

A COMPARISON OF THEORETICAL
AND PRACTICAL APPROACHES TO
THE TEACHING OF ANATOMY AT
"UNIVERSIDADE EDUARDO
MUNIZ" IN MOZAMBIQUE

MARIA ALEXANDRA FERNANDES RODRIGUES

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Maria Alexandra Fernandes Rodrigues

**Dissertation submitted to the Faculty of Health Sciences, University of the
Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree
of Master of Science in Medicine**

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DECLARATION

I, Maria Alexandra Fernandes Rodrigues, declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Science in Medicine in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

____ day of _____ 1999

In memory of

My brother

Agostinho N. F. Rodrigues

1953- 1997

My mother

Tereza N. M. F. Rodrigues

1930-1995

My father

Joaquim T.G. Rodrigues

1923-1973

Publications and Presentations

1. Rodrigues, M., Mitchell, J. & Manning, D. 1998. Percepção dos estudantes de medicina sobre a eficácia da dissecação como método de ensino em Anatomia, na Faculdade de Medicina da Universidade Eduardo Mondlane; Seminário da Associação Moçambicana de Investigação em Educação em Matemática e Ciências (AMIEMAC), 1998 April 18th; Maputo; Mozambique.

2. Rodrigues, M., Mitchell, J. & Manning, D. 1998. Does dissection make a difference to the teaching-learning process of Anatomy at UEM? 28th Congress of the Anatomical Society of Southern Africa (ASSA); 1998 July 7-10; Maputo; Mozambique.

ABSTRACT

During the academic year of 1997/98, two randomised groups of second year medical students at Universidade Eduardo Mondlane in Maputo learned gross anatomy of the limbs and the trunk by different teaching approaches. One group (A) dissected the thorax for 5 weeks according to an experimental programme, while the other (group B) worked on the same topic in the traditional way at UEM, which excluded dissection. The groups learned the abdomen by reversing the methods. For the study of the limbs, all the students learned the upper limbs by using the traditional approach while the lower limbs were dissected. Study guides were supplied to the Experimental Group and each of the practical classes started with a ten-minute preparatory tutorial when the structures to be studied were discussed. The same amount of time and the same background were given to both groups. At the end of the semester all students were examined by written and practical tests. The mean differences in the tests were statistically significant ($p > 0.001$) only in the case of the practical test on the anatomy of the limbs, favouring the Experimental Group. Pre-questionnaires and post-questionnaires were completed before and after the experimentation. The combination of lectures, tutorials and dissection was the most preferred teaching approach. The students' comments indicated that they felt that dissection enhanced the learning despite the short time devoted to it. On the other hand, dissection can enhance other skills which will be very useful later in pathology, surgery and in the patient/doctor relationship in a way not possible to achieve by means of tutorials, or even prosections. Therefore, these results suggest that dissection could be a useful complementary teaching approach at UEM in addition to lectures and tutorials in Anatomy.

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CHAPTER 1

INTRODUCTION

This chapter provides an overview of the context in which the research was carried out. The purpose of the research questions as well as the limitations of the study are also presented.

1.1 BACKGROUND TO THE STUDY

Mozambique, situated in Southern Africa, became independent from Portugal in 1975. In 1995, the population was estimated at 16 million people, with an average annual population growth rate of 2.7 percent (Direcção Nacional de Estatística, Maputo, 1995).

The education system of Mozambique consists of three levels: the (compulsory) primary cycle covers 7 years; the secondary cycle covers 5 years, with grades 8-10 being lower secondary, and grades 11 and 12 upper secondary or pre-university; and tertiary education. For tertiary education there are six institutions offering university degrees but the Universidade Eduardo Mondlane (UEM) is the only one in Mozambique that graduates medical doctors.

In the education system, all schools are co-educational and as Mozambique is a Portuguese-speaking country, the medium of instruction at all levels of schooling is the official language, Portuguese.

1.1.1 The Universidade Eduardo Mondlane (UEM)

The Universidade Eduardo Mondlane (UEM) was founded in 1962, during the colonial era and it is the oldest and the largest university in the country. UEM comprises nine Faculties (Engineering, Architecture, Economics, Sciences, Arts, Veterinary, Medicine, Agronomy, and Social Science), and offers twenty one degree programmes of five years duration each, with the exception of the course for medical doctors which extends over seven years.

The student population of UEM is about 6 000 students with a ratio of one female to three male students. Annually, about 800 to 900 students enrol in the different courses offered at UEM but only about 200 students graduate in all Faculties.

The academic year starts on August 1, and is divided in two semesters: the first semester covers the period from August to December and the second semester runs from February to June. Each semester comprises 16 weeks of active teaching, followed by a period of examinations.

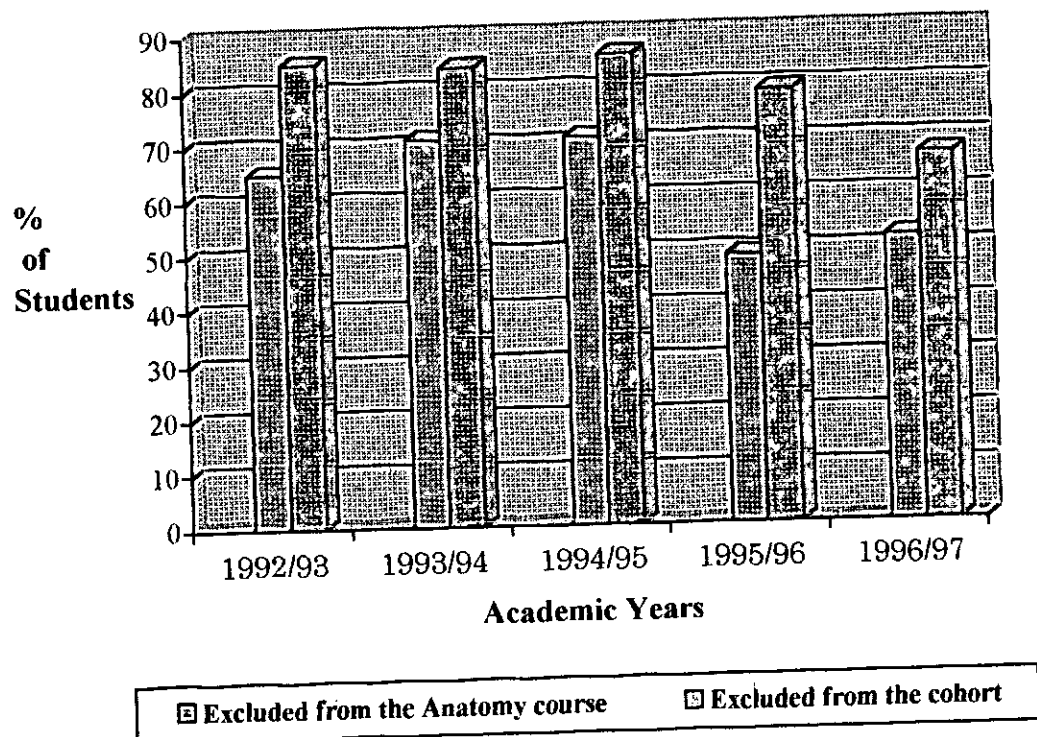
1.1.2 The Faculty of Medicine

The Medical curriculum consists of six semesters (the first three years) for pre-clinical subjects, followed by six semesters (the fourth, fifth and sixth years) for

clinical courses and finally a full year (the seventh year) of residency. To achieve the aims described in the curriculum, conventional teaching approaches, which include lectures, non-clinical teaching (seminars, tutorials and laboratory practicals) and clinical teaching (bed-side and community-medicine approaches) are used.

Annually, the Faculty of Medicine admits about 80 new students and graduates 20-30 medical doctors. Most of the medical students drop out early in their training (during the pre-clinical cycle) because of bad results in Anatomy. For example, the students' failure rates in Anatomy during the last five years show that about 50% to 70% of students were excluded from the Anatomy course and 60 to 85% were excluded from the cohort, as can be seen in Figure 1.1.

Figure 1.1: Percentage of students excluded from the Anatomy course and from the cohort: 1992/93 to 1996/97



It appears that Anatomy is a critical subject, failure in which prevents a large percentage of medical students from continuing with their career. During the two academic years preceding this study, (95/96 and 96/97), the success rate has improved. However, it is still far from the expectations of both the University and the Government, which provides state sponsorship.

1.1.3 The Anatomy course content

At UEM, Human Anatomy is taught over two academic years, i.e., in the first and second years of study. The syllabus for the first year comprises General (Basic) Anatomy and Gross Anatomy of the head, neck and upper limbs. For the second year, the syllabus comprises Gross Anatomy of the thorax, abdomen, lower limbs and nervous system. The topics and the number of weeks allocated to each are summarised in Table 1.1.

For each of the major sections of the body (head, neck, thorax, abdomen, limbs) the programme has been organised as follows:

- i) Musculo-skeletal framework (bones, joints, muscles and fascia, and how they are arranged together).
- ii) Vessels and nerves (from origin to termination and which structures are supplied by a specific vessel/nerve)
- iii) All regions (within the major divisions) are studied by considering the regional relations of the specific component structures and how the blood vessels and nerves supply it.

Table 1.1: Contents of Anatomy course and time spent on teaching the topics

FIRST YEAR			SECOND YEAR		
Topics		Weeks	Topics		Weeks
1.	Basic concepts	7	1.	Nervous System	13
2.	Head and Neck	18	2.	Trunk	12
2.1	Osteology	4	2.1	Osteology	1
2.2	Arthrology	1	2.2	Arthrology	1
2.3	Myology	3	2.3	Myology	1
2.4	Angiology	2	2.4	Angiology	1
2.5	Neurology	3	2.5	Neurology	1
2.6	Viscerology	3	2.6	Viscerology	7
2.7	Topography	2			
3.	Upper limb	5	3.	Lower limb	5
3.1	Osteology	2	3.1	Osteology	2
3.2	Arthrology	0.5	3.2	Arthrology	0.5
3.3	Myology	1	3.3	Myology	1
3.4	Angiology	1	3.4	Angiology	1
3.5	Neurology	0.5	3.5	Neurology	0.5
4.	Assessment	2	4.	Assessment	2
Total		32	Total		32

Because the programme has both regional and systematic elements linked together it does not follow one particular textbook. Both types of textbook (regional and systematic) are useful.

In 1996, it became possible to change the medical curriculum, as new opportunities became available to the Department of Anatomy at UEM. An additional semester (16 weeks) of Anatomy was introduced into the first-year Medical course during the academic year of 1995/96. This meant that the time allocated to the Anatomy course was increased from a total of 192 hours in the old curriculum to 256 hours in the new curriculum. However, it is still taught in the first and second years together with other pre-clinical subjects.

1.1.4 The teaching process of Anatomy at UEM

The procedure for teaching Anatomy at UEM varies considerably depending on the teaching aids and tutors' approaches. The teacher-centred style predominates with the tutor either giving a presentation, i.e., traditional lecturing, or engaging in teacher-student interactions, i.e., tutorials. Prosection is the most commonly used aid for demonstration purposes where possible, and it offers the students the opportunity of handling the specimens and discussing them between themselves under the guidance of their lecturer/ tutor.

Dissection of cadavers for learning Anatomy was unusual because of economical and technical difficulties and cultural practices in Mozambique which limited the acquisition of the bodies by the Department of Anatomy at UEM. The result was that only after approximately 20 years, in the academic year of 1997/98, dissection was reintroduced as a teaching procedure in this Department.

Lectures, the theoretical component of the course, are carried out in the traditional style (didactic lecture) and are held for the whole class. They serve three main goals:

- i) To emphasise important points of the topic.
- ii) To explain and clarify difficult parts of the topic.
- iii) To present important data that cannot be covered by the textbooks or handouts.

Attendance at the lectures is not compulsory, but the extra material presented (which is not included in the textbooks), is examinable. The average attendance is about 50-60% of the class.

Tutorials, as a practical component of the course, also represent an important part of the teaching process at UEM. These are held as a single two-hour session per week, for small groups, and serve two major functions:

- i) To discuss the most problematic parts of the material.
- ii) To solve different types of problems related to the topic. The latter function provides a tool for the continuous performance assessment of students and prepares them for the examination.

The number of students in the practical component of the course is about 15-18 students tutored by one lecturer.

1.1.5 The assessment procedure in the Anatomy course

During the academic year, students are assessed a number of times using written and practical tests. Each semester ends with written and practical tests covering the topics studied during the semester. The written test consists of a number of traditional multiple-choice questions (MCQs) using the standard format (five options and only one correct), and a number of true-false statements. The practical test consists of the identification of 40 anatomical structures presented as prosections.

The final mark for each student is obtained by combining the scores achieved in the tests and also in the oral assessments carried out by the lecturer during the practical classes. The formula used in the calculation of the final mark is:

$$\text{Final Mark} = 20\%(Wt_1) + 15\%(Wt_2) + 5\%(E) + 15\%(Pt_1) + 20\%(Pt_2) + 25\%(MP)$$

where:

Wt₁ = written test-1;

Wt₂ = written test-2;

Pt₁ = Practical test-1;

Pt₂ = Practical test-2;

E = Essay questions;

MP = Mean of Practical Assessment.

Those students who achieve a combined score equal to 10 marks (50%) or above, are admitted to a final examination consisting of a written and a practical test of the same format as the end-of-semester assessment.

The students, who achieve a mark equal to or above 10 (50%) in the combined written and practical examination, pass the subject. Those students who fail are allowed to take another examination. Those who fail a second time may repeat the course once more. However, any student who fails again is excluded from the Faculty for at least two academic years. According to the University rules, such students may try to return under special conditions (e.g. age and/or number of subjects completed successfully).

1.2 AIM OF THE STUDY

The aim of the study is to compare the effectiveness of the theoretical and practical approaches to Anatomy teaching under the following headings:

- 1. Is there any significant difference between the effect of the different teaching approaches in terms of the students' performance?*
- 2. Does learning Anatomy with dissection add significantly to the students' understanding of the concepts?*
- 3. Does teaching with dissection influence the students' perceptions of the effectiveness of the different teaching approaches in Anatomy?*

1.3 IMPORTANCE OF THE STUDY

The importance of this study focuses on the possible improvement of the teaching approaches and the students' pass rates in Anatomy at UEM. Consequently, it will contribute to the improvement of the medical students' background for the other subjects studied later and the quality of future doctors.

1.3. LIMITATIONS OF THE STUDY

Certain limitations of the present study need to be noted. Firstly, the study involved only the Anatomy course because it is that course which has the poorest results in the Faculty of Medicine at UEM. Secondly, the results of this study cannot be generalised to all students of Anatomy, but it pertains only to medical students at UEM. Similarly the conclusions of studies from many other countries, especially in the English-speaking world, cannot be readily transferred to the situation in Mozambique, as there are large differences between the school systems and their underlying educational and professional philosophies as well as in the economical development of the countries.

CHAPTER 2

LITERATURE REVIEW

This chapter comprises a brief review of the relevant literature on the teaching approaches to Anatomy and the definitions of important terms used in the dissertation.

2.1 INTRODUCTION

Anatomy is defined by many authors (e.g. O'Rahilly, 1985; Eizenberg, 1988; Latarjet and Liard, 1996 and Rouvière & Delmas, 1996) as the study of the structure of the human body, involving the description of form and the explanation of how a structure developed. According to Eizenberg (1988), the study of Human Anatomy may be attempted in either of two ways. One consists of collecting facts and memorising them and the other consists of correlating the facts, that is, studying them as regards their mutual relationships.

In 1964 Wells, in referring to the teaching of Anatomy, stated that teachers are being asked to teach the student not what he is going to require to know to get through his examinations, but what his clinical teachers are going to require him to know through the rest of his course and what he will be required to know for the

rest of his medical career. Thus, much of Anatomy that was of purely theoretical interest in the past is of practical importance now.

For most medical students, Anatomy is viewed as a difficult hurdle. As Al-Jomard (1997) states, mostly this is because the traditional curriculum usually allocates a relatively short period of time to Anatomy, which is hardly enough to receive, digest, structure and sequence the contents. On the other hand, Butler (1992) argued that in medical and paramedical education, the Biological Sciences (including Anatomy) are problematical areas because they are taught not just for the acquisition of facts but rather in order that the students may acquire medical knowledge, understand disease process and treatment rationale, and attain competent clinical skills.

Because of the rapidly increasing amount of knowledge within the constraints of a university degree or diploma, the relative time allocated to the teaching of specific university courses is decreasing remarkably (Grieve, 1992). On one hand, Adeyemi-Doro and Ojeifo (1988) stated that reduction in the time allocated to the teaching of Anatomy could mean a reduction in the Anatomy content knowledge that can be presented. On the other hand, Schormair et al. (1992) stated that in current educational systems, the teacher's task is confined to adding a single piece of knowledge - often without any context to clinical practice. Perhaps, as Holcomb and Garner (1973) argued, the instructors in the medical school need to reassess their role concerning how the medical students under their direction will acquire knowledge. Therefore, according to authors such as McMillan (1964) and Lloyd (1991), teaching methods and techniques should occupy a central position in the thinking of university departments.

2.2 SELECTING THE APPROPRIATE TEACHING APPROACH

Generally, as argued by Holcomb and Garner (1973), the teaching approach refers to the pattern of instruction, which is used to facilitate the accomplishment of selected educational outcomes. This means that no instructional method can be clearly identified as uniquely superior to any other method. Montecinos and Pantoja (1991), for instance, considered that the medical students have basic needs, which must be recognised and reflected in the selection of any particular method of teaching.

Medical teaching has diverse goals and teaching for the achievement of these goals should make use of diverse methods. Often, the success of the chosen teaching methods depends on the quality of resource materials and how they are used (Cox and Ewan, 1982). Hence, there is no simple and instant way of selecting a teaching method. The instructor must consider a number of factors including the type of learning and level required, group size, local constraints such as time available and facilities, the degree of autonomy of the learners, and finally, any preferences of the lecturer (Martin and Mwangi 1995).

Quite often, as argued by Schormair et al. (1992), medical education is characterised by overcrowded lecture theatres, a large number of different classes in clinical and theoretical disciplines and practical courses, as well as frequent rotations taking place even within a medical discipline. Many investigations have indicated that competence is fostered not primarily by teaching to deliver knowledge or teacher-centred approaches, but through teaching to engender specific kinds of cognitive activity (Dolmans et al., 1997). Specific teaching methods are of interest to medical students only to the extent that these methods lead them toward their goal of becoming a physician (Holcomb and Garner, 1973).

Authors such as Crosby (1996) and Metcalfe and Matharu (1995) stated that it is common in medical schools to find the teaching methods grouped into three sorts: lectures, non-clinical interaction (tutorials, seminars and practicals) and clinical interaction (ward rounds, ward teaching, clinics, etc.). However, lectures, tutorials and practical courses are often held in an inflexible and uniform way (Schormair et al., 1992). It is prudent to take into account that not all students are equally interested or enthusiastic about the same kind of teaching method and to remember that a lecture, for example, may be interesting and valuable to the teacher but not equally perceived by the students (Montecinos and Pantoja, 1991).

2.2.1 The lecture

The one-hour lecture has traditionally been the predominant teaching method used in medical schools, particularly during the pre-clinical years (Russell et al., 1983). According to Harden (1992), opinions of the value of the lecture as an instructional method range from the view that it is indispensable and cost effective to the view that it serves no useful purpose, encourages inappropriate learning styles and should be abandoned.

Nnodim (1990) stated that lectures are usually contrived to assist students in organising the information which they obtain from books and by other learning methods, to provide them with recent information, to compensate for any deficiencies in the recommended texts and to stimulate further reading. Advances in light-projection technology have facilitated the use of numerous audio-visual aids in delivering a formal lecture. These teaching aids have been developed in an attempt to increase the students' attention to factual matter presented (Harden,

1992), enhancing the transfer of information from the instructor to the student (Russel et al., 1983).

On the other hand, Martin and Mwangi (1995) argued that in the past, teaching in universities was largely didactic, with the lecturer telling and the learner listening passively. In many universities, this still remains the general practice. As a teaching technique, the lecture has come under much criticism in recent years in undergraduate medical education. The main criticisms, as levelled by McCarthy (1970:29), are as follows:

- (i) "Involvement of the students during the lecture varies from intense interest to deep slumber.
- (ii) Comprehension by students varies from complete to none at all.
- (iii) The lecture does not allow for individual differences in learning readiness or ability.
- (iv) The teacher has little or no knowledge of the impact he is making on the student.
- (v) The student has no way of assessing his comprehension as the lecture progresses.
- (vi) Organisation of the material by the lecturer is likely to be inappropriate to the current state of the students' knowledge.
- (vii) Didactically presented material is rapidly forgotten and almost complete forgetfulness occurs within two years."

This means that the didactic lecture works very well when there is a limited amount of information to be acquired and it is well presented, but difficulties arise when course content becomes excessive, student numbers are large, or when time constraints exist, which is often the position today. This is not to suggest that

lecturers should throw out lectures but they do need to be aware of their limitations so that they can avoid weaknesses (Martin and Mwangi, 1995). In other words, this implies that the lecture should be used only when the instructional task involves the dissemination of information that is available nowhere else (Fiel, 1976), and it must be used in conjunction with other methods and techniques, with evaluation by the students of effectiveness of these methods upon their learning (Butler, 1992).

2.2.2 Small groups

Small-group tutorials and discussion groups are commonly-used teaching methods in the health professions and impose different demands on the role of both the instructor and the students compared with the lecture (Kolars et al., 1997). Despite the fact that teaching in small groups can be more costly because it requires a higher teacher/student ratio, teaching small groups offers distinct advantages over the more widely used lecture and one-on-one methods (Nasmith and Daigle, 1996; Preston-Whyte, McCulloch & Fraser, 1996; Steinert, 1996). The growing interest in the use of the small-group approach during the pre-clinical years stems from several benefits that are ascribed to this teaching approach:

- (i) "Higher student interest and motivation.
- (ii) Increased collaborative learning.
- (iii) More active, self-directed learning on the part of students.
- (iv) Learning embedded in the context of clinical problems resulting in greater integration and application to clinical practice."

(Kolars et al., 1997:53).

The term small-group can be misleading, as small implies no definite number. It is important that the interaction should take place among all present. However, studies investigating the effects of group size showed that an increase of group size is associated with a decrease in students' participation (Dolmans et al., 1996). Small groups are not always the most appropriate method of teaching (Crosby, 1996) and the use of this method depends also on the objectives of the course. On the other hand, in student-centred learning, success is judged by what students learn rather than what they are taught (Harden et al., 1996).

2.2.3 Dissection

Traditionally, a major part of practical work in Gross Anatomy consists of cadaver dissection by students. This method of learning Human Gross Anatomy (Nnodim, 1990) is time-honoured, dating back to the Renaissance period. Alternative approaches did not come under serious consideration until the middle of the present century. Authors such as Simpson (1972), argued that laboratory teaching produces no greater improvement in student performance than do the other techniques, and it is considerably more costly in terms of student and teacher time. However, Guy and Frisby (1992) suggested that despite the fact that teaching Gross Anatomy with human cadavers is very expensive and labour-intensive, it is undoubtedly the best possible teaching method. That argument is supported by Gous (1996) who argued that dissection is still the primary teaching tool for the study of Anatomy in many medical schools and sufficient time for thorough dissections and informative discussions with tutors around the cadaver proved to be a sound educational strategy that facilitated a deep approach to learning.

However, Nnodim (1990) reported that in many of the undeveloped countries, cultural practices have severely limited the acquisition of cadavers and the ratio of students to cadavers has become increasingly unfavourable with time. On the other hand, as Guy and Frisby (1992) suggested, since Anatomy is a visual science, adding video-disc slides and cadaver demonstrations to an interactive-computer program should help students to develop a three-dimensional understanding of body regions as they learn anatomical details. It can shorten laboratory time for many students and replace cadaver dissection sessions for others, particularly in schools where cadavers are not available. As Nnodim (1990) noted, such aids in adequate numbers and quality, whether developed locally or purchased as finished products, do not, however, come cheaply.

2.3 EVALUATING THE TEACHING APPROACHES

Students' own views on how their education is being conducted (Nnodim, 1988; Das, El-Sabban & Bener, 1996) constitute an important dimension that ought to be taken into account in curriculum management. Despite the fact that post-course evaluation of teaching programmes by students is becoming more common today (Tai-Pong, 1997), such evaluation still receives less attention in medical schools than evaluation of other academic pursuits (Das, El-Sabban & Bener, 1996).

Informal conversations with students about the teaching they had experienced, as referred to by Metcalfe and Matharu (1995), suggested that they were well able to differentiate between good and bad teaching and explain the reasons for their views. However, as stated by Powell (1988); Nnodim (1990) and Crosby (1996) it is important to appreciate that students and teachers often have very different

views of the context in which learning takes place. These differences frequently result in outcomes that satisfy neither group of participants.

On one hand, there are the knowledge, interests, attitudes and aspirations which students bring into the classroom, and on the other, the subject matter, teaching methods, learning tasks, assessment procedures, teachers and departmental environments which they encounter in the University (Powell, 1988). Taking into account the view from the perspective of the student, this enables us to develop a sense of learning as an interaction between what students bring with them and their perceptions about the context in which learning takes place. Therefore, the process of teaching requires versatility. Teachers face a variety of challenges influenced by differences in learners, variation in content to be taught, and differences across learning settings. Each of these variables prompts a teacher to come up with new ways to enhance the effectiveness of his or her teaching approach (Kelliher, 1996).

In the study of Gustavson (1988), most of the students commented on the relationship of the Anatomy class to the general process of becoming a physician. Metcalfe and Matharu (1995) found in their study that lectures, practicals and bedside teaching generated more bad reports than good ones, while other forms of teaching were likely to be used as examples of good teaching. On the other hand, Kelliher, Sachdeva & Fleetwood (1996) found in their study that the learners listed the use of student-centred instruction, emphasis on references and research, and having a positive attitude towards teaching as important strategies used by effective teachers. In contrast, in the study of Nnodim (1988), the students ranked formal lectures second to reading in usefulness, while tutorials and informal discussions with lecturers were the least favoured methods.

Butler (1992) found that the students perceived the lecture as the least effective learning method in comparison to other teaching methods. However, the students included in the study of Kolars et al. (1997) tended to perform better on questions covering topic areas discussed in small groups compared with questions from areas presented in the lecture format despite the fact that they stated that one constraint on these results was related to the assessment of knowledge.

Jones, Olafson & Sutin (1978), in an evaluation of a Gross Anatomy programme without dissection, found that students in the multimedia programme with prosection tutorials learned Anatomy as well as those in the traditional lecture-dissection programme. On the other hand, all of the participants in the study of Das, El- Sabban & Benner (1996), disagreed with the statement that there was no need for training in the laboratory. Some advantages of skills training in the laboratory situation were proposed as being that they can afford to make mistakes and they can focus on individual skills in a controlled manner, preparing them for the subsequent contact with the patient. This is supported by Gustavson (1988), who said that when medical educators need to deal with the moral and psychosocial issues presented to students in the dissection laboratory, they can assist the students in formulating appropriate attitudes and behaviours toward patients.

Studies of academic success at medical school and prediction of a doctor's subsequent performance have resulted in equivocal conclusions. Early studies found little or no correlation between undergraduate grades and postgraduate performance ratings. At worst, these studies revealed a weak relationship between medical school grades and later performance in practice. At best, researchers have established a moderate relationship between medical school and practice

performance, with high correlations when an attribute is evaluated by a similar assessment method (Pearson, Rolfe & Henry, 1998).

2.4 DEFINITIONS OF IMPORTANT TERMS

Some definitions related to the concepts involved in the study need to be considered.

2.4.1 Achievement tests

Achievement test is a systematic procedure for measuring a set of representative samples of learning tasks. Thus, in most educational research involving students' performance, the indices are derived, in most cases by the administration of achievement tests (Ebel and Frisbie, 1991; Gronlund, 1993). A major distinction among the tests is whether they are norm- or criterion-referenced. In the norm-referenced test, the goal is to know whether the subjects know more or less than the norm-group, while in the criterion-referenced test a comparison is done between a given score and a criterion or standard.

2.4.1.1 Item analysis for norm-referenced tests

The item analysis procedure for norm-referenced tests provides the following information:

- i) The difficulty of the item.
- ii) The discriminating power of the item.
- iii) The effectiveness of each alternative.

The **difficulty index** of a question is the index for measuring the level of easiness or difficulty of a test question. Ebel and Frisbie (1991) have stated that it affects its contribution to score reliability. They also claim that items of intermediate difficulty are all capable of contributing much more to reliability of the test than the item that is extremely easy or extremely difficult. The difficulty index of a question can vary from 0 to 100%, the higher the index the easier the question; a question with a difficulty index lying between 30% and 70% is acceptable. A test with a difficulty index in the range of 50%-60% is very likely to be reliable as regards its internal consistency or homogeneity, (Guilbert, 1981; Ebel and Frisbie, 1991; Gronlund, 1993).

The **discrimination index** of a question is an indicator showing how significantly a question discriminates between "high" and "low" students, varies from -1 to +1. Using the index, we can judge questions as follows (Guilbert, 1981; Ebel and Frisbie, 1991; Gronlund, 1993):

- 0.35 and over - Excellent question;
- 0.25 to 0.34 - Good question;
- 0.26 to 0.24 - Marginal question (revise);
- under 0.15 - Poor question (most likely discard).

Thus, item-analysis information can tell us if a norm-referenced item was too easy or too hard, how well it discriminated between high and low group scorers on the test, and whether all of the alternatives functioned as intended, (Gronlund, 1993).

2.4.2 Attitude questionnaires

Schumacher and McMillan (1993) argued that the questionnaire is a very common and useful technique for collecting data in educational research, despite the fact that Corcoran and Gibb (1961) have listed several research techniques such as:

(a) observational methods; (b) interviews; (c) self-report methods which includes questionnaires, attitudes scales, sentence completion, projective techniques, and content analysis of essays.

2.4.3 Validity

Test validity is the extent to which inferences made on the basis of scores from an instrument are appropriate, meaningful, and useful. In other words, validity is a situation-specific concept: validity is dependent on the purpose, population, and environmental characteristics in which measurement takes place. In general, it is important to keep in mind that instruments including tests and questionnaires, are valid for some groups and in some situations, and invalid for other subjects or in other situations, (Ebel and Frisbie, 1991; Gronlund, 1993; Schumacher and McMillan, 1993).

Schumacher and McMillan (1993) stated that there are two types of design validity in quantitative research. One is internal validity, which express the extent to which extraneous variables have been controlled or accounted for. The other one is the external validity that refers to the generalisation of the results, or the extent to which the results and conclusions can be generalised to other people and settings.

There are various factors that should affect the validity of achievement scores:

- (i) "Test items that provide an inadequate sample of the achievement to be measured.

- (ii) Test items that do not function as intended, because of use of improper item type, lack of relevance, ambiguity, clues to answer, bias, inappropriate difficulty, or similar factors.
- (iii) Improper item arrangement and unclear directions for the test.
- (iv) Too few items for the types of interpretation to be made.
- (v) Improper test administration, such as inadequate time limits, excessive interruptions, seat arrangements that permit cheating, and testing just before an important school event.
- (vi) Scoring that is subjective or contains computational errors."

(Gronlund, 1993:163)

2.4.4 Reliability

Test Reliability refers to the consistency of measurement, the extent to which the results are similar over different forms of the same instrument or occasions of data collection. The goal of developing reliable measures is to minimise the influence of chance or other variables unrelated to the intent of the measure. The classical definition of score reliability makes use of the idea of the coefficient of correlation and equivalent tests given by Ebel and Frisbie (1991:40): "The Reliability coefficient, for a set of scores, from a group of examiners is the coefficient of correlation between that set of scores and another set of scores on an equivalent test obtained independently from members of the same group".

There are several factors that should be considered in interpreting reliability coefficients:

- (i) "The more heterogeneous a group is on the trait that is measured, the higher the reliability.
- (ii) The more items there are in an instrument, the higher the reliability.
- (iii) The greater the range of scores, the higher the reliability.
- (iv) Achievement tests with a medium difficulty level will result in a higher reliability than either very hard or very easy tests.
- (v) Reliability, like validity, is usually based on a norming group and, strictly speaking, the reliability is demonstrated only for subjects whose characteristics are similar to those of the norming group.
- (vi) The more that items discriminate between high and low achievers, the greater the reliability of the test. Thus, an alternative procedure giving the researcher an impression of internal reliability can be via good item discrimination and difficulty."

(Schumacher and McMillan, 1993:230).

CHAPTER 3

MATERIALS AND METHODS

This chapter describes how the research was carried out. All the measuring instruments used and the procedures, as well as the statistical techniques applied and data analysis are also included.

3.1 SAMPLE

The subjects for this study were 95 second year medical students, 53 females and 42 males, from the Faculty of Medicine at Universidade Eduardo Mondlane in Mozambique (UEM), all of whom were volunteers. They represented the whole student cohort registered for the Anatomy-II course in the academic year 1997/98.

3.1.1 Groups

The traditional teaching approach for teaching Gross Anatomy at UEM includes a one-hour lecture twice a week and a two-hour tutorial once a week. The medical students are randomly split into small groups of 15 students each for the practical lessons (seminars, tutorials and laboratory sessions) for all subjects. For the purpose

of this study, an experimental programme using dissection as an alternative practical teaching approach was introduced, covering the limbs and trunk. The class was divided in two groups, an experimental group and a control group. The students who dissected were designated as an "Experimental Group", while those who followed the traditional programme (without dissection) were designated as a "Control Group".

3.1.1.1 The Experimental Group

This group was given a 10 minute preparatory tutorial before each dissection period. During dissection, one or two students read out the instructions given in the dissection study guide, which was devised by the researcher and provided to all students. Two others dissected and demonstrated to the rest of the group who took notes. One lecturer tutored three tables of five to six students during the dissection sessions. The students were required to complete a resume as part of the assessment process.

3.1.1.2 The Control Group

The students in this group studied the topic using charts, atlases, slides, models, and preserved anatomical structures (i.e. prosections) and they were given a 10 minute preparatory tutorial before each discussion. The headings defined in these sessions were taken in a proximo-distal order of structures as they were presented during the lectures. Thereafter, prosected specimens, slides and models were used in the discussions, which were facilitated by the lecturer.

3.2 METHODS OF STUDY

3.2.1 Limbs

All students studied the upper limb during the last 5 weeks of the first year, using the traditional-teaching approach (i.e., without dissecting) and formed the Control Group. During the first 5 weeks of the following semester, the entire class dissected the lower limb, thereafter becoming the Experimental Group.

3.2.2 Trunk

In order to study the trunk, (i.e., thorax and abdomen), the students were divided randomly into two major groups, designated **A** and **B**. The two groups had an equal number of students each. Group **A** was the Experimental Group for the study of the thorax and dissected during these five weeks, while Group **B** was the Control Group, studying the same topic but by the traditional method used at UEM (i.e., without dissecting). For the following 5 weeks, the abdomen was studied by both of these methods. However, groups **A** and **B**, were reversed, with group **A** becoming the Control and group **B** the Experimental Group.

In each case, the Experimental Group was further divided into smaller groups of 5 to 6 students who were each allocated to a cadaver. All students were given the same amount of teaching for the same period of time. Because procurement of cadavers and preparing prosections and bodies is still a problem at UEM, students were not given the opportunity to use specimens or dissect out of classes.

3.3 MEASURING INSTRUMENTS

Generally, the efficacy of a method can be tested quantitatively using achievement tests, or qualitatively using individual questionnaires, for example. Thus, achievement tests and attitude questionnaires were used in this study as the instruments for data collection (***Ethical Clearance Certificate - Protocol Number M 9703** was obtained from the Committee for Research on Human Subjects, University of the Witwatersrand*). Comparing the students' results on the achievement tests and analysing the students' perception regarding the effectiveness of these teaching approaches, tested the efficacy of the teaching approaches in Anatomy.

3.4 PROCEDURES

As the language of instruction in Mozambique is the official language, Portuguese, this language was used for carrying out the research. However, for the purpose of later presentation, all the instruments, as well as the data collected from the students' responses to those instruments, were translated from Portuguese to English by the researcher.

3.4.1 Achievement tests

The first area of study was the effectiveness of teaching methods evaluated by the students' performance in both the written and the practical tests completed at the

end of the semester. As this research did not create any artificial situations, the achievement tests were compiled according to the existing Anatomy curriculum at UEM and, in the 16th week the tests were administered to the students as usual.

The written test consisted of 10 multiple-choice questions with 5 options (only one correct) and 20 questions (stems) with 5 statements (items) each, in true-false format, completed in 150 minutes (see Appendix A). The practical test, which aimed to assess the students' ability to recognise anatomical structures and their structural relationships, comprised 40 marked structures for identification in 40 minutes.

The items comprising these tests were related to the anatomical topics studied in the second semester of the first year (upper limb), and in the first semester of the second year (lower limb, thorax and abdomen). The students were familiar with the type of questions used. Neither the students who dissected nor those who learned the topic by tutorials had previously studied the specimens used for identification of marked structures, since they were museum pieces not accessible to students.

The contents and the time allowed for testing were not determined by the researcher but depended on the departmental regulations at UEM. The number of items included in each test was determined largely by the amount of time spent on teaching each topic and on the materials available. All students completed the test within the scheduled time. The tests were all hand-marked and scored by the Anatomy lecturers. The items were scored dichotomously (either right or wrong) and therefore the maximum score for the tests was 20 marks (100%).

3.4.2 Attitude questionnaires

All second year medical students present in the first practical class were asked, prior to starting the dissection programme, to complete a questionnaire (see Appendix B), which will be designated in this study as the **pre-questionnaire**, assessing their perception of the effectiveness of the teaching approaches used by the Department of Anatomy. This questionnaire was administered personally by the researcher and it was anonymously answered.

The questionnaires consisted of 48 statements based on a five-point Likert-type scale, ranging from 1 - "strongly disagree" to 5 - "strongly agree", as well as six statements to be ranked in order of preference of the 6 possibilities that could be used in teaching Anatomy at UEM. Lastly, students were given the opportunity to express their opinions in blank spaces provided.

The same questionnaire was given to the students as a post-dissection exercise, and designated in this study as the **post-questionnaire**, during the first practical class of the second semester (after conclusion of the achievement testing related to the topics involved in the study).

3.5 DATA ANALYSIS

A statistical data analysis was performed using the "SPSS 7.0" - Statistical Package for the Social Sciences, for Windows 95.

3.5.1 Students' performance

With regard to students' performance, the analysis was carried out considering the topics (limbs and trunk) and the students' groups (experimental and control groups). The mean scores and standard deviations for the written and practical tests, for both Experimental and Control Groups, were compared by using the t-test (unpaired) and the ratio of variance (i.e., the ratio between the squares of the standard deviations) of the Experimental and Control Groups). A similar comparison was also made for lower and upper limbs using the paired t-test, but in this case, only the non-repeating students (n=50) were included in the sample to ensure that the same group of students was evaluated. The t-test was used to indicate the probability that, the mean scores of the two groups are different. The statistical significance of the differences between groups was tested at the 1% level.

Pearson's product-moment correlation coefficients were calculated to determine any inter-relationship between the tests, written and practical, relevant to the all topics. Item analysis was also done, by calculating the discrimination and difficulty indices for each question of the thorax and the abdomen sections.

The calculation of the difficulty and discrimination indices follows the steps suggested in Guilbert (1981) and Gronlund (1993), as follows:

- (i) award of a score to each student
- (ii) ranking in order of merit by group
- (iii) identification of groups: **high** and **low** within each group
- (iv) calculation of the difficulty and discrimination indices of a question, for each group and for the whole sample, using the formulas:

$$Diff = \frac{H + L}{N} \times 100; \quad Disc = \frac{2 \times (H - L)}{N}$$

where,

- *Diff* is the numerical value of the Difficulty index of a question.
- *Disc* is the numerical value of the Discrimination index of a question.
- *H* is the number of correct answers in the high group.
- *L* is the number of correct answers in the low group.
- *N* is the total number of students in both groups.

(Guilbert, 1981 and Gronlund, 1993)

5. Critical evaluation of each question related to specific group performance.

3.5.2 Students' attitudes

The items of the questionnaires were studied separately to see how students perceived the effectiveness of the teaching approaches of Anatomy at UEM, and how this changed after they had dissected. With the intention of determining whether there were some patterns in the students' perceptions, the students were asked to choose the option which best defined their opinion related to these issues, using a five-point Likert rating-scale. The results were later grouped into three categories: "**Agreement**", "**Neutral**", and "**Disagreement**". "Strongly Agree" and "Agree" were taken together as **Agreement**, "Not sure" or "Undefined" were taken as **Neutral** and finally, "Strongly Disagree" and "Disagree" were combined and considered as **Disagreement**.

Means, standard deviations, frequency distributions and percentages related to the students' responses to both questionnaires were computed.

3.6 VALIDITY AND RELIABILITY

To examine validity and reliability of the instruments used in the research, the questionnaire was first submitted to all lecturers of the Anatomy Department and to the Deputy Director for Pedagogical Affairs, as previously described in section 3.4.2. Reliability was also assessed by inter-rater agreement, and by the difficulty and discrimination indices displayed by the achievement tests.

CHAPTER 4

RESULTS

4.1 ACHIEVEMENT TESTS

4.1.1 Test means

The students' performance in written and practical tests is summarised in Table 4.1, showing the means scores for the various anatomical topics (i.e., limbs, thorax and abdomen), related to the students' groups (Experimental and Control Groups).

Table 4.1: Students' performance in the written and practical tests by groups and topics

TOPICS	Written Test					Practical Test				
	Experimental		Control		<i>p</i>	Experimental		Control		<i>p</i>
	Mean	S.D.	Mean	S.D.		Mean	SD	Mean	SD	
Limbs	51.7	16.4	50.2	16.6	0.596	57.2	14.6	42.0	13.2	<0.001
Thorax	56.1	18.2	55.5	15.4	0.862	53.5	19.1	53.4	18.4	0.970
Abdomen	40.5	12.2	38.7	13.1	0.501	41.3	12.4	41.3	12.4	0.920

As can be seen in Table 4.1, in the written test the Experimental Group performed better than the Control Group in all the three topics. However, all differences were found to be not statistically significant at the 1% level using the *t*-test. Nevertheless, the ratio of 1.4, between the variances (i.e. square of the standard deviations) of the Experimental Group and the Control Group, in the thorax topic, shows that the Experimental Group was found to be more heterogeneous than the Control Group. In the practical tests, the difference of 15.2, between the mean scores for the two groups as regards the limbs, favouring the Experimental Group, was found to be statistically significant at 1% level ($t = 1.02$; $p < 0.001$). However, as regard the thorax and the abdomen topics, the results on mean performance show that both groups (Experimental and Control Groups) performed similarly. When the ratio of variances between groups was calculated, the value of 1.1 for Experimental to Control Groups for thorax shows more variability for the Experimental Group than for the Control Group, while the value of 1.0 for abdomen emphasises the greater homogeneity between the performance of the groups.

It must also be noted that in the limbs topic, the Experimental Group performed better in the practical test than in the written test. However, the Control Group performed better in the written test than in the practical test. The paired-*t*-test confirmed that the observed differences were statistically significant at 1% level, with $t = 3.48$, $p = 0.001$ for the Experimental Group, and $t = 3.57$, $p = 0.001$ for the Control Group.

A different picture was found in the results for the thorax, where both Experimental and Control groups performed better in the written test than in the practical test. On the other hand, for the abdomen topic, both Experimental and Control groups, performed better in the practical than in the written tests. However, the differences found were statistically not significant.

4.1.2 Instrument Correlation

Pearson's product-moment correlation coefficient was computed with data from the total sample to determine any inter-relationship between the results in the written and the practical tests. These results are shown in Table 4.2.

Table 4.2: Pearson's product moment correlation coefficient
between the test scores by topics

Written/Practical Tests	N	<i>r</i>	<i>p</i>
Upper limbs	50	0.43*	0.002
Lower limbs	50	0.83**	<0.001
Thorax	95	0.29*	0.004
Abdomen	95	0.36**	<0.001

* significant at 1% level

** significant at 0.1% level

There was a significant positive correlation between the scores of written and practical tests in each of the three topics. The Pearson product-moment correlation of the tests on lower limbs and abdomen was highly significant with $r = 0.83$ and $r = 0.36$, respectively (both $p < 0.001$). The correlation between the tests on upper limbs ($r = 0.43$) and on thorax ($r = 0.29$) was relatively lower, although statistically significant at 1% level, ($p = 0.002$ and $p = 0.004$, respectively).

4.1.3 Item Analysis

The values of the discrimination and difficulty indices for the Experimental and Control Groups were also computed for all the items of the written test (using the formulas presented in section 3.5.1), for the thorax and abdomen topics, where the mean differences were not found to be statistically significant.

The discrimination indices of these items are shown in Table 4.3. From this Table, several findings can be observed. Firstly, the values of the discrimination indices show that 25 out of 43 of the discrimination indices for the thorax and 30 out of 54 indices for the abdomen, were higher for the Control Group than for the Experimental Group. Three of the values of the discrimination indices in the thorax topic and eight in the abdomen were equal for both groups (Experimental and Control Groups).

The values of the difficulty indices for all the items of the written test are shown in Table 4.4 with regards to the thorax and the abdomen. When these values were compared, it was clear that for 26 out of 43 items related to the thorax and for 27 out of 54 items related to the abdomen, the Experimental Group had higher indices than the Control Group. Both experimental and control groups found the item 5 of stem 2 in the thorax, item 5 of stem 3 and item 1 of stem 6 in the abdomen as the easiest. All three items scored a difficulty index of 97% for the Experimental Group and 100% for the Control Group. Item 1 of stem 11 in the abdomen was experienced as the most difficult by both groups, with a value of 11% for the Experimental Group and 17% for the Control Group.

Table 4.3: Discrimination indices for the written test for the thorax and abdomen

Stem	Thorax										Abdomen									
	Item 1		Item 2		Item 3		Item 4		Item 5		Item 1		Item 2		Item 3		Item 4		Item 5	
	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)
1.	0.54	0.00	0.66	0.70	0.58	0.13	0.42	0.17	—	—	0.08	0.46	0.84	0.58	0.90	0.13	0.60	0.74	0.08	0.40
2.	0.24	0.52	0.20	0.26	0.36	0.56	0.06	0.34	0.00	0.62	0.78	0.38	0.08	0.48	0.26	0.27	0.44	0.42	0.14	0.75
3.	0.86	0.32	0.36	0.25	0.34	0.38	0.28	0.32	0.66	0.17	0.44	0.50	0.14	0.86	0.28	0.26	0.14	0.28	0.12	0.12
4.	0.00	0.08	0.25	0.24	0.06	0.06	0.06	0.14	0.06	0.06	0.44	0.72	0.20	0.34	0.28	0.06	0.06	0.06	0.42	0.40
5.	0.12	0.12	0.22	0.06	0.06	0.00	0.5	0.62	0.32	0.21	0.00	0.27	0.06	0.58	0.08	0.34	0.00	0.19	0.06	0.19
6.	0.12	0.14	0.00	0.08	0.38	0.26	0.26	0.13	0.18	0.28	0.06	0.06	0.30	0.00	0.28	0.28	0.14	0.38	0.18	0.09
7.	0.42	0.48	0.34	0.41	0.14	0.25	0.13	0.22	0.26	0.07	0.07	0.54	0.22	0.46	0.14	0.38	0.44	0.20	0.09	0.70
8.	0.52	0.34	0.02	0.26	0.36	0.56	0.06	0.34	—	—	0.26	0.40	0.52	0.13	0.20	0.20	0.14	0.44	0.00	0.28
9.	0.00	0.62	0.86	0.32	0.36	0.62	0.62	0.72	0.48	0.5	0.00	0.18	0.66	0.74	0.00	0.06	0.13	0.25	0.30	0.25
10.											0.30	0.00	0.06	0.00	0.06	0.26	0.20	0.25	—	—
11.											0.07	0.07	0.30	0.00	0.38	0.08	0.24	0.24	0.16	0.32

Exp = Experimental Group

Con = Control Group

Table 4.4: Difficulty indices for the written test for the thorax and the abdomen

Stem	Thorax										Abdomen									
	Item 1		Item 2		Item 3		Item 4		Item 5		Item 1		Item 2		Item 3		Item 4		Item 5	
	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)	Exp (%)	Con (%)
1.	87	97	78	65	35	32	63	61	—	—	30	61	56	57	52	94	67	63	73	84
2.	73	78	81	65	93	84	75	61	97	100	58	90	79	79	57	59	78	63	79	75
3.	45	35	89	88	83	88	29	24	63	87	68	29	64	83	83	90	64	57	97	100
4.	36	22	46	44	82	80	91	93	94	93	65	84	25	58	41	33	32	38	46	34
5.	97	97	83	96	88	84	58	56	94	89	76	59	57	68	83	83	92	87	66	81
6.	97	93	41	48	75	71	93	90	64	57	97	100	46	30	52	40	79	56	36	43
7.	57	64	42	79	81	79	87	85	87	85	68	60	83	77	81	81	59	50	43	47
8.	70	66	87	80	61	36	17	43	—	—	27	53	75	73	96	81	72	44	71	61
9.	31	50	50	90	41	81	73	76	71	75	67	93	97	94	83	89	71	59	90	88
10.											45	67	86	81	81	77	90	94	—	—
11.											11	17	37	38	58	22	44	24	48	64

Exp = Experimental Group

Con = Control Group

4.2 ATTITUDE QUESTIONNAIRES

From the total number of the second year medical students enrolling in the Anatomy course, 78% (74) completed and returned the pre-questionnaire while 84% (80) of the total sample completed the post-questionnaire concerning their perception about the effectiveness of the teaching approaches to Anatomy at UEM.

4.2.1 Students' preferences for the different teaching approaches to Anatomy

From Table 4.5, it is evident that the 1997/98 second-year medical students' preference was for the combination of lectures, tutorials and dissection sessions, considered as the most appropriate teaching approach to Anatomy at UEM.

Table 4.5: Students' ratings of the approaches to teaching Anatomy

Teaching Approach	Pre-questionnaire		Post-questionnaire	
	Mean	S.D.	Mean	S.D.
1. Only lectures	2.5	1.7	2.5	1.7
2. Only tutorials	3.0	1.4	2.9	1.4
3. Only dissection	2.6	1.3	2.8	1.2
4. Lectures & dissections	4.3	1.4	4.3	1.4
5. Lectures & tutorials	3.9	1.7	3.9	1.5
6. Lectures & tutorials & dissection	4.9	1.7	5.1	1.5

The mean rates of 4.9 and 5.1 in the pre- and post-questionnaires respectively, for the combination of lectures, tutorials and dissection sessions, were higher than those for the association of lectures and dissection sessions (4.3 in both questionnaires), rated as second, while lectures only received the lowest scores (2.5 in both questionnaires). Dissection sessions and tutorials were similarly rated in the pre-questionnaire (2.6 and 3.0) and in the post-questionnaire (2.8 and 2.9) respectively. Furthermore, despite the fact that the differences were not statistically significant, the students rated the combination of lectures and dissection higher (4.3) in both questionnaires than the combination of lectures and tutorials (3.9 in both questionnaires).

4.2. 2 Effectiveness of the teaching approaches

The students' perception of the effectiveness of the different teaching approaches are summarised in Table 4.6, as percentage distributions within the three categories (agree, neutral and disagree). As can be seen, from Table 4.6, the majority of the students was in agreement with 10 of the statements in the two questionnaires, (items: 1,2,3,5,6,7,8,9,10,14) out of 16 in all the three approaches. The attitudes of students with regard to the ability of teaching approaches to stimulate interest and thought (item 4) are of interest. Relating to lectures, 68% (pre-questionnaire) and 70% (post-questionnaire) disagreed. For tutorials the response was generally in agreement (68% and 70%) and even more positive for dissection (85% and 74%). In Table 4.6, it is also evident that the percentage of the students in agreement increased from the pre-questionnaire to the post-questionnaire in 6 of the statements (2, 3, 5, 6, 8 and 10) related to the lectures. Despite the fact that the degree of change was small in the other approaches (tutorials and dissection), the percentage of students in agreement decreased from the pre-questionnaire to the post-questionnaire.

Table 4. 6: Percentage of students' perceptions about the effectiveness of the different teaching approaches

	Lectures						Tutorials						Dissection sessions					
	Agree		Neutral		Disagree		Agree		Neutral		Disagree		Agree		Neutral		Disagree	
	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po
1. Are well structured	39	40	51	39	10	21	51	45	26	32	23	23	77	69	15	17	8	14
2. Facilitated the learning of course material	43	56	33	28	24	16	46	41	39	41	15	18	85	79	11	17	4	4
3. Enhance the logical structure of the course	50	61	32	25	18	14	49	49	28	35	23	16	42	44	36	32	22	24
4. Stimulate the interest and thought about the subject	15	10	18	20	67	70	68	70	15	14	17	16	85	74	7	14	8	12
5. Give a good understanding	61	71	20	16	19	13	74	64	20	24	6	12	69	67	18	18	13	15
6. Cover adequately the subject	38	49	31	35	31	16	47	42	26	28	27	30	28	27	31	29	41	44
7. Have an available time adequate to the contents	73	73	23	25	4	2	49	45	5	5	46	50	5	20	12	19	83	61
8. Allow a good usage of the audiovisual means	51	58	43	37	6	5	72	70	25	23	3	7	54	48	7	6	39	46
9. Use clear and understandable written course materials	64	55	36	16	0	29	62	74	35	20	3	6	49	51	5	0	46	49
10. Are more valuable than the other subjects	74	80	11	14	15	6	77	72	7	18	16	10	84	83	8	12	8	5
11. Allow a good contact between lecturer and students	11	12	47	44	42	44	60	46	32	29	8	25	40	30	22	20	38	50
12. Make the subject boring	10	13	24	19	66	68	19	24	11	10	70	66	10	11	20	18	70	71
13. Require an excessive self-motivation	17	0	24	23	59	77	41	55	35	21	24	24	9	6	11	11	80	83
14. Require an unreasonable preparation	61	71	27	18	12	11	46	48	23	27	31	25	48	38	22	26	30	36
15. Have classes which are too large	45	45	20	30	35	25	47	32	26	34	27	34	51	45	31	27	18	28
16. Deliver knowledge which is easily obtained in textbooks	32	34	19	26	49	40	27	16	34	40	39	44	16	21	38	28	46	51

Pr = Pre-questionnaire

Po = Post-questionnaire

4.2.3 Students' general comments and suggestions

In the questionnaires administered, students were given the opportunity to express their own opinions by providing them with blank spaces. A considerable number of students added suggestions and /or made comments. Some of the most common comments, as presented in Table 4.7, are considered in the study to enhance the interpretation of the attitudes of the students concerning the teaching approaches to Anatomy at UEM.

Table 4.7: Frequencies of the students' most common comments and suggestions

Comments	N.
Students	
1. Skills useful later in pathology, surgery and in the doctor-patient relationship could be gained through dissection	37
2. Dissection enhances learning	25
3. Dissection should be a complementary teaching method and should not be a replacement for the use of prosections, slides and charts	22
4. The structures imprint better on dissector's mind	13
5. It is necessary to improve the organisation of work as suggested in the guides	10
6. Smaller groups, more materials and more cadavers should be used	7

In this Table, it is evident that the most frequent comment by the students (N=37) was that the skills gained through dissection could be useful later in pathology, surgery

and in the doctor–patient relationship. This comment was then followed by the opinion of 25 students that dissection enhanced learning. Alternatives or further useful suggestions expressed by the students are also included in Table 4.7, and seven students suggested the need for improving the clarity of the written material in order to better utilise the time in practical classes for Anatomy at UEM. The suggestion for the inclusion of dissection as a complementary teaching approach and not an alternative one was made by 22 students (about 30% of the respondents).

CHAPTER 5

DISCUSSION AND CONCLUSIONS

In this chapter the implications of the findings are discussed and some recommendations for further studies are made.

5.1 DISCUSSION

5.1.1 Research Design

Two different approaches to teaching Gross Anatomy: one more theoretical, based on tutorials using prosections, and the other one more practical, based on dissection by students, were compared in this study using an experimental programme. This study was carried out in an attempt to establish which is the best teaching approach to reduce the number of failures in Anatomy at UEM.

The choice of the content for this programme was carefully considered to ensure that all students involved had the same opportunities for learning. Hence, in

comparing the two groups, some of the course subject matter was considered to be too different and complex to use. Therefore, it was decided to use the students' performance in the achievement tests to compare their working knowledge of the thorax and abdomen on the one hand, and the upper and lower limbs on the other hand. As students were tested on several anatomical topics by written and practical tests, Pearson's product-moment correlation coefficient was computed with data from the total sample. The highly significant correlation between the tests (see section 4.1.2) meant that the measuring instruments (achievement tests) were related to a high degree.

In this study, the decision to use two types of instruments for data collection, i.e. achievement tests and questionnaires, was reinforced by reference to previous studies (Schumacher and McMillan, 1993), where effective data collection was carried out by using these types of instruments. On one hand, as stated by Ebel and Frisbie (1991), all achievement tests are mainly tools of instruction which could determine the relative effectiveness of innovative or alternate methods of instruction and diagnose groups strengths and weaknesses for adjusting curricular content, emphasis or approaches. Schumacher and McMillan (1993) argued that in a questionnaire each respondent receives the same set of questions, phrased in exactly the same way and the data obtained from questionnaires are more comparable than information obtained by means of interviews.

Meanwhile Nnodim (1988) and Das, El-Sabban & Bener (1996), stated that students' own views on how their education is being conducted constitute an important dimension that ought to be taken into account in curriculum

management. Students as non-experts, but involved in the process of education as beneficiaries of the teaching approaches, are in the best position to comment on how the course is taught and how effective the approach is in helping them to understand the contents. Thus, it is in recognition of this necessity that the present study has also attempted to determine student's preferences regarding the teaching approaches in Human Anatomy at UEM as well as the impact of dissection on their opinions.

One of the inherent limitations of using a questionnaire in educational research is the influence of subjectivity. In this study, efforts were made to make the language of the questionnaire as simple as possible and students were encouraged to clarify doubts. The questionnaires were administered at a time when there was no major examination immediately before or after the completion the questionnaires. This could be one of the reasons for the high percentage of students (78% in the pre-questionnaire and 84% in the post-questionnaire) returning the questionnaires despite the fact that historically Anatomy is the subject in which students have achieved the lowest scores in the Faculty of Medicine of UEM. The anonymous nature of the questionnaires may also have contributed to the high return rate.

5.1.2 Students' performance

When performance levels on upper and lower limbs were compared, (see section 4.1.1), the Experimental Group (using dissection) had higher scores in both tests (written and practical) than had the Control Group taught by tutorials (mainly using prosections). This superior performance by the Experimental Group

suggests that dissection was an effective teaching approach for the study of the limbs. Considering that the course contents for the upper and lower limbs did not differ significantly, these results could mean that dissection enabled the students to better identify the anatomical structures and their relationships, than did tutorials (Control Group).

The analysis of mean performances of the groups for the thorax and abdomen did not show any statistically significant difference in the performance between the two groups (see section 4.1.1). This finding is supported by Jones, Olafson and Sutin (1978) in comparing the students performance after using prosections as an alternative to dissection. These authors found a similar result for the two approaches (prosections/dissection). However, despite the fact that the differences were not statistically significant in the present study, the students of both groups performed better in the practical test than in the written test for the abdomen while for the thorax the reverse was true. This finding is partially supported by Kolars et al. (1997) who found that the students performed better on topics covered by the small groups than by the lectures. Furthermore, the findings of the present study are supported by the study of Kelliher, Sachdeva & Fleetwood (1996), in which the students listed student-centred instruction, used by an effective instructor, as an important strategy.

The more student-centred approach of the small group tutorials may have contributed to the low benefit of dissection as a useful teaching approach to students, particularly in the study of the abdomen, where the students obtained the lowest mean scores in both tests (written and practical). It may be possible that this analysis excluded more specific differences between the two groups

(Experimental and Control), because the test as a whole was taken as a point of departure. Thus, an analysis of the items (see section 4.1.3) may also provide more information on the performance of Experimental and Control Groups in the written test on the thorax and abdomen.

When the values of the difficulty indices of the Experimental and Control Groups were compared, it was clear that, in general, the Control Group experienced more difficulties in the thorax than did the Experimental Group, while in the abdomen, both groups experienced a similar level of difficulty. The values for the discrimination indices showed that 25 of the indices in the thorax and 30 in the abdomen discriminated better between high and low performers in the Control Group than between high and low performers in the Experimental Group. This indicates that the frequency of the items answered correctly differed more within the Control Group than within the Experimental Group. These differences could be explained by the teaching approach used for each group.

In both tutorials and dissection, as student-centred approaches, students must take responsibility for their own learning that may result in a deeper understanding of the material. However, in such circumstances, time may be used less efficiently in dissection sessions and inappropriate interpretations of applications of knowledge are possible, particularly in tutorials. In the curriculum the same amount of time is allocated to different regions such as the thorax and abdomen, with regard to anatomical structures and their relationship, thereby reducing the efficacy of the teaching approach for the abdomen compared with the thorax. Moreover, the small number of cadavers available and the fact that students had to share the material during the unsatisfactorily short dissection

periods, were factors taken into account in considering reasons for the results obtained in the present study.

Although the same number of hours were devoted to tutorials and dissection (see section 1.1.3), the inadequacy of some local resources, such as libraries and specimens, impacted negatively on the quality of the tutorials more than on the dissection sessions. One of the main objectives of the tutorial classes, i.e. to get to know the students individually and identify their strengths and weaknesses, was rarely realised. For tutorials to work effectively, students must take the responsibility for preparing material. In practice, most of the students generally arrived unprepared and the focus of the sessions tended to be based on issues raised by them, with the tutorial often degenerating into another lecture.

Some of the improvement in Gross Anatomy scores may be due to the fact that, about two years previously, the format of the written and practical tests was changed from essay-type questions to multiple-choice questions and oral tests were replaced by practical questions. This argument is supported by Kolars et al. (1997) who stated that one of the constraints on their results was related to the assessment of the knowledge. It is possible that the dissection may have contributed to better testing as well as learning. Hence by dissecting, the students were more involved in the teaching-learning process and it was possible to assess the students more objectively, particularly in the practical tests. It is not likely that the improved test scores could be attributed to the memorisation of individual anatomical specimens, since an effort was made, for the purposes of the examinations, to use those dissections which were museum pieces and not used for learning of the subject matter.

5.1.3 Students' attitudes

In the evaluation of the students' perceptions about the effectiveness of the teaching approaches, several different affective variables were tested in the questionnaires. In the analysis of the students' responses, it was found that the combination of lectures, tutorials and dissection emerged from this research as being perceived as the most effective teaching approach when compared with the other uses of the teaching time. The high effectiveness rating given by the majority of the students (see section 4.2.1) indicates that it can be an effective teaching mechanism to engage the students actively in the course. It may well be that the combination of several methods served the students' needs better than fewer methods as was suggested by Butler (1992), who stated that lectures must be used in conjunction with other methods and techniques.

The main implications of accepting this combination as a general mechanism for improving students' learning are twofold. Firstly, the amount of preparation time for the specimens for tutorials and cadavers for dissection sessions is enormous, adding significantly to the work load of the lecturer. Secondly, there is the increased cost of acquiring materials for the two methods at the same time, which must be taken into account. Even considering the alternative approach using multimedia programmes, as Nnodim (1990) noted, adequate numbers and quality of such aids, whether developed locally or purchased as finished products, do not come cheaply. Thus, the time available for teaching Anatomy, as referred to by other previous researchers (Al- Jomard, 1997), could be the real problem for the effective implementation of this combination of approaches.

As regards the effectiveness of the different teaching approaches (lectures, tutorials and dissection sessions), most of the students changed their opinion positively after having dissected. This was confirmed by the increase in the percentage of the students in agreement with the majority of the items considered in the study (see section 4.2.3). However, despite the fact that the students felt that tutorials were the classes that engendered better staff-student contact, dissection as a teaching approach increased the students' interest in the subject and changed some of their behaviours. From students' responses to the questionnaire, it was evident that they were more highly motivated to learn by dissecting. The percentage of students agreeing that dissection motivated them to learn was higher than those percentages for the other approaches. This result was in agreement with previous researchers (Gous, 1996) where the effectiveness of dissection as the primary tool for the study of Anatomy was justified.

Although after dissection there was a non-significant drop in the percentage of students showing agreement with the effectiveness of tutorials and dissection, the latter approach seemed to enhance the students' views in that regard. For instance, the majority of the students started the course with uncertainty about the statements. This uncertainty was even more evident when lectures and tutorials were considered. However, the results of the post-questionnaire indicate that with respect to some statements, the level of uncertainty was reduced after dissecting. The students' enthusiasm certainly contributed to the popularity of dissection as a teaching approach and the ease with which it was integrated into the course. The creation of facilities in the dissecting room, such as acquisition of cadavers and other necessary material, enhanced this integration.

Students' expectations of the dissection programme were practically oriented because they expected that their dissection experience would be the most important part of the course, being closely related to their required future professional skills such as surgical skills and the doctor-patient relationship. However, studies such as that of Pearson, Rolfe & Henry, (1998) have revealed a weak relationship between medical grades and later professional performance. Understandably, the differences between dissection of cadavers and operative surgery are not yet appreciated by the students concerned, but even for the purposes of Gross Anatomy, it is doubtful that they possess the ability to produce good quality dissections by themselves. This may also have reflected an underestimation of the difficulties of acquiring the complex range of skills needed to be successful in the medical doctor's profession.

In this study, it was evident that the comment made most frequently by the students was that skills gained through dissection could be useful later in pathology, surgery and in the doctor-patient relationship. This was followed by the opinion that dissection enhanced the learning of Anatomy. Despite the fact that this was not borne out by the marks recorded in the achievement tests related to the thorax and abdomen, it would seem to be a subjective impression based on a vision of dissection under optimal conditions (enough cadavers, time, materials and good guidance), rather than in the circumstances experienced during the experimental part of the programme.

In spite of the level of uncertainty presented by the students (see section 4.2.2), some students' opinions were more definite. For instance, they provided suggestions for improving the quality of the teaching, such as the importance of better guidance during the dissection as well as the need of more cadavers, time

and materials. These recommendations suggest that some modifications could be made to the design and structure of the dissection sessions, as a teaching approach to Anatomy at UEM, for implementation to the next cohort. Finances, staff resources and time will need to be adjusted to enable effective teaching/learning to occur, as well as the provision of more cadavers and materials in order to improve learning by dissection.

5.2 CONCLUSIONS

1. Is there any significant difference between the effect of the different teaching approaches in terms of the students' performance?

Dissection was found to be an effective teaching approach when a comparison was made between the students' performance on the limbs, where the Experimental Group performed better than did the Control Group in the achievement tests. The same result was not clearly found in the thorax and abdomen where no relationship could be defined between the performance of the students and the teaching approach used.

2. Does learning Anatomy with dissection add significantly to the students' understanding of the concepts?

It has already been noted that during the short experience of dissection of the limbs students might have been able to learn the concepts more effectively. In both the written and the practical tests, the students performed better in the lower limbs (which they had dissected), appearing to have used the dissection effectively as a

The salient point gleaned from the results reported here is that, within the context of this study, dissection was perceived as being of benefit to the students. It must be realised that this study may not be wholly ideal, but still produces a definite and interesting result, which should be considered when deciding on teaching methodologies for the Anatomy course. In conclusion, this exploratory study has produced useful information regarding a possible effective teaching approach to Anatomy at UEM.

5.3 RECOMMENDATIONS

Because of the nature of the study, and despite the fact that the students had a short experience of dissection, it will be important for the Department of Anatomy at UEM to continue to investigate the effect of dissection on students' performance to confirm the improvements reported here. In addition, further research into issues related to testing and to the role of the group interactions, must be considered with the long term goal of improving the students' performance and thereby reducing the failure and exclusion rate.

tool for visual and factual learning. In the study of the thorax as well as the abdomen, the test item analysis revealed that the Control Group (without dissection) experienced more difficulties than did the Experimental Group (who dissected) despite the fact that the difference between the groups' means scores was not statistically significant.

3. Does teaching with dissection influence the students' perceptions of the effectiveness of the different teaching approaches in Anatomy?

From an analysis of the students' responses in the questionnaires, it was found that dissection influenced the students' opinions in a considerable number of statements. There was nearly total agreement among students that dissection is more effective as a teaching approach than the use of prosection in tutorials, confirmed by the changes from the pre-questionnaire to the post-questionnaire.

The use of dissection in teaching Anatomy supports the institutional goals and objectives of the undergraduate programme at UEM. Moreover, it could contribute to the acquisition of skills necessary for the medical profession and would probably reduce the need for tutorials, in their present form. More time may need to be devoted to dissection for it to be optimally effective. Research findings from other studies investigating students' responses to the effectiveness of teaching methods indicated that on initial exposure to the method, the majority of the students find experiential methods strange and ineffectual. It is only with time and exposure to the method that the students become comfortable and confident both with the method and with their role in this respect.

The salient point gleaned from the results reported here is that, within the context of this study, dissection was perceived as being of benefit to the students. It must be realised that this study may not be wholly ideal, but still produces a definite and interesting result, which should be considered when deciding on teaching methodologies for the Anatomy course. In conclusion, this exploratory study has produced useful information regarding a possible effective teaching approach to Anatomy at UEM.

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UNIVERSIDADE EDUARDO MONDLANE
FACULDADE DE MEDICINA
DEPARTAMENTO DE ANATOMIA HUMANA
TESTE DE ANATOMIA II (22/11/97)

Nome _____ N. _____

MEMBRO INFERIOR

1. Sómente uma das afirmações é correcta
 2. Assinale a afirmação correcta. Deixe em branco nos casos de dúvida.
Pontos negativos serão deduzidos das respostas erradas.
-

1. A parte ilíaca do osso coxal dá inserção aos seguintes músculos excepto o :

1. piramidal
2. glúteo médio
3. quadrado lombar
4. tensor da fáscia lata
5. grande dorsal
6. sartório

2. A artéria femoral dá os seguintes ramos colaterais excepto a:

1. circunflexa ilíaca superficial
2. pudenda externa superficial
3. pudenda externa profunda
4. pudenda interna
5. femoral profunda

3. O nervo obturador inerva os seguintes músculos excepto o :

1. obturador interno
2. adutor curto
3. gracilis
4. adutor magno
5. adutor longo
6. obturador externo

4. A pele do lado interno da perna é innervada pelo nervo:

1. sural
2. obturador
3. Safeno
4. femoral
5. tibial
6. peroneal comum

5. Os seguintes músculos são abdutores da coxa excepto o:

1. pequeno glúteo
2. piriforme
3. glúteo
4. grande glúteo
5. tensor da fáscia lata

6. A extremidade inferior do fémur dá inserção muscular aos seguintes músculos excepto:

1. músculo adutor magno
2. músculos articulares do joelho
3. músculo gastrocnémio
4. músculo plantar delgado
5. músculo poplíteo

7. A artéria tibial anterior não dá os seguintes ramos colaterais

1. artéria recorrente tibial anterior
2. artéria recorrente tibial posteriop
3. artéria maleolar anterior interna
4. artéria maleolar anterior externa
5. artérias musculares
6. artéria dorsal do pé

8. O principal flexor do joelho é o músculo:

1. solear
2. gastrocnémio
3. plantar delgado
4. biceps femural
5. semi-membranoso
6. poplíteo

9. Sobre o nervo grande ciático:

1. é ramo terminal do plexo sagrado
2. inerva os músculos da região posterior da coxa
3. bifurca-se a nível do ângulo superior da fossa poplíteia
4. atravessa o buraco grande ciático
5. todas as afirmações são certas
6. todas as afirmações são falsas

10. O triângulo de Scarpa é limitado pelos:

1. ligamento inguinal, músculos sartório e pectíneo
2. ligamento inguinal, músculos sartório e adutor curto
3. ligamento inguinal, músculos sartório e gracilis
4. ligamento inguinal, músculos sartório e adutor magno
5. ligamento inguinal, músculos sartório e adutor longo
6. ligamento inguinal, músculos sartório e vasto interno

TRONCO:

-
1. Qualquer número de afirmações (1,2,3,4,5) pode ser verdadeiro ou falso.
 2. Assinale com um (V) as afirmações verdadeiras e com um (F) as falsas. Deixe em branco todos os casos de dúvida. Pontos negativos serão deduzidos das respostas erradas.
-

11. A coluna vertebral no adulto:

1. termina a nível da L1-L2
2. é suportada anterior e posteriormente pelo ligamento dentado
3. dá origem às raízes nervosas anteriores e posteriores
4. possui uma dilatação cervical
5. não tem drenagem venosa

12. O sacro:

1. não tem elementos vertebrais
2. tem um foramen anterior para a emergência dos nervos
3. dá inserção ao piriforme próximo dos dois forâmens superiores anteriores
4. tem uma superfície auricular para articulação
5. superiormente tem uma faceta articular para a 5ª vértebra lombar

13. O diafragma:

1. é o maior músculo respiratório no recém-nascido
2. tem uma inserção no apêndice xifóide
3. é perfurado pela aorta descendente a nível da 6ª vértebra tóraxica
4. é innervado pelos nervos frénicos
5. ascende durante a inspiração

14. A nível do plano transpilórico, o folheto anterior da aponevrose do recto abdominal recebe contribuições de:

1. fáscia transversa
2. fáscia tranversa e aponevrose do músculo transversso abdominal
3. aponevrose do transversso abdominal e dos músculos oblíquos interno e externo
4. aponevrose do músculo oblíquo interno e do músculo transversso
5. aponevroses dos músculos oblíquos externo e interno

15. O coração:

1. começa a bombear o sangue quando ainda é um simples tubo
2. normalmente começa uma completa separação do sangue oxigenado do desoxigenado na altura do nascimento
3. acelera os batimentos quando estimulado por uma inervação parasimpática
4. é innervado em parte pelo nervo vago
5. localiza-se no mediastino médio

16. As seguintes estruturas são encontradas no ventrículo direito do coração:

1. trabéculas carnosas
2. válvula pulmonar
3. trabécula do septo marginal
4. válvula mitral
5. músculos papilares

17. A veia ázigos:

1. recebe a veia intercostal superior direita
2. termina na veia cava inferior
3. é formada parcialmente pela veia lombar ascendente
4. drena as veias brônquicas direitas
5. situa-se medialmente em relação ao ducto torácico

18. A artéria tóraxica interna:

1. dá um ramo para a glândula tiróide
2. termina como artéria epigástrica superior
3. é acompanhada pelas veias do mesmo nome
4. irriga os pulmões
5. origina-se da primeira porção da artéria axilar

19. Os quatro pares superiores de artérias lombares:

1. passam profundamente ao arco tendinoso do músculo psoas maior em ambos os lados
2. passam anteriormente á veia cava inferior do lado direito
3. passam lateralmente aos corpos vertebrais das respectivas vértebras lombares
4. passam profundamente ao tronco simpático

20. A veia cava inferior:

1. situa-se na porção livre direita do pequeno omento
2. está situada à direita da aorta
3. tem como tributária a veia mesentérica inferior
4. entra na aurícula direita a nível da t10
5. é formada pela união das veias ilíacas comuns

21. O recto:

1. começa na porção média do sacro
2. é coberto no seu 1/3 superior, anterior e posteriormente pelo peritoneu
3. tem uma flexão ano-rectal através da qual se liga para frente
4. é irrigado apenas pela artérias rectais média e inferior
5. situa-se imediatamente em frente ao músculo piramidal

22. O pequeno epiplone:

1. está ligado superiormente ao hilo do fígado e ao sulco do canal venoso de Arâncius
2. estende-se inferiormente até ao colon transversal
3. separa a retrocavidade dos epiplones da grande cavidade peritoneal
4. faz parte dos limites do hiato de wislow
5. abraça a veia porta

23. O esófago abdominal:

1. penetra no abdómen por entre os pilares direito e esquerdo do diafragma
2. está revestido pelo peritoneu
3. tem relações íntimas com os nervos frénicos
4. tem relações íntimas com o lobo esquerdo do fígado
5. é rodeado por um esfíncter esofágico externo

24. O duodeno:

1. é quase todo intra peritoneal
2. situa-se por detrás da veia porta
3. situa-se por diante do hilo do rim direito
4. é cruzado anteriormente pelos vasos mesentéricos superiores
5. tem 35 cm de comprimento

25. No intestino delgado:

1. o ângulo duodeno-jejunal situa-se à esquerda da primeira vértebra lombar
2. o jejuno tem a parede mais espessa do que o íleon
3. o jejuno situa-se acima e à esquerda do íleon
4. a raiz do mesentério cruza o músculo psoas esquerdo

26. O cego:

1. é intra-peritoneal
2. não possui fitas cólicas
3. repousa sobre o músculo psoas direito
4. possui um orifício ileocecal que se abre para baixo
5. situa-se junto do nervo femoral direito

27. O apêndice:

1. origina-se na face inferior do cego
2. possui um extenso meso
3. raramente existe
4. normalmente tem uma posição retrocecal
5. é intraperitoneal

28. O tronco celíaco:

1. nasce a nível do bordo inferior do pâncreas
2. dá três ramos terminais
3. é rodeado por um plexo nervoso
4. irriga a parte superior do tubo digestivo
5. não dá ramos colaterais

29. A veia porta:

1. drena sangue venoso de todo o tracto digestivo intra-abdominal
2. recebe a veia esplénica
3. recebe sangue proveniente do fígado
4. tem relações íntimas com a artéria hepática
5. recebe veias da parede abdominal anterior

30. Existe uma anastomose porto-cava entre:

1. a veia grande ázigos e a veia gástrica esquerda
2. as veias epigástricas e as veias no ligamento falciforme
3. a veia porta e a veia renal
4. a veia porta e as veias supra-hepáticas

**UNIVERSIDADE EDUARDO MONDLANE
FACULTY OF MEDICINE
DEPARTMENT OF HUMAN ANATOMY
TEST OF ANATOMY II (22/11/97)**

Name: _____

N. _____

LOWER LIMB:

1. Only one statement is correct in each question.
 2. Place a thick (✓) opposite of the correct statement. Leave a blank on the sheet if you do not know whether the statement is correct. Marks will be deducted for wrong answers.
-

1. **The ilium gives attachment to the following muscles except:**
 1. piriformis muscle
 2. gluteus medius muscle
 3. quadratus lumborum muscle
 4. tensor fascia lata muscle
 5. latissimus dorsi muscle
 6. sartorius muscle

2. **The femoral artery has the following collateral branches except:**
 1. superficial circumflex iliac artery
 2. superficial external pudendal artery
 3. external pudendal artery
 4. medial pudendal artery
 5. profunda femoris artery

3. **The obturator nerve supplies the following muscles except:**
 1. obturator internus muscle
 2. adductor brevis muscle
 3. gracilis muscle
 4. adductor magnus muscle
 5. adductor longus muscle
 6. obturator externus muscle

4. **The medial skin of the leg is supplied by the:**
 1. sural nerve
 2. obturator nerve
 3. saphenus nerve
 4. femoral nerve
 5. tibial nerve
 6. common peroneal nerve

5. **The following muscles are adductor muscles except:**
 1. gluteus minimus muscle
 2. piriformis muscle
 3. gluteus medius muscle
 4. gluteus maximus muscle
 5. tensor da fascia lata muscle
6. **The lower end of the femur gives attachment to the following muscles except:**
 1. adductor magnus muscle
 2. articularis genu muscle
 3. gastrocnemius muscle
 4. plantaris muscle
 5. popliteal muscle
7. **The anterior tibial artery has the following collateral branches except:**
 1. anterior tibial recurrent artery
 2. posterior tibial recurrent artery
 3. medial malleolar artery
 4. lateral malleoloar artery
 5. muscularis artery
 6. dorsal digitalis artery
8. **The principal flexor of the knee is:**
 1. soleus muscle
 2. gastrocnemius muscle
 3. plantaris muscle
 4. biceps femoris muscle
 5. semimembranosus muscle
 6. popliteal muscle
9. **The sciatic nerve:**
 1. is a terminal branch of the lumbosacral plexus
 2. innervates the muscles of the back of the thigh
 3. usually divides just above the popliteal fossa
 4. crosses the greater sciatic foramen
 5. all the statements are true
 6. all the statements are false
10. **The femoral triangle of Scarpa is bounded by the:**
 1. inguinal ligament, sartorius and pectineus muscles
 2. inguinal ligament, sartorius and adductor brevis muscles
 3. inguinal ligament, sartorius and gracilis muscles
 4. inguinal ligament, sartorius and adductor magnus muscles
 5. inguinal ligament, sartorius and adductor longus muscles
 6. inguinal ligament, sartorius and vastus medialis

TRUNK

-
1. Any number of statements (1,2,3,4,5) in each question may be correct or incorrect.
 2. Place a (T) opposite the correct statement and a (F) opposite an incorrect statement, and leave a blank if you do not know the answers. Both (T) and (F) will score a point if correctly answered, but points will be deducted for wrong answers. To all blank answers will be given 0 points.
-

11. The vertebral column in the adult:

1. terminates at the level of L1-L2
2. is supported by denticulate ligaments anteriorly and posteriorly
3. gives rise to anterior and posterior nerve roots
4. has a cervical enlargement
5. has no venous drainage

12. The sacrum:

1. has no costal elements
2. has anterior foramina for the emergence of nerves
3. gives attachment to piriformis around the upper two anterior foramina
4. has an auricular surface for articulation
5. has superior facets which articulate with the 5th lumbar vertebra

13. The diaphragm:

1. is the major muscle of respiration in the new-born
2. has an attachment to the xiphoid process
3. is pierced by the descending aorta at the level of the 6th thoracic vertebra
4. is innervated by the phrenic nerves
5. ascends during inspiration

14. At the level of the transpyloric plane, the anterior wall of the sheath of the rectus abdominis muscle receives contributions from the:

1. transverse fascia
2. transverse fascia and aponeurosis of the transversus abdominis muscle
3. aponeuroses of the transversus abdominis and internal oblique muscles
4. aponeuroses of the transversus abdominis and internal and external oblique muscles
5. aponeuroses of the external and internal oblique muscles

15. The heart

1. starts pumping when it is still a single tube
2. normally begins complete separation of oxygenated from deoxygenated blood at birth
3. accelerates its pumping when signalled by the parasympathetic innervation
4. is innervated in part by the vagus nerve (CN X)
5. is located in the middle mediastinum

16. The following structures are to be found in the right ventricle of the heart:

1. trabeculae carneae
2. the pulmonary valve
3. the septomarginal trabeculae
4. the bicuspid (mitral) valve
5. papillary muscles

17. The azygos vein:

1. receives the right superior intercostal vein
2. ends in the inferior vena cava
3. is formed partly by the right ascending lumbar vein
4. drains the right bronchial veins
5. lies medial to the thoracic duct

18. The internal thoracic artery:

1. gives a branch to the thyroid gland
2. gives off the epigastric artery
3. is accompanied by venae comitantes
4. supplies the lungs
5. arises from the first part of the axillary artery

19. The upper four pairs of lumbar arteries:

1. pass deep to the tendinous arches of the psoas major muscle on both sides
2. pass anterior to the inferior vena cava on the right
3. run laterally on the bodies of their respective lumbar vertebrae
4. arise from the ventral aspect of the abdominal aorta
5. pass deep to the sympathetic trunks

20. The inferior vena cava:

1. lies in the right free edge of the lesser omentum
2. is situated to the right of the aorta
3. has a tributary, the inferior mesenteric vein
4. enters the right atrium at the vertebral level T10
5. is formed by the junction of the common iliac veins

21. The rectum:

1. begins at the middle piece of the sacrum
2. is covered in its upper third with peritoneum anterior and laterally
3. has an anorectal flexure which bends forwards
4. is supplied only by the middle and inferior rectal arteries
5. lies immediately in front of the pyramidalis muscle

22. The lesser omentum:

1. is attached superiorly to the porta hepatis and the fissure for the ligamentum venosum
2. extends inferiorly as far as the transverse colon
3. separates the lesser sac and greater sac of peritoneum
4. forms part of the boundaries of the epiploic foramen
5. embraces the portal vein

23. The abdominal oesophagus:

1. enters the abdomen between the right and the left crux of the diaphragm
2. is enveloped by the peritoneum
3. is closely related to both the anterior and posterior gastric nerves
4. is closely related to the left lobe of the liver
5. is surrounded by an external oesophageal sphincter

24. The duodenum:

1. is almost completely covered by the peritoneum
2. lies posterior to the portal vein
3. lies anterior to the hilus of the right kidney
4. is crossed anteriorly by the superior mesenteric vessels
5. is about 25 cm long

25. In the small intestine the:

1. duodenojejunal flexure lies on the left of the first lumbar vertebra
2. jejunum has a thicker wall than the ileum
3. arterial arcades are less numerous in the jejunum than in the ileum
4. root of the mesentery crosses the left psoas muscle
5. jejunum lies above and to the left of the ileum

26. The caecum:

1. is completely invested in peritoneum
2. possesses a longitudinal muscle coat but no taeniae coli
3. lies on the right psoas muscle
4. has an ileocecal orifice opening inferiorly
5. lies adjacent to the right femoral nerve

27. The appendix:

1. arises from the inferior aspect of the caecum
2. has a mesentery
3. is commonly absent
4. usually lies retrocaecally
5. is clothed in peritoneum

28. The coeliac trunk:

1. arises at the level of the inferior border of the pancreas
2. has three main branches
3. is surrounded by a plexus of nerves
4. supplies the foregut and structures derived from it
5. supplies the lower oesophagus

29. The portal vein:

1. drains venous blood from the whole of the intra-abdominal alimentary tract
2. receives the splenic vein as a tributary
3. receives branches from the liver
4. is closely related to the bile duct and common hepatic artery
5. gains tributaries from the anterior abdominal wall

30. A portal-systemic anastomosis occurs between the

1. azygos and left gastric veins
2. epigastric veins and the veins in the falciform ligament
3. portal veins and the inferior vena cava
4. portal vein and renal vein
5. portal vein and the extra hepatic tributaries of the hepatic vein

APPENDIX B

UNIVERSIDADE EDUARDO MONDLANE
FACULDADE DE MEDICINA
DEPARTAMENTO DE ANATOMIA HUMANA

QUESTIONÁRIO

Percepção dos estudantes acerca da eficácia dos métodos de ensino

Caro estudante:

A sua opção em relação às afirmações apresentadas nas páginas seguintes poderão contribuir para que os métodos de ensino usados no nosso departamento possam ser realmente eficazes, pelo que é indispensável que o questionário seja preenchido com seriedade.

A sua resposta poderá ser dada circundando o número que melhor representa a sua opinião/sentimento. No fim de cada secção encontrará espaço para que possa fazer qualquer comentário, sugestão ou crítica em relação aos métodos de ensino.

nota: Toda a informação obtida através deste questionário será usada apenas para efeitos de investigação.

I- INFORMAÇÃO GERAL:

Sexo: M___ F___

Idade: ___anos

II- MÉTODOS DE ENSINO

A. AULAS TEÓRICAS

Os números referidos em cada afirmação indicam

1. Discordo plenamente
2. Discordo
3. Não concordo nem discordo
4. Concordo
5. Concordo plenamente

Aulas teóricas	
1. São bem estruturadas	1 2 3 4 5
2. Facilitam a aprendizagem	1 2 3 4 5
3. Melhoram a estrutura lógica do curso	1 2 3 4 5
4. Estimulam o meu interesse pela disciplina	1 2 3 4 5
5. Permitem uma boa compreensão dos conceitos ministrados	1 2 3 4 5
6. Cobrem adequadamente o programa da disciplina	1 2 3 4 5
7. Possuem um tempo disponível para o ensino adequado para o volume de matéria ministrada	1 2 3 4 5
8. Permitem um bom uso dos meios audio-visuais	1 2 3 4 5
9. O material escrito usado é claro e compreensível	1 2 3 4 5
10. São mais importantes para a minha formação geral quando comparadas a de outras disciplinas	1 2 3 4 5
11. Permitem um adequado contacto entre o docente e o estudante	1 2 3 4 5
12. Tornam a disciplina aborrecida	1 2 3 4 5
13. Exigem muita motivação por parte dos estudantes	1 2 3 4 5
14. Exigem uma preparação anterior exagerada	1 2 3 4 5
15. Têm um número excessivo de alunos	1 2 3 4 5
16. O mesmo conhecimento podia mais facilmente ser obtido através do livro de texto	1 2 3 4 5

Comentários: _____

B. SEMINÁRIOS

Os números referidos em cada afirmação indicam:

1. Concordo plenamente
2. Concordo
3. Não concordo nem discordo
4. Discordo
5. Discordo plenamente

Seminários	
1. São bem estruturadas	1 2 3 4 5
2. Facilitam a aprendizagem	1 2 3 4 5
3. Melhora a estrutura lógica do curso	1 2 3 4 5
4. Estimulam o meu interesse pela disciplina	1 2 3 4 5
5. Permitem uma boa compreensão dos conceitos ministrados	1 2 3 4 5
6. Cobrem adequadamente o programa da disciplina	1 2 3 4 5
7. Possuem um tempo disponível para o ensino adequado para o volume de matéria ministrada	1 2 3 4 5
8. Permitem um bom uso dos meios audio-visuais	1 2 3 4 5
9. O material escrito usado é claro e compreensível	1 2 3 4 5
10. São mais importantes para a minha formação geral quando comparadas a de outras disciplinas	1 2 3 4 5
11. Permitem um adequado contacto entre o docente e o estudante	1 2 3 4 5
12. Tornam a disciplina aborrecida	1 2 3 4 5
13. Exigem muita motivação por parte dos estudantes	1 2 3 4 5
14. Exigem uma preparação anterior exagerada	1 2 3 4 5
15. Têm um número excessivo de alunos	1 2 3 4 5
16. O mesmo conhecimento podia mais facilmente ser obtido através do livro de texto	1 2 3 4 5

Comentários: _____

C. DISSECÇÃO

Os números referidos em cada afirmação indicam:

1. Concordo plenamente
2. Concordo
3. Não concordo nem discordo
4. Discordo
5. Discordo plenamente

Dissecção	
1. É bem estruturada	1 2 3 4 5
2. Facilita a aprendizagem	1 2 3 4 5
3. Melhora a estrutura lógica do curso	1 2 3 4 5
4. Estimula o meu interesse pela disciplina	1 2 3 4 5
5. Permite uma boa compreensão dos conceitos ministrados	1 2 3 4 5
6. Cobre adequadamente o programa da disciplina	1 2 3 4 5
7. Possui um tempo disponível para o ensino adequado para o volume de matéria ministrada	1 2 3 4 5
8. Permite um bom uso dos meios audio-visuais	1 2 3 4 5
9. O material escrito usado é claro e compreensível	1 2 3 4 5
10. É mais importante para a minha formação geral quando comparadas a de outras disciplinas	1 2 3 4 5
11. Permite um adequado contacto entre o docente e o estudante	1 2 3 4 5
12. Torna a disciplina aborrecida	1 2 3 4 5
13. Exige muita motivação por parte dos estudantes	1 2 3 4 5
14. Exige uma preparação anterior exagerada	1 2 3 4 5
15. Tem um número excessivo de alunos	1 2 3 4 5
16. O mesmo conhecimento podia mais facilmente ser obtido através do livro de texto	1 2 3 4 5

Comentários: _____

D: MÉTODO DE ENSINO PREFERIDO

Assinale por ordem de preferência as seguintes possibilidades para o ensino da disciplina de Anatomia na Faculdade de Medicina:

- | | |
|---|-------------|
| 1. Apenas através de aulas teóricas | 1 2 3 4 5 6 |
| 2. Apenas através de aulas práticas do tipo seminário | 1 2 3 4 5 6 |
| 3. Apenas através de dissecação | 1 2 3 4 5 6 |
| 4. Através de aulas teóricas e dissecação | 1 2 3 4 5 6 |
| 5. Através de aulas teóricas e seminários | 1 2 3 4 5 6 |
| 6. Através de aulas teóricas, seminários e dissecação | 1 2 3 4 5 6 |

Comentários: _____

Universidade Eduardo Mondlane
Faculty of Medicine
Department of Human Anatomy

QUESTIONNAIRE:

Students' feelings about the effectiveness of teaching methods

Dear student:

Your opinion related to the statements presented in the following pages can be helpful to the Anatomy Department in improving the effectiveness of the teaching approaches. In this way it will be good if you can answer seriously.

Please circle the number in the column that best represent your feelings on each statement. Also space is provided for any specific criticisms, suggestions and comments you have, concerning the teaching approaches.

All information obtained from this questionnaire will be used only for the research purpose.

I-GENERAL INFORMATION:

Gender: M___ F___

Age:___ Years

II. TEACHING APPROACHES

A. LECTURES:

The numbers in each statement indicated:

1. Strongly disagree
2. Disagree
3. Nor agree nor disagree
4. Agree
5. Strongly agree

Lectures	
1. Are well structured	1 2 3 4 5
2. Facilitated the learning of course material	1 2 3 4 5
3. Enhance the logical structure of the course	1 2 3 4 5
4. Stimulate the interest and thought about the subject	1 2 3 4 5
5. Give a good understanding	1 2 3 4 5
6. Cover the subject adequately	1 2 3 4 5
7. Have an available course time adequate to the contents	1 2 3 4 5
8. Allow a good usage of the audio-visual aids	1 2 3 4 5
9. Use clear and understandable written course materials	1 2 3 4 5
10. Are more valuable than in the other subjects	1 2 3 4 5
11. Allow good contact between lecturer and students	1 2 3 4 5
12. Make the subject boring	1 2 3 4 5
13. Require excessive self-motivation	1 2 3 4 5
14. Require unreasonable preparation	1 2 3 4 5
15. Have a classes which are too large	1 2 3 4 5
16. Deliver knowledge which is easily obtained in textbooks	1 2 3 4 5

Comments: _____

B. TUTORIALS:

The numbers referred in each statement indicate:

1. Strongly disagree
2. Disagree
3. Nor agree nor disagree
4. Agree
5. Strongly agree

Tutorials	
1. Are well structured	1 2 3 4 5
2. Facilitated the learning of course material	1 2 3 4 5
3. Enhance the logical structure of the course	1 2 3 4 5
4. Stimulate the interest and thought about the subject	1 2 3 4 5
5. Give a good understanding	1 2 3 4 5
6. Cover the subject adequately	1 2 3 4 5
7. Have an available course time adequate to the contents	1 2 3 4 5
8. Allow a good usage of the audio-visual aids	1 2 3 4 5
9. Use clear and understandable written course materials	1 2 3 4 5
10. Are more valuable than in the other subjects	1 2 3 4 5
11. Allow good contact between lecturer and students	1 2 3 4 5
12. Make the subject boring	1 2 3 4 5
13. Require excessive self-motivation	1 2 3 4 5
14. Require unreasonable preparation	1 2 3 4 5
15. Have a classes which are too large	1 2 3 4 5
16. Deliver knowledge which is easily obtained in textbooks	1 2 3 4 5

Comments: _____

C. DISSECTION:

The numbers referred in each statement indicate:

1. Strongly disagree
2. Disagree
3. Nor agree nor disagree
4. Agree
5. Strongly agree

Dissection	
1. Is well structured	1 2 3 4 5
2. Facilitates the learning of course material	1 2 3 4 5
3. Enhances the logical structure of the course	1 2 3 4 5
4. Stimulates the interest and thought about the subject	1 2 3 4 5
5. Gives a good understanding	1 2 3 4 5
6. Covers the subject adequately	1 2 3 4 5
7. Has an available course time adequate to the contents	1 2 3 4 5
8. Allows a good usage of the audio-visual aids	1 2 3 4 5
9. Uses clear and understandable written course materials	1 2 3 4 5
10. Are more valuable than in the other subjects	1 2 3 4 5
11. Allows good contact between lecturer and students	1 2 3 4 5
12. Makes the subject boring	1 2 3 4 5
13. Requires excessive self-motivation	1 2 3 4 5
14. Requires unreasonable preparation	1 2 3 4 5
15. Has classes which are too large	1 2 3 4 5
16. Delivers knowledge which is easily obtained in textbooks	1 2 3 4 5

Comments: _____

D: PREFERRED TEACHING APPROACH

Circle in a sequential order of preference the following possibilities for teaching Anatomy in the Faculty of Medicine of UEM:

Teaching Approach	Rate
1. Only lectures	1 2 3 4 5 6
2. Only seminars	1 2 3 4 5 6
3. Only dissection	1 2 3 4 5 6
4. Lectures and dissection	1 2 3 4 5 6
5. Lectures and seminars	1 2 3 4 5 6
6. Lectures, seminars and dissection	1 2 3 4 5 6

Comments: _____
