashion (Mehl, 1987,p.3) with Black people whose living conditions are similar to those in many developing countries.

2.2 Inservice Teacher Education in Developed Countries

Inservice teacher education, though not a recent phenomenon, has increasingly received wide-spread attention during the past twenty years (Yarger, 1985). As stated earlier, inservice teacher education has been accorded numerous terms and definitions. Reynold & Clark are of the opinion that such "...divergences in terms gave an indication of the sustained factual problems in the field which received attention at any point in time" (1982, p.23). On the positive side though, an editorial in The International Bureau of Education views such terminological divergences as "...a symptom of the vigorous development which the in-service education of teachers is undergoing" (1981, p.2).

Basically inservice teacher education has received attention in an almost dichotomous manner. According to a survey conducted by the International Bureau of Education in 1985, inservice teacher education, up to the mid-seventies, almost exclusively focused on the "development of individual inservice programmes and courses, preparation of methodologies for individual teaching subjects, problems facing beginning teachers, etc." (1985, p.8). Such a view of inservice teacher education can be interpreted as attempting to address the needs of the school in an educational system.

This was however, not a surprising trend in the mid-seventies because inservice teacher education was perceived primarily as an avenue through which new curricula and curricular changes, new
teaching methods, etc. could be implemented (Dove, 1986). Decisions on the content of inservice courses were taken accordingly (IBE Editorial, 1981). Thus, up to the mid-seventies, the body of literature on the inservice education of teachers paid little attention to the teachers, their roles as change implementers and, most importantly, the local conditions under which changes were to be implemented.

Unfortunately this earlier perception of inservice teacher education as one responding to the needs of an educational system, may still pervade the teaching profession today. We still have non-participating teachers outnumbering participating teachers by a great margin. It would, however, only be fair to state that other factors such as "a fear of failure and damaged prestige, lack of self-confidence and an unwillingness to undergo examinations" (IBE Editorial, 1981, p.9) may also contribute to this apparent lack of interest in inservice education by the teachers.

If, in ecological terms, the interacting nature of the school and its teachers is to be regarded as being vital to the existence, the maintenance and the development of an educational system, then the effects of inservice teacher education of the seventies should be clear. By its almost exclusive emphasis the needs of one of its ecological units -the school- the school, inservice education has created an imbalance in the development and growth of the educational system. This was, however, soon changed.

Towards the turn of the decade, a different concept of inservice teacher education evolved and was subsequently labelled as 'continuing education' by one of the influential educational bodies in the world. Recommendation 69 of the thirty-fifth session of the International Conference in Education (1975) became the forerunner for the reconceptualisation of inservice teacher education. The specific paragraph of this recommendation that deals with this reconceptualisation states that:
Continuing education should be an integral part of the educational process and should therefore be arranged on a regular basis for all categories of educational personnel. Procedures should be as flexible as possible and adaptable to the teachers' individual needs and to the special features of each region, taking into account development in the different specialities and the extension of knowledge. (IBE Editorial, 1981, p.12).

Thus, the ecological balance of an educational development process had, at last, been restored. Attention has now also been focused on the teacher as an ecological unit within the educational system.

Concomitant with this new perception of inservice teacher education, a variety of issues emerged which became the foci of many research studies. These issues included, amongst others, questions with regard to teachers' needs, attitudes and commitment, their participation in decision-making and the design of inservice courses, the role and training of teacher tutors, etc. Other issues which also became priorities for research on inservice teacher education were:

(1) the role of the school in inservice teacher education,

(2) the contribution of adult learning theories and practices to inservice teacher education,

(3) the evaluation of inservice teacher education,

(4) new materials for inservice teacher education

(5) costs and efficient utilisation of available resources

The above issues have received the attention of numerous authors in the past decade (Cropley & Dave, 1978; Bolam, 1982; Hoyle & Megarry, 1980).
In keeping with this reconceptualisation of inservice, a new term - school-focused inservice education - evolved to describe the restoration of, and to make concrete, the ecological balance in inservice teacher education as earlier referred to. That attention should be focused on both the school and its teachers in their dynamic interaction, became the underlying philosophy of school-focused inservice education.

British scholars were instrumental in coining, and in effect defining the term, school-focused inservice education. Bolam gave some characteristics of the activities of school-focused inservice teacher education:

- it would vary considerably in length but rarely extend beyond one year;

- be staffed by teachers from the school and by external advisors and invited contributors or consultants;

- be initiated, and often designed by the school in light of school and group policies;

- be attended by individuals, groups or the whole staff from the school and sometimes by outsiders;

- be aimed at the group and whole staff (i.e. the system) development needs of the school, etc. (Bolam, 1982).

Having studied the various definitions and rationales that have been put forward in support of such definitions, Howey presented his own definition of the concept of school-focused inservice teacher education. He defined it as "...those continuing education activities which focus upon the interests, needs and problems directly related to one's role and responsibilities in a specific schoolsite" (1980, p.125).
Although educational authorities today give most attention to school-focused inservice teacher education, other inservice programmes aimed solely at improving the academic qualifications of the teacher corps, are still in existence at various institutions world-wide.

In short then, inservice teacher education in developed countries has gone from a programme responding solely to the needs of the school in an educational system (i.e. the corporation according to Joyce, 1979) to an ecologically sound concept which focuses also on the teacher as an ecological unit within that corporation. However, the premise of inservice teacher education in developed countries rests on a well-established preservice or initial training that the teachers have received prior to attending any inservice education courses. It is thus expected that inservice teacher education in such countries will attend more to the professional development of their teacher forces than to furthering their academic qualifications.

Such a perception of inservice teacher education in the developed countries is probably best illustrated by the following definition that Bolam gives of inservice education:

Those education and training activities engaged in by primary and secondary school teachers and principals following their initial professional certification, and intended mainly or exclusively to improve their professional knowledge, skills and attitudes in order that they can educate children more effectively. (Bolam 1982, p.62)

It is exactly this premise of inservice teacher education in developed countries (i.e. a well-established preservice or initial training) that sets it apart from the activities taking place in developing countries.
2.3 Inservice Teacher Education in Developing Countries

Educational systems in many developing countries today are burdened by a legacy of seemingly insurmountable problems. These problems arose mainly due to educational mismanagement and an indifference to the education systems of these countries by the colonial powers that occupied them until the late fifties and sixties (Dove, 1986).

Commenting particularly on the attitudes of the colonial powers towards teacher training, Dove states that:

In the early days, ... in the colonies, governments took a *laissez faire* approach to teacher training. Later this evolved into a policy of 'filling in the gaps where voluntary provision [i.e. by Christian missionaries] was insufficient. (1986, p.187).

However, putting aside the effects of such a bequest from the colonial powers, Farrant also lists four other factors that contributed to the difficulties facing educational authorities in developing countries. These are:

a) the rapid growth and movement of the population,

b) the excessive demands for education,

c) the need to make curricula and methods relevant and

d) the soaring costs of education (Farrant, 1982).

Furthermore, a number of developing countries has embraced the idea of Universal Primary Education for their citizens and virtually all of them are "...aiming for full literacy of the population by the year 2000" (IBE Editorial, 1985, p.15). Together these issues have generated a host of problems for educational authorities in developing countries. With particular reference to the teacher force,
for example, Bray (1981) found that in Nigeria the rapid school expansion led to an overall decline in the proportion of trained and certified teachers.

The impact of these problems could also be seen in the general make-up of the teachers corps in developing countries because it had resulted in:

   a) untrained teachers,

   b) unqualified teachers who have undergone training but failed to acquire proper certification,

   c) teachers with low qualifications and

   d) teachers with adequate certification.

What implications do these educational inadequacies and especially such a varied composition of the teaching force hold for inservice teacher education in developing countries?

Perhaps the opening remarks made at a conference on inservice teacher education in developing Asian countries in 1979 capture exactly what the centre of concern had been for developing countries over the past two decades, if not since having gained independence:

   The need for a continuing programme of in-service training to raise the qualifications of teachers and to update their knowledge and skills cannot be overemphasized (Proceedings from a Conference, In-service Teacher Education: developing innovatory strategies and instructional materials, 1979, p.8)

Although the above remarks are reminiscent of similar calls made as early as the fifties (Vivian, 1968), developing countries are hitherto still faced with this duality of aims insofar as it concerns their programmes of inservice teacher education. Whilst they need to upgrade the low academic qualifications that resulted from an inadequate or sometimes non-existent preservice training, they also
have to attend to the lack of a professional climate amongst their teacher corps.

Taking into consideration all the issues discussed thus far and especially the implied two-fold objectives of an inservice teacher education programme in any developing country, it is no small wonder that the concept of inservice teacher education is increasingly viewed in these countries as as a panacea, the 'quick-for-all' solution to their educational problems.

Approximately thirty years earlier, the same perception of inservice education pervaded those countries now considered as 'developed'. Educational systems of these countries were beginning to feel the effects of the postwar population boom. According to Yarger, "...the primary activity of inservice education, at least until the early 1960s, was to provide for completion of degree and certification requirements" (1985, p.883).

Having surveyed several inservice education activities in English-speaking Africa, Greenland lends weight to the belief that inservice teacher education has the potential to contribute towards solving some of the educational problems that are facing developing countries. He states that:

The attraction of INSET is that it is a tool potentially able to deal with all these problems: unqualified teachers who have been in the classroom for months or years can be given initial training; teachers with low qualifications can follow a course of training culminating in a higher grade; teachers singled out for promotion to new roles as college tutors, headteachers or inspectors can be given appropriate training; all teachers faced with a new curriculum can be adequately prepared for the new task; and lastly, the morale of all teachers, particularly those that have been in the field now for years, can be raised by the provision of general refresher courses. (1983, p.20)

As can be seen from the above statement, inservice teacher education in developing countries shares, in its purpose, many commonalities with programmes in developed countries. However, the salient difference remains to be the extent to which, or even
whether, participants in inservice courses have received prior or initial training as teachers.

Other related concerns which influence and set inservice teacher education programmes in Third World countries apart from those in developed countries, are well capsuled by Bolam (1983) in his discussion of such differences between African countries and OECD countries (a body comprised of most of the developed nations in the Western world).

He draws our attention first to the fact that the contraction of Western education systems, both in terms of student enrollment and the subsequent reduced demand for teachers, is not a characteristic feature of developing countries. It therefore does not concern policymakers and practitioners of inservice teacher education in these countries as much as it does in developed countries.

Secondly, a well-established and supportive infra-structure for the provision of inservice teacher education is very rarely to be found in developing countries and would thus bring about the usual problems of communication, co-ordination, logistics, etc.

Thirdly, "...a well-established climate of professional attitudes and behaviour in which teacher initiatives are expected and encouraged and in which demands for continuing professional education are frequently voiced" (Bolam, 1983, p.186), is often lacking in most of the developing countries. The absence of a climate in which professional attitudes and behaviour can be fostered is, however, a natural outcome of the educational concerns that are prevalent in particular countries. For example, Yarger points out that professional development in the United States, in the wake of the curricular expansion following the Sputnik-era, amounted to nothing more than assisting "...teachers in developing skills necessary to implement these packaged programs" (1985, p.884). He goes on to say that professional development "..had reverted to a focus of molding the
teacher to fit nationwide curricula - a focus that had dominated the field just thirty years earlier" (1985, p.884). Developing countries also now have similar and other concerns such as overcrowded classrooms, lack of textbooks, etc. that impede the establishment of such a professional climate.

On some of these issues, Bolam is essentially capturing the concerns already expressed by Goodridge in 1976 about inservice teacher education in developing countries who asserted that:

We need to develop inservice teacher education programmes which are better co-ordinated, conceptualised on a long-term development basis, and comprehensive in scope; and which focus on evolving more effective strategies for attacking the weaknesses and deficiencies in our educational systems.(1976, p.72).

In summary then, the pre-occupations with regard to inservice teacher education in developing countries differ from those in developed countries in the following respects:

a) In Third World countries inservice teacher education in most instances takes on the role of preservice education.

b) A well-established and supportive infra-structure for the provision of inservice teacher education is lacking.

c) The rapid population growth in developing countries has a significant influence on the planning activities of inservice teacher education.

d) There is a lack of adequate professional skills and attitudes needed for successful school-focused initiatives.

With regard to the education of Black people in South Africa, the situation with respect to the above issues, is no different as shall be seen in the next discussion on the realities of Black education in South Africa.
2.4 Realities of Black Education in South Africa

The education of Blacks\(^3\) in South Africa essentially takes its roots from the Bantu Education Act of 1953 which was designed to set up a separate educational system for Black people in South Africa. This educational policy reflected the philosophy and goals of the ruling National Party that had come to power only 5 years earlier in 1948. Its grand architect, Dr. H.F. Verwoerd, then Minister of Native Affairs, and later Prime Minister of South Africa, was quoted as saying that:

It is the policy of my department that education would have its roots entirely in the Native areas and in the Native environment and community. There Bantu education must be able to give itself complete expression and there it will perform its real service. The Bantu must be guided to serve his own community in all respects.

There is no place for him in the European community above the level of certain forms of labour. Within his own community, however, all doors are open. For that reason it is of no avail to him to receive a training which has as its aim absorption in the European community, where he cannot be absorbed. Until now he had been subjected to a school system which drew him away from his own community and misled him by showing him the greener pastures of European society in which he never was allowed to graze. This attitude is not only uneconomic because money is spent for an education which has no specific aim but is also dishonest to continue. It is abundantly clear that unplanned education creates many problems, disrupting the community life of the Bantu and endangering the community life of the European. (Mehl, 1987, p.2).

Alongside this development, three other national education systems were established to realise the fundamental principle of apartheid, an ideology, simplistically stated, designed to segregate the peoples of South Africa along racial lines. Thus came into being a system for Whites, for Asians (mainly persons of Indian descent) and one for so-

\(^3\) The term 'Black' is used in its generic sense and presently reflects a term of identification by all the oppressed people in South Africa.
called Coloureds\textsuperscript{4} (persons of Khoi/San descent and of mixed descent).

Education became one of the tools with which the ruling National Party set out to preserve domination and control by 6 million Whites over the lives of 27 million Blacks. This was reflected principally in the discriminatory nature of state expenditure on the education of a Black child compared to that of a White child. One ninth of the amount spend on a White pupil is usually accorded to a Black pupil. Numerous other factors add to the inequalities in the provision of education for Blacks in relation to Whites in South Africa.

While the education of Whites has always been free and compulsory up to Grade 10, this is only a recent development, and under certain conditions, in the case of Black people, the majority of whom are at the bottom of the income scale in South Africa. In terms of physical resources, Black education is further subjected to a shortage of schools\textsuperscript{5} and poorly equipped thereby, pupil-teacher ratios of 1 to 40, and a teacher force of underqualified and unqualified individuals.

2.5 Events leading up to the formation of FITMAST

Student resentment towards Black education finally exploded in 1976 and is popularly known as the Soweto uprising, when thousands of Black students boycotted classes and took to the streets demanding an end to Bantu education. It was, however, 4 years later, when another long schools boycott was in progress, that the

\textsuperscript{4} Although this term of reference is imposed by the government, it is regarded as derogatory label amongst the people of that particular group and therefore the author chooses to use the term 'so-called'.

\textsuperscript{5} In 1985, the Minister responsible for Black education estimated that, at a calculation of 38 pupils per classroom, there was a shortage of 5117 classrooms in Black schools throughout South Africa. In November, 1985 the South African Teachers' Association stated that there were 205 000 vacant places in White schools (Race Relations Survey, 1986: author's emphasis).
Government ordered an investigation into the state of education in South Africa. The outcome of this investigation is revealed in the Report of the De Lange Commission of Inquiry into Education under the auspices of the Human Sciences Research Council.

Of particular importance to this study, was the finding of the Commission that 70-90% of Black mathematics and science teachers were grossly underqualified. Not only were mathematics and science teachers found to have low qualifications, but they were also in critically short supply. Based on this, the Commission recommended that those institutions responsible for the training of mathematics and science teachers in South Africa should be requested, as a matter of immediate and urgent importance, to:

- participate in an inservice training enterprise on a national scale,

- attend to the real needs of teachers of the sciences and mathematics in particular, and

- take such other steps as they deem feasible and appropriate to increase their output of qualified teachers in these subjects (Recommendation 4.9.4 c(i), p.137: Main Report, 1981).

The inservice teacher education programme, FITMAST (Formal Inservice Training of Mathematics and Science Teachers) was born in response to this call.

In 1981 a few academics at the University of the Western Cape (U.W.C.), the institution where FITMAST is presently based, considered the idea of establishing a resources and support centre for teachers. These academics were particularly concerned about the poor qualifications of Black mathematics and science teachers. According to one of the concerned academics who happens to be the
present director of FITMAST, the idea was actually spurred on by the findings of the investigation into education. The idea of a resource centre for Black teachers also fit in quite well with the direction that U.W.C. was moving towards at that time. The institution, through a declaration by its Senate, resolved to broaden its community base so as to reflect the educational, socio-economic, and the political realities of a fast changing South Africa. The dubbing of U.W.C. by its immediate past Rector as the "University of the Working Class" captures exactly the position that U.W.C. has committed itself to in a country where the majority of people are denied basic political rights.

However, although FITMAST was to be based at U.W.C., it was not to be the sole institution involved in the inservice teacher education programme. In 1982 the Department of Education and Culture (the body governing the education of so-called Coloured persons from which FITMAST were to draw its participants) asked U.W.C. and the nearby University of Stellenbosch to prepare a joint plan for a programme for inservice teacher education. At that time, U.W.C. had no structured approach to, or any involvement with inservice teacher education. On the other hand, since 1978, the University of Stellenbosch had been running mathematics, science and biology teacher development programmes for the Cape Education Department (the body governing the education of Whites in the Cape Province of South Africa). These programmes were presented annually through the Institute of Mathematics and Science Teaching of the University of Stellenbosch (IMSTUS).

The IMSTUS-model of inservice teacher education was adopted and a tripartite contract for 10 years was signed that involved the two institutions and the Department of Education and Culture.
2.6 A description of FITMAST

2.61 Aims and objectives

This inservice teacher education programme was launched in January 1983 with the first intake of Mathematics, Science and Biology teachers drawn from so-called Coloured schools throughout South Africa. Adoption of the IMSTUS-model in its entirety was right from the outset, however, deemed to be an unfeasible exercise. Teachers in the FITMAST programme made up a completely different clientele than their White counterparts in the IMSTUS-project.

First, in terms of the qualifications of teachers, the investigation by the Human Sciences Research Council in 1981 revealed that only 25% of Whites teaching Mathematics and Sciences were underqualified in comparison to the 70-90% of Black teachers. With specific reference to those teaching Biology, the table below indicates that 66% of so-called Coloured teachers are underqualified while only 39% of White teachers under the Cape Education Department are underqualified.

Table 3. Underqualified teachers of Biology in two different Education Departments in South Africa

<table>
<thead>
<tr>
<th>EDUCATION BODY</th>
<th>CRITERION SET*</th>
<th>BIOLOGY (STD. 8-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>**N</td>
</tr>
<tr>
<td>CAPE EDUCATION DEPT.</td>
<td>A</td>
<td>425</td>
</tr>
<tr>
<td>'COLOURED' EDUCATION</td>
<td>C</td>
<td>186</td>
</tr>
</tbody>
</table>
* These are the minimum criteria laid down by the two departments for qualifications as Biology teacher.

Set A: Second-year university credits in Botany and Zoology.

Set C: First-year university credits in Botany and Zoology.

** N = Number of teachers whose qualifications were assessed

***UQ = Number of these teachers who are underqualified in terms of the criteria applied by their department.

Source: Adapted from 'Report of the Work Committee: Teaching of the natural sciences, mathematics and technical subjects' HSRC Investigation into Education, Pretoria, South Africa (1981 p.63)

A further look at the criteria which the two educational bodies apply as the minimum qualifications standards for Biology teachers, paints an even more dismal picture of so-called Coloured teachers. Unqualified teachers also curtail the number of schools offering Mathematics and Science.

Whites in South Africa constitute approximately 16% of the school-going population yet, almost 50% of the educational expenditure budgeted for the 1986/87 financial year, was spent on the education of Whites (Race Relations Survey, 1986). Needless to say that the impact of such a distribution of money is felt in various areas in the education of the Black people of South Africa.

Insofar as the different conditions under which the FITMAST teachers and the ISTMUS teachers are operating in the schools, the pupil/teacher ratios are 26 to 1 and 15 to 1 respectively. Furthermore, FITMAST teachers do not have at their disposal, the excellent facilities and teaching aids that their White counterparts under the Cape Education Department are enjoying. For example, unlike the ill-equipped laboratories within which FITMAST teachers have to present practical sessions to their large classes, a spokesperson for the White Cape Education Department (CED)
asserted that:

...CED laboratories...have been labelled as amongst the best in the world...all essential apparatus...is provided for doing individual work or practical work in small groups... (Report of the Work Committee: Teaching of the natural sciences, mathematics and technical subjects, 1981, p.108)

Given the better qualifications, the smaller teaching classes and the better facilities that White teachers have, it is become clear that the so-called Coloured teachers who participate in the FITMAST programme, have different needs than the White teachers entering the IMSTUS-project. Nel, et al., elaborate on this point in the following way:

Although the needs for further education and teacher development differ slightly in the ISTMUS and FITMAST projects, both have the same broad aims. The differences in emphasis (updating versus upgrading) arise from the fact that the course participants of the IMSTUS Project are from the Cape Education Department (which foots the bill in their case) and they require a less qualification-orientated course than their counterparts, simply because they are better qualified for general secondary teaching. In the FITMAST Project, however, we definitely focus on credits for diplomas and degrees... (Nel, Finnemore & Rhodes, 1987, p.108)

Thus the difference in emphasis in FITMAST was one of upgrading academic qualifications as opposed to the mere updating of knowledge as experienced in the IMSTUS-project.

According to Nel, Finnemore and Rhodes (1987), the aims of FITMAST are:

1) to improve the qualifications of those teachers that presently teach either Mathematics, Science or Biology

2) and to improve the competence and confidence of the teachers in the teaching of their subjects.
These are thus the aims that FITMAST is hoping to achieve in its ten years of operation.

2.62 Structure of the FITMAST programme

The FITMAST academic year

The FITMAST academic year is divided into a residential and a distance teaching component made up of the following four phases:

a) A summer school

This takes place at the University of the Western Cape (U.W.C.) during January for a period of three weeks and represents the first residential session.

b) Distance teaching period

This period follows immediately after the January residential session and covers the months from February until May. The end of May also brings to a close the first semester's work.

c) A winter school

U.W.C. also hosts this residential session during the month of June. This session lasts for two weeks and usually begins with an examination on the work covered in the first semester.

d) Distance teaching period

The second series of distance teaching lasts from July until September. Final examinations are written in early November at various locations throughout the country.
The teachers are thus on campus for three weeks in January and for a further period of two weeks in June. This represents a total of 25 working days, which at six hours per day, yields 150 hours of contact teaching time per year. According to Nel, et al. (1987), this amount of time is roughly equal to the time normally allocated to year-long courses for full-time first year students.

Teachers entering the programme study one of the five subject disciplines offered annually. The courses are only available at the first-year and include Botany, Zoology, Mathematics, Physics and Chemistry. According to Nel, et al (1987), this arrangement was made bearing in mind that the inservice teacher does have other responsibilities that impinges upon his/her time. One of FITMAST's tutors has even acknowledged that "...the highest priority placing any teacher could give to FITMAST is fourth" (Davis, 1987, p.6). The implication of taking one course per annum is that it would take a teacher 3-4 years to obtain the necessary amount of credits to allow him/her to proceed to the second faculty year.

The governing body

Although the Department of Education and Culture bears the costs for the programme, the directorship of FITMAST is shared on a two year rotating basis by Professor M.C. Mehl of U.W.C. and Professor J.H. Nel of the University of Stellenbosch. These two persons form part of a board of ten whose responsibilities include decisions pertaining to the overall direction of the FITMAST programme. The other members of the board include two representatives each from U.W.C. and University of Stellenbosch, and four people from the Department of Education and Culture which includes inspectors of education as well as subject advisors in Mathematics, Science, and Biology.
2.63 Participants

The Staff

The teaching corps, made up of 47 part-time lecturers assisted by 15 technical staff, are recruited from both U.W.C. and the University of Stellenbosch. (Davis, 1987).

These lecturers are responsible for the presentation of lectures and laboratory classes during the residential sessions as well as the setting and evaluation of assignments during the distance teaching component. For each of the five courses offered, there is a course co-ordinator appointed by the Director and taken from the ranks of the lecturers.

Although the appointment of lecturers is the province of the Director, he mainly relies upon the advice of these course co-ordinators since he is unable to be an expert in all the subject disciplines. At first the lecturers were appointed on a semester basis, but this measure created numerous problems, especially in terms of the continuity and fluidity of the programme. The lecturers are now offered a one year contract with the possibility of renewal subject to a satisfactory performance and, of course, their willingness to be involved in FITMAST again.

In addition to its teaching staff, FITMAST also employs two full-time tutors who, amongst other duties, liaise between the lecturers and the teachers. According to Mr. S. Rhodes, the Mathematics tutor, his duties also include keeping in contact with teachers throughout and counselling them on problems in Mathematics directly related to either the course lectures and/or assignments. Both he and Mr. D. Finnemore, the tutor for the Physical Sciences, also provide guidance, according to Mr. Rhodes, on "...questions and doubts in teachers' minds..."
that are not subject specific". These are issues such as examination-preparation, study methods, etc.

The underlying philosophy behind their duties, as Mr. Rhodes puts it:

"...is to let teachers know that there are people, a heart behind this project rather than it being just a project."

Due to a lack of adequate funds, a Biology tutor could not be employed and thus Messrs. Rhodes and Finnemore also had to oversee the Zoology and Botany courses respectively.

On the administrative side, the tutors also assist the lecturers in drawing up assignments, developing self-instructional materials and identifying the difficulties that teachers encounter with the course materials. The latter is made possible by the tutors' almost daily telephone contact with the teachers. In addition to their general liaison work, the tutors also oversee the dispatch and receipts of assignments, convene and conduct workshops for teachers residing in the Cape Peninsula, and from time to time, they also undertake upcountry trips for the same purpose.

As can be seen from the above description of their duties, the tutors are essentially involved in the day-to-day running of FITMAST, a level of involvement once described by one of the Directors as being at the "coal-face".

The teachers as students

In terms of academic qualifications and professional training pertaining to Mathematics, Biology or Science, the teachers are a varied group. Their qualifications range from having last taken these subjects in Matric (= Grade 12) to the standard three year teaching diploma obtained at teacher training colleges which have no affiliation to universities.
However, a college diploma does not mean that a teacher has acquired a more in-depth knowledge in any of the above subjects. In an interview, the Director of FITMAST explains:

"Now in South Africa, teacher training college qualifications are supposed to empower people to teach in primary schools, yet many of them [i.e. the teachers] are teaching at high schools. So, they are teaching the subject at the level they have passed it themselves."

The teachers were variable in their teaching experience, ranging from those in their induction year to teachers who had more than fifteen years of teaching behind them.

FITMAST is thus faced with a group of teachers who are desperately in need of improved academic qualifications as well as professional training in Mathematics, Biology and Science. Davis brings a greater educational and political perspective to the teachers background:

Products of inferior education and training themselves, the large majority [of these teachers] are trying to teach too-large classes in poorly equipped schools, where their inadequacies turn them all too easily into targets for pupils' burning resentment over apartheid education.

These are the people on whose skills rests South Africa's ability to produce the scientists, engineers and technologists that its developing economy demands. The fact that they aren't equal to the task is cited by educationists [in South Africa] as the biggest single problem facing black education. (1987, p.1: author's emphasis)

2.7  A description of activities within the Biology component during the June 1987 winter residential session

The Biology component of the FITMAST programme affords the teachers the opportunities to acquire first-year university credits in Botany or Zoology courses. The curricula of these courses build upon the foundation of secondary school Biology (see appendix 7 to
compare the school curriculum and those of the FITMAST courses). In fact, in a circular sent out to all prospective participants, the course administrators advise the teachers to re-acquaint themselves with the Matric Biology textbooks (appendix 5).

The objectives of each FITMAST course are to broaden the teachers' content knowledge of a subject beyond the Matric-level, to improve the laboratory skills of the teachers, and to offer didactic methods and techniques for teaching Biology at the school-level.

Appendix 8 gives an indication of how the course time is broken down during the June residential session. What follows is an account of the author's observations on how well the objectives are achieved.

Teachers had to sit through 4 hours of lectures with an assigned tea-break of 20 minutes halfway through the lecture session. Other breaks of approximately 5-10 minutes between lectures are usually negotiated between the lecturer and the teachers.******

Lunch, taken at 1 p.m., concludes the morning session that consisted of lectures alone. At 2 p.m. the teachers return to the laboratories for the start of the afternoon session⁶ that lasts for 2-3 hours. In the laboratory session, practicals are held on the lectures covered in the morning session. Once in the laboratory, the lecturer would first give an outline of the work to be done for the afternoon. The lecturer normally allows for a question period to deal with any misunderstandings that might have arisen. After that the teachers set about their tasks. Occasionally lecturers advised the teachers on the appropriate techniques for doing their practical work. Although a lecturer and the laboratory assistants would be available throughout this session, teachers tended to consult their classmates when they were experiencing difficulties. In one of the laboratory sessions, a

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⁶ At times no laboratory sessions were held and the teachers would return to the classes for more lectures. In this case, the lecturer normally chooses to complete the lectures of a unit before doing any practical work on it.
teacher responded in the following way when asked why she preferred to consult with a friend:

"Anyone... uh, one can relate easier to your fellow student because you'll probably be having the same difficulties as they have. So you can understand what your fellow student would mean before somebody else come and explain... uh, he'll be [i.e. the laboratory assistant] slightly more technical than what your friend would be.

The lecturers and the assistants were, however, very helpful when approached by the teachers for assistance.

Thus, with regard to improving the teachers' laboratory skills the author observed only a few attempts by the lecturers that would have made it possible for teachers to acquire laboratory skills during the residential session. The author is under the impression that some lecturers assumed that the teachers had the skills needed to do their practical work.

As far as enriching the didactic skills of the teachers, a few lecturers were impressive in that they taught by example. In their classes the teachers often raised questions on how to teach, the work that was then under discussion, at the secondary school level. Often this atmosphere carried over into the laboratory sessions where the teachers and the lecturer would exchange ideas on the presentation of practical lessons.

On the other hand, in some classes the lecturer simply read from a set of notes which the teachers also had copies of. At times elaborate explanations were given by the lecturer on some of the concepts in the notes. In these classes, the teachers rarely asked questions.
In addition to the efforts by the lecturers to enrich the didactic experiences of the teachers, each course has a didactic session with the following activities (appendix 7):

1) Hints regarding the presentation of practicals in schools

2) Laboratory techniques

3) Technology in teaching and optimal media use

4) The experiment as exploratory technique

5) Evaluation techniques

The author attended a didactic session and, although there were exchanges between the lecturer and the teachers, only a few teachers appeared to be participating and taking notes. The author agrees with the following comment passed by a middle-aged participant:

"...I realised that it was mostly hints that he [i.e. the lecturer] offered and most of it was known to me being a teacher myself.

I think that most of the things he gave us were new to some teachers, but it couldn't or didn't really supplement our knowledge so that's why we were mostly passive... uh, I think think that's why the guys didn't really contribute that much even though he requested us to inform him of the things we knew as well, but it didn't work out that way."

The author is of the opinion that very little activities with regard to the enhancement of the teaching competence of the teachers are undertaken in practice.
Chapter 3

Research design and methodologies

This chapter will present the research design and methodologies employed in the collection and analysis of the data. It will start off with a statement on the focus of this study, followed by a discussion on the nature of this study and data sources, and finally, the author will explain how the data was analysed.

3.1 Recapitulation of the focus of the study

As stated in Chapter 1, the focus of the study was to:

a) ascertain how the tension between the academic and didactic aspects of FITMAST, as well as other problems that beset FITMAST, manifest themselves in the teachers' perceptions and experiences of the programme and in the views of the administrators.

b) provide, in the form of recommendations, a direction for change based on the teachers' course experiences.

3.2 The nature of the study and the sources of data

Because the focus of this study was to get at the views of the teachers and the administrators, the following definition of a case study rendered by Adelman, Jenkins and Kemmis was instrumental in influencing the author's selection of the case study method as a research procedure:

Case study is an umbrella term for a family of research methods having in common the decision to focus on enquiry around an instance. (1980, p.48)
This definition opened up various possibilities for the collection of qualitative data. However, by employing multiple data collection techniques the author also hope to address the questions of validity, reliability and objectivity normally raised with respect to case studies. Denzin (1978) refers to these multiple methods of data collection as an example of "triangulation" and views the use of triangulation as a means of bringing multiple kinds of data to bear on a single issue, in this instance the Biology component of the FITMAST programme.

The data for this study were by employing the following methods:

a) interviews conducted with some of the Biology teachers who attended the June, 1987 residential session held at the University of the Western Cape. (see appendix 6)

b) interviews conducted with the Director of FITMAST and one of the full-time tutors.

c) the author's field notes taken during attendance at the June, 1987 residential session.

d) questionnaires which were mailed out to all the Biology teachers who have taken the Botany and/or Zoology courses offered by the FITMAST programme (see appendix 2).

Rist is of the opinion that "...the greater the alternative sources of data employed in the analysis of a setting, the greater the possibilities for accuracy and a holistic presentation" (1982, p.444)

The use of multiple data sources enabled the author to get a holistic view of the programme which might otherwise not have been possible. For example, questionnaires can prove to be very restrictive in nature with regard to exploring the teachers' opinions
on a certain issue. In a questionnaire, teachers' responses might be limited to a few choices. In an interview however, the teachers are allowed more time and space to elaborate more extensively on the same issue thus revealing a breadth and scope not easily obtainable through the use of a questionnaire.

A further advantage arising out of using a case study with multiple data collection techniques, is that it allows for three kinds of analysis to which the author adhered: descriptive, comparative and interpretative analysis (Edwards, 1987). These kinds of data analysis will be discussed under a different section in this chapter.

The following discussion essentially focuses on the different sources of data so as to provide detailed insights into how the data were collected.

3.21 Interviews conducted with teachers of the 1987-group

The author had an interview outline (appendix 1) that guided his questioning of the teachers. This outline was drawn up using information received from the FITMAST offices, telephone conversations conducted with one of the programme's directors and from remarks passed by fellow teachers on the activities of FITMAST. The interview outline was followed to guide the author's questioning. However, the author did not strictly adhere to it so as to allow the teachers the time and opportunity to elaborate extensively. This strategy is recommended by Jones (1985) when conducting interviews.

Teachers for the interviews were chosen without knowledge of:

1) a selected teacher's background,
2) a teacher's academic qualifications save for the fact that he or she, by virtue of attending FITMAST, did not possess a degree in the Sciences and

3) the teacher's performance in the FITMAST courses up to the time of the interview.

Selections were however, made in accordance with the following criteria:

1) gender, so as to present an equal sample of males and females,

2) geographical location, so as to obtain the views of teachers residing within the Cape Peninsula, i.e. within close proximity of U.W.C., and of those who reside outside the Cape Peninsula and

3) the course studied, in order to obtain an equal representation of Zoology and Botany participants.

Approximately two weeks prior to the June, 1987 residential session, the selected teachers were contacted by telephone and invited to participate in the research study. Subsequent contact with these teachers were then made at the residential session. None of the teachers approached, declined the invitation and all were enthusiastic about participating.

The interview outline contained questions that focused on four aspects with regard to the FITMAST programme. These four aspects are listed here below.

a) Expectations and Needs.

b) Social context : (1) workload of a single day
Interviews covering all the four aspects were conducted with 4 teachers for approximately 40-45 minutes each. The other teachers were interviewed on at least two of the aspects listed above and such interviews lasted for about 15-20 minutes.

In addition, the author also obtained the permission of two of these teachers to closely follow and observe them for a period of one week in the residential session. The only criterion applied in selecting these 2 teachers were that one should be in the Botany class while the other studies Zoology.

For the first week of the 2-week residential session, the author attended the Zoology classes and held the selected teacher under close observation. The author observed, for example:

1) whether the teacher raised any questions in class or the laboratory session,

2) whether teachers conferred with or consulted fellow participants in class,

3) how the teacher worked in the laboratory session, etc.
At the end of every alternate day, the author interviewed the particular teacher on the observations made. Likewise, the author also observed and interviewed a teacher in the Botany classes in the following week.

3.22 Interviews conducted with the administrators

These interviews were conducted after the June, 1987 residential session. Questions with regard to the birth and launching of the FITMAST programme, the status quo in 1987 and future plans were directed at the administrators (see appendix 1). The author also raised, with the administrators, some questions that arose out of the concerns expressed by teachers in their interviews.

3.23 Field notes

The author attended the June, 1987 residential session held at the University of the Western Cape in Bellville, South Africa. Even though close attention was paid to the observation of the afore-mentioned two teachers, additional notes were made on other academic and social activities undertaken during the residential session. In this regard, observations were recorded on such aspects as:

1) lecturer-student interaction in the classes and laboratory sessions,

2) student conversations during break-time,

3) social activities of students, etc.

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7 The author also stayed in residence on campus as did the majority of teachers.
3.24 Questionnaires

The issues that emanated from all the interviews conducted with teachers were used as the basis for the construction of a questionnaire.

Since almost 60% of the interviews were conducted in Afrikaans, the author had to translate such interview data into English. A cross-check with regard to the accuracy of the translated interview data was done by another native speaker of Afrikaans. This person translated some of the interview data from Afrikaans into English. The translations of the author were found to be in close agreement with that of the other person.

As stated, all the interview data were used as a basis from which to construct the questionnaire that was eventually sent out to the participants. The questionnaire was constructed in the following way.

First of all, the interview data gathered on a specific aspect investigated, were compared to check for similar concerns expressed by the different teachers. Other comments passed by the interviewees with regard to a specific aspect were also compared to the author's field notes to see whether there was any overlap of views. Where indeed an overlap was found, the author deemed it appropriate to include questions with regard to issues raised in the overlapping areas.

Secondly, the sets of interview data for each aspects were compared to check for any related comments that might further justify the questions that were to be included in the questionnaire. For example, a comment on the workload of the residential session, might surface again during responses to questions on the distance teaching component.
The questions constructed out of the interview data in these ways, were then put together on a questionnaire and mailed out to the teachers. The teachers were thus requested to respond to issues that were deemed to be of concern by their fellow participants.

Towards the end of March 1988, a total of 160 questionnaires were mailed out to the participants chosen for this study. Of these 31 were returned unopened to the author's research assistant in South Africa. These questionnaires did not reach those participants for the sole reason that they had changed residences. By following the accepted practice, these respondents were subtracted from the original total and thus 129 teachers formed part of this investigation.

Returns of assignments were requested by 31 May 1988. A follow-up letter (appendix 3) was then mailed out in the first week of June to all the 129 participants irrespective of the fact whether they had already returned a completed questionnaire or not. By 15 July 1988, when the analysis of the questionnaire data began, 45% of the teachers had already returned the questionnaires. By August 12th 1988, after the initial data reduction of the questionnaires into categories of years, another 8 questionnaires were received thus yielding a rate of return of 52%. Each of these 8 respondents were analysed against the overall views of the teachers that attended FITMAST in the same year as the particular respondent did.

3.3 The analysis of the data

Lincoln and Guba suggest the technique of triangulation as a mode of "...improving the probability that the findings and interpretations will be found credible" (1985, p.305). Having employed different methods of data collection in this study (interviews, questionnaires and field notes), it was possible to make a triangulation of the data so as to inform the author on the case under investigation, namely
the Biology component of the FITMAST programme. The author consequently believes that the findings that will result from this study, can be regarded as credible as suggested by the assertion of Lincoln and Guba above.

As a first step in the data reduction of the questionnaires, teacher responses for a particular year were fully summarised and recorded. The author was therefore able to obtain the overall views of the teachers in a particular year.

The second step of questionnaire data reduction thus involved putting together all the views of the teachers from the different years. From this summarised data, an overall sense of how the teachers view FITMAST was obtained.

Three kinds of data analysis were carried out:

3.31 Descriptive analysis.

Following the strategy of Edwards, the author, in an attempt to make sense of the interview data, "...considered them [i.e. the interview data] in relation to the interview questions." (1987, p.58). This was done mainly with the data resulting from the interviews with the administrators so as to provide a description of the issues, actions and policies considered with regard to the establishment, implementation, maintenance and future modifications to the FITMAST programme. However, this kind of analysis was also very useful in the initial stages of the questionnaire's construction.

3.32 Comparative analysis.

This method of analysis consisted mainly of comparing the data from the different sources so as to determine the congruencies and the differences between.
Wherever differences were found between the interview data and the summarised questionnaire data, the author presented both viewpoints and used arguments based on the interpretation of the data to explain the discrepancies. At times, the author's field notes were also used as a means of checking the validity of the two different views espoused.

The frequencies of questionnaire responses, expressed in the form of percentages, formed the major method of analysis whenever congruencies of opinions existed between the interview and the questionnaire data. In some cases relationships between and among the questions of the questionnaire are also presented.

In those instances where teachers had to choose between a number of given responses to a particular question, number-scales, with values assigned to each given response, were drawn up to analyse the data.

3.33 Interpretative analysis.

At times, this was done simultaneously with the comparisons made between the different sources of data. The interpretative analysis of the data was mainly done in relation to the teachers' expectations and needs, their experiences in the FITMAST programme. On some occasions however, the interpretative analysis of the data also revolved around considering the findings of the study in relation to some aspects raised in the literature review.
Chapter 4.

Summary of the data

In this chapter the author will set out to present the analysis of the data that were gathered on FITMAST through the use of various modes of collection.

The presentation of the data will be done as follows. The analysis of the teachers' views on FITMAST will be given first followed by the opinions of the administrators. It is hoped that this order of presentation will allow the reader to make comparisons between the two viewpoints much easier since the short presentation of the administrators' views will follow after a lengthy discussion of the teachers' opinions and feelings about FITMAST.

4.1 Teachers' views with regard to the expectations and needs.

In this section, an examination of the participants' responses will be made in the following areas:

a) Their initial contact with the FITMAST course.

b) What their stated needs and expectations are.

c) Their level of satisfaction with the course.

It is hoped that the discussion of the responses to the above issues will provide the interpretative framework for the rest of the data analysis.

4.11 Initial contact with the FITMAST course.
It appears that most of the teachers have the principal and/or the subject advisor as their first contact with FITMAST. From the questionnaire data, we find that more than eighty percent of the teachers have indicated that these two persons had strongly recommended the course. The selling of FITMAST as a commendable course by the principal and the subject advisor reached its peak with the 1987-teachers for they had listed their recommendation as one of the reasons for their participation in FITMAST. It is, however, surprising to note that FITMAST is not really advertised that much by its former participants; a recommendation from former participants received a low rating amongst the reasons for participation.

It also seems that, throughout the five years, teachers do not attach a great deal of importance toward gaining academic and financial benefits through their participation (see table 4 below). The teachers were requested to rank their reasons for participation on a scale of most important (value = 1) to least important (value = 7).

<table>
<thead>
<tr>
<th>Table 4. Teachers' reasons for participation in FITMAST.</th>
<th>83</th>
<th>84</th>
<th>85</th>
<th>86</th>
<th>87</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) On advice from the principal or subject advisor......</td>
<td>[4]</td>
<td>[6]</td>
<td>[5]</td>
<td>[4]</td>
<td>[3]</td>
</tr>
<tr>
<td>c) To gain credits towards a degree........................</td>
<td>[5]</td>
<td>[5]</td>
<td>[3]</td>
<td>[3]</td>
<td>[5]</td>
</tr>
<tr>
<td>d) To improve your knowledge of the subject.............</td>
<td>[1]</td>
<td>[2]</td>
<td>[1]</td>
<td>[1]</td>
<td>[1]</td>
</tr>
<tr>
<td>f) To gain financial benefits through possible promotion...</td>
<td>[6]</td>
<td>[3]</td>
<td>[4]</td>
<td>[5]</td>
<td>[4]</td>
</tr>
<tr>
<td>g) To gain new insights into the teaching of Biology......</td>
<td>[2]</td>
<td>[1]</td>
<td>[2]</td>
<td>[2]</td>
<td>[2]</td>
</tr>
</tbody>
</table>

The results from the above table are in line with the ways in which teachers were recruited into FITMAST. Initially, the recruitment and selection of teachers were left in the hands of the Dept. of Education and Culture through the principals and the subject advisors. As can be

1The 1983 participants were the first to attend FITMAST.
seen from this table, these people appeared to have embarked enthusiastically about their job of recruiting teachers since their recommendation of FITMAST is listed amongst the top four reasons for teacher participation in 1983, the year of FITMAST's inception. As earlier reported in Chapter 2, this method of recruitment resulted in a wide spectrum of teachers attending the course.

In 1984 and 1985 we see that their influence has declined. In 1986, however, their selling of FITMAST had picked up again and actually reaches a peak in 1987 with a rating of third overall. This tendency is in accord with the shift in the method of recruitment that have taken place in 1985. The administrative staff of FITMAST made a study of the qualifications of all the Mathematics and Science teachers under the auspices of the Dept. of Education and Culture. After having defined, in consultation with the subject advisors, their prime recruits, a communiqué was sent to all principals instructing them to inform and encourage all Mathematics and Science teachers to submit applications. Selections of teachers were now made with top priority given to the prime candidates.

4.12 Teachers' expectations and needs.

Throughout the five years teachers expected that FITMAST would attend equally to academic content and teaching methods. This expectation arises out of their intuitive feelings about inservice teacher education. Such an intuition, is in fact, well supported by their two principal reasons for participation (see Table 4), namely to:

a) improve their subject knowledge and

b) gain new insights into the teaching of Biology.
Thus, with an eagerness to learn new ideas and a determination to succeed, teachers embarked on this course. However, a feeling of anxiety after a long lay-off from studies can be interpreted from the table below as an apprehension that teachers had about the course. It should be borne in mind that the categories of feelings listed below were derived from the preliminary interviews conducted with teachers of the 1987-group. These categories of feelings were then put to all former participants on a questionnaire. The teachers were asked to rank their responses to these categories with the value 1 corresponding to a category that best described their feelings. Teachers were, however, also given the opportunity to express other feelings not covered by the questionnaire. The following table gives a summary of teachers feelings upon entering FITMAST.

Table 5. A summary of teachers' feelings upon entering FITMAST

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) positive about success</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>b) wait-and-see attitude</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>c) determined to succeed</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>d) eager to learn new ideas</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>e) feelings of anxiety after a long lay-off from studies</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

4.13 The level of satisfaction.

According to most of the questionnaire respondents, however, the course met only slightly more than half of their reasons for participation. To this extent, they repeatedly stated that one of their reason for participation, the broadening of their subject knowledge, is the most valuable aspect gained from attending FITMAST.

On the other hand, two kinds of opinions were received on whether new teaching methods, which is their other major reason for participation, were indeed acquired. The majority of teachers only gave it a rating of "just valuable" when asked to respond to the
perceived value of teaching strategies acquired. Secondly, the lack of such teaching insights is reported as one of the two main reasons why they perceived FITMAST as not being valuable.

Such opinions as regards the teaching strategies are important for if teachers had hoped to broaden their subject knowledge and gain new teaching insights, then it is reasonable to conclude that FITMAST did not provide new teaching strategies.

Most teachers agreed that the course had made them more confident Biology teachers. This is probably a direct result of the broadening of their content knowledge. Teachers who are normally deficient in their knowledge of a subject often resort to "... a survival strategy of a heavy reliance on the textbooks and an inflexible, authoritarian style of teaching ...they are inclined to discourage questions, limiting classroom discussions and their pupils' ability to think for themselves" (Davis, 1987, p.2). The evidence for this change in confidence is well illustrated in the following written reflections of three teachers as regards the value of the course:

"When I started teaching Biology, I had no background and struggled initially. Since taking these courses, I have learned a lot and the results of our school also improved."

"I am now more confident about conducting experiments..."

"The content of the course had prepared me well for the new Biology school syllabus."

Thus, with teachers now having a more secure background knowledge, it would have probably been appropriate to consider furnishing them with alternative teaching strategies. Teachers might find that their methods previously used might not seem as appropriate anymore. For
example, a teacher who had always resorted to survival strategies such as those earlier referred to by Davis, might not be able to handle the transition to a flexible, open-discussion learning environment; a transition that one would hope to be brought on by a broader subject knowledge. The inability to handle the above-mentioned transition would present a recipe for potential chaos in the classrooms where, in Black South African schools, large class sizes are the order of the day. More importantly though, having received no alternative teaching strategies with which to convey their newly acquired knowledge, might increasingly lead to feelings of frustrations amongst these teachers.

The teachers are fairly consistent in their reasons for valuing the FITMAST course. They refer repeatedly to the broadening of their subject knowledge and the enhancement of their confidence as Biology teachers, as the reasons why teachers should consider taking it. To a lesser extent, they also value the laboratory skills to be acquired through it. In this regard one teacher, as earlier mentioned, stated that he is now more comfortable with conducting experiments in class.

Figure 1 on the following page gives a summary of teachers' feelings about the value of a FITMAST course that they have gone through. Teachers were asked to make value judgements, ranging from slightly valuable to extremely valuable, on aspects that some of the 1987-participants, who were interviewed, thought to be the salient ones gained from the courses. The judgements were then rank ordered on a scale from 1 to 3 with the value 1 corresponding to the judgement of slightly valuable and the value 3 corresponding to the judgement of extremely valuable. The mean value calculated for each aspect was taken to be the representative feeling of the teachers in a particular year.
Issues by which the teachers had to judge a FITMAST course

a) It broadened my knowledge of the subject

b) It made me a more confident Biology teacher

c) It enriched me with new teaching methods in Biology

d) It enhanced my laboratory skills

On the other hand, the overriding reason why teachers thought that FITMAST was not a valuable exercise, stems from the absence of new teaching methods that they had hoped to gain from this course. The lack of supplying alternative teaching strategies is a noteworthy failure on the part of the FITMAST course and one which may well be addressed for reasons earlier referred.

Data taken from the questionnaire reveal that the teachers also hold the opinion that the course does not take into consideration the different levels of teaching that they are involved with at school. Both the latter two issues surface again as the principal reasons why
some teachers would not readily recommend the course to their colleagues.

In general teachers reported that their feelings with regard to the value of the course have not changed since starting the course and up to the time of responding to this questionnaire. Of those who indicated that a change of feelings has taken place, only one responded in a negative way by emphatically stating that FITMAST "was a waste of time". The majority, however, indicated that their change in feelings leaned more towards the positive. Some of the written comments passed by teachers in this regard include the following:

"I am more positive now than what I initially was..."

"I am even more positive now and wanted to continue, but the courses were not offered at the 2nd-year level."

In recommending this course to their colleagues, the teachers listed a few reasons why they think the course would benefit others. These reasons were gathered from teachers' responses to an open-ended question that requested them to state why they would recommend FITMAST to their colleagues. These responses were categorised broadly into five main reasons. Such reasons (in descending order of frequency) include the following:

1) The broadening of subject knowledge and the concomitant increase in confidence as Biology teachers. The following two written examples probably illustrate best how teachers felt in this regard:

"I would recommend it. It broadens your knowledge - certain areas of Botany and Zoology are better understood and this work is thus presented with more confidence and clarity to the pupils."
"Enrich your subject matter. Teachers can learn how to use apparatus, esp. the microscope. Makes you as a teacher know more than just the school textbook."

2) The contact with other teachers in the same field and the sharing of ideas. Teachers expressed themselves in the following ways:

"The contact with other teachers (course participants) and their methods, the broadening of your subject knowledge is invaluable..."

"Learning from other teachers in the field."

3) Some laboratory techniques, as well as the uses of audio-visual equipment were acquired during these residential sessions. One of the teachers captured the feeling in this regard, stating that:

"One gets acquainted with new terminology, new techniques, the computer, video equipment and laboratory practices."

4) The academic benefits in terms of course credits, as well as the indirect financial benefits through promotion, to be gained from it.

5) The opportunity to re-evaluate your own teaching methods against those of the lecturers. One teacher put it this way:

"One imagines, due to your perceptions and interest in the presentations of the lecturers, how your own pupils might react to your presentation."

4.2 Opinions of the teachers on the residential sessions

In this section an examination of the following three aspects will be discussed. These aspects are:
a) The teachers' perceptions of their workload during these sessions,

b) their opinions of the course materials and

c) their views on the practical sessions conducted during the residential period.

Three sources of data have been analysed to get an understanding of the teachers' views on the above issues. These data emanate from the interviews conducted with teachers, the author's field notes and the questionnaires that were sent out to teachers. Whereas the interviews were conducted with a few teachers from the 1987 group only, the questionnaires were distributed to all the Biology teachers that participated in FITMAST since 1983 up to 1987 when this study was launched. The questionnaires thus form the major source of data. In addition to the interviews and the questionnaires, the author's field notes, taken while attending the June 1987 residential session, complete the data base on this section.

4.21 Teachers' perceptions of their workload.

A common thread that emerged throughout the three sources of data, is the teachers' belief that too much work is covered during the residential sessions. The graph following gives a clear indication that the teachers' concern with the amount of work done, needs to be addressed. Teachers were asked for their opinions on the following issues listed a-f below (see appendix 2, section A):

a) The amount of work covered during any residential session.
b) The time spent on an average day in the lecture room.

c) The number of topics that were covered on an average day.

d) The amount of time normally spent on any topic.

e) The total number of laboratory practicals held during any residential session.

f) The time spent on an average day in the laboratory.

The above issues had emerged from the interviews as the foremost concerns of the teachers about the residential sessions. They were asked to respond to each issue on a scale ranging from a feeling of too much to one of too little. In analysing the data the author rank ordered these feelings on a scale of 1 to 5 with the value of 1 corresponding to the feeling of too little and the value of 5 corresponding to the feeling of too much. The average value calculated for each issue was taken to be the representative feeling of a particular year's teachers. The results are given on page 61.
Years and number of respondents

Issues to which the teachers were asked to respond

a) The amount of work covered in any residential session.
b) The time spent in the lecture room on an average day.
c) The number of topics covered (e.g. Osmosis, Photosynthesis, etc. in Botany or Genetics, Evolution in Zoology) on an average day.
d) The amount of time normally spent on any topic.
e) The total number of laboratory practicals held in any residential session.
f) The time spent on an average day in the laboratory.

From figure 2 we see that the teachers' opinions are fairly consistent in their belief that the work covered in the residential session is definitely more than what they deem to be appropriate. Where a greater number of responses were obtained (cf. 1983, 1986 & 1987), we see that the level of consistency to be very high on the belief that too much work is covered during a residential session.
Except for the participants of 1985, the above opinion is backed up by their assertions that the time spent in the lecture rooms as well as the number of topics covered per day, is slightly more than what they regard as to be adequate. The close correlation between the issues a, b & c is not a surprising one, but can simply be interpreted as lending weight to the teachers' perception of a large workload during residential sessions. The following opinion, taken from an interview with a very dejected teacher, seems to tie together the above three issues as well as supporting the preceding interpretation. This particular teacher stated that:

"I do think that we're doing too much work in this time-period...uh, like today specifically. We treated six chapters in the first session, the first two hours... and that is really discouraging, 'cause the next session somebody else comes along and start with different work, so one feels that it's too much...one feels like giving up, because I don't know where to touch. I don't know where to start when I get back to the hostel."

The perception of a large workload evidently had numerous effects on the teachers during the residential sessions. In the interviews, teachers constantly referred to the residential sessions as "crash courses" and this belief generated amongst the teachers a constant pre-occupation with time. Some of the interviewees were of the opinion that both the lecturers and themselves realised that the work was covered under the pressure of time.

Others interviewed felt again that, with the large workload hanging over them, their inquiries in class become very limited. In responding to a question of how he deals with problems encountered in class, a long-time FITMAST participant summed it up this way:

"In class, we all feel a sort of pressure on us, and the lecturers themselves too. So, we really don't wanna spend time on stretching a lecture
much longer, 'cause as soon as a lecturer can run through his work, the better for all of us. So, preferably we would...uh, if there is something very serious that we'd like to discuss, we would go after a lecture to that person.[i.e. the lecturer]."

Some English-speaking students sitting through mostly Afrikaans lectures, indicated that they are normally hesitant to request terminological clarification on certain aspects. In the opinion of one teacher, such requests would not be fair towards the rest of the mainly Afrikaans-speaking class. He expressed the feeling that:

"...it would be, you know, unfair of me to make the guy [i.e. the lecturer] go back to that particular section when the rest of the class know what's going on...because of the language once again you see!"

The constant concern with time by the teachers of the 1987-group that were interviewed, is again clearly detectable when we look at the analysis of the teachers' responses to whether enough time was spent per topic covered during a residential session. In the above table we find that, while all other teachers found the average time spent on a topic to be slightly inappropriate, the 1987-group indicated that the time spent was definitely less than what they would consider to be appropriate, The results from the table, on the particular issue of time spent per topic, are yet again a natural outcome of the belief that too much work is covered during a residential session.

A few of the teachers interviewed were fatalistic in their acceptance of such a workload for they saw no other way out for FITMAST to deal with the situation. One teacher remarked that:

"Well, I don't think that we have an alternative. I think that because of the short time here we have to take in all the knowledge that we can."
However, some teachers made a couple of recommendations pertaining to this large workload. One participant suggested an extension of the residential sessions even though it would mean sacrificing another week of their school holidays. Another was adamant that a lot of the course work was already known to most of them and suggested that the lecturers and the teachers sit down to cut out the familiar work thereby reducing the workload. The following quote was taken from an interview with this particular teacher:

"I'd like to see the sessions being shortened, the work be slightly cut 'cause ...I mean, some of us teachers already had some contact with part of the work so that such work should be eliminated as soon as possible and concentrate more on the work we don't know anything about. Then I think that it would definitely lead to the improvement of one's knowledge, but now it's mostly a duplication of work. One goes to listen to work that we already know and man, it's really frustrating. If it was something new, one would have probably looked more forward to the work to be done."

The latter recommendation merits inspection because quite a few teachers share the same opinion on the familiarity of the course content as we shall see in the following discussion.

4.22 Teachers' views on the course material.

A teacher's comment that "...the work is easy, but too much" probably underscores the importance of this discussion in relation to the previous one. It could offer substance to the suggested reduction of a declared large workload, since reference to this workload permeates the collected data of this case study. In general, a majority of teachers reported that they thought the content of the lectures to be mostly easy with only a few difficulties encountered here and there.
A similar response was obtained on a question on the familiarity of the course materials. In an interview with one of the teachers, remarks were often passed that the course material frequently overlapped with the work covered in the final year at the teacher training colleges.

The three important views emerging thus far from the discussion on the residential session appear to be:

a) the opinion that too much course material is encountered during such sessions.

b) the perception of the low level of difficulty of the course materials.

c) the view that much of the course work is familiar.

With regard to the first issue, the author observed some behavioural traits and overheard some comments that probably attest to the teachers' belief on this issue. As regards the low level of difficulty of the course material, the author found this difficult to assess since few questions were actually raised by the teachers during the lectures. Whether or not such behaviour can be interpreted as evidence for the easy comprehension of the course work covered, is an open question. The author would rather ascribe the low amount of questions raised to a perceived pressure of time on the side of the teachers; a feeling of "let's get over with it". Another possibility being, of course, that the course work really is familiar to the teachers.

While there appears to be consensus, between teachers and the administrators that a hefty amount of work is covered during these residential sessions, it remains and could possibly be established
whether much of the work covered is indeed familiar to the participants. As for the declared low level of difficulty of the course work, the author is of the opinion that such a perception is probably closely related to the belief that a lot of the course work had been dealt with before.

4.23 Teachers' comments on the practical sessions.

Although teachers had various complaints against the practical sessions, they were, judging from interviews conducted with the 1987-group, generally united in their criticisms of the following aspects:

1) too many topics were covered per lab session,

2) few or no explanations were given on the uses of laboratory instruments,

3) and practicals were not transferable to the school situation.

In contrast to what the 1987-group of teachers said above about the amount of topics covered per laboratory session, the author observed that the atmosphere in the laboratory was a much more relaxed one than in the lecture room. It thus left the impression that the amount of work done in a practical session was adequate. In fact, from the results shown in the previous graph, it can be seen that the teachers expressed general satisfaction with the laboratory sessions.

Although the uses of the laboratory instruments were rarely explained, the lectures and the laboratory assistants were always eagerly prepared to assist and explain to the teachers how the
instruments were to be used. The author believes that the lecturer simply assumed that teachers were familiar with the uses of the laboratory instruments.

From observations that the author made in the laboratory sessions, it appeared that the teachers do indeed lack the necessary laboratory skills. It can thus be assumed that their previous training did not include much laboratory or practical work. Such an assumption is backed up by their opinions of the course materials. It was previously reported that the majority of the teachers thought that much of the course work was familiar to them.

If indeed the course work was familiar to them, then one would have expected a certain amount of knowledge with regard to practical work on the course materials deemed to have been familiar to them. However, having tacitly acknowledged a lack of practical knowledge through one of their criticisms of the practical sessions, it leaves the impression that their prior training had merely been theoretical in nature.

As far as the lack of the transferability of the practicals to the school situation is concerned, such an opinion should be judged against the background of the teachers' expectations about FITMAST. It also strengthens the belief that FITMAST had failed to provide the teachers with alternative teaching methods even insofar as skills and strategies relating to the conduct of school laboratory sessions are concerned.

On the brighter side though, the majority of teachers believed that the practical sessions were important because:
1) it helped to explain and clarify some aspects of the work covered in the lectures and also served to strengthen their understanding of the course work.

2) the laboratory reports were valuable especially in that they served to reinforce certain concepts at a later stage when away from campus.

Thus, as far as functioning to supplement the academic content of the course, the laboratory sessions are, judging from the above responses, perceived to be very useful by the teachers. Such an interpretation is probably validated by their assertions that the number of laboratory sessions as well as the time spent therein, is appropriate to them (see figure 2).

4.3 The views of the teachers on the distance teaching component.

The analysis of the data on this aspect of FITMAST will mainly center around the teachers' views on the distance teaching component. As in the previous section, the data collected on the teachers' opinions stem from the interviews conducted with teachers of the 1987-group and from the questionnaires that were sent out to all the Biology teachers who had participated in FITMAST since its inception in 1983.

The distance teaching component has two periods. The first period, following the January residential session, lasts from February until May. The second period runs from July until September and it follows the June residential session.

The distance teaching component involves the completion and return of assignments to the particular lecturers who were responsible for
drawing up his/her particular assignment. According to the present director, the distance teaching mainly has an evaluative role in that the assignments merely set out to test whether the teachers have gained comprehension in the work covered during the residential sessions.

4.31 **Opinions on the time spent in completing an assignment.**

Analysis of the questionnaires revealed that the majority of the teachers thought that the number of assignments they were required to complete was quite adequate. Although the majority also indicated that there was enough time between the due dates of assignments, in the interviews the teachers voiced their frustrations on the late arrivals of assignments and the fact that assignments were sometimes not received at all!

The teachers indicated that they spend an average of six to eight hours in completing an assignment. They were asked to indicate the percentage of this time spent on the six activities listed below (see appendix 2, question 13):

1) "looking for materials and sources in libraries"

2) "consulting a fellow participant"

3) "consulting a knowledgeable person"

4) "going through your notes and textbooks"

5) "contacting a lecturer or the FITMAST tutors"

6) "actually writing out the assignment"
Their responses yielded the following results as contained in figure 3 below.

Figure 3. Time spent in completing assignments

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**Percentage of time spent**

Issues on which the teachers were requested to indicate their time spent

a) Contacting a FITMAST lecturer or tutor
b) Contacting a fellow participant
c) Consulting a knowledgeable person
d) Other*
e) Going through their notes and prescribed textbooks
f) Actually writing out the assignment
g) Consulting textbooks and other sources in the library

*---Only one teacher indicated that about 5% of his time is spent on "checking the answers to the assignment"
From figure 3, two kinds of outcomes are observable with regard to how teachers spend their time completing their assignments. On each of the following three activities they spent less than 10% of their time.

a) consulting a fellow participant

b) contacting a lecturer or FITMAST tutor

c) consulting a knowledgeable person

If the role of the assignments is simply to evaluate the teachers' comprehension of the work covered in the residential session, then the outcome with regard to the above three activities, is not a surprising one. One teacher even indicated in the "other" option provided that 5% of his time is spent on checking his solutions to the assignment. We can conclude from this remark, as well as the outcome with regard to the three activities listed above, that assignments indeed focus on evaluating the teachers' comprehension of the work covered in the residential session.

In addition, the majority of the remaining time is spent on activities that are consistent with this interpretation. Teachers reported that approximately 60% of their time is spent on going through their notes and textbooks and actually writing out the assignment. The following remarks of the teachers interviewed probably explain why so much time is spent in this regard:

"Usually the textbooks and your notes are more than adequate in completing an assignment."

"...the assignments are mainly based on what we've done, and of course, also having to use your textbook."
"Man, I can tell you...in the past semester they (i.e. the assignment), were not that difficult 'cause everything was in the textbook..."

Although teachers indicated that approximately 15-20% of their time (see figure 3) is spent in a library, this probably holds true mainly for teachers in the urban area since some of the interviewees stated that the libraries in the rural areas are not well equipped for research purposes related to their assignments. If then the assignments do indeed have a function of evaluating the teachers understanding of the work covered in the residential sessions, then the body of knowledge which a teacher would draw upon in attempting to complete an assignment, should be mainly his/her classnotes and prescribed textbook.

4.32 Teachers' views on the relation of the work covered in the residential session to that of the assignments.

On the relation of the factual content of the assignment to that of the work covered in the lectures, (see appendix 2, question 17) the teachers reported that only at times did they actually receive different work. In the interviews where teachers were able to express themselves more extensively, the following opinions were given:

"Yeah, well...the assignments were actually based on or rather it covered the work we did in class and it (i.e. the solutions) was to be found in the textbook,...uh, certain chapters in the textbook. So, there was a connection or link between the assignment and the work covered during the January session except for the one on pollution which we only slightly touched upon in January."
"It was based on the contact session....like, what you've learned during the first session (i.e. the residential session) you could easily apply to your assignments....uh, one knew what to expect, it was nothing unfair or new."

Surprisingly though, a summary of the data taken from the questionnaires indicates that the teachers firmly rejected the statement that the assignments required of them simply to reproduce their notes and/or prescribed textbooks. They thought that the assignments did require them to:

a) consult sources and textbooks other than their notes and the prescribed textbooks.

b) show an in-depth understanding of the work covered in the residential session.

c) give their version of comprehension of such work.

One would expect that when such activities as listed above are undertaken in the course of completing an assignment, the result would be a greater comprehension of the work covered in the residential sessions. From the graph given below, we see that teachers strongly agreed that the assignments did indeed aid in increasing their understanding of the work done in the residential sessions.

Such a consistency of opinion on the value of assignments gives credence to the teachers' belief that the completion of assignments is definitely not an exercise in rewriting their notes and/or prescribed textbook. This interpretation is also in line with a value judgement they made about the assignments. Teachers throughout the five years strongly repudiated the opinion that "assignments are not
valuable because they are repetitions of the work covered in the contact sessions" (see issue f below).

Figure 4. Teacher responses to aspects of the distance teaching component

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Issues on which the teachers were prompted

a) School-related activities do not allow me much time for assignments

b) Assignments are not difficult but are time-consuming

c) Assignments helped me to understand better the work done in the residential session

d) The evaluation of the assignments gave me an indication on how to answer the work covered in the residential session

e) Assignments are only useful for examination preparation

f) Assignments are not valuable because they are repetitious of the work covered in the residential session.

g) Workshops in my area would be useful to clear up problems with assignments
Although the majority of respondents from the questionnaire data subscribed to the views that the assignments required them to consult other sources, to give their version of comprehension and that they did indeed help them to better understand the work done in the residential sessions, there were some dissenting voices. A few teachers expressed the opinion that the assignments basically required them to reproduce their notes and/or prescribed textbooks. Such an assessment is consistently echoed in the interviews conducted with teachers where greater freedom of expression and elaboration is possible.

For example, a look at the five interview excerpts on p.72-73 in which teachers commented on other issues such as time spent on assignments and the relation of the factual content of the work done in the residential session to that of the assignments, we find expressions that seem to validate the minority assessment outlined above. Teachers talked about knowing "what to expect", of "everything was in the textbook" and of solutions to the assignments "to be found in the textbook".

Thus, while the analysis of the questionnaire data indicate that the majority of teachers believes that the completion of assignments are not simply exercises in rewriting their notes and/or textbook, the interview data seems to support the opposing view held by a few teachers. The minority view cannot be discarded and, in fact, needs a more careful examination since it contradicts the majority opinion obtained from the questionnaire data.

The following comments of a teacher on the value of the assignment's feedback can possibly also serve to reinforce the belief that the completion of an assignment is basically an exercise in reproducing the notes and/or prescribed textbook:
"I...well, I'll honestly tell you...uh, maybe I haven't concerned myself much with the feedback, 'cause sometimes you feel that what you've written down is what you've taken from the textbook...well, there are little things that you've left out, probably things that one overlooked in the textbook...but honestly, I didn't bother much. To tell you the truth, one only looks at the marks.(Laughter)...I hardly look at what they have said" (author's emphasis).

Further evidence in support of the minority view can also be extracted from the questionnaire data on the teachers' opinions on the assignments as shown in figure 4.

We see that teachers generally agree that assignments are not difficult but take up a lot of time. Although earlier reported (see figure 3) that approximately 40% of such time is spent going through their notes and textbooks, the following two extracts from interviews with teachers add detail as to how they tackle assignments. These comments also strengthen the suggestion that the above general agreement by the teachers can be interpreted as further evidence supporting the belief that assignments merely required teachers to repeat the work done during the residential sessions.

"...many lecturers give some question and answer sections, but you still have to look up the relevant chapters, 'cause they won't give you something that is very obvious. You still have to read up and delve for the answers"(author's emphasis).

"A lot of questions we were able to answer making use of the lecture notes and the textbook, but there were in some of the lecturers' assignments...uh, we had some trouble finding the answers in the book..."

Thus far the author has given supportive evidence from both interview and questionnaire data to the minority position that assignments simply evaluate teachers' understanding of the work
done in the residential sessions and require them to merely reproduce their classnotes and/or prescribed textbooks. However, the author also referred to other questionnaire data that supported the majority view that assignments were not merely exercises in rewriting their notes and/or textbooks. We thus seem to have two conflicting views by the teachers as to what the assignments required them to do. The author proffers the following reasons for their contradictory perceptions.

The contradictory nature of their views might possibly have resulted from the methods of data collection. The author believes this factor to be a legitimate one. It was shown that the questionnaire data was not only contradicted by a different method of data collection, in this case, the interview, but also by information on other issues that emanated from the same questionnaire under discussion. Central to the discussion here is the greater freedom of elaboration made possible by an interview; an issue which appears to have surfaced and resulted in data from the questionnaire to be contradicted by other data from the same questionnaire.

Secondly, insofar as the assignments were deemed to improve comprehension of the work covered in the residential session, the author believes that this perception needs careful scrutiny. For the reasons following, such a perception might have obscured the fact that the teachers could actually have been reproducing their notes and/or textbook in completing an assignment.

After those residential sessions of intense academic activities in which comprehension of the work covered might have been very low due to their declared large workload, the only time the teacher encounters the work again is through the assignments. Respondents already indicated that close to 40% of their time spent (see figure 3) in completing an assignment is used to go through the notes and/or
textbooks. The teacher thus gets to take another thorough look at the work already done in the residential session. Having now re-acquainted themselves, in the privacy of their homes, with the work done in the residential session, it becomes understandable why they believe that greater comprehension has been gained through completing the assignments. Satisfied that they now understand the work better, they may overlook the fact that they might have just reproduced their classnotes and/or textbook in completing an assignment.

In the third instance, and as reported earlier, the teachers strongly dissociated themselves from the opinion that assignments were not valuable because they were repetitious of the work done in the residential session. Rejection of such an opinion appears to be supportive of the majority view that assignments are not repetitious of the work covered in the residential sessions.

However, their strong disagreement can also be interpreted in a different way. In the above case teachers were required to make a value judgement of assignments on the basis of a single issue. In another such instance where the usefulness of the assignments was linked to examination preparation only, we see that the teachers strongly disagreed again. It therefore seems that whenever teachers were expected to evaluate assignments on the basis of a single issue, the restrictive nature of the expected value judgement becomes very clear. A look at the other issues investigated above, does in fact reveal that they believe assignments to be valuable for other reasons as well. Thus, a strong disagreement or rejection of the opinion that assignments are repetitious of the work covered in the residential session, need also be interpreted against the background of the value judgement it invoked.
From the above three reasons given, it becomes understandable why the teachers appeared to have contradictory views on the relation of the assignments to the work covered in the residential sessions. The author is of the opinion that the first two reasons outlined above probably explain why the minority view is a more valid interpretation of the analysed data.

4.33 Teachers' comments on other aspects of the distance teaching component.

From the data supplied in figure 4 we find that the teachers agreed that school-related activities did not allow them much time for assignments. Other activities and responsibilities which, according to the teachers also impinge upon the time needed for the completion of assignments, emanated from the interviews. In this regard they named family responsibilities and community activities as the two main factors that limit the time they can set aside for assignments.

Throughout the five years of FITMAST's existence, we find that the teachers overwhelmingly support the idea that workshops be held in their respective areas to assist them with problems related to their assignments (see figure 4). In the interviews where once again, greater freedom of expression were possible, the teachers generally spoke in favour of such workshops. Some teachers expressed themselves in the following ways:

"I feel that at such a workshop problems with respect to the course can be discussed with your colleagues, thus gaining a second opinion. With regard to motivation, it (i.e. the workshop) can be sort of a feeding source for it...uh, one could have your motivation restored at such workshops."

"Maybe to clarify things you don't understand, and.....to make contact with each other again."
"Um...I think it'll be good, 'cause there do come times when you need somebody to help you in this field...They do expect us to call the campus, but sometimes it is impossible to do so or the times when you are able to phone, are usually in the afternoons and they (i.e. the lecturers) might not be there, probably off-campus and so it remains a problem."

Teachers of the 1987-group who were interviewed indicated that workshops were held for those teachers residing within a 50 kilometer radius of the campus of the University of the Western Cape. However, such workshops quickly disappeared due to problems such as the timing and purpose of a workshop, and other teacher-related difficulties as revealed below. Three teachers who reside within that area gave the following versions of the workshops that were held:

"Normally the workshops would be called if we had problems with an assignment...uh, sometimes it was called after an assignment was handed in, or like a day before (it was due). Well, to me it was senseless going to a workshop after I've completed an assignment or to have it a day before it was due."

"It (i.e. the workshop) was very short...uh, for about half an hour 'cause most of the people that turned up, mainly came to seek information with regard to the assignment itself."

"I think an effort was made and on one occasion I did attend on a Friday afternoon, I think. So, an effort was made to have these workshops, but it flopped because consensus could not be reached as to when it should be conducted, therefore it flopped."

We thus see that the teachers would welcome workshops for the encouraging and motivational aspects of it, as well as to assist them in clearing up some problems with their assignments.
Although teachers value the idea of a workshop to assist them in discussing difficulties with regard to assignments, we see in figure 3 that, in the completion of an assignment, they spent less than 10% of their time consulting persons that they would encounter at such workshops, namely the FITMAST lecturers or tutors and their fellow participants. This apparent inconsistency might be resolved by considering the following possibilities:

1) Teachers may not contact their fellow participants believing that their peers are not able to assist them. In one instance for example, one of the interviewees did contact a fellow participant and the end result of that is given in the following excerpt:

"Well, the quickest thing is to...uh, I'd phone a friend and inquire about his or her solutions....(laughter)...well, that's the honest truth I'm giving you. We'd uh argue a bit over the phone, and then decide together what solution or solutions we would hand in on a specific assignment."

The fact that teachers nevertheless call for workshops to be held can also be construed as being consistent with their stated need of having these workshops to serve as a "feeding source" from which motivation and encouragement can be drawn through interaction with people experiencing the same difficulties.

2) The low percentage of time spent on consulting or contacting a lecturer can possibly be attributed to them experiencing difficulties in contacting the lecturers concerned. In this regard they are even more disadvantaged in that neither of FITMAST's tutors is trained in Botany or Zoology so as to render immediate guidance or assistance even when teachers do succeed in contacting them. Thus believing that they would again in the future encounter difficulties contacting
lecturers, these teachers have added their voices to the call for workshops to be held.

3) Probably the most likely reason to explain the contradiction between the teachers low level of contact with lecturers and their overwhelming support for workshops to be held, stems from the option afforded with regard to the completion of assignments. One of the FITMAST tutors explained:

"Uh...can I just take you on 'completed assignment'? We have a big battle on this, because I think, teachers themselves feel obliged to fully complete an assignment and are reluctant to return a partially completed one. Uh...perhaps, academically they feel that they don't wanna reveal weaknesses in particular question topic areas, uh...perhaps genuinely, in a lot of cases, we have the time-factor coming into play. We try to persuade them that ...along the lines that any return is welcome and is better than no return."

Rather than contacting the FITMAST tutors for assistance, some teachers readily took up the option of returning an incomplete assignment. The following extracts from interviews with the 1987-group reveal the approaches of two teachers:

"Uh..it is very seldom that I do encounter difficulties, but when I do have problems, I would leave that part blank because it is an option that they give us. If you don't understand some sections or you experience some trouble, they recommend that we send in an incomplete assignment rather than nothing at all."

"...so, you'd leave that part blank if for example, you can't get a certain label of a drawing."

It is therefore against this background that the aforementioned contradiction should be seen; the contradiction between the teachers' call for workshops even though they have reported a low contact time
with the likely participants of such workshops. While taking into account the other explanations for the low level of contact by the teachers with lecturers or fellow participants, the author wants to reiterate that, the option of returning an incomplete assignment, is the most likely explanation that can be given in attempting to resolve the apparent contradiction that the teachers' call for workshops has created.

4.4 The opinions of the teachers on the didactics aspect of FITMAST.

The didactics aspect of FITMAST normally comprises one lecture session of approximately 4-6 hours or roughly 4% of the total residential session's time. During one such session that the author attended, the lecturer imparted a lot of hints with regard to teaching Botany topics at the school level. Now and then teachers raised questions which the lecturer duly attempted to answer. In general, the didactics session is one on which the teachers are not examined and usually takes place towards the end of a residential session. Of late, teachers were also taken on field trips as another means of enriching their didactic experiences. The interviewees had very favourable comments with regard to this move. The following comments are illustrative of the praise they had for one such field trip:

"We had a very nice one last semester (i.e residential session), but we didn't have one this time. I don't know why, but last time we had a lady ..... I don't know her name. In any case, she did Ecology which is very important in the new syllabus (i.e. school syllabus) and she did it very well...very informative."
"For example, this year the person who did didactics, was responsible only for Ecology.....she really went out of her way doing that Ecology topic and it was very useful. I mean she actually asked us what we wanted to know and she gave us some new ideas...uh, like you could actually teach Ecology with a transparency without having to go out in the veld, you know!"

At present, some of the teachers interviewed perceive didactics to be implicitly relayed to them through the lectures. The extent to which this is done appears to be very insignificant. On this one of the teachers remarked that "...we just pick it up informally by the way, you know." Although teachers stated that a few valuable hints were passed over to them, only two or three lecturers are singled out and commended for making explicit attempts to teach by example.

The interviewees were asked to value the importance of didactics to themselves on a scale of 1 to 10. Most of them assigned it a value as high as 9. Such a value-rating goes hand in hand with a call for an increase in time spent on didactics and less on theoretical work. One of the teachers interviewed gave the following breakdown of course time which the author deems to be very significant for reasons to be discussed hereafter:

"What percentage of this course would I prefer to be used for...for d...for didactics? A helluva lot more than what used already. From my point of view, I would like to see the course...uh, most of our time should be spent on practicals, let's say 60% practical. Of the 40% left, I'd like to see as little as 10% for theoretical lectures which we can master at home , you know, in a more relaxed atmosphere. More assignments I'd say, more assignments which would help and thus the remaining time on didactics, specifically method lessons, how to teach a specific lesson, that type of thing."

With regard to the above statement, the author feels that the teacher has suggested a completely different role for the distance teaching
component; to become part and parcel of the whole process of instruction and not just having, as it does at present, an evaluative function. In terms of the discussion on the didactics aspect, the above excerpt adds yet another voice, as we shall see later, to the call for more time to be spent on didactics.

A second look at all the different issues and opinions discussed thus far, will actually show that a call for more time to be spent on didactics, has its roots in the teachers' expectations of FITMAST and their needs they thought FITMAST would address.

As reported in an earlier discussion on teachers' expectations and needs, the teachers thought that approximately half of the residential session would be devoted to the didactics of teaching Biology. This belief was further emphasised by their reasons given for participation of which their pursuit of new insights into the teaching of Biology, had ranked as the second most important reason why they decided to embark on a FITMAST course. From the same discussion we found that FITMAST has not met this expectation/need; a failure which the author has already singled out to be a significant one. From the following discussion of the questionnaire data on the teachers' views of the didactics aspect of FITMAST, it should be abundantly clear as to why this shortcoming is indeed a noteworthy one.

A summary of the questionnaire data revealed that the majority of teachers were not satisfied with the time spent on this aspect of the course. In essence, most of them call for an increase in time to be devoted to the didactics aspect. Overall, they indicated that approximately 20-40% of an entire FITMAST course should be used for didactics. The 1983-group was even more adamant in this regard for the majority of them felt that 40-60% of a course should lean towards didactics. From the host of reasons supplied for the
extension of the didactics aspect, the author has grouped them into four main categories:

1) Teachers felt that they need to be taught how to convey the knowledge gained here in a simple manner to their pupils. The following written comments are illustrative of their views:

"As a teacher, factual knowledge of subject matter is important, but it is more important to carry over that knowledge to a child on a level he'll understand. We should not only be taught what to teach but also how to teach."

"The aim of the course should be two-fold; to upgrade the Biology teachers (esp. those lacking in qualifications) as well as to enrich the didactic experiences of educator - educand (the pupil)."

2) The teachers expressed the need to be shown how to teach a practical lesson. Some of the written comments received in this regard were the following:

"To learn more about the practical presentation of the work covered for it (i.e. presentation of practicals) is a big shortcoming in our teaching."

"It is easy to find facts relating to subject matter. However going about the lesson (plan) is different e.g. how to work out practicals; what apparatus can be used; how to include the pupils in the lesson, etc."

3) The third major category is devoted to reasons not covered by the above two categories but which the author nevertheless thought to be important for they touch upon issues already discussed under previous sections. Two points need to be made here. It should be borne in mind that the reasons to be listed below, are essentially important insofar as they reflect why teachers call for an increase in time to be spent on didactics. Secondly, these reasons are also
important in that they reiterate the teachers' expectations, needs and views on other issues discussed thus far. The following written comments were given by the teachers as the reasons why they want more time to be spent on didactics.

a) "Since only 10% is spent on it."

The author views this comment, given with regard to time, as an indication that the teachers' expectation of an equal division of course-time to be placed on academic content and teaching methods, has not been met.

b) "Too much factual content is compressed into 2-3 weeks."

Although given as a reason why more time should be spent on didactics aspects of this course, it can also be interpreted as an expression of a heavy workload encountered during the residential session.

c) "Inservice education would be more valuable if it is more than just an accumulation of facts, but also spending more time on teaching methods and explaining how to present the subject matter in more interesting ways."

This comment is in line with the teachers' previous assertion with regard to the value of FITMAST: that FITMAST has broadened their subject knowledge, but that no new insights into the teaching of Biology have been gained.

4) The fourth category contains reasons that can be interpreted as other needs and concerns of the teachers with regard to didactics.

"Mainly to be taught how to use modern teaching aids effectively."
"To learn how to effectively interpret school syllabi."

"To improve a teacher's approach and attitude towards the subject."

"To the benefit of the pupil; studying can be done at home (author's emphasis)."

"Cause teachers have to go back to deal with everyday classroom situations."

These remarks set the scene for the following discussion on the teachers' needs with regard to didactics.

4.41 **Teachers' expressed needs with regard to didactics.**

The list of needs given below in figure 4 were gathered from the interview data and were then put on a questionnaire (see appendix 2, question 20) to all the teachers that have attended FITMAST throughout its five years of operation. Teachers were requested to indicate the degree of importance of the needs expressed by some of their 1987-colleagues who were interviewed. Judgements were to be made on a scale ranging from very important to completely unimportant. These judgements were then rank ordered on a scale from 1 to 3 with the value 1 corresponding to the judgement of completely unimportant and the value 3 corresponding to the judgement of very important. The mean value calculated for each need was taken to be the representative feeling of the teachers in a particular year. The summary of these feelings are given on page 90.
Issues on which teachers were prompted

a) More effective utilization of science instructional tools

b) Learning techniques for teaching science in overcrowded conditions

c) Utilizing audio-visual equipment as instructional materials

d) Sharing of fellow teachers' experiences

e) Learning laboratory management skills

f) Creation of small tutorial groups to discuss problems in the teaching of certain topics and approaches to resolve such problems

g) Information on the use of low-cost materials for Biology experiments
An obvious conclusion that can be drawn from the above questionnaire data, is that each item or need was deemed to be of great importance by the teachers throughout the five years. What is not revealed here, is the finding that approximately 30% of the teachers in each year group indicated that all the items were very important to them. There appears thus to be overwhelming support for the needs expressed in the above figure. This is however, not a surprising phenomenon because most of the needs listed above situate themselves in previously discussed feelings and/or requests of the teachers. A careful scrutiny of the relationship between the above-listed needs and the previously expressed feelings and/or requests now follows.

A look at items (a) and (c) listed above will show that they correspond to the first two needs grouped under the fourth category on p.88 where teachers gave their reasons why more time has to be spent on didactics.

Items (d) and (f) are needs that can be traced back to similar comments passed by teachers on the value of workshops. (see p.80).

That teachers would definitely want to learn laboratory management skills (item e) can be construed from their criticisms lodged against the practical sessions of the residential component (see p.66). This need is reiterated on p.87 as the second major category of reasons supplied by the teachers for the extension of time to be spent on didactics.

It should become clear that the overwhelming support given for greater didactical activities, is consistent with, and in fact, gives greater coherence to the teachers' assessment over the past five
years that new teaching methods were not acquired during their participation in FITMAST.

Finally on this discussion of the didactics aspect of FITMAST, the teachers were requested to state what they would "like to see happen in a didactics session" (see appendix 2, question 21). The responses obtained were consistent with those reasons teachers gave as to why more time should be spent on didactics. A great amount of overlap with the needs in figure 5 was also evident. The following written comments taken from the questionnaire data are illustrative of this overlap:

"More informal sharing of ideas by the participants especially with regard to the problem areas of Biology."

"To acquire ideas on the setting of school assignments and practical work."

"All the above suggestions [i.e. the listed needs] be carried out."

'To see as many video or 35mm films on teaching techniques."

"Present more opportunities to become knowledgeable on how to use laboratory instruments."

"Above needs be implemented especially for teachers in their induction year."

"Learning methods of how to present Biology more effectively."

In the light of all the views presented in this discussion of the didactics aspect of FITMAST, three points become conspicuous as the major conclusions to be drawn with respect to the teachers' needs, expectations, feelings and opinions on didactics:
1) Teachers' expectations and intuitive feelings about the nature of inservice teacher education were not met, i.e. they did not find an equal division of time spent on academic content and teaching methods.

2) Teachers strongly believe that didactics should form a major part of the FITMAST programme.

3) Teachers feel that they need to enrich their didactic experiences.

These conclusions warrant serious attention for they surface continually through the teachers' opinions on the different aspects of FITMAST. Perhaps the following remark captures best the seriousness with which the teachers view the importance of didactics:

"...it should be a prerequisite that the lecturer should do that kind of thing [i.e. enrich didactic experiences] (author's emphasis)."

4.5 Teachers' general concerns on the FITMAST programme.

Only a few concerns were raised with regard to FITMAST in general. However, the significance of this handful of comments lies in the voluntary nature that it was acquired. The author regretfully did not make provision for general concerns to be raised with regard to FITMAST, but teachers nevertheless expressed the following written comments:

"Participants' background knowledge should first be established. Problem areas of the secondary school syllabi should be identified and discussed. The course should be directly linked to the syllabus [i.e. of the schools]."
"This type of inservice education increases one's frustration, 'cause two credits [i.e. Botany and Zoology] doesn't mean anything especially to a teacher from the rural areas."

"I hope that second and third-year courses can be offered in the future."

"FITMAST should help in the promotion of the idea of Biology Teachers' Societies where exchanges of teachers' ideas can take place."

"We should write the same exam paper as the U.W.C. students especially since UNISA [University of South Africa - a major correspondence university] is now beginning to question the use of different exam papers which it suspect to be below standard."

Having now given a complete analysis of the opinions expressed by the teachers with regard to their feelings and experiences of FITMAST, we turn to the administrators to see to what extent their views are congruent and/or different to those of the participants.

4.6 The views of the administrators.

This discussion draws mainly from interviews that the author conducted with the Director of the FITMAST programme and with one of the programme's two full-time tutors. These views are included so as to present a full picture of the various opinions that exist on the issues discussed thus far. Such an inclusion will also enable us to see whether the administrators are aware of the teachers' concerns and in fact, also to see to what extent the views of the two groups are congruent on the stated concerns of the teachers.
4.61 Views of the administrators on teachers' expectations and needs.

The administrators are aware that teachers had expected an equal emphasis to be placed upon subject knowledge and teaching methods for the duration of the course. In this regard the FITMAST tutor stated that:

"We had to compromise between uh, trying to give the teachers' opportunities to earn first-year university credits, while at the same time giving them more insight and guidance into the teaching of their subjects at school-level."

Although not ranking high amongst the teachers' reasons for participation, (table 4) the administrators are adamant that right from the inception of FITMAST, teachers wanted to know how they were going to benefit from attending FITMAST. The Director puts it this way:

"You see, when the teachers came the first time [i.e. in 1983], the very first thing they wanted to know was what was in for them...uh, what would they get at the end of the period, because nobody would just come to upgrade and upgrade himself, since most of these teachers regard themselves as fairly good already. Thus the whole question of what the course mean [to them] came to the fore right at the beginning."

According to the Director, this issue had a major bearing on the original course syllabi. Initially the courses included a fair amount of academic subject content of appropriate university standards as well as a good deal on teaching and teaching methods. However, when the teachers indicated that they would like to get university recognition for the courses they were about to undertake, a review of these original syllabi had to be done in order for the University of the Western Cape to grant such recognition. The major change that took
place was, according to the Director, a "content shift", that is, more academic content had to be included in order for the Faculty of Science at U.W.C. to recognise the courses as full first-year credits. Consequently, the time spent on the didactic aspects were reduced significantly.

Just when the academic standard of the FITMAST courses were brought in line with university standards, another issue emerged which had to be addressed. The Director of FITMAST states just what the issue was:

"...we found earlier on that we had to balance, on the one hand, relevance of content[ i.e. of the FITMAST courses] to the school situation with the question of accreditation. You see, the teachers wanted it and it came straight from them."

Insofar as certain subjects, including Botany and Zoology, were concerned, the Director stated that it proved to be no problem to make the course content relevant to the school situation while at the same time maintaining a university academic standard, because:

"...there is a considerable amount of overlap between a first-year and a Matric [i.e. Grade 12] course...uh, a very considerable amount."

However, the extent to which the relevancy of course material to the school syllabi has been attained, is questioned by the teachers' experiences of FITMAST. On p.57 we found that the issue of relevancy of the course materials to that of the different grade-levels' school syllabi was already raised and perceived to be non-existing. From an interview with one of the 1987-teachers, the non-existence of this matter of relevancy is stated even more bluntly:

"I was under the impression that we'll be treating the std.9 & 10 syllabi[i.e. Grades 11 & 12] and a lot of the guys here was also under the same impression
that we'll mostly be dealing with the school syllabi. I think that's one of the reasons why the guys also become drop-outs."

4.62 Views of the administrators on the residential sessions.

The administrators of FITMAST are aware that teachers are experiencing a heavy workload during the residential sessions. The following line of conversation with one of the tutors on the orientation session, convincingly support this assertion:

**Author:** I think you mentioned to me in an earlier conversation, and this was an off-hand remark, that you are actually trying to put off the teachers from coming here.

**Tutor:** That's correct, yes...[laughter]...that's right. When I say that we try to give as true a picture as we can, I think that we must make no bones about it that this course is a tough one, and it requires a great deal of stamina, if nothing else, physical stamina as well as mental stamina.

If we can discourage people at that stage[i.e. the orientation session] then the better, than to have come to the residential session and be disappointed or disillusioned. As I've mentioned this morning, we know that teachers are going to suffer a gross information-overload at some period of the residential course.(author's emphasis).

However, the extent to which the tutors are driving the above message home, is in some ways contradicted by the data emanating from this research. As far as giving a full account of the toughness of the course, the tutors are probably being fairly accurate. A full account should however, also give the teachers an idea as to the breakdown of the course time to be spent on academic work and didactics. This appears not to be done accurately for the majority of
teachers come to the FITMAST courses believing that equal time would be devoted to academic work and didactics.

The teachers' view that much of the course work covered here is already familiar to them, seems to be supported by the Director's comments on the amount of overlap between Matric and first-year university work. This consensus by the teachers and the administrators on the familiarity of the course materials may set the ground for a reduction of the workload during the residential session.

4.63 Views of the administrators on the distance teaching component.

That the distance teaching component is beset with numerous difficulties, is probably best illustrated by the remarks of the present Director:

"The distance tuition is still the single biggest problem, 'cause I've held all along that simply to send people assignments on work they did not understand in the lectures in the first place, are not helpful..."

The above excerpt also serves to illustrate the difference in perception between the administrators and the teachers as to what the problem(s) is with regard to the distance teaching component.

In the administrators' opinions, the single biggest complaint lodged by the teachers against the distance teaching component, centre around the pressure placed upon the teachers by the late arrivals of assignments. Other related difficulties experienced by the teachers are, according to the administrators, the lack of library facilities and colleagues with which to consult in their immediate vicinities. and, especially for those teachers that are not teaching Matric
classes, encountering the course work for a second time only when sitting down for examinations.

In figure 4 we saw that the teachers indicated that school-related activities do not allow them much time for assignments and that assignments are not difficult but take up a lot of their time. The administrators believe that these two factors brings about much pressure to bear upon the teachers and consequently, the Director stated that "...teachers quite easily get discouraged."

Teachers are heavily committed at school and to other community and/or family responsibilities. At the end of the January residential session, teachers return to their respective schools having already missed two weeks of the school year. Having no one that stood in for them while they were away, they return to an accrued workload. They also get back to school time-tables on which they were never consulted and often find themselves teaching classes of a higher grade than what they had been assigned the previous year. The Director of FITMAST adds a greater perspective as well as empathy to the teachers' situation:

"Once they do get back[i.e. to the schools], they're really getting thrown into the deep end, 'cause nobody has done their work, there was not somebody standing in for them, so they really get in over their heads right away, and they find that they lose contact exponentially with the course (author's emphasis)."

A look at the pattern of the return of the assignments probably attests to the belief that teachers are indeed heavily committed at school and to other community or family responsibilities. Despite the hardships faced by the teachers on their return to the schools, a high percentage of returns, estimated at 90-100% by one tutor, is usually obtained on the first assignments. According to the administrators, the percentage of returns decrease during the course of semester and
by the time the last assignment of the first semester is due, the return rate drops to approximately 45-50%. There is a slight tendency in the second semester to follow the same pattern with the difference however, that a peak is reached towards examination time "...as people are using assignments as preparation for the exam." The percentages given above are independent of the number of people that have dropped out of the course.

Other issues adding to the maelstrom of problems that surrounds the distance teaching component, involve lecturers:

1) who, after the residential sessions, become so tied up in their own academic responsibilities, that they appear to lose motivation for the FITMAST programme.

2) who might be very good at lecturing, but lack the necessary skills to produce written assignments.

3) who, through their actions, put a lot of pressure to bear on the administrative staff to have assignments completed and sent out to the participants on time. These lecturers normally prefer to first complete certain modules in the residential sessions before setting assignments on them and consequently hand these assignments to the administrative staff who then has a very short time to get them ready for dispatch to the participants.

On the role that the distance teaching component plays in the FITMAST programme, the following remarks by the Director lend weight to the author's earlier assertion that the emphasis of the distance teaching component is on evaluating the teachers' knowledge of the work done in the residential session:
"...what we are trying to evolve now is an instructional format within the
distance tuition. In other words, we're trying to arrange the course so that the
distance tuition is also part of the teaching component and not simply part of the
evaluative component..."

Since the administrators agree that assignments are merely
evaluation exercises, they should be aware that the teachers' main
sources of reference in completing an assignment would be their
notes and prescribed textbooks. In an address to a conference on
distance education in South Africa, one of the tutors acknowledged
such an awareness:

...teachers say that they are not at ease to tackle assignment questions. They must
refer to lecture notes, textbooks, and if that is still not enough they must try
consultation with colleagues, tutors and lecturers (Nel, Finnemore &

A variety of ideas had previously been undertaken in an attempt to
supplement the present format of the distance tuition which is
solely made up of assignments with a question-answer character.
Amongst these were the uses of audio-cassettes and in some
courses, the computer. One of the tutors explained how audio-
cassettes were used:

"...the most successful venture thus far was using a cassette recorder in
conjunction with the written material as a scene setter, as a general problem
solving guidance so that the teacher was directed towards a particular text, a
particular way of thought, a particular collection of background circumstances
that would lead to a full appreciation of a particular question he was about to
tackle..."

The tutor also intimated that the use of the computer is to be
exploited more fully in future since most of the schools are now in
possession of such technology. The video cassette recorder is another
such medium that can now be found abundantly in schools and therefore its use is also to be explored. Although generally supportive of these innovations, one of the tutors calls for some restraint too:

"And against innovations, I think that there is a lot to be said for a stable format where the teacher knows what his general requirements are and it would be wrong of us to subject them to constantly changing media and demanding perhaps slightly different things in the way of distance education. So we have to be a little progressive and we have to be a little conservative on one side too."

On distance education in general, the administrators hold the view that it is the most important aspect of the FITMAST programme that needs to be revised. The Director expresses himself in the following way:

"So we are really working hard to try and change the nature of the distance tuition to a more learner-centred approach and trying to make it more of a learning experience than just simply an evaluation experience. If we can do that, I think that we can make a fairly significant contribution to the educational practice in this country."

One of the tutors is of the opinion that any changes with regard to the distance teaching component should be made in line with perceived needs of teachers:

"...uh, there is not inherent in the programme any mechanism that helps a learner with learning difficulties, in any form whatsoever, to learn.

I think the value of the distance education is that, because teachers are able to follow that component at their own pace in their own time, we should exploit that and give more general study skills incorporated into the distance education component."
4.64 Views of the administrators on workshops.

Workshops have only been held since 1985 for the local participants. Subject-specific workshops were initially held which the administrators thought would be advantageous to the teachers.

However, the tutors soon found out that the format of a workshop that they had in mind was not what the teachers wanted and thus changed the emphasis towards what the teachers requested. One of the tutors explains:

"...in general the teachers had wanted something more related to lectures they had been attending and to the assignments they were doing.

We adopted the policy at first of not giving specific answers [i.e. questions in the assignments] and that's fairly easy to do...uh, and then we found that we were still not responding directly to the teachers' needs. Teachers collectively solved their own problems.

...all you need is a tutor as a facilitator to bring those conversations in focus. So, I think that's where we're moving now."

It thus seems that the administrators do recognise the need and the importance of workshops for teachers.

4.65 Views of the administrators on the didactics aspect of FITMAST.

In this regard, the administrators indicated that they are aware that teachers would like to see more time to be spent on didactics.
This need is, however, also perceived by the administrators to be highlighting the tension between the two aims that FITMAST tries to achieve, i.e. to upgrade the academic qualifications while at the same time trying to offer new teaching methods to its participants. The Director expresses himself on this tension in the following way:

"Uh, always a tension...from day one there was this tension. It's a very difficult one to reconcile...ja, there is this tension. I suppose I have to understand it.

Besides the formal time set aside for didactics and the field trips undertaken lately, there were other activities pursued in the course of trying to enrich the didactical experiences of teachers. According to the Director they would at night "...get some people to come along and give them [i.e. the teachers] hints, demonstrations, especially on the use of the laboratory which is a sore point with teachers."

Such endeavours do not however, touch upon the central issue at stake here; that teachers want an increase of course time to be spent on didactics. These activities do not alter the course structure in any way and can merely perceived to be consoling the teachers rather than acting on their concerns. This perception is perhaps underscored by the remarks of the Director when questioned about major alterations to the FITMAST courses in general:

But I would say that those [given above] are more peripheral activities than fundamental changes.

It thus seems that considerable attention needs to be given to the didactics in view of the fact that teachers call for a greater time to be afforded the didactics session, and because of the administrators' perception that this call creates a "tension" between the objectives they are trying to achieve.
In this chapter the author will present the major conclusions to be drawn from the analysis of the views of the teachers and the administrators on the Biology component of FITMAST. It will start off with a short overview of the purpose of the study and the issues that were investigated.

This overview will be followed by a presentation of both the agreements and differences of opinions between the two groups on the various aspects of FITMAST. Recommendations will then be made on a specific aspect following the discussion of the views of the teachers and administrators on the particular aspect. Finally, all the recommendations made will be considered in proposing an alternative format for the Biology component of FITMAST.

5.1 Overview of the study

This study was undertaken so as to present a picture of FITMAST as seen through the eyes of the most important participant in any inservice teacher education programme: the teacher. A particular concern in this regard, was the high percentage rate, estimated at 30% by Davis (1986), of teachers that either failed or dropped out of the FITMAST programme.

Preliminary analysis of the data indicated that teachers were dissatisfied and/or disillusioned with FITMAST. Administrators, on the other hand, attributed this high failure and drop-out rate to overall administrative problems and the tension created by the pursuit of the programme's dual aims namely,

- to improve the academic qualifications of Mathematics and Science teachers and
to improve the competence and the confidence of teachers in the teaching of these subjects.

The purpose of this study was to examine how this tension and other problems that beset FITMAST manifest themselves in the teachers' perceptions and course experiences, as well as in the views of the administrators. Based on the information gathered, the author hopes to provide, in the form of recommendations, a direction for change within the present framework of the FITMAST programme.

This investigation sought the views of the teachers and the administrators on:

1) the needs and expectations of Biology teachers upon entering FITMAST,
2) the teachers' experiences of the residential sessions,
3) the distance teaching component,
4) workshops and
5) the issue of didactics.

It is within this framework that the conclusions and recommendations will be presented. These recommendations will then be taken together so as to map out a new direction for FITMAST.
5.2 Conclusions and recommendations

5.21 Views given with regard to the teachers' needs and expectations.

In Chapter 4 we have found that the teachers' expectations about FITMAST, or for that matter, inservice teacher education were that such courses would attend equally to:

1) the broadening a teacher's content knowledge of a particular subject and,

2) supplying them with new insights into the teaching of the particular subject.

From Table 5 we see that teachers assigned a high priority to meeting the above-mentioned expectations.

Such expectations about the nature of FITMAST or inservice teacher education are in line with the goals of inservice teacher education in developing countries. It is in fact also consistent with the stated objectives of the FITMAST programme. The teachers' expectations about the nature of inservice education thus led them to believe that equal emphasis would be placed on the broadening of their content knowledge of Biology and the acquisition of new insights into the teaching of the subject.

Furthermore, these expectations of the teachers might also have been shaped by other sources of information. The majority of teachers indicated that the first time they came to hear about FITMAST was through the principal or the subject advisors. The picture of FITMAST
painted by these individuals who, most likely have not attended a FITMAST course, might have contributed to the teachers' belief that their aforementioned intuitions will receive equal attention.

Another source of information (appendix 5) which might have shaped the teachers' intuitive feelings and raised their expectations of FITMAST, is the circular sent out to all prospective participants. Although alluding to the prospect that the time to be spent on didactics would be minimal, the letter nevertheless creates the impression that didactics is indeed a significant aspect of the programme. The following extract taken from the letter is testimony to this impression:

Participants should however, not underestimate the sense of personal satisfaction and confidence in successfully completing this course. Add to this the increased academic knowledge and improved classroom methodology... (1985, p.2: author's emphasis)

Teachers thus bring to the orientation sessions strongly held beliefs about what FITMAST would entail.

The administrators acknowledged their awareness of the expectations that the teachers had about FITMAST. They actually indicated that FITMAST was instigated with both these expectations in mind for the original course syllabi included a substantial amount of academic content and much more didactics than is the case at present.

Both parties seem to agree that one of these expectations was not met by this programme, i.e. the expectation that new insights into the teaching of a particular subject would be acquired.

However, these groups give totally different reasons for this shortcoming. The administrators are of the opinion that teachers' demands for academic as well as financial benefits to be derived from attending FITMAST, have precipitated this shortcoming. In
response to such demands, the administrators were forced to change the original syllabus of a FITMAST course, from one where equal emphasis was to be accorded the teachers' two expectations, to the present form having a strong academic content flavour so that such a course can be accredited as a full university course. Consequently less time could be spent on improving the competence of the teachers in the teaching of Biology.

The teachers on the other hand, believe that the reason for not gaining new insights into the teaching of their particular subjects is simply because too much time is devoted to academic content. It seems that the teachers cannot make a causal connection between the reduction in time spent on teaching and teaching methods and the earlier demands of the 1983-group that academic and financial benefits be granted for attending FITMAST. This assertion is supported by the low priority the teachers accorded the demands of financial benefits and academic credits in Chapter 4. (Table 5)

The administrators' raison d'être for the present format of the course seems be a fact of which the teachers are ignorant. This ignorance on the side of the teachers needs to be addressed or pointed out so that they might come with more realistic expectations to the FITMAST programme.

Although orientation sessions are held countrywide to brief the teachers about FITMAST, it appears that such sessions do not cover all the aspects of the programme. Such an inference with regard to the orientation sessions, becomes evident when we see from the above discussion that administrators and participants seem to have different views on certain aspects of the programme. It was previously also suggested that past orientation sessions appeared to have emphasised only certain aspects of the course.
5.211 Recommendation 1

If FITMAST is to continue operating within the present framework, then serious attention should be paid to the ways in which teachers are informed about FITMAST in order to eliminate any misunderstandings that prospective participants might have with regard to the programme.

In this regard, the following possibilities might be considered:

a) A comprehensive briefing to all subject advisors and school principals on the exact nature of FITMAST courses should be arranged.

b) Based on this research, the school principal and the subject advisors should be informed about the expectations that the teachers bring to FITMAST, what teachers experience at the residential sessions, and what the distance component is all about for the teachers. It is hoped that such an insight into the experiences of their staff members involved in this inservice education programme would render the principals and subject advisors sympathetic to the studies of these teachers.

c) A different orientation session whereby former participants share their experiences with prospective participants, should be implemented.

d) A circular reflecting the exact nature of FITMAST be drawn up, evaluated by former participants for the accuracy of its representation and then distributed to all prospective participants.
5.22 *Views on the residential sessions.*

The major opinions offered by the teachers in this regard were:

1) that the amount of course work expected to be completed during the residential session is too much,

2) that most of the course content covered here was familiar to them

3) and that the course work has a low level of difficulty.

With regard to the first opinion, the administrators think the same way because, already during the orientation session, they confront prospective participants with the issue of a large workload to be encountered during the residential sessions. Also, by acknowledging that much of the FITMAST course work overlaps with the Matric school syllabus, they seem to support the teachers' assertion that certain areas of the course work are familiar terrain.

As for the perception that the FITMAST courses are not really difficult, the author has already offered that such a view might be closely related to the belief that a lot of the course work has been dealt with before.

There appears thus to be a congruence of opinion between the teachers and administrators on the following two aspects:

1) a large amount of course work is covered during the residential session and

2) much of the course work covered, might be familiar to the teachers.
In view of such commonalities in the opinions of the teachers and the administrators, the author proffers the following recommendation.

5.221 Recommendation 2

The amount of course work covered during the residential session should be reduced by considering the following options:

a) If FITMAST is to continue operating within the present framework, then it is recommended that the extent of the overlap between the course materials and the Matric syllabus be assessed. Those sections of the course work found not to be overlapping with the Matric syllabus, should become the focus of what is taught during the residential session. The teachers should then bear responsibility for re-acquainting themselves with the sections of work that did overlap.

b) If a restructuring of the entire course is to be made, then it is recommended that the course work be equally divided between the residential and the distance components. It is recognised that such a recommendation would necessitate a change in the function that the distance component is fulfilling at present. It actually suggests that the distance component becomes a significant part of the instructional process, rather than its present role which is perceived by administrators and participants alike, as being merely consolidating and evaluating the teachers' understanding of the work covered in the residential session.
5.23 Views on the practical sessions

The teachers expressed feelings of satisfaction with the practical sessions insofar as these served to supplement the lectures received.

Criticisms levelled against the practical sessions pertained mainly to the following areas:

1) the lack of transferability of these practicals to the school situation and

2) explanations on the uses of the laboratory instruments and apparatus were rarely given; in this regard the author has already hinted that the lecturers simply assumed that teachers had such laboratory skills.

With regard to the latter point of criticism, the author believes that most of the teachers have had little practical experiences in Biology during the course of their previous training and thus lack overall laboratory skills.

This assertion is supported by the teachers' views on the familiarity of the course work. Having already indicated that most of the course work is known to them, it seems that this familiarity is with the theoretical content for they seem to lack the laboratory skills that should have been gained in those areas of the course work that they are acquainted. The following extract from an interview with a teacher of the 1987-group supports the assertion that teachers had little prior experiences in laboratory work:

I : Uh, it comes through to me that...uh, especially the practicals were a surprise...surprising you 'cause you've never encountered so many practicals?
R: Not because I've never encountered so much. We never did practicals at school. It was just theory we did and now...[ I : And at training college?]. uh, college? We just touched here and there...I can really remember just one practical we did at college, but at school, none.

Although the administrators were not specifically questioned on their views of the practical sessions, a remark by the Director that it is "...the use of the laboratory which is a sore point with teachers", might be perceived as an awareness on their side that teachers do not have and need to learn laboratory skills.

5.231 Recommendation 3

It is recommended that the FITMAST courses for Biology teachers incorporate in every practical session, discussions on laboratory skills and management. The following ideas could be considered:

a) Explanations on the uses of each instrument to be employed during the course of a particular practical session.

b) As far as possible, similar materials be used in the practical session than what the teacher would use at school.

c) Time be set aside at the end of each practical session to discuss how the practical session can be made relevant to the school situation

5.24 Views on the assignments of the distance teaching component.

The teachers expressed strong views on the time available for completing assignments. Two issues that emerged here are their views that assignments are not difficult but time-consuming and that their school-related activities do not allow them much time for
their completion. Although teachers have indicated that an assignment takes them, on average, 4-6 hours to complete, some assignments only took up 3 hours while others may require up to 10 hours to complete, thereby making deep inroads into the time they can set aside for assignments.

A factor that also impinges strongly upon the time set aside for assignments is the late arrivals of assignments, a major complaint lodged against the distance teaching component by the teachers.

Teachers are satisfied with the number of assignments that they were required to complete and they accept the due dates for the completion of such assignments, but it just seems that they would be hard pressed for more time to be devoted than the average 4-6 hours they had indicated as being spent per assignment.

5.241 **Recommendation 4**

In view of the fact that FITMAST is a programme of considerable importance to the Department of Education and Culture, it is recommended that:

a) school principals be requested to give appropriate consideration to FITMAST participants in the allocation of school duties to enable the teachers to have more time for their assignments.

b) insofar as the length of an assignment is concerned, it is recommended that FITMAST staff undertake an examination of the assignments they normally set for the teachers. By drawing on feedback from the teachers on the time taken to complete each assignment, they can work towards some consistency in setting assignments that would take approximately 4-6 hours to complete.
5.25 Views on the relation of work done in the residential sessions to that of the assignments.

On this aspect of the distance teaching component, two views emerged from the analysis of the data:

1) the majority of teachers indicated that the assignments did not require them to simply reproduce their class notes and/or prescribed textbooks.

2) the minority viewpoint is that the assignments were merely exercises in reproducing their notes and/or prescribed textbooks.

The author has shown through arguments based on the interpretation of the data that the minority viewpoint is a more valid interpretation of the data. It was then concluded that the assignments only served to evaluate the teachers' understanding of the work covered in the residential sessions.

Such a conclusion is in line with the opinions held by the administrators for they now attempt to move the distance component away from being an evaluative component to one having an instructional or teaching format.

The advantages arising out of this move could be two-fold:

1) it could relieve the teachers of the heavy workload experienced during the residential session through sharing the weight of the instructional process.

2) a reduction in the academic work at the residential session opens up the possibility for extending the time to be spent on
improving the competence of teachers in the teaching of their subjects.

These advantages which may result from changing the format of the distance component to one of being part of the instructional process, also serve to illustrate the close interrelation of the residential and the distance components. In the third recommendation on changing the entire structure of the course, the author also hinted that any attempts at changing one component should be accompanied by similar actions with regard to the other component. The following recommendation may therefore be seen as an extension of the second recommendation.

5.251 Recommendation 5

In the light of the advantages to be obtained, the format of the distance component should be changed so that it becomes part of the whole process of instruction.

The following ideas can then be considered:

a) As suggested earlier, the degree of overlap between the course work and the Matric syllabus should be determined. The people involved here ought to be the FITMAST lecturers and tutors in collaboration with prospective and former participants. The areas of the two syllabi that do not overlap should then be taught during the residential sessions.

Instead of now leaving the rest of the course work to the teachers to cover by themselves, the distance component can, through the use of assignments, be adapted to actually offer instruction on such work. Since teachers would already have some acquaintance with this work, it should not be difficult to accommodate assignments set on it within the time of 4-6 hours that teachers normally set aside for assignments.
b) Since the assignments will now serve to address the *theoretical content* of the work set aside for the distance component, the practical side of such work has to be covered as well. It is suggested that practical sessions on the work done in the distance component, be held at selected venues throughout the country.

c) Video-recordings of lecturers teaching the "overlapped work" to full-time students, can be made. These cassettes can then also be shown to the teachers when they gather for the practical sessions mentioned in (b).

5.26 **Views on workshops.**

There is overwhelming teacher support for the idea of workshops. Teachers mentioned specifically in this regard the encouraging and motivational support that such workshops can provide. They also stated that workshops would be helpful in clearing up problems with their assignments.

Once again we find that the administrators concur in that they also perceive workshops to be of immense importance to the teachers for solving and clearing up any problems with regard to the assignments. In fact, they stated that the teachers actually solve the problems that they bring to the course, all by themselves.

A workshop could indeed prove to be useful in various other aspects too. For example, it could probably help to offset the declining rate of assignments returns towards the end of a semester. Where teachers would be able to come together, exchanging ideas and strategies in tackling assignments, as well as encouraging and supporting each other, it is likely that a sustained interest and effort with regard to the FITMAST courses could emanate from these human interactions.
Another positive outcome that might arise out of interaction with their fellow FITMAST participants, could be a reduction in the number of teachers opting out of the programme. The author believes that teachers might come away from these workshops with renewed strength of commitment and application towards their studies.

A workshop would not only meet the teachers' requests for participant-interaction, but would provide the ideal opportunity to serve as a tool for possibilities (b) and (c) mentioned earlier under recommendation 5 which pertains to the distance teaching component.

5.261 Recommendation 6

Since teachers feel so strongly about the need for workshops and in light of the positive comments on the side of the administrators in this regard, it is recommended that workshops be held for all the FITMAST Biology teachers throughout South Africa.

The following activities can be undertaken in this regard:

a) A study should be made each year of all areas from which prospective participants are to be drawn so that accessible venues can be determined for workshops to be held during the year.

b) Responsibility for the conduct of these workshops could be passed on to local consultants or tutors. In this regard the local consultant would be expected to liase with all the participants in the area so as to straighten out any concerns or difficulties arising out of the arrangement of such workshops.

c) The role of the FITMAST Biology tutor would then be to co-ordinate these workshops on a national level. Those teachers that cannot be included in a workshop area due to an extreme low density of
participants, should receive the personal attention of the FITMAST Biology tutor.

5.27 Views on didactics

From the analysis of the data, it was shown that the majority of teachers was not satisfied with the amount of time spent on didactics. In fact, teachers called for more time to be devoted to didactics and from the host of reasons supplied for requesting this extension, four broad categories were identified:

1) Teachers felt that they need to be taught how to convey the knowledge gained here in a simple manner to the pupils.

2) The teachers expressed the need to be taught how to present a practical lesson.

3) A third category of reasons which could actually have been interpreted as didactic needs and concerns of teachers other than those named in (1) and (2) above.

4) This category of reasons, although stated with regard to didactics, reiterated the teachers' views on different aspects of FITMAST. For example, aspects such as the heavy workload encountered during the residential session or the lack of workshops.

Specific needs/activities that teachers would like to be implemented in a didactics session were assessed. (see Figure 5). The overwhelming support given to such activities was found to be not surprising for it was shown that the list of activities have actually been raised by the teachers in the discussions of other aspects of FITMAST.
With regard to didactics, it was concluded that:

1) Teachers' expectations and intuitive feelings about the nature of inservice teacher education were not met, i.e. they did not find an equal division of time spent on academic content and teaching methods.

2) Teachers strongly believe that didactics should form a major part of the FITMAST programme.

3) Teachers feel that they needed to enrich their didactic experiences.

The administrators have indicated that they are aware that teachers want more time to be spent on didactics. It seems however, that this need expressed by the teachers has brought again to the surface an issue which appears to be still a dilemma to the administrators: how to upgrade the academic qualifications of the teachers while at the same time trying to improve their competence in the teaching of Biology. This has been shown in the literature to be a dilemma facing inservice teacher education programmes throughout developing countries.

Attempts by the FITMAST staff at providing some advice on teaching and teaching methods to the teachers, have been labelled as "peripheral activities" by the Director of FITMAST for such activities did not alter the way in which time was spent in the FITMAST courses. Didactics still received only a marginal amount of time in comparison to the academic work.

Having already alluded thereto in other recommendations, it seems that any increase in time to be accorded the didactics session, hinges upon changes undertaken within or to the FITMAST programme. In this regard two changes suggested earlier would realise an extension of time to the didactics session:
1) See recommendation 2 (a) for a suggestion applicable within the present framework. The resultant reduction in the academic workload, would open up the possibility of extending the time used for didactics.

2) For a suggestion accompanied by a change in the present format of FITMAST, see recommendation 5 (a). By sharing the weight of the teaching load with the distance teaching component, the residential session could be planned so as to allow more time to be spent on didactics.

5.271 Recommendation 7

The time accorded to the didactics aspect of the FITMAST courses should be extended as an urgent response to a strongly expressed need of the teachers to enrich their didactic experiences.

The following activities could be considered with regard to didactic sessions:

a) Since overwhelming support was given to the needs listed in figure 5, immediate attention could be paid to those issues.

b) An open discussion be held at each orientation session to elicit from the teachers specific didactical needs as well as ideas as to how the didactic session should be run.

c) The teaching experiences of participants should be explored as a source from which ideas on teaching and teaching methods could be tapped.

d) Discussion groups should be formed where the school syllabi for the different grade-levels are treated, the problem
areas identified and ideas and experiences be exchanged on the approach to such problems.

5.3 Summary of recommendations applicable within the present framework of the FITMAST programme.

On informing the teachers about the exact nature of the FITMAST courses, Recommendation 1(a-d) can be implemented.

Recommendation 2(a) can be considered in an attempt to reduce the amount of work covered during the residential session.

With regard to the practical sessions, Recommendation 3(a-c) can be incorporated into such sessions.

Considerations with regard to the time that teachers need to complete their assignments, can be addressed by Recommendation 4(a-b).

Insofar as meeting the teachers' needs with regard to didactics, Recommendation 7(a) can be considered as a basis for the didactics session held during each residential session.
5.4 A suggested alternative format that can be considered for the Biology section of FITMAST

In view of all the recommendations listed, the author proposes the following format for the Biology section of the FITMAST programme.

<table>
<thead>
<tr>
<th>First semester</th>
<th>Second semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time-period</strong></td>
<td><strong>Activities</strong></td>
</tr>
<tr>
<td>January residence</td>
<td>Teach new material</td>
</tr>
<tr>
<td>(2 weeks)</td>
<td>Teach didactics</td>
</tr>
<tr>
<td></td>
<td>Discuss assignments</td>
</tr>
<tr>
<td></td>
<td>two assignments</td>
</tr>
<tr>
<td>February workshop</td>
<td>Assignment practicals</td>
</tr>
<tr>
<td>(3 days)</td>
<td>Show video-cassettes</td>
</tr>
<tr>
<td></td>
<td>Discuss assignments</td>
</tr>
<tr>
<td></td>
<td>two assignments</td>
</tr>
<tr>
<td>April workshop</td>
<td>Assignment practicals</td>
</tr>
<tr>
<td>(3 days)</td>
<td>Show video-cassettes</td>
</tr>
<tr>
<td></td>
<td>Discuss assignments</td>
</tr>
<tr>
<td></td>
<td>one assignment</td>
</tr>
<tr>
<td></td>
<td>Examination preparation</td>
</tr>
</tbody>
</table>

*--Insofar as recommending assignments to new recruits, the author believes that two things can be accomplished:

1) prior knowledge, on which the new course material to be presented in the January residential hopes to build on, can be passed on to the new participants.
2) new participants can get a sense of what assignments would require, thereby possibly aiding them in making a conscious decision as to whether they would really like to participate in FITMAST or not.

5.41 Rationale behind the proposed format.

5.411 Residential sessions

The reduction of the January residential session by one week is proposed with two objectives in mind:

1) Teachers will now miss just one week of school and consequently the schoolwork would not fall behind that far.

2) The week "saved" in the January residential session can be used to release the teachers for 2 days each semester to participate in the proposed workshops.

5.412 Workshops.

It is proposed that workshops be held over 3 days (including a weekend) in which all the activities suggested be carried out. The author recognises that the tutor network would have to be extended to include local consultants who will be responsible for conducting workshops. It was already suggested that teachers falling outside the selected venues, should receive the personal attention of the FITMAST Biology tutor.

From an economic point of view, it is hoped that the salaries of the local consultants as well as other expenses associated with these workshops, be defrayed by the finances that would result from a reduction of the January residential session.
5.413 **Orientation session.**

By running an orientation session during the October workshops, an ideal setting is provided for new recruits to interact with present participants. These new recruits would thus be able to get a good idea as to what FITMAST entails.

In proposing this format, the author is convinced that it would be of great appeal to the teachers. Insofar as its practical application is concerned however, the author suggest that a study based on the proposed format be undertaken so as to determine the feasibility of its implementation.

5.5 **Concluding remarks**

The FITMAST programme is an attempt at contributing to the improvement of the poor qualifications of science teachers in the Black schools of South Africa.

However, although this programme affords so-called Coloured teachers the opportunity to improve their qualifications, FITMAST is only assisting in alleviating one area of the educational problems that results from the ideology of apartheid. As long as the discriminating nature of expenditure on Black education is going to continue, programmes such as FITMAST can only respond to the effects of such a practice on the education of the Black people in South Africa.

It is against the background of these circumstances that the proposed recommendations and changes should be seen. These recommendations will **not** affect the discriminatory nature of the provision of education for Blacks in South Africa.
Hopefully these recommendations and changes, if implemented, will realise the noble objectives of the FITMAST programme and affect the teachers in such a way that they would refrain from dropping out of the programme.

However, the author trusts that these recommendations and changes will have their greatest impact within the context of the provision of inservice teacher education in South Africa. Inservice teacher education should be an ongoing commitment to the teachers rather than being just of a finite length as is the case of FITMAST.
Bibliography


Participation or non-participation in this interview will not affect your course status in any way. Your participation is voluntary. You may refuse to participate or end this interview at any time without prejudice or effect on your course standing. The information will be confidential and individuals will not be identified.
SECTION 1

Expectations and Needs

A. Origin/Source of Information

1. How did you first come to know of FITMAST?

2. What did you learn, hear, or read about FITMAST?

B. Expectations

3. (a) When did you decide to participate in FITMAST?

(b). Why are you participating?

4. What do you hope to gain/learn by being a participant in this course?

C. Needs and Justifications

5. You mentioned A, B, C. as reasons for participation. Of these, which are the most important to you?

6. Why are these important to you?
D. Mismatch with Needs

7(a). You have now been participating in FITMAST for 6 months/18 months. Have you experienced any surprises during the course that you never anticipated?

(b). What are these?

(c). Why were you surprised?

E. Expectations of Success/Failure

8(a). At this present moment, how do you feel about the possibility of successfully completing the course?

(b). Has this feeling about success changed since you started this course?

9. Are there any specific factors that caused this change in feelings?

F. Demands of the Course

10(a). Is FITMAST a greater/lesser challenge than what you first expected?

(b). Why do you now think it to be a greater/lesser challenge to you?
SECTION II

The Social Context

A. Workload of a Single Day

1. You are required to attend altogether 4 hours of lectures per day and a laboratory session of 2 hours (+).

a) What do you think of this daily schedule?

b) Why do you think that?

C) What would you prefer? Why?

2. Besides attending these lectures and laboratory sessions, do you do any additional work?

a) No- Why not?

b. Yes - what do you do?

c. Why are you doing it?

d) What amount of time do you spend daily on this?

3. Do you attend tutorials? Yes/No - Why?

a) How long do the tutorials last?
b) How regularly do you attend?

c) Of what value are these tutorials to you?

4. Do you consult with the lecturers after class? Yes/No - Why?

a) How long do you spend with them?

b) How regularly do you consult them?

c) Of what value are these to you?

5. What amount of time on average do you spend on counsel work in a single day?

B. Recreational Time Per Day

1. You have a full and busy day. Where do you have your breaks? - List them.

2. Do the scheduled breaks come at good times for you?

a) Are there enough of them?

b) Are they of sufficient length?

3. With whom do you meet during these breaks?

a.) Do you meet at a favourite place? Why?
b.) What is generally talked about during these breaks?

c) Do you always have your breaks with a group? Yes/No - Why?

d) What do you do whenever you do not meet with a group?

C. General

1. The residential courses are conducted during the holidays.

a.) Does this suit you?

b) Yes/No - Why?

2. The inservice education courses are held at UWC in Cape Town.

a) How do you feel about it?

b) Does it suit you? Yes/No - Why?

C) What alternatives would you suggest? Why?

3. You had a choice of either staying on - or off - campus.

a) What did you choose?

b) Why have you chosen to stay there?
4. Are there any advantages in staying at X/Y?

a) What are these?

b) You have mentioned A,B,C. How do these serve as being particularly advantageous/beneficial to you?

c) Some students also mentioned D,E,F. Do you regard it as being advantageous to you?

5. Are there any disadvantages in staying at X/Y?

a) What are these?

b) Why would you regard A,B,C, as being particularly disadvantageous to you?

c) Some students also mentioned D,E,F. Do you feel these disadvantages apply to you?

6. You have now mentioned all the advantages and disadvantages to me.

a) Do these influence for the good/worse in obtaining success in your courses?

b) How do they influence you?
c) What would you suggest to strengthen/counter act these positive and negative influences?

SECTION III
Intellectual Context

A. Lectures

1.(a) Do you regard the listening to lectures as a good way for you to learn? Yes/No - Why?

b) What method of instruction did you previously encounter?

2.(a) The lectures are approximately 2 hours long. Does this length of time suit you? Yes/No - Why?

b) What length of time would you prefer for a lecture? Why?

3. Do you find that the content of these lectures are easy or difficult to understand? Yes/No - Why?

a) What do you do when you do not understand? Why?

b) Does this help you to get in better understanding?
4. Do people interrupt the lecturer?
   
a) Yes- for what purpose?
      -Does this help you?
      -What response do they get?

b. No - Why not?

5. (a) Do you interrupt the lecturer? Yes/No - Why?

b) Of what value is it to you?

6. a) Is the amount of new information imparted to you suitable? Yes/No - Why?

b.) What would you like to see happen in this regard?

B. Laboratory Sessions

1. Are there any rules/regulations?
   
a) Are you happy with them?

b. Do you observe them? Yes/No Why?
2. a) How do you know what to do in those sessions?
   
b) Is such information ready available?
   
c) Is it easy/difficult to understand? Yes/No - Why?
   
3. a) Are the uses of the laboratory instruments explained to you beforehand?
   
b) Is this explanation sufficient to allow you to use them? Yes/No - Why?
   
4. a) Is help available in the laboratory?
   
b. From whom?
   
c. Do you draw on such help? Yes/No - Why?
   
5. You do work in pairs.
   
a) Do you choose your own partner?
   
b) Why did you choose your particular mate?
   
c) Is working in pairs good for you? Yes/No - Why?
   
d) Are you allowed to consult other pairs?
   
e) Do you do it? Yes/No - Why?
6. You have to complete laboratory assignments.
   a) How long does this take you?
   b) Do you work together in this?
   c) Do you find these assignments helpful? Yes/No - Why?
   d) Are these evaluated and are the comments available to you? Yes/No - Why?

7. The laboratory sessions are 2 hours long.
   a) Is the time sufficient for you to complete your work?
   b) Is the amount of work too much/too little?

8. Do the laboratory sessions help to shed some light on the lectures? Yes/No - Why?

9. What are your overall views of the laboratory sessions?
   a) Are you able to make your views known to the lectures?
   b) Do you do it?
   c) What suggestions would you make to contribute to the effectiveness/satisfaction of the laboratory sessions?
C. The Didactics Session

1. Didactics is a part of the course that assists you in applying, in the schools, some of the ideas gained at these FITMAST courses.

a) Are the topics treated in this section those that you think to be important? Yes/No -- Why?

b) Are the topics/didactics presented in ways that are easily applicable in the schools?

Yes - How? No - Why not?

2. (a). Do you regard the time spent on this section as being sufficient to you?

b) What percentage of the course would you prefer to be used for didactics?

3. On a scale of 1 - 10, where would you place didactics in terms of its value to you? Why?

4) What would you like to see happen in this didactics course?
D. Examinations.

1. How often do you write examinations each year?

2. (a) When are these written?
   (b) Where are they written?
   (c) How are they supervised?

3. Do the exam dates suit you?

4. Do you have enough time to prepare?

5. (a) What was examined in the June examinations?
   (b) What was examined in the November examinations?

6. (a) What is the format of the examination?
   (b) Did you know of this format before you took the examination? When?
Section IV

Distance teaching component.

A. Assignments

1. The distance component demands the completion of assignments.

   a) How many assignments do you have to complete during the Jan-June session? And the July-Oct. session?

   b) On average, how long does it take you to complete an assignment?

   c) Over a year, this amounts to X hours of work. How do you feel about this work load?

2. These assignments demand that you work by yourself, looking up books, papers, etc.

   a) How do you find studying and working alone? easy/difficult? Yes/No - Why?

   b) What do you do when you experience difficulties?

3. In completing your assignments, you need a text book and other resources.

   a) Can you obtain the resources needed? Yes/No - Why?
b) Where do you get this from?

4. How did your assignment work relate to the residential courses you have taken during January?

5. Your assignments are evaluated.
   a) How is this administered? ......mechanism.
   b) Are the evaluations helpful?

   Yes - in what ways do they help?
   No - why do they not help you?

6. a) When were you given your assignments for Jan-June?
   b) Did this give to adequate time to complete the work? Yes/No - Why?

7. a) What was the format of the assignment for Jan-June?
   b) What format are you expected to use in completing the assignments?
   c) Was this prescribed?
B Workshops

1. Did you attend any workshop in the period Jan-June? Yes/No - Why?

2. How many did you attend?

3. What length of time does this take?

4. a) Does it come at a good time for you? Yes/No - Why?

   b) When would it be better for you?

5. Are these workshops helpful/valuable to you, Yes/No - Why?
Questions put to administrators on the socio-political context of FITMAST.

A. How it came about?/Driving forces behind it?

- When first contemplated/considered/conceived?
- By whom?
- Why thought to be of necessity/a need?

B. Preparations for launching.

- Who were consulted and why?
- Which sponsors were approached?
- Who devised/designed the programme or course?
- What were the initial objectives and why?
- Initial recruiting methods/selection criteria?
- Who were to be responsible for running it?
C. Birth

- Number of recruits/lecturers.

- Lecturers and students enthusiasm/complaints/problems.

- General "teething" problems.

D. Present situation

- Funding sources.

- Recruiting channels/selection criteria.

- Successes and failures.

- Major course alterations/ additional ones?

- Changes to objectives.

E. Future Plans

- New developments/expansions.

- Its feasibility in light of the present situation.
Appendix II

Teacher questionnaire

Title

FITMAST : A Case Study of One Programme of Inservice Training for Teachers. (Biology)

Research student : A.D. Harris
University of British Columbia, Vancouver

Instructions

1. Please read carefully through the questions and answer them to the best of your abilities.

2. Use a pencil to mark your responses by making a cross (X) in the boxes provided.

3. Whenever the 'other' option is chosen by you, first mark the box and then give your comment.

4. Return the completed questionnaire in the envelope provided as soon as you possibly can.

Thanking you once again.
**Background information**

1. Are you [ ] male [ ] female

2. Are you [ ] English-speaking [ ] Afrikaans-speaking

3. When did you first take the Botany/Zoology course?


   In answering all the following questions, please refer to the year within which you took the Botany/Zoology course.

4. Within which of the following age groups did you fall then?

   [ ] [ ] [ ] [ ] [ ] [ ]
   20-25yrs 26-30yrs 31-35yrs 36-40yrs 41-45yrs over 45yrs

5. Were you [ ] single [ ] married

6. What academic qualifications did you hold then with regard to Biology or General Science?

   [ ] [ ] [ ] [ ] [ ] [ ]
   Matric 1st yr college 2nd yr college 3rd yr college 4th yr college none
   Biology Science Science Science Science

7. At the time of attending FITMAST, did you teach at a school in:

   [ ] [ ] [ ] [ ] [ ] [ ]
   Cape Peninsula Cape Province Natal Orange Free State Transvaal Namibia

8. Which standard(s) in Biology or General Science did you teach at the time of attending the FITMAST course?

   [ ] [ ] [ ] [ ] [ ]
   Std.10 Biology Std.9 Biology Std.8 Biology Std.7 Gen. Science Std.6 Gen. Science

9. At the time of attending FITMAST, how long have you been teaching?

   [ ] [ ] [ ] [ ] [ ]
   0-5yrs 6-10yrs 11-15yrs 16-20yrs more than 20yrs

10. How long have you been teaching Biology or General Science at that time?

    [ ] [ ] [ ] [ ] [ ]
    0-3yrs 4-6yrs 7-9yrs 10-12yrs 13-15yrs more than 15yrs
The following questions will set out to gather information on your expectations and experiences of the Botany/Zoology course, as well as your attitudes and feelings towards the course.

1. How did you first come to know of FITMAST?
   a) through the principal ................................................................. [ ]
   b) through the subject advisor ......................................................... [ ]
   c) through a former participant ....................................................... [ ]
   d) other : ......................................................................................... [ ]
   Please specify:

2. What did you expect to find on entering the Botany/Zoology course?
   a) an emphasis on academic work mainly .......................................... [ ]
   b) an emphasis on teaching methods mainly ....................................... [ ]
   c) an equal emphasis on both academic work and teaching methods ......................................................... [ ]
   d) other : ......................................................................................... [ ]
   Please Specify:

3. Which one of the following factors gave rise to your expectations?
   a) information sent to you from the university ..................................... [ ]
   b) comments of former participants .................................................... [ ]
   c) comments of principal ..................................................................... [ ]
   d) comments of the subject advisor ..................................................... [ ]
   e) own intuitive feelings about inservice training .................................. [ ]

4. Which of the following words or phrases best describe your feelings upon entering this course? Rank your responses 1,2,3,4, etc.
   a) positive about success .................................................................... [ ]
   b) wait-and-see attitude ....................................................................... [ ]
   c) determined to succeed ...................................................................... [ ]
   d) eager to learn new ideas ................................................................... [ ]
   e) feelings of anxiety after a long lay-off from studies .................................. [ ]
   f) other .................................................................................................. [ ]
   Please specify:
5. The following is a list of reasons why teachers have decided to participate in the Botany/Zoology course. You are requested to indicate those reasons for your participation by marking the appropriate box. If none of the reasons given below prompted your participation please feel free to add your own.

a) On advice from the principal or subject advisor.......................... [ ] [ ]
b) On recommendation from a former participant................................ [ ] [ ]
c) To gain credits towards a degree..................................................... [ ] [ ]
d) To improve your knowledge of the subject....................................... [ ] [ ]
e) Out of curiosity.................................................................................. [ ] [ ]
f) To gain financial benefits through possible promotion.......................... [ ] [ ]
g) To gain new insights into the teaching of Biology.................................. [ ] [ ]
h) Other.................................................................................................. [ ] [ ]

Please specify:

6. Of the reasons given, please write down, by letter and in decreasing order of importance, only those that you stated were of importance to you. (Example: [g], [d], [f], [a], [b] where [g] would be the most important and [b] the least important reason.)

   Most important............................................................................. Least important

Example: [ g ] [ d ] [ f ] [ a ] [ b ] [ ] [ ] [ ] [ ] [ ]

Your reasons: [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

7. To what extent did the Botany/Zoology course meet your expectations (reasons for participation)?

a) it met all or nearly all my reasons for participation......................... [ ]
b) it met more than half my reasons for participation............................ [ ]
c) it met less than half my reasons for participation.............................. [ ]
d) it met none of my reasons for participation...................................... [ ]

8. Having gone through the Botany/Zoology course, was it of value to you?

a) Yes........................................................................................................ [ ]
b) No......................................................................................................... [ ]

If 'no', please go directly to Question 10.
If 'yes', please answer Question 9.
9. The Botany/Zoology course was valuable to me:
(check only those applicable to you and indicate extent of the value of each reason given)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Extremely valuable</th>
<th>Just valuable</th>
<th>Slightly valuable</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) it broadened my knowledge of the subject</td>
<td>[]</td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>b) it made me a more confident Biology teacher</td>
<td>[]</td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>c) it enriched me with new teaching methods in Biology</td>
<td></td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>d) it enhanced my laboratory skills</td>
<td></td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>e) other</td>
<td>[]</td>
<td>[]</td>
<td>[]</td>
</tr>
</tbody>
</table>

Please specify:

10. The Botany/Zoology course was not valuable to me
because: (check those applicable to you)

<table>
<thead>
<tr>
<th>Reason</th>
<th>[]</th>
<th>[]</th>
<th>[]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) it was not related to the level at which I taught</td>
<td>[]</td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>b) it did not go beyond the level of Bot/Zoo that I know</td>
<td></td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>c) it did not provide new ways/methods of teaching Biology</td>
<td></td>
<td>[]</td>
<td>[]</td>
</tr>
<tr>
<td>d) Other</td>
<td></td>
<td>[]</td>
<td>[]</td>
</tr>
</tbody>
</table>

Please specify:

11. Have your feelings on the value of the course changed between
the year you attended the course and the present?

a) Yes

b) No

If 'yes', please answer question 12 and then proceed.
If 'no', please go directly to question 13.

12. Briefly state how your feelings have changed.

........................................................................................................
........................................................................................................
........................................................................................................

13. Did the kind of orientation you received about the course
reflect what the course entailed?

a) Yes

b) No

If 'no', please answer question 14 and then proceed.
If 'yes', please go directly to Question 15.
14. If you had been given a detailed orientation on the Botany/Zoology course, would you still have participated?

a) Yes................................................................. [ ]

b) No................................................................. [ ]

15. Having attended the course, would you recommend it to a fellow teacher?

a) Yes................................................................. [ ]

b) No................................................................. [ ]

16. Why do you recommend / not recommend the Botany/Zoology course?

The following questions deal with your experiences on the content and structure of the Botany/Zoology course.

A. Workload and Time allocated

For each of the following statements, indicate which box best represents your view.

1. The amount of work covered during any residential session was.............. [ ] [ ] [ ] [ ] [ ]

2. On an average day, the time spent in the lecture room was................. [ ] [ ] [ ] [ ] [ ]

3. The number of topics that were covered(e.g Osmosis, Photosynthesis, etc in Botany or Genetics, Evolution in Zoology) on an average day was.............. [ ] [ ] [ ] [ ] [ ]

4. The amount of time normally spent on any topic was....................... [ ] [ ] [ ] [ ] [ ]

5. In the laboratory sessions, the total number of practicals held in a residential session was................ [ ] [ ] [ ] [ ] [ ]

6. On an average day, the time spent in the laboratory was.................... [ ] [ ] [ ] [ ] [ ]
B. Content

7. The content of the lectures was:
   a) mostly easy, but sometimes difficult to understand........................................ [ ]
   b) mostly difficult, but sometimes easy to understand........................................ [ ]
   c) always difficult to understand........................................................................ [ ]
   d) always easy to understand............................................................................ [ ]

8. Did the language of instruction make it difficult for you to understand the content of the lectures?
   a) Yes................................................................................................................ [ ]
   b) No............................................................................................................... [ ]

   If 'yes', please answer question 9 and then proceed.
   If 'no', go directly to question 10.

9. The language of instruction affected me because the lectures were:
   a) entirely in English......................................................................................... [ ]
   b) mostly in English and occasionally in Afrikaans........................................... [ ]
   c) entirely in Afrikaans.................................................................................... [ ]
   d) mostly in Afrikaans and occasionally in English........................................... [ ]

10. The content covered in the course was:
   a) usually familiar, but sometimes new to me............................................... [ ]
   b) usually unfamiliar, but sometimes known to me......................................... [ ]
   c) completely new to me.................................................................................. [ ]
   d) completely known to me............................................................................. [ ]

11. The practical sessions:
   a) helped to explain the work I did not understand in the lectures........... [ ] [ ]
   b) helped to clarify some aspects of the work covered in the lectures..... [ ] [ ]
   c) served to reinforce my understanding of the work covered
      in the lectures................................................................................................. [ ] [ ]
   d) did not assist me at all.................................................................................. [ ] [ ]
   e) none of the above (i.e. neutral)................................................................. [ ] [ ]
C. Assignments: Distance session

10. The number of assignments required to complete is:
   
   a) too many ................................................................. [ ]
   b) adequate ................................................................. [ ]
   c) too few ................................................................. [ ]

11. Is there enough time between the due dates of the assignments in order for you to complete your assignments?
   
   a) Yes ............................................................................... [ ]
   b) No ............................................................................... [ ]

12. On average, how long does it take you to complete an assignment?
   
   a) 2 hours ........................................................................ [ ]
   b) 4 hours ........................................................................ [ ]
   c) 6 hours ........................................................................ [ ]
   d) 8 hours ........................................................................ [ ]
   e) 10 hours ........................................................................ [ ]

13. The participants in the Botany/Zoology course indicated that the following tasks can be part of completing an assignment. Please estimate what percentage of your time is taken up by each of these ways. Your total time spent should add up to 100%.
   
   a) looking for materials and sources in libraries ......................................................... [ ]
   b) consulting a fellow participant ................................................................................ [ ]
   c) consulting a knowledgeable person ........................................................................ [ ]
   d) going through your notes and textbooks ................................................................ [ ]
   e) contacting a lecturer or the FITMAST tutors ............................................................ [ ]
   f) actually writing out the assignment .......................................................................... [ ]
   g) other ................................................................................ [ ]

   Please specify:
   
   100%
14. Did the assignments require of you:

   a) to simply reproduce your notes and/or textbook? [ ] [ ]
   b) to consult sources & textbooks other than your notes & textbook [ ] [ ]
   c) an in-depth understanding of the work covered in the contact session? [ ] [ ]
   d) to give your interpretation of the work done in the contact session? [ ] [ ]
   e) other ........................................... [ ] [ ]
       please specify.

15. How did the factual content covered in the assignments relate to the lectures of the contact sessions? (Check one only)

   a) always different work................................................................. [ ]
   b) always the same work............................................................... [ ]
   c) sometimes different work......................................................... [ ]
   d) sometimes the same work........................................................ [ ]

16. The following are some of the opinions expressed by teachers on assignments. Please indicate, by marking the appropriate box, the single category that best represent your view on each statement.

       strongly agree slightly agree does not apply slightly disagree strongly disagree

   a) school-related activities do not allow me much time for assignments............ [ ] [ ] [ ] [ ] [ ]
   b) assignments are not difficult but they are time-consuming...................... [ ] [ ] [ ] [ ] [ ]
   c) assignments help me to understand better the work done in contact sessions..... [ ] [ ] [ ] [ ] [ ]
   d) the evaluation of the assignments gives me an indication on how to answer some questions in the examinations............................... [ ] [ ] [ ] [ ] [ ]
   e) assignments are only useful for examination preparation........................ [ ] [ ] [ ] [ ] [ ]
   f) assignments are not valuable because they are repetitions of the work covered in the contact sessions......................... [ ] [ ] [ ] [ ] [ ]
   g) workshops in my area would be useful to clear up problems with assignments.... [ ] [ ] [ ] [ ] [ ]
D. Didactics

17. Do you think that the time spent on the didactics segment of the Botany/Zoology course was sufficient?

   a) Yes................................................................................................................. [ ]
   b) No............................................................................................................... [ ]

   If 'no', please answer questions 18, 19 and then proceed.
   If 'yes', go directly to question 20

18. In your opinion, what percentage of the course should be used for didactics?

   a) 0-20%........................................................................................................... [ ]
   b) 20-40%....................................................................................................... [ ]
   c) 40-60%....................................................................................................... [ ]
   d) 60-80%....................................................................................................... [ ]
   e) 80-100%..................................................................................................... [ ]

19. Why would you like to have the percentage indicated to be used for didactic purposes?

   .................................................................................................................................
   .................................................................................................................................

20. The following are some of the needs expressed by teachers with regard to what they would like to learn in the didactics part of the course. Please indicate the importance of these requests to you.

   a) more effective utilization of science instructional tools................................. [ ] [ ] [ ]
   b) learning techniques for teaching science in overcrowded conditions............... [ ] [ ] [ ]
   c) utilizing audio-visual materials as instructional materials................................ [ ] [ ] [ ]
   d) sharing of fellow teachers' experiences......................................................... [ ] [ ] [ ]
   e) learning laboratory management skills......................................................... [ ] [ ] [ ]
   f) small tutorial groups to discuss problems in the teaching of certain topics and approaches to resolve such problems................................. [ ] [ ] [ ]
   g) information on the use of low-cost materials for Biology experiments................ [ ] [ ] [ ]

20. What would you like to see happen in a didactics session?
Appendix IV

Teacher questionnaire results

The following questions will set out to gather information on your expectations and experiences of the Botany/Zoology course, as well as your attitudes and feelings towards the course.

1. How did you first come to know of FITMAST?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>69.3%</td>
<td>33.3%</td>
<td>72.7%</td>
<td>47.4%</td>
<td>31.2%</td>
<td>50.8%</td>
</tr>
<tr>
<td>b)</td>
<td>30.7%</td>
<td>55.6%</td>
<td>18.2%</td>
<td>26.3%</td>
<td>56.2%</td>
<td>37.4%</td>
</tr>
<tr>
<td>c)</td>
<td>00.0%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>28.3%</td>
<td>06.3%</td>
<td>10.6%</td>
</tr>
<tr>
<td>d)</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>06.3%</td>
<td>01.2%</td>
</tr>
</tbody>
</table>

*---Received notice while acting deputy-principal.

2. What did you expect to find on entering the Botany/Zoology course?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>15.4%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>12.5%</td>
<td>36.8%</td>
<td>16.9%</td>
</tr>
<tr>
<td>b)</td>
<td>15.4%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>12.5%</td>
<td>05.3%</td>
<td>10.8%</td>
</tr>
<tr>
<td>c)</td>
<td>69.2%</td>
<td>77.8%</td>
<td>81.8%</td>
<td>75.0%</td>
<td>57.9%</td>
<td>72.3%</td>
</tr>
<tr>
<td>d)</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
</tr>
</tbody>
</table>

*---Improvement in teacher qualifications
*---To gain credits towards a B.Sc.(ed) degree

1There are minor differences in the wording between some of the following questions and the corresponding ones found in the original questionnaire. This was done for the sake of brevity and does not affect the meaning of the question. The original questionnaire is attached so that readers can compare the questions that were affected.
3. Which one of the following factors gave rise to your expectations?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean('83-'87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) information from the university.....</td>
<td>23.1%</td>
<td>22.2%</td>
<td>54.5%</td>
<td>25.0%</td>
<td>26.3%</td>
<td>30.2%</td>
</tr>
<tr>
<td>b) comments of former participants.</td>
<td>00.0%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>00.0%</td>
<td>10.5%</td>
<td>06.2%</td>
</tr>
<tr>
<td>c) comments of principal...............</td>
<td>15.4%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>10.5%</td>
<td>05.2%</td>
</tr>
<tr>
<td>d) comments of the subject advisor.....</td>
<td>07.7%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>25.0%</td>
<td>00.0%</td>
<td>06.5%</td>
</tr>
<tr>
<td>e) intuitive ideas on inservice education</td>
<td>53.8%</td>
<td>66.7%</td>
<td>36.4%</td>
<td>50.0%</td>
<td>52.7%</td>
<td>51.9%</td>
</tr>
</tbody>
</table>

4. Which of the following words or phrases best describe your feelings upon entering this course? Rank your responses 1, 2, 3, 4, etc.

a) positive about success
b) wait-and-see attitude
c) determined to succeed
d) eager to learn new ideas
e) feelings of anxiety after a long lay-off from studies
f) other

See Table 5 on p.53 for results.

5. The following is a list of reasons why teachers have decided to participate in the Botany/Zoology course. You are requested to indicate those reasons for your participation by marking the appropriate box. If none of the reasons given below prompted your participation please feel free to add your own.

a) On advice from the principal or subject advisor.
b) On recommendation from a former participant.
c) To gain credits towards a degree.
d) To improve your knowledge of the subject.
e) Out of curiosity.
f) To gain financial benefits through possible promotion.
g) To gain new insights into the teaching of Biology.
h) Other.

See Table 4 on p.51 for results.
6. Of the reasons given, please write down, by letter and in decreasing order of importance, only those that you stated were of importance to you. (Example: [g], [d], [f], [a], [b] where [g] would be the most important and [b] the least important reason.)

Most important

Example:
[g] [d] [f] [a] [b] [ ] [ ] [ ] [ ]

Least important

Your reasons:
[d] [g] [e] [a] [c] [f] [ ] 83[mean response]
[g] [d] [f] [e] [c] [a] [b] 84[mean response]
[d] [g] [c] [f] [a] [e] [b] 85[mean response]
[d] [g] [c] [a] [f] [b] [e] 86[mean response]
[d] [g] [a] [f] [c] [b] [e] 87[mean response]

7. To what extent did the Botany/Zoology course meet your expectations (reasons for participation)?

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<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
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<tr>
<td>a)</td>
<td>15.4%</td>
<td>11.1%</td>
<td>63.6%</td>
<td>18.8%</td>
<td>15.8%</td>
<td>24.9%</td>
</tr>
<tr>
<td>b)</td>
<td>61.5%</td>
<td>77.8%</td>
<td>18.2%</td>
<td>62.5%</td>
<td>57.9%</td>
<td>55.6%</td>
</tr>
<tr>
<td>c)</td>
<td>07.7%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>12.5%</td>
<td>26.3%</td>
<td>09.3%</td>
</tr>
<tr>
<td>d)</td>
<td>00.0%</td>
<td>11.1%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>02.2%</td>
</tr>
</tbody>
</table>

Non-responses: 15.4% 00.0% 18.2% 06.2% 00.0% 07.9%

8. Having gone through the Botany/Zoology course, was it of value to you?

<table>
<thead>
<tr>
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<th>'87</th>
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<td>69.2%</td>
<td>88.9%</td>
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<td>81.3%</td>
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<tr>
<td>b) No</td>
<td>23.1%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>12.5%</td>
<td>05.3%</td>
<td>12.1%</td>
</tr>
</tbody>
</table>

Non-responses: 07.7% 00.0% 00.0% 06.2% 00.0% 02.8%

If 'no', please go directly to Question 10.
If 'yes', please answer Question 9.
9. The Botany/Zoology course was valuable to me:
See figure 1 on p.56 for results
(check only those applicable to you and indicate extent of the value of each reason given)

<table>
<thead>
<tr>
<th></th>
<th>extremely valuable</th>
<th>just valuable</th>
<th>slightly valuable</th>
</tr>
</thead>
</table>
a) it broadened my knowledge of the subject...[ ] | [ ]               | [ ]             |
b) it made me a more confident Biology teacher...[ ] | [ ]               | [ ]             |
c) it enriched me with new teaching methods in Biology...[ ] | [ ]               | [ ]             |
d) it enhanced my laboratory skills...[ ] | [ ]               | [ ]             |
e) other...[ ]                                                   | [ ]               | [ ]             |

10. The Botany/Zoology course was not valuable to me
because it: (check those applicable to you)

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
</tr>
</thead>
</table>
a) was not related to the level at which I taught... | 100%| 100%| 100%| 100%| 100%|
b) did not go beyond the level of Bot/Zoo that I know | 00.0%| 00.0%| 00.0%| 00.0%| 00.0%|
c) didn't provide new methods of teaching Biology... | 100%| 100%| 100%| 100%| 100%|
d) Other... | 00.0%| 00.0%| 00.0%| 00.0%| 50.0%|

---Not enough practical work

11. Have your feelings on the value of the course changed between the year you attended the course and the present?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean('83-'87)</th>
</tr>
</thead>
</table>
a) Yes... | 15.4%| 00.0%| 00.0%| 12.5%| 31.6%| 11.9%         |
b) No... | 76.9%| 100%| 81.8%| 87.5%| 47.3%| 78.7%         |

Non-responses: 07.7% 00.0% 18.2% 00.0% 21.1% 99.4%

If 'yes', please answer question 12 and then proceed.
If 'no', please go directly to question 13.
12. Briefly state how your feelings have changed.

Some comments received in this regard:

* I'm even more positive now..."

* It is a waste of time for me since I'm teaching std. 5 [Grade 7]."

* They should follow it up with second-year courses."

* Lecturers were very encouraging and supportive."

* Family considerations made me think about how the course is run. I would rather study home and do my practicals at a local university."

13. Did the kind of orientation you received about the course reflect what the course entailed?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Yes</td>
<td>53.8%</td>
<td>77.8%</td>
<td>54.5%</td>
<td>66.8%</td>
<td>52.6%</td>
<td>61.5%</td>
</tr>
<tr>
<td>b) No</td>
<td>30.8%</td>
<td>22.2%</td>
<td>27.3%</td>
<td>18.7%</td>
<td>42.1%</td>
<td>28.2%</td>
</tr>
</tbody>
</table>

Non-responses: 15.4% 0.0% 18.2% 12.5% 05.3% 10.3%

If 'no', please answer question 14 and then proceed.
If 'yes', please go directly to Question 15.

14. If you had been given a detailed orientation on the Botany/Zoology course, would you still have participated?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Yes</td>
<td>75.0%</td>
<td>100%</td>
<td>50.0%</td>
<td>66.6%</td>
<td>75.0%</td>
<td>73.3%</td>
</tr>
<tr>
<td>b) No</td>
<td>25.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>33.3%</td>
<td>25.0%</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

Non-responses: 00.0% 00.0% 50.0% 00.0% 00.0% 10.0%
15. Having attended the course, would you recommend it to a fellow teacher?

<table>
<thead>
<tr>
<th>Year</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Non-responses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'83</td>
<td>76.9%</td>
<td>15.4%</td>
<td>7.7%</td>
</tr>
<tr>
<td>'84</td>
<td>77.8%</td>
<td>0.0%</td>
<td>22.2%</td>
</tr>
<tr>
<td>'85</td>
<td>81.2%</td>
<td>0.0%</td>
<td>18.8%</td>
</tr>
<tr>
<td>'86</td>
<td>81.3%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>'87</td>
<td>94.7%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Mean (83-87)</td>
<td>82.4%</td>
<td>07.9%</td>
<td>09.7%</td>
</tr>
</tbody>
</table>

16. Why do you recommend / not recommend the Botany/Zoology course?

See discussion on p.57-58

The following questions deal with your experiences on the content and structure of the Botany/Zoology course.

A. Workload and Time allotted

For each of the following statements, indicate which box best represents your view.

1. The amount of work covered during any residential session was...
   - too much
   - more than enough
   - appropriate
   - less than appropriate
   - too little

2. On an average day, the time spent in the lecture room was...
   - too much
   - more than enough
   - appropriate
   - less than appropriate
   - too little

3. The number of topics that were covered (e.g. Osmosis, Photosynthesis, etc in Botany or Genetics, Evolution in Zoology) on an average day was...
   - too much
   - more than enough
   - appropriate
   - less than appropriate
   - too little

4. The amount of time normally spent on any topic was...
   - too much
   - more than enough
   - appropriate
   - less than appropriate
   - too little

See figure 2 on p.61 for results.
5. In the laboratory sessions, the total number of practicals held in a residential session was..........................[ ] [ ] [ ] [ ] [ ]

6. On an average day, the time spent in the laboratory was..........................[ ] [ ] [ ] [ ] [ ]

B. Content

7. The content of the lectures was:

\[
\begin{array}{cccccc}
\text{'83} & \text{'84} & \text{'85} & \text{'86} & \text{'87} & \text{mean(83-87)} \\
69.2\% & 77.8\% & 72.7\% & 31.0\% & 63.2\% & 62.8\% \\
15.4\% & 00.0\% & 00.0\% & 56.2\% & 15.8\% & 17.5\% \\
00.0\% & 00.0\% & 00.0\% & 00.0\% & 10.5\% & 02.1\% \\
15.4\% & 11.1\% & 18.2\% & 12.5\% & 10.5\% & 13.6\% \\
00.0\% & 11.1\% & 09.1\% & 00.0\% & 00.0\% & 04.1\% \\
\end{array}
\]

Non-responses:

8. Did the language of instruction make it difficult for you to understand the content of the lectures?

\[
\begin{array}{cccccc}
\text{'83} & \text{'84} & \text{'85} & \text{'86} & \text{'87} & \text{mean(83-87)} \\
15.4\% & 22.2\% & 00.0\% & 25.0\% & 15.8\% & 15.7\% \\
84.6\% & 77.8\% & 100\% & 62.5\% & 68.4\% & 78.6\% \\
00.0\% & 00.0\% & 00.0\% & 12.5\% & 15.8\% & 05.7\% \\
\end{array}
\]

Non-responses:

If 'yes', please answer question 9 and then proceed.
If 'no', go directly to question 10.

9. The language of instruction affected me because the lectures were:

\[
\begin{array}{cccc}
\text{'83} & \text{'84} & \text{'85} & \text{'86} & \text{'87} \\
00.0\% & 00.0\% & * & 00.0\% & 00.0\% \\
00.0\% & 00.0\% & * & 25.0\% & 00.0\% \\
00.0\% & 00.0\% & * & 00.0\% & 00.0\% \\
100\% & 100\% & * & 75.0\% & 100\% \\
\end{array}
\]

Non-responses:
10. The content covered in the course was:

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>69.2%</td>
<td>88.9%</td>
<td>81.8%</td>
<td>56.3%</td>
<td>57.9%</td>
<td>70.8%</td>
</tr>
<tr>
<td>b)</td>
<td>23.1%</td>
<td>00.0%</td>
<td>09.1%</td>
<td>31.2%</td>
<td>36.8%</td>
<td>20.0%</td>
</tr>
<tr>
<td>c)</td>
<td>07.7%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>01.5%</td>
</tr>
<tr>
<td>d)</td>
<td>00.0%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>04.1%</td>
</tr>
<tr>
<td>Non-responses:</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>12.5%</td>
<td>05.3%</td>
<td>03.6%</td>
</tr>
</tbody>
</table>

11. The practical sessions:

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>*(23.1%)</td>
<td>*(9.1%)</td>
<td>*(12.5%)</td>
<td>*(05.3%)</td>
<td>*(10%)</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>53.8 : 23.1%</td>
<td>77.8 : 22.2%</td>
<td>72.7 : 18.2%</td>
<td>31.3 : 56.2%</td>
<td>78.9 : 15.8</td>
<td>62.9 : 27.1%</td>
</tr>
<tr>
<td>c)</td>
<td>*(7.7%)</td>
<td>*(11.1%)</td>
<td>*(18.2%)</td>
<td>*(15.8%)</td>
<td>*(10.5%)</td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>69.2 : 23.1%</td>
<td>77.8 : 11.1%</td>
<td>81.8 : 18.2%</td>
<td>75.0 : 06.3%</td>
<td>73.7 : 10.5%</td>
<td>75.5 : 15%</td>
</tr>
<tr>
<td>e)</td>
<td>*(15.2%)</td>
<td>*(11.1%)</td>
<td>*(25%)</td>
<td>*(15.8%)</td>
<td>*(13.4%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*(11.1%)</td>
<td>*(25%)</td>
<td>*(15.8%)</td>
<td>*(13.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>*(23.1%)</td>
<td>*(22.2%)</td>
<td>*(18.2%)</td>
<td>*(06.3%)</td>
<td>*(10.6%)</td>
<td>*(16.1%)</td>
</tr>
<tr>
<td>e)</td>
<td>00.0 : 76.9%</td>
<td>11.1 : 66.7%</td>
<td>09.1 : 72.7%</td>
<td>12.5 : 81.2%</td>
<td>10.5 : 78.9%</td>
<td>08.6 : 75.3%</td>
</tr>
<tr>
<td>e)</td>
<td>*(84.6%)</td>
<td>*(55.6%)</td>
<td>*(81.2%)</td>
<td>*(87.6%)</td>
<td>*(84.2%)</td>
<td>*(78.7%)</td>
</tr>
<tr>
<td></td>
<td>*(00.0 : 15.4%)</td>
<td>*(00.0 : 44.4%)</td>
<td>*(00.0 : 18.2%)</td>
<td>*(06.2 : 06.2%)</td>
<td>*(05.3 : 10.5%)</td>
<td>*(02.4 : 18.9%)</td>
</tr>
</tbody>
</table>

*( )—figures in brackets indicate the non-responses.
C. Assignments: Distance session

10. The number of assignments required to complete is:

<table>
<thead>
<tr>
<th>Year</th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>Mean (83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) too many</td>
<td>07.7%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>10.5%</td>
<td>03.6%</td>
</tr>
<tr>
<td>b) adequate</td>
<td>84.6%</td>
<td>100%</td>
<td>91.9%</td>
<td>93.3%</td>
<td>84.2%</td>
<td>91.9%</td>
</tr>
<tr>
<td>c) too few</td>
<td>07.7%</td>
<td>00.0%</td>
<td>09.1%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>03.3%</td>
</tr>
</tbody>
</table>

Non-responses: 00.0% 00.0% 00.0% 00.0% 00.0% 02.2%

11. Is there enough time between the due dates of the assignments in order for you to complete your assignments?

<table>
<thead>
<tr>
<th>Year</th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>Mean (83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Yes</td>
<td>100%</td>
<td>88.9%</td>
<td>100%</td>
<td>87.5%</td>
<td>84.8%</td>
<td>92.2%</td>
</tr>
<tr>
<td>b) No</td>
<td>00.0%</td>
<td>11.1%</td>
<td>00.0%</td>
<td>06.3%</td>
<td>10.5%</td>
<td>05.5%</td>
</tr>
</tbody>
</table>

Non-responses: 00.0% 00.0% 00.0% 00.0% 00.0% 02.3%

12. On average, how long does it take you to complete an assignment?

<table>
<thead>
<tr>
<th>Year</th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>Mean (83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) 2 hours</td>
<td>07.7%</td>
<td>11.1%</td>
<td>00.0%</td>
<td>12.5%</td>
<td>05.3%</td>
<td>07.3%</td>
</tr>
<tr>
<td>b) 4 hours</td>
<td>46.2%</td>
<td>55.6%</td>
<td>18.2%</td>
<td>18.8%</td>
<td>10.5%</td>
<td>29.8%</td>
</tr>
<tr>
<td>c) 6 hours</td>
<td>23.1%</td>
<td>22.2%</td>
<td>63.6%</td>
<td>06.3%</td>
<td>36.6%</td>
<td>30.3%</td>
</tr>
<tr>
<td>d) 8 hours</td>
<td>07.7%</td>
<td>11.1%</td>
<td>09.1%</td>
<td>43.7%</td>
<td>31.6%</td>
<td>20.6%</td>
</tr>
<tr>
<td>e) 10 hours</td>
<td>07.7%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>12.5%</td>
<td>10.5%</td>
<td>06.0%</td>
</tr>
</tbody>
</table>

Non-responses: 00.0% 00.0% 09.1% 06.2% 05.3% 04.0%
13. The participants in the Botany/Zoology course indicated that the following tasks can be part of completing an assignment. Please estimate what percentage of your time is taken up by each of these ways. Your total time spent should add up to 100%.

a) looking for materials and sources in libraries
b) consulting a fellow participant
c) consulting a knowledgeable person
d) going through your notes and textbooks
e) contacting a lecturer or the FITMAST tutors
f) actually writing out the assignment
g) other

See figure 3 on p.70 for results

14. Did the assignments require of you:

<table>
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<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) to reproduce notes &amp; the textbook?</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td></td>
<td>(15.4%)</td>
<td>(00.0%)</td>
<td>(18.2%)</td>
<td>(12.5%)</td>
<td>(10.6%)</td>
<td>(11.4%)</td>
</tr>
<tr>
<td>b) to consult sources and textbooks not your own?</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td></td>
<td>(07.7%)</td>
<td>(00.0%)</td>
<td>(00.0%)</td>
<td>(06.2%)</td>
<td>(05.2%)</td>
<td>(03.8%)</td>
</tr>
<tr>
<td>c) an in-depth understanding of the work done in the contact session?</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td></td>
<td>(07.7%)</td>
<td>(11.1%)</td>
<td>(27.3%)</td>
<td>(12.5%)</td>
<td>(21.1%)</td>
<td>(15.9%)</td>
</tr>
<tr>
<td>d) to give your version of the work done in the contact session?</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
<td>Y/N</td>
</tr>
<tr>
<td></td>
<td>(07.7%)</td>
<td>(11.1%)</td>
<td>(27.3%)</td>
<td>(18.7%)</td>
<td>(15.8%)</td>
<td>(16.1%)</td>
</tr>
<tr>
<td>e) other</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>none</td>
</tr>
</tbody>
</table>

* Figures in brackets indicate the non-responses
15. How did the factual content covered in the assignments relate to the lectures of the contact sessions? (Check one only).

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean('83-'87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) always different</td>
<td>07.7%</td>
<td>11.1%</td>
<td>00.0%</td>
<td>00.0%</td>
<td>05.3%</td>
<td>04.8%</td>
</tr>
<tr>
<td>work..................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) always the same</td>
<td>15.4%</td>
<td>22.2%</td>
<td>54.5%</td>
<td>25.0%</td>
<td>26.3%</td>
<td>28.7%</td>
</tr>
<tr>
<td>work..................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) sometimes different</td>
<td>61.5%</td>
<td>55.5%</td>
<td>18.2%</td>
<td>68.8%</td>
<td>63.1%</td>
<td>53.4%</td>
</tr>
<tr>
<td>work..................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) sometimes the same</td>
<td>00.0%</td>
<td>00.0%</td>
<td>27.3%</td>
<td>06.2%</td>
<td>05.3%</td>
<td>07.8%</td>
</tr>
<tr>
<td>work..................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Non-responses: 15.4% 11.1% 00.0% 00.0% 00.0% 05.3%

16. The following are some of the opinions expressed by teachers on assignments. Please indicate, by marking the appropriate box, the single category that best represent your view on each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>strongly agree</th>
<th>slightly agree</th>
<th>does not apply</th>
<th>slightly disagree</th>
<th>strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) school-related activities do not allow me much time for assignments.....</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>b) assignments are not difficult but they are time-consuming................</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>c) assignments help me to understand better the work done in contact sessions</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>d) the evaluation of the assignments gives me an indication on how to answer some questions in the examinations...........</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>e) assignments are only useful for examination preparation...................</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>f) assignments are not valuable because they are repetitions of the work covered in the contact sessions......</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>g) workshops in my area would be useful to clear up problems with assignments.</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

See figure 4 on p.74 for results.
D. Didactics

17. Do you think that the time spent on the didactics segment of the Botany/Zoology course was sufficient?

<table>
<thead>
<tr>
<th></th>
<th>'83</th>
<th>'84</th>
<th>'85</th>
<th>'86</th>
<th>'87</th>
<th>mean(83-87)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Yes</td>
<td>30.8%</td>
<td>33.3%</td>
<td>36.4%</td>
<td>18.8%</td>
<td>15.8%</td>
<td>27%</td>
</tr>
<tr>
<td>b) No</td>
<td>61.5%</td>
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If 'no', please answer questions 18, 19 and then proceed.
If 'yes', go directly to question 20.

18. In your opinion, what percentage of the course should be used for didactics?

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<td>c) 40-60%</td>
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<td>d) 60-80%</td>
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<td>16.7%</td>
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19. Why would you like to have the percentage indicated to be used for didactic purposes?

See the discussion of these responses on p.86-89.
20. The following are some of the needs expressed by teachers with regard to what they would like to learn in the didactics part of the course. Please indicate the importance of these requests to you.

<table>
<thead>
<tr>
<th>Request</th>
<th>Very Important</th>
<th>Somewhat Important</th>
<th>Completely Unimportant</th>
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<td>a) more effective utilization of science instructional tools</td>
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<td>b) learning techniques for teaching science in overcrowded conditions</td>
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<td>c) utilizing audio-visual materials as instructional materials</td>
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<td>d) sharing of fellow teachers' experiences</td>
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<td>e) learning laboratory management skills</td>
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<td>f) small tutorial groups to discuss problems in the teaching of certain topics and approaches to resolve such problems</td>
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<td>g) information on the use of low-cost materials for Biology experiments</td>
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See figure 5 on p.90 for results.

20. What would you like to see happen in a didactics session?

See the discussion of these responses on p.92.
On some evenings after supper, your subject coordinator may arrange an evening session not exceeding 1½ hours. This is designed as a tutorial session or a film may be shown or you may work on PLATO. It is NOT for further instruction but rather for consolidation.

While we expect most participants to stay in the hostel, those who have applied to commute are entitled to lunch and supper at the hostel.

Please note that you are cordially invited to a Welcome Function at the UWC Senate Hall on Wednesday 7 January at 7.00 p.m.

REQUIREMENTS FOR JANUARY CONTACT SESSION

1. While you will be receiving all the textbooks and notes necessary for the course you will be following on January 5, you will need to bring your own stationery.

2. For those of you coming from other parts of the country, please remember that it is hot in Cape Town in January and that you need to choose your attire accordingly.

3. While the programme is an extremely full one with very little leisure time, you may find some time to make use of the squash courts and/or swimming pool on campus. Or perhaps an early morning jog in the Sports Stadium may be more to your liking. If so, come prepared.

DISTANCE TUITION

An integral part of the course is the distance tuition conducted by lecturers by means of assignments. In the first semester you will need to complete 4 or 5 assignments while 3 or 4 will be expected in the second semester after the June contact session. (The exact number depends on the subject)

We have asked lecturers to limit the completion time of each assignment to ±5 hours (i.e. for the student to complete, not the lecturer!). The assignments are designed with two main goals in mind:

(i) To help you consolidate and learn.

(ii) To give an indication of what you may expect in the examinations.

Persons who complete the assignments successfully are virtually assured of an examination pass.

We are aware of the many inroads which are made on your time once you leave the contact sessions and return to your school. However, we are convinced that the assignments, which must be returned by specified dates which will be given to you, play a very important role in keeping you in contact with the work covered in the residential periods.

It may be worth remembering that we do not necessarily expect a perfectly completed assignment. Submit what you have done and indicate the questions with which you had difficulty.
Appendix VI

Interview excerpts on various aspects of FITMAST

A Interview excerpt on the teachers' needs and expectations.

I: When did you come to hear of FITMAST for the first time?

R: Through correspondence... they sent us some letters informing us about a course for science teachers.

I: Did every science teacher at the school receive such a letter?

R: No, a common one was received. Apparently first to the principal and he had to send a list of all teachers offering science at the school and afterwards they choose and we received (I: You got direct correspondence then?) Yes, directly to us.

I: Now before arriving at FITMAST what have you heard or read about... say from friends, people who've attended before...what did you hear about FITMAST?

R: The only thing one always heard was the fact that it was a lot of work involved... it's a bit too much for the short period of time one spends there, assignments are too much... what I mean is the assignments being too much since we have such a lot of other work to consider.

I: Uh... oh, so that's the basic complaint amongst the teachers. Anything positive?

R: Positive?... Yes, I mean I specifically spoke to the person that was here before me and she... probably because she didn't have much... say experience in the subject, only at college level, did she learn much from it. She said there were a lot of things one could learn, that could help a person. Let me put it this way, as far as theory is concerned, it's a success but practically... one learns a lot but work is too much.

I: When have you decided to come... I mean, after the letter arrived, or when have you decided to participate?

R: Uh... when I got the letter... when the principal approached me and asked whether I was interested in the course... it was last year... about this time last year, I decided to come.

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1 Note In the interview transcripts that follow, the abbreviations used are:

I - Interviewer i.e. the researcher.

R - Respondent i.e. the teacher interviewed.
I: Miss, why are you participating in the course?

R: In the first place, because I feel that I need it... I'm not that good... I feel my qualifications are not that good in order for me to teach the pupils in the best manner. I feel... I don't think that which I've learnt at college was enough and secondly... probably because I like the subject itself.

I: Thus, when you came here, what did you hope to learn or gain from this course?

R: Um... that which we're doing... I think that this is... how, how can I put this... I have hoped to learn about the work we are doing at school, but on a more broader level.

I: So, you're actually telling me that you've come here to get a broader knowledge of the work you're doing at school?

R: Yes, at school and, of course, for my own benefit too. I mean... I think it's good to know a little bit more than what you teach the kids at school to even enrich them too, so that they wouldn't only know the work in the textbook... so that one can always give them something extra.

I: I see... I see a few reasons why you are participating. How do you feel? Which are the most important of those you've mentioned?

R: Because it is my job, I think it is important to the child... I feel the child should. (I: In other words,... I don't wanna put words in your mouth, you should tell me if I'm wrong... a broadening of your own knowledge to enrich the child?) Yes, to expand or broaden the child's knowledge... thus mine should be so greater in order to help him.

I: At this moment, let me see, you started in January. You're now six months here. Are there things that really surprised you... things you didn't think you'd encounter or learn here? Can you think about anything which surprised you about FITMAST. (R: Specifically FITMAST or do you mean specifically about the subject?) anything.

R: Well, if you mean the subject, I'd say that I enjoyed the biochemistry immensely... it is in fact the area I knew little about, so I've learned a lot there that I feel... I feel I can go back more sure about... well, not everything in the course, but also some like... can I mention the specific chapters? (I: Sure, go ahead) well I've learnt a lot about... I've really learnt a lot. Well, we're still busy and today I've felt so confident that I could go back and tell the kids more about it than last year when I tackled it only with the little knowledge I had... now I have much more than what textbooks give.

I: So, you've surprised yourself here?

R: Yes, I do feel so and... but then there are sections where I feel that the lecturer can do better... if he'd thrown more weight into it and give us more on certain things just than reading from the textbook. I mean, I could have done it myself... in such cases I feel I'm just wasting my time in the classroom.

I: So that was disappointing? (R: Specifically that section... I mean there are other sections, but that really upset me and... oh, oh, the other section was Ecology) Surprising, enjoyable, disappointing?
R: That I also enjoyed... you know, it's really true I believed... I've not realised it that one always... that which you see... how can I put this... that which you see,... if you don't know something you won't see it, but if you know it, you'll see it and that's what I've learnt in Ecology. There are a lot of things that I didn't take note of before, because I didn't know these things, or looked at it and try to explain it. These are just little things I've learnt in Ecology.

I: You've talked now in terms of subject... you didn't expect you'll come and earn in such an enjoyable fashion. That surprised you... it was refreshing to you (R: Yes, definitely...that I want to mention specifically, 'cause it was really the case)...and about the whole set-up at FITMAST, what surprised you?

R: Uh... in what respect? Are you talking about the social aspect? (I: Uh... something surprises you when you don't expect it, right. So, anything in that regard, when you came here?) Uh... it's such a broad question.(I: Maybe,maybe I can just give you an idea. Say, you came here to FITMAST and suddenly meet an old friend... that's really surprising isn't it? So, like you've said, the social aspect, possibly also administrative things and so on, you know.) Okay... if I'm to start with the administrative side, I'd say... say if I have to talk about the organisation of the course here. Well, I think to me sometimes I didn't like... it's a bit messy... uh, I'd say it's too messy if I think in terms of... oh, no it's correspondence I was thinking of now.

I: So, was it disappointing?

R: Yes, definitely... man the set-up here and... I can't think of specific things now... oh, the lecturers attitude also surprised me. (I: How or why were you surprised at it?) Well, I mean... well some makes one feel good and then some were a bit (I: stiff?) Yes, stiff, formal... one feels that you can't to them, but with those whom we went on the excursion, they were great while those that didn't accompany us...uh, one keeps them at a distance

I: Look... now I wanna ask you how you feel about the possibility of successfully completing the course?

R: Man... one feels that... when you're here (i.e. at the residential session) one feels very discouraged.(I: Oh! when you're here?) Yes when you're here... and even when you're at home you feel that sometimes it just gets too much... I sometimes think they can make this session longer, that's why I think that most teachers don't return...it's too much, one never really get a chance for oneself...I'm specifically referring to Botany. From January we've always had a full programme and sometimes you feel so tired, exhausted and then you still have to do a little bit of work... then one really feels like quitting, but on the other hand, when thinking about the pupils, you'd think...oh, well let me come back again.

I: So, now I'm asking you...do you feel you'll be successful in the course you're taking now?

R: At this moment? (I: Yes.) At this very moment I feel very discouraged...it's possibly due to my mood or he state of mind I've been in this past week...but that is how I'm feeling, maybe it's the past exam too...but I do feel very negative. It feels that I'm not gonna be successful, but on the other hand, I tell myself that I don't need to be, even if
it means that I only learn a little bit from the course. At least, then I'll be satisfied. I can tell you that I feel very negative at present.

I: That's exactly what I want to get at...some clear expressions of your feelings...you've probably mentioned it already, but how has this feeling changed, from the start up to now?

R: Well, at the start it was enjoyable to me, you know. One felt very good, positive...uh, it was a challenge and now... now it's getting....maybe as I've said, it might be either the past exam or the pressure of the work, but I do think that we're doing too much in this time-period. I feel that...if I can take today for example, I feel that if we are more specific here...if the specific thing you are dealing with in school, is treated with you, then that would be great...they do elaborate a bit here, but they can impossibly go through 15 sections... like today specifically, we treated 6 chapters, short ones, in the first session...uh, the first 2 hours, and that is really discouraging, 'cause in the next session somebody else would come and start with different work, so one feels that it's too much...one feels like giving up, because one doesn't know where to touch. I don't know where to start when I get back to the hostel.

I: So, all these things add up to.(R: It adds up to... I don't know if I really can say more) That's exactly why I'm coming to my next question. Is FITMAST now a greater or lesser challenge to you?

R: No, it's bigger, definitely not smaller...I don't know if it's getting bigger or smaller (I: Bigger or smaller against what you first felt?) No, I don't see that...I'm not getting more confident... I'm getting more discouraged you know.
B. Interview on the social context.

I: You are required to attend altogether 4 hours of lectures per day and a lab session of 2 hours (+). Now what do you think of such a daily schedule... difficult, easy?

R: It is very exhausting. Really, especially this June session... we've just come from exams (at school) and now to come and sit down here is really very exhausting (I: Which format would you've preferred)...uh, how many would I think, if they'd have... they are now starting to alternate it with films, slides, etc. If only in the past they did it also, but even now... well, after lunch, it feels that one can't concentrate anymore. I suppose one's brain can only absorb a certain amount at a time.

I: So, would you say that it is okay to retain that 4 hours, but they should... (R: Alternate it with something else). Besides the attendance of lectures and lab sessions, do you do any additional work?

R: Well, not here at the course, but definitely at home... in Kimberley.

I: Why not while you're here?

R: I think exactly because one is so tired after... when coming from the labs, one is really, really very tired and... we, especially the Zoology guys didn't write any class tests, etc which would've compelled us to go back to the books. We only wrote one test in January and that sort of forced us to go back to the books.

I: So, you don't spend anytime on that... I mean on additional work (R: No, not really.). Do you attend tutorials? I mean, PLATO-sessions, for example?

R: Yes, we do attend PLATO-sessions and last night we had to come back for a film.

I: How long do these PLATO-sessions last?

R: Uh... well, I can't... last time one lasted about 1 to 2 hours (I: And how regular do you have these?) Not very regular. We had two last time and for this session it was optional.

I: So, when you say last time, you actually mean (R: I mean the January session.) This past January you had two and now it was optional. You said that it takes about an hour, so you spent about 2 hours (+) last time. (R: Yes, 2 hours and a little bit more) and this time it was optional. Of what value were these sessions to you?

R: I think... I think it was something more, say that which was not mentioned in class, you could've gotten there... uh, ways of how they would pose questions in the exams and so on.

I: Thus, you get a broader idea of what you can possibly expect from them.

R: Yes, definitely.

I: Tell me, Miss do you sometimes consult with the lecturers after class?

R: Sometimes, yes... like, like when I don't understand something.
I: How long do you spend with them?

R: Oh, about 10 minutes... and of course, depending on how long it would take to solve my problem.

I: Regularly or only at times?

R: No, only at times.

I: And is it important to you?... of what value is it to you?

R: It is important and valuable to me 'cause for that which I don't understand, I get solutions. (I: thus the work that you don't understand is clarified to you.) Yes, and naturally only with certain lecturers not all of them.

I: So you don't consult all the lecturers?

R: No,... I mean if you ask for something to be explained to you, not, not all of them need to be asked.

I: Coming to your recreational times per day and it mostly apply to the breaks you're having. You have a very busy day as I can see. Where do you have your breaks?

R: Are you referring to the 10-minute ones? (I: Not specifically, you may talk about all of them.) Well, the 10-minute breaks are mainly spent in front of the classroom .... (I: When are you having such breaks?) Well, it's supposed to be after one hour and after the 2-hour session, we have a 20-minute break... uh, tea-break and then we'd go over to the common block for tea, where ...(I: Around what time is that?) It is around 10.30 a.m. till 10.50 a.m. in the morning. (I: And then?) Then it's back to lectures for 2 hours after which we go for lunch at the hostel's dining-room for an hour. (I: From 1 p.m. till 2 p.m.?) Yes and then we go back for 2 hours in the lab.

I: These breaks, do they ... do you feel they come just at the right time?

R: Yes, 'cause you really feel you can't go further anymore.

I: Are there enough breaks according to you?

R: I think they are adequate (I: And their length of time?) I think they can extend the time a little bit (I: Which break now?) I'm talking about the 10-minute break, they can extend it to 15 minutes.

I: With whom do you meet during these breaks?

R: During the short or long ones? (I: Any break, with particular persons?) Yes, especially with the class group during the 10-minute breaks. But during the longer breaks, there one come across many people.

I: But, with whom do you meet specifically? A small, particular group? A regular bunch?
R: Uh...I'd say with a small group.

I: Do you have a favourite place where you meet?

R: No, not a favourite place.

I: What is talked about during these breaks? Let's first take the 10-minute breaks. What is the general talk there?

R: Mostly, it is on the work that was done in the class. (I: A discussion on the work just covered?) Yes, a discussion...if you didn't understand something in class, a colleague would then clarify it for you there... uh, shed some light on it.

I: And during the 20-minute breaks?

R: Well, there the talk would lean more over to the social side... how things are at home, etc. (I: And naturally in the lunch break too) Yes... and of course, the school situation, comparing the school situations.

I: I'm only asking,...would you at times review the day's work or talk about the impending lab session?

R: As I've said before, during... during the 10-minute breaks before re-entering the class, we'd talk about the work.

I: Do you always take your breaks with a group? (R: No, not necessarily.) Uh,...what do you do when not in a group?

R: I'd for instance, take my textbook and read on the work just covered in class.

I: In general, I wanna ask a few questions. These contact or residential sessions are held during your holidays. Does it suit you?

R: No, I don't think it really suits me. It is a bit difficult,...I think the January session could still have passed, 'cause we already had some holiday before we had to come here. Thus, to a certain extent, one already had some rest, and... we were not there the whole of our holidays since we only sacrifice a week of our holidays. But now in June, it is taking up two weeks of our holidays and as I've said before, one is tired 'cause the school term was difficult and you have to get immediately... immediately into a lot of work. So it is difficult the... the June session, but the January was okay, better than the June session.

I: These courses are held at UWC in Cape Town. How do you feel about it?

R: Well, that is really a big headache for us that have to come from so far away. Really a headache, I mean taking into consideration one's responsibilities at home and so on.

I: Does it suit you?

R: No, it doesn't suit me. (I: Why not?) As I've said, one has to ....it is really a problem 'cause you have to find people to stay in your house while you're away and so on.

I: What alternatives would you suggest?
R: Well, I don't think there is really an alternative, 'cause we don't have universities there to offer these courses. So I suppose one has to sacrifice if you wanna achieve something.

I: Tell me, you did have a choice to either stay on- or off-campus and what have you chosen?

R: I have chosen to stay off-campus.(I: Any reason why?) Yes, I ...maybe it's personal, but I found it difficult in the hostel.(I: So, the first session, you were in the hostel?) Yes, I was and the second session off-campus, because... because I think I was shocked by the behaviour of the adult people at the hostel... there isn't any respect for the next person. They'd party till 4 a.m. in the morning and the next day one would be tired in the class. That's why I'm not in residence this session.

I: Are there any advantages in staying where you are right now... off-campus?

R: I'd say it's a more quiet place, one feels more relaxed, it is more private.

I: You are naming the privacy, your more relaxed state and a lower level of noise... how do these three together forms an advantage and how does it influence your studies?(R: I... I don't understand the question.) Okay, how does the advantages of your off-campus residence help you in the course?

R: I think... I'd say I would have gotten more frustrated if I haven't moved off the campus, because besides the fact one arrives back at the hostel very tired, you had to go back the following morning still feeling tired.

I: Other students have mentioned that some of the advantages of staying off-campus are that... well some say you are not so restricted in having fixed meal-times; (I: Yes, definitely, you're more free.)... uh, one could get to see more of Cape Town, easier than being on campus where they felt like being in a prison environment and for the fact that one meets more people when off the campus. Are these advantages also applicable to you?

R: Yes it is... I'd agree with that.

I: Any disadvantages? I mean, if there are advantages, surely there must be some disadvantages. If there aren't any, tell me,... but are there any disadvantages in staying off-campus?

R: I don't think so. At present there are no disadvantages to me. It possibly would have been if we were required to work a lot after hours. At the residence it would have been easier for there are a lot of people around, but we're two people staying together. So, there aren't any... well, possibly a lot of travelling to campus. It's working a bit on the nerves, but it doesn't have a great impact.

I: Well, some people mentioned that something that can be a disadvantage is... okay, you're two staying together, but it's not same as a big group that can better shed slight on the work covered in class that day and there is also a time-factor involved,... uh, having to rush here in the morning which really upset them.
R: No, not really to me... I can say we never really rushed here,... I mean if you get up early enough and possibly, 'cause we don't stay so far from campus. (I: How far away do you stay?) Here in Bellville... so it isn't really far and thus there is no rush to get here.

I: You have now mentioned all the advantages and disadvantages with regard to your present residence. Do these influence you for the good or the worse in obtaining success in this course?

R: The fact that I'm staying off-campus does... I think it does have an influence (I: For better or worse?) For better, definitely... for better results.

I: What would you suggest to strengthen the positive things you've mentioned and to counter-act the negative things?

R: The negative things, like at residence? (I: No, the negative things, like the fact that you have to rush here) Well, it isn't a negative thing. The negative thing might be the fact that we two are alone. Well, I think a solution might be to... if you have your own transport, to drive to the hostel sometimes and then to return (I: And to strengthen the positive things?) I think that it is better to be off-campus so that you can work out your problems first by yourself.
I: Well sir, I suppose that's the way it goes and as I've said before, we'll now move over to the intellectual context of the residential session which includes the lectures, lab sessions etc. Now I want to ask you, do you regard the listening to lectures as a good way for you to learn?

R: Well, definitely not for me, not at this stage. The listening of lectures is not of much value to me. Let me tell you this, the one section of the work, physiology, one can say that one needs a little bit of listening, in biochemistry too, but as far as the others are concerned, morphology, etc, it is not worth the while to go and sit down and listen to lectures. One could rather have spent the time on field work, practicals... doing more practicals and to do one's own (I:notes?) notes, yes and record your observations.

I: Which method of instruction have you previously encountered?

R: Basically the same as that which I have experienced here, here at the course. Dependent on listening, you know. (I:less doing?) yes less doing, doings on your own.

I: The lectures are approximately two hours long per session. Does this length of time suit you?

R: Definitely not. Two hours per session are murderous man. One would expect a session of an hour, well may be a little less, not longer than an hour. It is exhausting I think after the first hour, one doesn't take in any more. You just sit there, you are not really part of the set-up there anymore.

I: Is the content of the lectures easy or difficult to understand?

R: Content of the lectures... easy to understand. Well for me it is easy to understand, you know. A lot of the work I have done in my third year at college, so it is basically a repetition, but definitely not difficult.

I: Suppose you encounter problem or you don't understand, what do you do then?

R: Well, if you don't understand, one would consult the lecturers themselves or one would do research in the library.

I: And does this help you to get a better understanding?

R: Yes, definitely to get a better understanding of the work.

I: Sir, I'd like to know whether people interrupt the lecturers?

R: Well there is questioning, definitely there is some questioning. (I: For what purpose?) Well to get a better understanding of the work. There are people in the class that possibly don't have any contact with the specific work, that have... it is one of the problems, having never encountered the work. There are interruptions, yes, more positive than in a negative sense.
I: Does it help you?

R: It really helps me too, especially if you consider that there are guys who cannot pose questions, then it does help me... especially if one is a bit afraid to pose questions in front of other guys and would rather do it privately in a lecturer's office.

I: What kind of response do the guys get when interrupting the lecturers?

R: From the lecturer himself? (I: Yes.) I can say they are positive, they want to help... they are prepared to help... uh, they're never negative towards any interruptions.

I: Do you interrupt the lecturer?

R: [Laughter] I'll tell you this. In the session, the one which is basically a theoretical session, I don't interrupt the lecturer, mainly because I... because I understand most of the work and also knows it, but in the practical sessions... yes definitely, I interrupt the person, go up to him and ask him to show me some things, whether these are the things he expects me to see, etc.

I: The amount of information...uh, amount of knowledge, conveyed to all of you during the contact session... would you regard it as enough and adequate, much too less or too much?

R: Well, I would say that it is definitely too much, it is a lot of work, Gee, I don't know. When you are finished with that session, you feel like somebody that is simply dwelling around, not knowing in which direction you go, it.... it is too much work.

I: What would you like to see happen in this regard?

R: I'd like to see the sessions being shortened, the work slightly being cut because I mean some of us teachers already have some contact with part of the work, so that such work should be eliminated as soon as possible and have us concentrate more on the work that we are not familiar with. Then I think it would definitely lead to increasing one's knowledge but at present it is mostly a duplication of work. One goes to listen to work that one already knows and man, it is really frustrating. If it was something new one would have probably looked more forward to the work to be studied.

I: In other words, if I read you correctly, you are telling me that all of you should sort of in conjunction with the lecturer, determine which of he work you know and those that you don't know...

R: That's it man. That is definitely the idea. It must come from the side of the teacher that, which he wants from the course, not something given or thrown at you.

I: On the laboratory sessions. Are there any rules or regulations given to you for these sessions?... uh, that you are compelled to follow?

R: Yes, there are certain rules to be followed. After the practical sessions, we have to hand in our task-sheets. So we must follow these rules...

I: I mean... I actually mean rules laid down for lab sessions \ such as those that you would have in your own classroom, like safety for example.
R: It is a pity, it is in fact a real pity that it is missing. One would like to see the laboratory rules there. For example, the handling of microscopes which one can convey later to the kids, you know.

I: How do you know what to do during these lab sessions... uh, with regard to the work specifically.

R: Well all our assignments are given at the start of each session. Something like... this is the practicum, this is what you should look at, this being what you should draw or investigate. At least there is an assignment.

I: How are these instructions given to you?

R: It is in fact a pity that they are written on the blackboard, one would have liked to see it on a xeroxed page, you know.

I: Are these instructions easy or difficult to understand?

R: Easily understood, very easy to understand.

I: Are the uses of the laboratory instruments explained to you beforehand?

R: No, not at all.

I: Any reason why?

R: I think it's because the session is so short. It is about three hours long. For three sessions of theory, you have one practical session, so that you have to carry out quite a few practical assignments within a time limit of two hours, and that is why, in my opinion, there are no explanations at the start.

I: Say, for example you're gonna use an instrument, say the potometer. Is the use of the potometer explained to you beforehand? Something like that, I mean.

R: No, definitely not... the instruments' uses are not explained.

I: I put this to you. You should contradict me if you don't agree. These people simply assume that you have a knowledge of the instruments.

R: Man, it is definitely so, because some of us are doing some of the experiments at school... but there are others, of course, people that don't do it at school. So we have now this problem of no explanations, but I even think that some of the teachers don't do the experiments at school because they might not know how to handle the instruments and thus hoped that they would have learned it here during the lab sessions, the steps, how to use them but it isn't given here.

I: Is help available in the laboratory?

R: Yes, freely available (I: From whom?) From the lecturer and the lab assistants.
I: Do you draw on such help, sir?

R: Yes, definitely.

I: You do work in pairs. Is that so?

R: Yes, usually in two's.

I: Did you have any say in the choice of your partner?

R: Yes, we basically work this way where by you choose the guy nearest to you, but mostly one that you might have befriended at the hostel.

I: Why have you chosen your specific partner?

R: I chose him because I could reach him easily at night in the hostel than what I could reach somebody else. It is usually my roommate with whom I am most of the time (I: Oh I see) Yes, then it is easier to exchange knowledge..uh, ideas.(I: And you also feel more free to do this with him?) Yes, that is truly so.

I: This working in pairs. Is it good for you?

R: I would rather prefer, at this stage, to work on my own, to do things by myself, but one can understand that the time is so limited that they probably don't want to make available so much apparatus... it would perhaps take up more time and so forth.

I: Are you allowed to consult other pairs?

R: Yes, there is liaison between pairs (I: Do you do it?) we consult with other guys in the class before writing down our results, making conclusions, etc.

I: You are, of course required to hand in at the end of the day, sometimes not that particular day as such... uh, some laboratory reports or tasks. How long does it take you to complete such a laboratory report?

R: Well, they usually request them to hand them in by the following day because I don't believe that one can finish your report in a neat and proper way during that session. It would be unreasonable, for in those two hours, you observe, draw something, make a conclusion, etc. So I think, to prepare it in a neat way and to write it out properly... man, there's just no time in those two hours.

I: Now, how long does it take you at home or wherever you do it, to complete such a report.

R: Usually, an hour

I: Do you work together in this, you and your partner?

R: We usually work together on it after the session... sometimes more people, 4 to 5 of us working together.

I: Do you feel that these assignments are of value to you?
R: Yes, practical tasks are definitely valuable. One do need those things that you pick up here sometime during your life.

I: These assignments are evaluated. Is that so?

R: They are evaluated, but we don't know if we do get a mark for it as part of one's year mark. It really is a story which I'm definitely not sure about [Laughter] It has never been clarified to me.

I: Tell me, the comments on it, are these available to you?

R: Yes, immediately after it had been marked one gets it back together with some comments on it.

I: This feedback... is it of any value to you?

R: Yes man, it is positive, it definitely has a positive effect.

I: The laboratory sessions are two hours (+) long. Do you feel it gives you adequate time to complete all your work?

R: No, definitely not. I think we are there six hours per day, some days up to eight hours and the volume of work is too much to go and apply all that theory in that space of time. It is definitely too much work.

I: You have now talked about the theoretical work that sort of gets reinforced during the practical sessions. Now, I actually want to ask you whether these practical sessions help to shed some light on the work covered in the lectures?

R: Yes, definitely. Man, I can tell you that those lab sessions help, but it is just a pity that it is so short. One would have preferred a longer practical session.

I: To what extent does it help?

R: Well, apparently... uh, sometimes there are concepts and terms which one cannot comprehend while the lecturer explains it in theory, but when one looks at a thing, you definitely form a better idea of it.

I: What is your general opinion on the laboratory sessions sir?

R: General opinion? Well, it is a positive contribution. It supplements the theory, but one would have liked to have it for a longer time period, so that one can have more contact, to enable one to do things on your own, each person on its own I mean, and not in pairs.

I: Are you able to make your views known to the teachers... with regard to these sessions?

I: Yes, we have.... they have their own evaluation forms where one would state how you'd feel about a practical session, theoretical session and even the examination. And it is good, man.
I: What recommendations would you make to contribute to the effectiveness of the sessions?

R: Man, to contribute to the effectiveness of the lab sessions, I'd say that one has to investigate on one's own... really self-investigation and that one is given the time to complete and write out your lab assignments/reports, then to compare with your friends, and then to draw up a general practical report for that session. (I: And, of course, as I've read you the whole time, a longer time period). Yes, a longer lab session.

I: Sir, we've come to the end of this interview
D. Interview on the distance teaching component.

I: The first aspect of this programme I wanna cover is the distance tuition. The distance component requires the completion of assignments. Is that so?

R: Yes

I: Now, I wanna know, how many assignments were you required to complete in the January to June session?

R: January-June session? Let me count quickly. Well, one for Mr. Weitz, Mr. Aalbers let's say 5 assignments.

I: 5 assignments are you sure of this? (R: Yes). And for the July-October session, were you given an idea of how many need to be completed?

R: Yes, there are 4 assignments

I: How long does it take you on average to complete one assignment...uh, how long in terms of time do you spend on it?

R: Yes, well...plus-minus...if you take into consideration the quality of the time spend on it, I'd say it depends on the nature of the task or it depends on the type of problems posed by each assignment, but say, plus-minus 2 to 3 hours. Some tasks that are however, research-oriented, for example the one on pollution, I've made a real effort to travel to Cape Town, so on one like that, I'd say you will spend a little more than three hours.

I: Can we have an average of say, 3 hours?

R: Yes, we can say on average 3 hours.

I: You have told me...uh, let's see, 5 plus 4 and that's 9 assignments at an average of 3 hours, thus 27 hours per annum do you have to spend on the distance tuition's assignments. How do you feel about such a work load?

R: Yes, the workload is a bit tough, but I think that we should see the workload against the background of, not only the 27 hours, but in terms of my duties and responsibilities as a teacher and the course is in any case for teachers. So, the workload should not be seen against the background of 27 hours only 'cause the teacher really also has administrative duties at school, he's got commitments towards his pupils, marking work...uh, he's also got...in my case, as a married person, you also have a lot of responsibilities towards your family. So, the time for assignments is really a little bit restricted.

I: So, you're saying time is a little bit restricted, sir?

R: By restricted, I mean I really want to give my best...my best in this course and sometimes one gets frustrated at not being able to deliver your best and when time gets short and you have to hand in an assignment that you personally feel is not your best.
I: These assignments require self-study, reading of books, articles (R: Yes) etc. How do you find this method of working and studying on your own? Easy, difficult?

R: Again, it depends on the direction or certain sections of the work. Some sections are easy, some lend themselves to research, but then there are other sections where one do get frustrated and certainly needs some help. But I... I have found this type of learning very pleasant especially (Laughter) especially if you don't encounter problems.

I: So you are actually telling me that you enjoy working on your own?

R: Yeah, I do enjoy working on my own and I don't know... I'm just possibly one of those persons that might not ask people for help, but first try to run through a problem myself before I would ask other people's advice. I don't want to commit plagiarism, but just getting other's work... I feel I want to run through the course and that which I'll be extracting from the course, I wanna know that at least it is my own effort, I've done it by myself.

I: Now, how do you go about when encountering problems?

R: Yeah, well, in the case of the one lecturer Mr. Weitz, I telephoned him as well as Mr. Aalbers. I can remember that I've once called him on a Saturday night at 11 pm and that's how I've solved one problem. Again, in biochemistry, I've contacted one of my classmates about DNA, RNA to sort of try to tackle the problem together.

I: In the completion of an assignment, you need, of course a textbook and other sources of information. Now, can you obtain these resources that you need?

R: In... in one assignment, I had immense problems, and it was the assignment on pollution in the Western Cape. Probably not,... not so much problems, but I had a problem of sifting through the information... uh, at the University of Western Cape, there are some articles shown on the microfiches... it appears on it, but it was nowhere to be found on the campus, so I had to travel to Cape Town. I realise... I do realise that I'm in the privileged position in that the 2 or 3 universities are close to each other and that sort of eliminated a lot of problem for me.

I: I wanna ask you. How did these assignments relate to the course work covered in the January contact session?

R: Yeah, well the tasks were actually based on or rather, it covered the work we did in class and it was to be found (solutions) in the textbook... in certain chapters of the textbook. So, there was a connection or link between the assignments and the work covered during the January session, except for the one on pollution, which we only slightly touched upon in January.

I: It was thus a... (R: a self-study project). Your assignments are evaluated, marked?

R: Yes.

I: Now how is it done? The mechanism?
R: The only insight into the evaluation is through a memorandum from the lecturer after plus-minus 4 weeks. You are sent a memorandum and your mark obtained for the assignment which you now can compare.

I: Are these evaluations of any help to you?

R: Yes, they were...uh, especially in the areas where one had problems. One could now see how you've tackled a problem area and why and where you encountered problems. It was really helpful.

I: Uh... when did you receive the assignments for the January-June distance session? At the residential session, during the course of the distance session?

R: At the... for the January-June session, they sent us an assignment each month, I speak under correction, so we've received it during the course of the year, but at the June residential session, we received all the assignments in one bundle.

I: Any specific reason why you got it in one bundle for the July-October distance session?

R: No, I don't know.

I: So, those people just decided to give it to you in bulk?

R: Yeah, I suppose so that we can now work at our own rate. Some people, work slower, others faster.

I: So, are you telling me there are no due dates on these assignments?

R: No there are due dates, but we've now received at least all the assignments at the June session.

I: At least you can now space your work as you've said (R: Yes, one can space them now) Now, tell me sir, what was the format of the assignments for the January-June session? Is there a specific form or format that they had?

R: Yes, Mr. Weitz's assignment...uh, there was one section and that was Section A which was mostly a set of multiple choice questions, a section on terminology, a sketch to be drawn and a "distinguish-between" section. And then, Mr. Raitt made a statement and one had to discuss the statement in the light of the work covered in the thesis or self-study project on air pollution. Then we had Mr. Joubert's assignment with questions on... we basically had to draw sketches and to distinguish between certain concepts.

I: I get a picture whereby the format of an assignment depends on the lecturer involved. Is that so?

R: Yes, it appears to me that it depends on the specific lecturer, for there is no uniformity amongst the lecturers as to how they would set an assignment.

I: Now, we get to the idea of workshops. Uh... the persons I've interviewed previously informed me that there were no workshops held in the January-June period and that
workshops are in any case, not included in the whole course. As a result, I wanna have your opinion on the idea of a workshop where a few teachers would come together during the term, discuss problems, etc.

R: I think an effort was made and on one occasion I did attend on a Friday afternoon, I think. So, an effort was made to have these workshops, but it flopped because consensus could not be reached as to when it should be conducted... so it flopped.

I: Would it be of any value to you to have such workshops? How do you feel about the idea of workshops?

R: Yes, in fact I think that in the event of myself having some time for it, a workshop would be of value to me(!!: Why?) I feel that...uh, at such a workshop problems with respect to the course can be discussed with your colleagues, thus gaining a second opinion. With regard to the motivational aspect, it could be a sort of feeding source for it...one could have your motivation for the course restored at such workshops. Thus, a workshop...if one thinks in terms of the aforementioned aspects, can produce good results by keeping the participants motivated and can make the course easier,...and, of course, with the lecturer present too.

I: That's exactly what I'm trying to get at. Whether you have a get together with one or two lecturers in a specific subject. Some people have mentioned to me that it would be worthwhile especially if one has lost direction with the work...the understanding of it,.... then these workshops would provide them with the opportunity to consolidate,etc. Would you share the same opinion?

R: Yes, I think that's what I've been trying to say...it would also provide the opportunity to gain other insights from your colleagues thereby understanding the work better.
INTRODUCTION

1. OBJECTIVES

1.1 To guide pupils to an understanding and an appreciation of the interdependence of living things (especially man) and their relationship to their environment;

1.2 to teach pupils to appreciate how the development and application of scientific knowledge affect the progress of civilisation;

1.3 to excite pupils' interest in biological phenomena, to promote their powers of observation and to stimulate imaginative thinking;

1.4 to enable pupils to grasp the scientific method of approach and to cultivate habits of logical and systematic thinking in them;

1.5 to cultivate a desire in pupils to read more widely and more deeply in biological matters;

1.6 to foster in pupils a love for South African flora and fauna and to stress the vital importance of nature conservation.

2. STUDY APPROACH AND GENERAL AIMS

The approach should be such as to stimulate the pupil's awareness and appreciation of the wonder of Creation, of the richness of our heritage in flora and fauna, of the processes characteristic of life and of the mutual interdependence of living things. This should lead pupils to an understanding of the ecosystem and energy flow within this system.

To this end the following should be noted:

2.1 In the implementation of this syllabus, the emphasis should be on organisms in relation to their environment and the life processes manifested by organisms.

2.2 As part of their training in the scientific methods of study, pupils should be given constant practice in critical observation and accurate recording.

For the same reason they should have practice not only in handling material and apparatus, but also in applying their knowledge and understanding to new problems in order that they may cultivate habits of logical and systematic thinking.

2.3 Instruction should in the main be based on pupils' own observations within their environment.

2.4 The methods of evaluation of pupils' progress should reflect an emphasis on facts being understood, interpreted and applied rather than on the mere memorisation of the bare facts.

2.5 Pupils should be led to realise that all scientific work is based on the questioning and revision of previously accepted and currently held theories.

3. GENERAL REMARKS

3.1 The basic principles of physics and chemistry should receive the necessary attention whenever applicable.

3.2 No attempt has been made to prescribe too closely the general approach, nor to advocate a specific method of study for any particular part of the syllabus.

3.3 The arrangement of the components of the subject-matter must be such that provision is made for the integration of plant and animal studies in order that the pupils may become aware of the phenomena of life.
3.4 The syllabus is not a scheme of work and the order of the subject-matter should be arranged to suit local conditions.

3.5 Those paragraphs of the Standards 9 and 10 syllabus dealing with the diversity of plant and animal life should lead to a comparative study of the different types of plants and animals mentioned with regard, not only to the distinguishing external characteristics, but also to the various physiological functions specified in the syllabus.

3.6 Practical work: instructions and recommendations:

3.6.1 Although practical work is an integral and compulsory part of the course, there will be no formal practical examination as such on the work at the end of the year.

3.6.2 Subject-matter in which it is desirable that practical work and/or observation be done, is indicated in asterisks.

3.6.3 The proper recording of the practical work done, (a) by demonstration and (b) by the pupils themselves is important.

3.6.4 As far as possible, pupils should examine fresh and/or preserved material and must keep a record of their own observations. It is advisable that the work be planned on a seasonal basis in order that as much fresh material as possible can be obtained.

3.6.5 Candidates must be introduced to the use of the microscope.

3.6.6 Photomicrographs supplied by the Administration can be used with advantage.

3.6.7 It is recommended that two successive periods be set aside every week for practical work.

THE SYLLABUS

STANDARD 8

1. ENERGY AND BIOLOGICAL ENERGY PATHWAYS


1.2 Pigments which comprise chlorophyll. Chlorophyll in sunlight and change of radiant energy to chemical energy.

1.3 Contrast between living things which acquire energy and employ it to maintain their order and organisation, and non-living things which do not. Other differences, largely dependent on this, between living organisms and non-living matter.

1.4 Energy sources of heterotrophic and autotrophic organisms.

2. STRUCTURE AND PROPERTIES OF MATTER

Physical and chemical concepts which will facilitate the meaningful study of biological processes.

2.1 Atoms, molecules and ions relevant to this syllabus and which foster a better understanding. (No details with regard to atomic structure and bonding theory are required)
Molecules: covalent bonds between atoms simply indicated by bond lines.
Structural formulae of the following molecules: hydrogen, oxygen, nitrogen, water, ammonia, carbon dioxide, hydrogen chloride, hydrogen sulphide and methane.
Acids, bases and salts as sources of ions in aqueous solutions.
Refer to the following examples: hydrogen chloride, sodium hydroxide and sodium chloride.
(Memorising of individual structural formulae is not required)

2.2 Inorganic compounds: water, carbon dioxide; and ions as sources of the elements found in living organisms.

2.3 Kinetic energy of molecules and its importance: "Diffusion, osmosis and Brownian movement illustrated with experimental demonstrations".

3. THE CELL

3.1 Basic structure of plant and animal cell. "Structure of simple plant and animal tissue e.g. cytoplasm, nucleus, cell wall and other features observable through a student's microscope".

3.2 Comparison between plant and animal cells.

3.3 The organisation of cells into tissues and the physiological interdependence of cells; concept of organs and systems.

4. GENERAL BODY PLANS OF ANIMALS: THEIR SKELETONS AND THEIR LOCOMOTION: ASPECTS OF THEIR TRANSPORT SYSTEMS

The following types should be studied, as far as possible in relation to their environment; i.e. the study of locomotion, the relation between the locomotory appendages, their muscle and the "skeleton" should receive attention as well as the type of propulsion, e.g. by flexing and/or extending appendages in contact with the substratum.

At least one example of each of the phyla classes or sub-classes named, is to be studied. Reference must also be made to other animals belonging to the particular group. An introduction to taxonomy, is to be included here but will not be examined.

4.1 Phylum - Protozoa: *Amoeba*
Unicellular. Amoeboid movement.

4.2 Phylum - Coelenterata: *Hydra*
Body form: radial symmetry and its significance to a sessile animal.
Support of body; hydrostatic skeleton. Mode of locomotion of adult.

4.3 Phylum - Platyhelminthes: *Planaria*
Body form: triploblastic; bilateral symmetry and its significance for a motile animal.

**Cephalisation. Mode of locomotion.**

**4.4 Phylum - Annelida:** *Earthworm*

Body form: external structure; transverse section; triploblastic; coelomate; bilaterally symmetrical with through alimentary canal.

Support of body: importance of coelomic fluid as hydrostatic skeleton.

Mode of locomotion.

Circulatory system: closed type and its importance.

**4.5 Phylum - Arthropoda:***

**4.5.1 Class-Crustacea:** *Crawfish or crab*

**4.5.2 Class - Arachnida:** *Scorpion or spider*

**4.6 Phylum - Mollusca:** *Snail*

**4.5.3 Class-Insecta:** *Locust*

**4.7.4 Aves-one example of a bird.**

**4.7.5 Mammals - one example of a mammal.**

**4.7.3 Reptilia-one example of a reptile.**

**4.7 Phylum - Chordata**

**4.7.2 Amphibia-one example of a *frog*.**

**4.7.1 Osteichthyes-one example of a *bony fish*.**

**4.10 Transport systems of a mammal.**

**4.10.1 Blood circulatory system.**

Heart: *internal structure*, cardiac cycle, but not S.A. node or "pace-maker".

Structure and functions of arteries, capillaries, veins.

Plan of double circulation with main arteries and veins and organs served. *Observe main arteries and veins in a dissected mammal.*

*Observation of the action of the valves of the heart of a large mammal*.

**4.10.2 Lymphatic system: brief introduction.**

**5. PLANT ORGANISATION: ANATOMY AND PHYSIOLOGY OF ANGIOSPERMS**

**5.1 Structure and functions of plant organs and tissues.**

Where applicable, the relationship of structure to function and their relationship to environment should be emphasised.

**5.1.1 Embryonic tissue**

Apical meristem gives rise to differentiated tissues and organs. *(No details of apical meristem required.)*

Site of primary growth.

**5.1.2 Permanent tissue**

Structure and functions of *epidermis*, including stomata; *parenchyma*, including chlorenchyma; collenchyma; sclerenchyma; xylem; phloem.

**5.1.3 *Observation of the above tissue in suitable preparations.**

Making of simple wet mounts, but not permanent preparations, for microscopic study.*

**5.1.4 *The anatomy of a young dicotyledonous root as seen in transverse section to:"**
(a) show the arrangement of tissues in plan;
(b) show the types of cells of the tissues."

Functions of the various tissues *(Secondary growth not to be included)*

5.1.5 *Anatomy of a young monocotyledonous stem and a dicotyledonous stem, as seen in transverse section to:
(a) show the arrangement of tissues in plan;
(b) show the types of cells of the tissues."

Functions of the various tissues. Secondary thickening of a dicotyledonous stem as illustrated by a plan only of a transverse section of such a stem.

5.1.6 *Anatomy of a dorsiventral dicotyledonous leaf as seen in transverse section to:
(a) show the arrangement of tissues in plan;
(b) show the types of cells of the tissues."

Functions of the various tissues.

5.2 Transpiration
The process of transpiration in relation to the anatomy of plants; its functional significance.

6. THE EXAMINATION: STANDARD 8

6.1 The promotion examination will be of 3 hours duration.

6.2 The paper will consist of the following sections:
Section A: A compulsory section on questions of an objective type to which the answers are short but which require reasoning as well as memory work.
Total 60 marks
Section B: Each question divided into 2 to 5 subsections.
At least 7 questions of at least 45 marks each are set of which FOUR must be answered.

6.3 Practical Work: 30 marks for the task book in which pupils' experiments and observations are recorded.

6.4 Year Marks: 30 marks for examinations and class tests taken during the year.

6.5 The total mark for the examination 300 marks

6.6 Summary of mark division:
Year mark 30 marks
Practical work 30 marks
Section A 60 marks
Section B *(4 x 45)* 180 marks
Total 300 marks

6.7 Pupils must be able to sketch diagrammatic drawings with labels. No involved drawing in perspective, or with light and shade effect is required.

6.8 The examination questions on the standard grade will be more direct and less demanding than those on the Higher Grade, but will nevertheless test insight and comprehension as well as factual knowledge. Differentiation between the Higher and Standard syllabuses will largely be determined by the type of questions set.

STANDARDS 9 AND 10

1. STRUCTURE AND PROPERTIES OF MATTER

1.1 Acids and bases: an acid simply interpreted as a hydrogen containing compound which yields hydrogen ions (hydronium ions) in aqueous solution. A base simply interpreted as a compound which yields hydroxyl ions in solution.

Mention only, without referring to their origin, the ions which are formed in the following cases: hydrochloric acid and sodium bicarbonate. pH-values as indications of acidity and alkalinity. Neutralisation.

1.2 Inorganic nutrients: of the many substances which may be present, a few are really essential: distinction between essential macro- and micro-nutrients and indication of the similarities and the differences in this respect between plants and animals. The significance of the following elements for living organisms: carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorous, magnesium, calcium, potassium, sodium and chlorine.

1.3 Dispersion systems: True solutions and colloidal systems as applicable to the cell (See paragraph 2).

1.4 Organic compounds
Memorisation and identification of individual formulae of organic compounds are not required. This section must, however, be taught by using structural formulae and/or suitable models.

1.4.1 Carbon bonding leading to the formation of organic molecules as applied to
(a) the alkanes: methane, ethane, propane and normal butane;
(b) the alcohols: methanol, ethanol, 1-propanol and 1-, 2-, 3-propanetriol, 1-butanol;
(c) the mono-carboxylic acids: methanoic, ethanoic, propanoic and butanoic acids.

1.4.2 Carbohydrates
Composition: C, H and O compounds with H:O ratio of 2:1. Monosaccharides, with 5 or 6 carbon atoms in the molecule e.g. glucose \( \text{C}_6\text{H}_{12}\text{O}_6 \); ribose \( \text{C}_5\text{H}_{10}\text{O}_5 \).
Disaccharides and polysaccharides synthesized from monosaccharides by elimination of water molecule(s). (Illustrate by referring to structural formulae.)
Reversibility of these reactions—hydrolysis. A test for starch and test for glucose.
Physical property: solubility. (Except for the largest molecules e.g. starch and cellulose, carbohydrates are usually readily soluble in water.) Biological importance: reserve energy source; structural components of cellulose cell walls and of nucleic acids.
Storage in seeds and other storage organs in plants.

1.4.3 Lipids (fats and oils)
Composition: C, H and O-compounds, but ratio of H to O is a great deal higher than 2:1.
1.4.4 Proteins

Composition: simple proteins - compounds containing C, H, O, N and other elements e.g. P and S.

Amino acids: monomers (building blocks) of proteins.

Proteins differ from each other with regard to:
- the amino acids of which they are composed,
- the arrangement of these acids and their configuration.

Physical properties: macro-molecules, form colloidal systems, sensitive to temperature and pH.

Biological importance: building blocks of organisms and structural components of membranes; reserve energy source; enzymes.

2. THE CELL (PLANT AND ANIMAL CELL)

2.1 Generalised cell as interpreted from electron micrographs. Diagramatic representation.

2.1.1 Protoplasm: physical properties; chemical composition: water and proteins the main constituents.

2.1.2 Cell wall: a product of protoplasm; functions.

2.1.3 Cytoplasm: cell membrane; endoplasmic reticulum; plastids (Chloroplasts, chromatoplasts, leucoplasts); mitochondria.

Limited to site and function (no structure) of the above mentioned.

2.1.4 Vacuoles: functions, viz. mechanical support, storage of water, dissolved salts and other materials, including wastes.

2.1.5 Ribosomes: occurrence

2.1.6 Centrosomes: occurrence

Nucleus: nuclear membrane; chromosomes; nucleolus; functions

2.2 Cell division

Mitosis: outline of the process and its importance.

Meiosis: Outline of the process. The role of meiosis in relation to reproduction and alternation of generations.

2.3 The cell and heredity

2.3.1 Nucleic acids

Polymers of nucleotides - sugar, phosphate and organic nitrogenous bases.

Diagrammatic representation of a short length of the DNA-molecule.

Distinguish between DNA and RNA: nitrogenous bases and sugar.

Replication of DNA.

Occurence: DNA in chromosomes.

Function of RNA: control of protein synthesis.

(Details and mechanisms of protein synthesis are not required.)

2.3.2 The chromosome as the carrier of DNA. The DNA molecule as hereditary material.

2.3.3 Monohybrid crosses with and without dominance.

Monohybrid crosses: F₁, F₂ and F₃ generations.

Mendel's Principle of Segregation.

3. ENERGY AND THE BIOLOGICAL ENERGY PATHWAYS

3.1 Chlorophyll

Chlorophyll in sunlight and the conversion of radiant energy to chemical energy.

3.2 Enzymes as proteins and as organic catalysts.

Their role in metabolism; specificity of enzymes; their sensitivity to temperature, pH; the concept co-enzyme.

3.3 Energy carriers

ATP a well known example. The absorption of energy when ADP combines with phosphate to form ATP. Energy is again released when ATP is changed to ADP. (No further chemical details are required.)

3.4 Use of energy

Work in cells, e.g. active intake and excretion, synthesis of larger molecules, movement of cytoplasm, contraction e.g. of muscles, causing movement of organism. Energy needed for all life processes of protoplasm.

3.5 Photosynthesis

The process involves two phases:

3.5.1 Photolysis (Light phase) - conversion of light energy to chemical energy.

3.5.2 The Dark Reaction - utilization of the products of the light reaction for the formation of organic material, e.g. sugars.

(Details of the biochemical pathways not required.)

3.6 Food storage in plant

Necessity for storage in insoluble form.

Hydrolysis of proteins, carbohydrates and fats by enzymes for translocation.

*Food tests applied to storage organs*

3.7 Respiration

A simple treatment of the stepwise breakdown of glucose.

3.7.1 Glycolysis

A process, occurring in the cytoplasm outside the mitochondria during which large energy-rich organic molecules such as glucose, a 6-carbon compound, are converted to a 2-carbon compound called pyruvic acid. During glycolysis a little energy is released and this is trapped in ATP. Under anaerobic conditions fermentation takes place.

(No further details of the biochemical pathways are required.)
3.7.2 Tri-carboxylic-acid cycle (Kreb's Cycle):
This is the main energy-releasing phase of respiration and occurs in the mitochondria where all the necessary enzymes are present. Acetyl-CoA (co-enzyme A) formed by glycolysis enters the mitochondria where it is incorporated into a cycle of reactions with the following results: carbon dioxide is released and energised hydrogen is removed from the substrate and accepted by co-enzymes. (No further details of the biochemical pathways are required)

3.7.3 Oxidative phosphorylation:
Energy is released from the co-enzymes which carries hydrogen and much of this is trapped in ATP. Hydrogen removed from the co-enzyme, which carries hydrogen, is transferred to molecular oxygen which serves as the final hydrogen acceptor, forming water. (No further details are required)

3.8 Gaseous exchanges related to respiration and photosynthesis:
Removal of waste products of respiration, notably carbon dioxide, from one-celled organisms into surrounding medium by diffusion; from multicellular plants by diffusion often through stomata from cells and air space systems; in multicellular animals by diffusion into tissue fluid, then often accelerated by blood circulation. Corresponding routes by which oxygen reaches respiring cells of plants and animals.

4. DIVERSITY OF ORGANISMS

4.1 Viruses:
Biological importance

4.2 The Plant Kingdom

4.2.1 Schizophyta (Bacteria only):
Distinguishing characteristics and reproduction. Nutrition of heterotrophic bacteria, viz. nitrogen-fixing bacteria, saprophytic and parasitic bacteria. Bacteria useful or harmful to man.

4.2.2 Mycophyta:
Distinguishing characteristics. *Habitat; structure; mode of nutrition; life cycle of a mould*.

4.2.3 Phycoiphyta:
Distinguishing characteristics. *Habitat; structure; mode of nutrition; life cycle of a unicellular and a filamentous alga*.

4.2.4 Bryophyta:
Distinguishing characteristics. *Habitat, structure, macroscopic but archegonia and antheridia by means of micro-slides*, mode of nutrition and life cycle of one example of a named moss.

4.2.5 Pteridophyta:
Distinguishing characteristics. *Habitat, structure (as for Bryophyta)*, mode of nutrition and life cycle of one example of the class Filicinae.

4.2.6 Spermatophyta:
Distinguishing characteristics.

4.2.6.1 Gymnospermae:
Distinguishing characteristics. *Habitat, external structure and life-cycle of Pinus (The pine)*. (Particulars of the development of the male and female gametophytes are not required)

4.2.6.2 Angiospermae:
(a) Distinguishing characteristics
(b) Typical life-cycle of an angiosperm with double fertilisation (Particulars of the development of the male and female gametophytes are not required)
(c) Formation of seeds, embryo, endosperm, testa
(d) Development and functions of parts of a seed during germination*
(e) *Structure of a flower of a monocotyledonous family: Liliaceae or Amaryllidaceae*.
(f) *Structure of a flower of a dicotyledonous family: Leguminosae or Cruciferae*

5. Plant-water relations

5.1 Water potential as a property which is characteristic of water, watery solutions, e.g. cell sap and soil solutions, which causes the movement of water molecules in a specific direction, through a differentially permeable membrane.

5.2 Diffusion of water as a result of the difference in water potential on either side of the differentially permeable membrane.

5.3 The concept that a lower water potential in the cell sap causes the absorption of water from a solution with a higher potential with the resultant increase in volume and in pressure inside the cell, against the cell wall.

5.4 The factors which determine the water potential inside a living cell: Concentration of dissolved substances in the cell sap, cell wall pressure.

5.5 The inter-relationship between the water potential of the cell sap in a vacuole and the concentration of the dissolved substances in the cell sap, and cell wall pressure.

Turgor pressure and cell wall pressure. (The use of the term and concept: osmotic potential, is not required. No further details are expected).

5.6 Transpiration:
The process of transpiration in relation to the anatomy of the plants mentioned above, and its functional significance.

Only the mechanisms of the function of the stomata, without any biochemical explanation of the process, is required.

The relationship between sunken stomata; hair; cuticle; shape, size and arrangement of leaves, and transpiration.

Movement of water from the xylem tissue through the mesophyll cells and via the substomatal cavity, to the atmosphere.

5.7 Movement of water through plants:
Movement of water into xylem. Path of water.
Mechanisms of water movement in xylem. Relationship of these processes to structural suitability of xylem and to water potential. Root pressure, guttation.

5.8 *Structural and physiological features of hydrophytes and xerophytes.

Devices found in plants which enable them to live successfully in wet or dry environment respectively.

6. CHEMICAL CO-ORDINATION IN PLANTS

6.1 Auxins with regard to growth in the tips of stems and roots.

6.2 *Experimental demonstrations of geotropism in roots and stems and of phototropism in stems.*

7. DIVERSITY OF ANIMALS

Although a detailed study is made of one example of each phylum/class/sub-class, reference must also be made to other animals belonging to the particular group. *Distinguishing characteristics of the phyla mentioned in paragraph 7.1 to 7.6 must receive the necessary attention.*

7.1 Phylum - Protostomia: *Amoeba*

Nutrition - Ingestion, intracellular digestion, absorption, excretion.

Excretion - role of contractile vacuole in osmoregulation, excretion of nitrogenous waste and carbon dioxide by diffusion.

Reproduction - by binary fission.

7.2 Phylum - Platyhelminthes: *Planaria*

Nutrition - one opening, ingestion, intracellular digestion; importance of a flattened body and a branched alimentary canal.

Respiration - through body surface. Cells exchange gases directly by diffusion. Significance of flattened body - form.

Reproduction - by regeneration and sexual reproduction without detailed structure of organs.

7.3 Phylum - Coelenterata: *Hydra*

Nerve plexus and nerve responses; relationship to radial symmetry.

Reproduction - simple outline of budding and of sexual reproduction without detailed structure of organs.

Nutrition - mode of feeding: one opening, ingestion, extracellular and intracellular digestion; significance of radial symmetry.

7.4 Phylum - Annelida: *Earthworm*

Nutrition - ingestion; through gut (no details of its parts) and coelom; significance of both.

*Transverse-section*

Excretion - role of nephridia in osmoregulation and excretion.

Respiration - moist body surface; blood with pigment for transport of gases.

Reproduction - sexual, no details of structure of organs.

Significance of hermaphroditism.

7.5 Phylum - Arthropoda

7.5.1 Class - Insecta: *Locust*

Reproduction - sexual; external sex differences; oviparity.

Metamorphosis in insects; significance of complete and incomplete metamorphosis, but detailed study not required.

Nervous system - centralised, sensory organs at anterior end, relationship to bilateral symmetry.

Structure of compound eye.

Respiration - terrestrial, with gaseous exchange organs inside limiting deccoration; air carried directly to tissues by trachea and tracheoles.

Mechanism of breathing.

Blood not used for transport of gases.

Feeding habits of an insect with biting mouthparts.

7.5.2 Distinguishing characteristics of the arthropod classes: Crustacea, Insecta and Arachnida.

7.6 Phylum - Mollusca: *The snail*

Gaseous exchange - breathing.

Reproduction - hermaphroditism involving only one gonad; cross-fertilisation.

7.7 Phylum - Chordata

7.7.1 Sub-phylum Vertebrata

Distinguishing characteristics of this sub-phyllum.

7.7.2 A general survey of the methods of reproduction and of breathing mechanisms (gaseous exchange), referring to one example of each of the following classes and/or sub-classes:

(a) Osteichthyes - "any bony fish*.

(b) Amphibia - "a frog, a toad, a tadpole, anuran, a frog, a toad, a tadpole, anuran, a frog.*

(c) Reptilia - "lizard or chameleonic".

(d) Aves - *any bird*.

(e) Mammalia - *rat, rabbit, guinea pig or other small mammal.*

Note:

A detailed study of the organs is not required.

In the study of reproduction refer to internal and external fertilisation, oviparity, ovovivipary, vivipary.

7.7.3 A summary of the distinguishing characteristics of the classes or sub-classes of the Vertebrata determined by means of a comparative study under the following headings:

(a) Structure: division of body, form of body

(b) Body covering: macroscopic characteristics and origin

(c) Appendages: kinds, position of limbs with regard to movement. *No details with regard to the structure of the skeleton, with exception of mammals are required.*

(d) Locomotion.

(e) Methods of reproduction.

(f) Breathing.

Note:

This section also refers to work already done in Standard 8.
8. THE BODY OF MAN WITH AN INTERNAL ORGANISATION TYPICAL OF MAMMALLIA

8.1 Mammalian Tissues:
Review connective and muscle tissue (in standard 8 syllabus)
Epithelium — through which exchanges take place and which protects, as in skin.
Location, structure and functions of the following in a mammal:
Squamous, cuboidal, columnar, ciliated and stratified epithelia.
Nerve tissue, including sensory and motor neurons.

8.2 Respiration:
Organs for gaseous exchange enclosed, preventing desiccation.
Structure of *respiratory tract and lungs* with details of alveoli.
Inhalation and exhalation. *Simple experiments to demonstrate mechanism of breathing*.
Gaseous exchange at lung and tissue surfaces.
Transport of gases by blood; the function of haemoglobin.

8.3 Nutrition and fate of foods:
*Main parts of alimentary canal with associated glands*.
Digestive glands as invaginations of wall of gut lined by epithelia.
Need for digestion; mastication; peristalsis; main constituents of digestive juices and their functions, including enzyme action.
*Experiments on digestion by salivary amylase and by pepsin*.
Importance of water in digestion.
*Structure of villi*.
Absorption and fate of products of digestion.
Main functions of liver.
Defaecation.

8.4 Excretion; homeostasis:
Necessity for maintenance of constant internal environment of cells.
*Kidney, external and internal structure (macroscopic)*.
Structure and function of nephron in osmoregulation and excretion.

8.5 The Skin:
*Structure*; its role in excretion and maintenance of constant body temperature.
Significance of constant temperature for efficient enzyme action.

8.6 Lymphatic system:
Functions; drainage of tissue fluid; removal of toxins and bacteria and manufacture of white corpuscles; transport of food.

8.7 Reproduction:
Gametogenesis and gamete formation.
Internal fertilisation; implantation and embryonic development up to the blastula stage.
Allantois, amnion, chorion, yolk sac, placenta and their functions.

8.8 Nervous co-ordination

8.8.1 Nerve tissue: structure of a neuron
8.8.2 Central nervous system

(a) Brain: Functions only of cerebrum, cerebellum, and medulla oblongata.
(b) Spinal cord: functions only.

8.8.3 The reflex arc as the structural basis for the functioning of the nervous system.
8.8.4 Structure and functions of the eye and ear illustrated by models.
8.8.5 The functions only of skin, taste and smell receptors.

8.9 Chemical co-ordination
Position and the important endocrine function of:
the hypophysis (growth hormone, FSH, LH only)
the thyroid (thyroxine only)
the islets of Langerhans (insulin only)
the duodenal wall (secretin only)
the adrenals (adrenaline and cortisone only)
the gonads (testosterone and oestrogen only)

8.10 *Dissection of a small mammal with identification of main organs of abdominal and thoracic cavities*.

9. ECOLOGY

9.1 The scope of ecology.
9.2 The ecosystem
9.2.1 The concept of the ecosystem.
9.2.2 The changing structure of the ecosystem, with emphasis on the relationships of the components with the whole:
(a) Abiotic components: physical factors viz. temperature, light, water, atmospheric gases, edaphic and physiographic factors.
(b) Biotic components: producers, consumers: herbivores, predators, omnivores, decomposers.
9.2.3 Food chains. Diatoms.
9.2.4 Energy flow: recycling; nitrogen and carbon cycles.
9.3 Interaction in the ecosystem:
9.3.1 Competition.
9.3.2 Symbiosis, mutualism, commensalism and parasitism (concepts only referring to examples; details of type studies not required).
9.3.3 Predation
9.4 Man and the ecosystem
9.4.1 At least two examples of each of the following: air pollution; water pollution; and land pollution to emphasize the need for nature conservation.
9.4.2 The necessity for conserving the indigenous flora and fauna.
10. THE EXAMINATION

10.1 The standard 9 promotion examination will be on the work of one year only with the proviso that basic concepts and principles dealt with during the standard 8 year will not be excluded.

10.2 The final standard 10 examination will cover only the work prescribed for standards 9 and 10.

10.3 The standard 9 promotion examination and the final standard 10 examination will both be of 3 hours duration.

10.4 The standard 9 and 10 papers will consist of the following two sections:
   - Section A: A compulsory section of questions of an objective nature which require both reasoning and memory work. The questions may relate to any part of the syllabus.
   - Mark division as follows:
     - Standard 9: 70 marks
     - Standard 10: 75 marks
   - Section B: Each question is divided into 2 to 5 sections.
   - Mark division as follows:
     - Standard 9: at least 8 questions of 40 marks each of which FIVE must be answered.
     - Standard 10: at least 8 questions of 45 marks each of which FIVE must be answered.

10.5 Practical work
   - Standard 9: 30 marks (of the total) for the workbook in which the pupil's experiments and observations are recorded.
   - Standard 10: no marks for practical work are taken into account in the final examination.

10.6 Year mark
   - Standards 9 and 10: no cumulative mark is taken into account.

10.7 The total number of marks in the examination will be 300.

10.8 Summary of the division of marks:

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<th>Standard 9</th>
<th>Standard 10</th>
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<td>Section A of paper</td>
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<tr>
<td>Section B of paper</td>
<td>5 x 40 200</td>
<td>5 x 45 225</td>
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<tr>
<td>TOTAL</td>
<td>300</td>
<td>300</td>
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10.9 Pupils must be able to sketch diagrammatically with labels. No involved drawings in perspective or with light and dark effect will be expected.

10.10 The examination questions on the Standard Grade syllabus will be more direct and less demanding than in the case of the Higher Grade syllabus but insight and comprehension will nevertheless be tested. Differentiation between the higher and lower grades will in large measure be determined by the type of question which will be set.
FITMAST PROJECT

BOTANY SYLLABUS

Presented by: Dept. of Botany, University of the Western Cape

1. The Physical Basis of Life: J. Aalbers and L.M. Raitt
   Matter, Energy and Life

   1.1 Matter: Classification, states of and structure.
   1.2 Chemical Bonds: Classification.
   1.3 Chemical Reactions: Patterns of; the course and mechanism of;
      factors influencing pH and buffers.
   1.4 Colloidal Systems: Classification, properties, practical applications.
   1.5 Diffusion and Osmosis: Osmotic quantities, membranes.
   1.6 Organic substances in living organisms: carbohydrates, lipids,
      proteins and nucleic acids.
   1.7 Enzymes: Nature, properties and action.

2. Ecology: Dr. J.G. Smith
   The link between the natural and the social sciences.

   2.1 The scope of Ecology (Chapter 1)
   2.2 The Ecosystem (Chapter 2)
   2.3 Energy flow within the Ecosystem. Food Chains, etc. (Chapter 3)
   2.4 Biogeochemical cycles (Chapter 4)
   2.5 Population Ecology (Chapter 5)
      Only: Competition p128
      Predation p135
      Parasitism p139
      Positive Interaction p146
   2.6 Ecology and Man (Chapter 6)
      Resource, Pollution.
      Ecosystem management.
3. **Energetics and Cell Physiology**: J. Aalbers and L.M. Raitt

Textbook: as in 1

3.1 **Energy**: forms of; conversions.

3.2 **Photosynthesis**: chloroplasts and light, electron transfer and photosynthetic phosphorylation, the Calvin Cycle, the $C_4$ pathway, CAM-pathway, photo-respiration.

3.3 **Respiration**: Glycolysis, Krebs Cycle, electron transfer, aerobic and anaerobic respiration.

3.4 **Anabolism**: Synthesis of carbohydrates, lipids and proteins.

4. **Morphology and Anatomy**: A. Joubert and F.M. Weitz

Textbook: Weier, T.E. et al. 1982

Botany. An introduction to Plant Biology.


John Wiley and Sons.

4.1 **Morphology**: Mr. F.M. Weitz

4.1.1 **Origin and structure of seed**

Different seed types and their germination.

4.1.2 **Organography of the root**

Characteristics
Functions
Root systems
Modified roots with secondary functions.

4.1.3 **Organography of the stem**

Characteristics
Functions
Stem types
Buds
Modified stems with secondary functions.

4.1.4 **Organography of the leaf**

Characteristics
Functions
Leaf types and arrangement
Leaf shape and venation
4.1.5 **Morphology of the flower**
The different floral parts.
Typical life cycle with double fertilization as an example.
Pollination and pollination mechanisms.

4.1.6 **Morphology of fruit**
Kinds of fruit.
Fruit and seed dispersal.

4.2 **Anatomy**: Mr. A. Joubert

4.2.1 **Meristems**
The root- and shoot apices.

4.2.2 **Permanent tissue**
Structure and functions of epidermis, collenchyma, sclerenchyma, xylem and phloem.

4.2.3 **Anatomy of a young dicotyledonous- and monocotyledonous root**
to illustrate the cell types and tissues with functions.

4.2.4 **Anatomy of a young dicotyledonous- and monocotyledonous stem**
to illustrate the cell types and tissues with functions.

4.2.5 **Secondary growth in a dicotyledonous stem**.

4.2.6 **Anatomy of a dorsiventral leaf** to illustrate the cell types and tissues with functions.

5. **Water relations and Mineral Nutrition**: J. Aalbers


5.1 **Uptake, transport and transpiration**
Water uptake by roots, cohesion of water theory, root pressure, transpiration, special adaptations in plants, phloem transport.

5.2 **Mineral Nutrition**
Soil, essential elements, passive and active uptake.
6. **Growth and Development in Plants**: L.M. Raitt

Textbook: as in 5.

6.1 **Plant Growth Substances**
- auxins, gibberellins, cytokinins, ethylene and abscisic acid.

6.2 **Control of Growth and Development**
- Growth substances, phytochrome, plant reactions to environmental factors.

7. **Systematics**: Messrs. F. Weitz and A. Joubert

Textbook: as in 4.

7.1 **Introduction to plant systematics**
- The concepts, taxonomy and systematics
- Historical review
- How plants are classified
- Methods of taxonomic research
- Fossil history and evolution of plants

7.2 **A systematic survey of the Plant Kingdom which reflects evolutionary tendencies**

7.2.1 **Viruses**
- Nature and structure of viruses
- Biological importance.

7.2.2 **Bacteria**
- General characteristics, structure, movement, reproduction, nutrition.
- Economic importance to man.

7.2.3 **Algae**
- Differentiating characters
- Broad outline of classification
- Life cycle of a unicellular- and filamentous alga.
- Economic importance.

7.2.4 **Fungi**
- Differentiating characters
- Broad outline of classification
- Life cycle of a few examples.
- Economic importance.
7.2.5 **Lichens**
Form and Structure
Symbiotic relationships.

7.2.6 **Mosses**
Differentiating characters.
Differences between Mosses and Algae.
Life cycle of a liverwort and a moss.

7.2.7 **Ferns**
Differentiating characters.
Broad outline of classification.
Life cycle of one example of the Filicinae.

7.2.8 **Gymnosperms**
Differentiating characters.
Broad outline of classification.
Life cycle of the pine.

7.2.9 **Angiosperms**
Differentiating characters.
Comparison of the angiosperm life cycle with a primitive plant.
Selected families of the dicotyledoneae.
Differences between mono- and dicotyledons.
Selected families of the monocotyledoneae.

8. **Didactics of Botany**
8.1 The experiment as exploration technique.
8.2 Laboratory techniques.
8.3 Media utilization.
8.4 Evaluation.

9. **Cytology** Covered by the Zoology Department of U.W.C.
FITMAST PROJECT

SYLLABUS: ZOOLOGY

Lecturers

Prof. C.J. Leonard
Dr. M.D. Hofmeyr
Mr. B. de Vries
Mrs. M. Moore
Prof. G. van der Horst

Dept. of Zoology UWC

Prescribed handbooks

Ryke, P.A.J. - Dierkunde; n funksionele benadering
van Rensburg et al - Practical Animal Anatomy

1.00 Cytology

1.10 The cell theory
1.20 The ultrastructure of eukaryote cells:
   1.21 Plasmamembrane
   1.22 Mitochondria
   1.23 Endoplasmic reticulum and ribosomes
   1.24 Golgi-apparatus
   1.25 Lysosomes
   1.26 Peroxysomes
   1.27 Plastids
   1.28 Microtubules and microfilaments
   1.29 Cilia and related structures
1.30 The nuclues
1.40 Cell diversity
1.50 Movement into and out of cells
1.60 Ultrastructure of prokaryote cells
1.70 Didactic component
   1.71 Microscopic examination of cells
   1.72 Making transparencies for use in school
   1.73 Building models of the cell for classroom use.
2.10 Protozoa
   2.11 Examples of Protozoa from different classes.
   2.12 Biology of selected example(s).
   2.13 Practicals: a) Examination of living Protozoa
                   b) Examination of slides
                   c) Hints re presentation in school

2.20 Introduction to the Metazoa
   Evolutionary trends within this group.

2.30 Coelenterata
   2.31 Diploblastic organization
   2.32 Three classes with examples
   2.33 Obelia, with special reference to colony formation and
        polymorphism.
   2.34 Practicals:
        a) Examples of Coelenterata
        b) Method of presentation in school

2.40 Introduction to the Bilateria
   2.41 Triploblastic organization
   2.42 Acoelomate condition
   2.43 Pseudocoelomate condition
   2.44 Coelomate condition
        a) Origin of coelomate plan
        b) Basic circulatory system
        c) Excretory and reproductive ducts and their relation to the
           coelome.

2.50 Platyhelminthes
2.60 **Annelida**

2.61 General characteristics
2.62 Classification
2.63 Morphology and biology of *Lumbricus*
2.64 Practicals:
   a) Dissection of earthworm or other suitable examples.
   b) Method of presentation in school.

2.70 **Arthropoda**

2.71 General characteristics
2.72 Classification
2.73 Comparative morphology of representatives from the classes
Crustacea, Insecta, Chilopoda, Diplopoda and Arachnida.
2.74 Practicals:
   a) Identification of suitable examples
   b) Dissections to illustrate lectures
   c) Hints re presentation in school.

2.80 **Mollusca**

2.81 General characteristics
2.82 Classification
2.83 Morphology and biology of *Helix aspersa*
2.84 Practicals:
   a) Representatives from classes Amphineura, Scaphopoda, Gastropoda,
      Bivalvia and Cephalopoda.
   b) Dissection of *Helix aspersa*
   c) Hints re presentation in school.

2.90 **Phylum: Chordata**

2.91 Characters, origin and basic body plan
2.92 **Subphylum: Vertebrata:**
Characters, subdivision into classes and the emergence of classes
in time.
2.93 **Cyclostomata:** Classification, characters and general biology.
2.94 **Chondrichthyes:** Classification, characters and general biology.
2.95 **Osteichthyes**: Classification, characters and general biology of a few examples.
2.96 **Amphibia**: Classification, characters and general biology.
2.97 **Reptilia**: Classification, characters and general biology.
2.98 **Aves**: Classification, characters and general biology.
2.99 **Mammalia**: Classification, characters and general biology.

3.00 **Systems (Biology of -)**

3.10 **Feeding and Digestion**: The alimentary canal and associated glands. Food-requirements, digestion and absorption.
3.20 **Respiration**: Concepts internal and external respiration, structure of air passages, respiratory movements, transport of respiratory gases in blood.
3.40 **Urogenital system**: Ontogeny of organs and ducts. Mutual relationships of the ducts and their positions relative to the coelome. Structure and function of the vertebrate kidney. Water metabolism and excretion.
3.50 **Nervous- and chemical control**: Ontogeny and morphology of the two systems. Functioning and integration of the two systems. Special senses: The eye, The ear, Taste and Smell.
3.60 **Skeleton, Muscles and Integument**: Levers, muscle contraction.
3.70 **Basic histology of tissues**
3.80 **Basic Embryology**: Gastrulation and origin of extra-embryonic membranes. Introduction to organogenesis.

4.00 **Animal Physiology**

4.10 **Feeding and Digestion**: Comparative overview of feeding and a summary of digestion in mammals.
4.20 **Oxygen**: Respiration, functions of blood, \( O_2 \)-uptake and metabolic rate.
4.30 Temperature: Thermoregulation in poikilothermic and homoiothermic animals.

4.40 Water: Water, solutes and osmosis. Osmoregulation in aquatic and terrestrial animals; renal function.

4.50 Muscles: Mechanism of muscle contraction; histology of muscle.

4.60 Nervous system: Neurons and impulse conduction.

4.70 Practicals.

5.00 Genetics

5.10 Cell division: Mitosis and Meiosis

5.20 Mendel's laws (Classic Genetics)

5.30 Sex linkage

5.40 Mutations

5.60 Methods of presentation in school

6.00 Didactics of Biology

6.1 Hints regarding the presentation of practicals in school

6.2 Technology in teaching and optimal media use

6.3 Evaluation techniques.
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**SESSIONS**

Pouses van tot 10 minute per sessie word voorsien.
Breaks of up to 10 minutes per session are envisaged.

Aandsessies gereël te word tydens die eerste week, vir die duur van kontaktyd.
Evening sessions to be arranged during the first week, for all of the contact session.

Dosente pas hul praktika in soos hulle goed dink.
Lecturers fit in their practical classes at their own discretion.

**LOKAAL/VENUE**

Voorlesingkamer: D29
Laboratorium: D124
(In die Zoologie-gebou/In the Zoology block)
LABORATORIUM-ASSISTENTE: Mnr. M.G. Hendricks en R. Lakay.

DOSENTEN/LECTURERS

CJL = Prof. C.J. Leonard  
BdV = Mnr. J.B. de Vries  
EP = Mej. E. Pretorius

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WERKSTUIKJE/ASSIGNMENTS

S/87/5 Modules 16, 18, 19, 20 EP  
S/87/6 Module 14 CJL  
S/87/7 Modules 14, 15, 17 CJL + BdV