ABSTRACT

INSTRUCTIONAL UNIT COSTS IN
SELECTED CENTRAL AMERICAN UNIVERSITIES

by Merlin George Duncan

The purpose of this study was to examine productivity and instructional unit cost for introductory courses in three selected Central American Universities. For purposes of anonymity these three universities were referred to as University A, University B and University C. University B was found to be the most centralized in terms of the organization of introductory courses. University C was the most decentralized according to the same measure and University A was moderately centralized.

The basic data used in this study were obtained from IIME (Instituto de Investigaciones y Mejoramiento Educativo) located in Guatemala City, Guatemala, a joint project of the University of San Carlos Guatemala and Michigan State University. This study was only one part of the larger research considering productivity and instructional unit cost in Central America presently being conducted by IIME. For this reason, it was not intended to be considered alone, but should be read in the context of the overall educational research conducted by IIME.

The productivity and instructional unit cost categories were directly related to the terminology utilized and therefore special definitions were provided for the following terms:

1. Matriculates
2. Passes
3. Examinations

4. Class Hours
5. Instructional Hours
6. Contact Hours.

Productivity was ascertained for each course and for each university according to the following measures:

1. The percent of matriculates who presented themselves for the course examination (measure one).
2. The percent of matriculates who successfully completed the course examination (measure two).
3. The percent of those who engaged in the examination who successfully completed the examination (measure three).

Instructional unit costs were determined according to the following categories:

1. The unit cost per class hour.
2. The unit cost per instructional hour.
3. The unit cost per matriculate.
4. The unit cost per contact hour.
5. The unit cost per contact hour with pass.
6. The unit cost per pass.

A comparison was made of the productivity of introductory courses at the three universities by utilizing three variables. These variables introduced were class size, organization and class hours. Two variables were implemented in the comparative analysis of instructional unit cost. These latter two variables were organization and productivity.

On the basis of this study the findings indicated that there were major differences in productivity between the three universities as well as within each university. It was found that class size had some influence on the percent of productivity within institutions as well as between institutions. Organization and class hours, however, were not found to be strongly influential in either increasing or decreasing institutional productivity.

It was found at University A that chemistry was decidedly more expensive in terms of instructional unit cost than any other introductory course at University A. At University B physics was significantly higher in terms of instructional unit cost than any other course at University B and in addition the findings indicated that physics was, in absolute terms, more expensive per instructional unit cost per pass than any other introductory course at any of the three institutions studied. University C had no significant difference between the introductory courses examined. University C was also consistently lower in terms of instructional unit cost than the other two universities. Laboratory courses were not found to be significantly different from non-laboratory courses in terms of instructional unit cost at any of the three institutions. The variable organization was not found to influence unit cost in any introductory course examined, but the variable productivity was an important factor in three of the unit cost categories studied. Productivity, however, did not affect unit cost per contact hour, unit cost per matriculate and unit cost per instructional hour.

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CHAPTER I

INTRODUCTION

There is very little information available at the present time regarding higher education in Central America. There is, however, an increasing interest in Central American countries to develop better and more efficient programs in their institutions of higher learning. This trend toward educational development and improvement is evident from Costa Rica in the south to Guatemala in the north and many steps are being taken to institute educational reform. The purpose of this reform is to provide an educational system that is more nearly related to the general needs of the societies involved.

A problem exists due to the fact that much of the reform in the educational sphere that is taking place is not based on research findings and often times there is a tendency to act on a program without assessing the alternatives. This is not, of course, peculiar only to Central American educational reform, but is found in other countries of the world including the United States.

One major area of concern in Central American educational circles relates to introductory courses often referred to as General Studies, General Education or Basic Studies.[1] Each of the five Central

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[1]There is a genuine controversy in Central America regarding the merit of offering General Education, General Studies or Basic Studies. The details of this controversy are not within the scope of this study. Therefore, these programs will be considered introductory courses throughout this study.

American national universities has either an on-going program in General Studies or is considering the development of such a program. The programs that presently exist are the product of decisions based solely on the basis of the subject matter taught and do not presently nor did they at their beginning take into account the financial aspects as they relate to the offering of these introductory courses. To date there have been no publications regarding the instructional unit cost in the introductory courses in Central American higher education. In fact, at present only the Instituto de Investigaciones y Mejoramiento Educativo (IIME) located in Guatemala City, a joint endeavor of the University of San Carlos and Michigan State University,[1] has attempted to make comparative regional studies of instructional unit costs in higher educational institutions in Central America.

STATEMENT OF THE PROBLEM

The purpose of this study is to examine the productivity of and instructional unit costs for introductory courses which typify courses

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[1] The Instituto de Investigaciones y Mejoramiento Educativo (IIME) is a dependency of the University of San Carlos of Guatemala. At the present time its activities are centered around the Inter-university Program carried out jointly by the University of San Carlos and Michigan State University. This Inter-university Program has been incorporated to the Plan for Regional Integration of the Consejo Superior Universitario Centro Americano (CSUCA) (Central American University Superior Council). The Inter-university Program covers regional studies on secondary education, higher education and rehabilitation and special education. The first two years of operation of this program were financed with funds obtained through a contract between Michigan State University and the Agency for International Development (AID) of the United States Government.

commonly taken in the United States in General Studies, General Education, or Basic Studies Programs in three selected Central American universities. Overall productivity will be measured according to the following three categories:

1. The percent of students who do not take the examination of those who are matriculated during the current period in which they matriculated.
2. The percent of students who successfully complete the examination of those who matriculated.
3. The percent of students who successfully complete the examination of those who present themselves for the examination.

Instructional unit cost will be assessed totally on the basis of wages or salaries for instruction paid to the instructors and the relationship of these instructional costs to the following categories:

1. Matriculation: The number of students who are enrolled in a course. A matriculate is a particular student who is enrolled in a course.
2. Class Hours: These are the number of hours required by the university for each student to be able to attend in a particular course. (Attendance is not required or checked.)
3. Instructional Hours: These are the number of hours invested by the university in actual instruction for a given course.
4. Passes: The number of students who successfully complete a course examination. A pass is a particular student who completes an examination successfully.

5. Contact Hours: The product of the number of matriculates times the number of class hours times the number of instructors present or teaching the class will provide the number of contact hours for a given course.

6. Contact Hours with Pass: This category is derived in exactly the same manner as contact hours with the exception that the number of matriculates is deleted and substituted in its place are the number of those who successfully complete the course examination.

The foregoing unit costs are determined and examined for each of the General Studies courses at each of the three selected institutions.

SCOPE OF THE STUDY

The investigation into productivity and instructional unit costs was limited to three selected Central American universities and the information analyzed was for the average of the years 1961 and 1962. The courses studied were selected as introductory courses at each of the three selected institutions by the investigator on the basis of course content or on the basis that the university in question has designated certain courses as General Studies courses, Basic Studies courses, or General Education courses.

This study does not purport to measure cost in all of its varying aspects, but intends solely to deal with the instructional unit cost as reflected in the salaries or wages of instructors teaching particular courses since the instructor in Central America is normally paid by the course.

Research in instructional unit cost and productivity in introductory courses will be only a part of a larger and more comprehensive study that is needed to ascertain administrative cost and to determine the cost of maintenance, plant depreciation, etc. However, due to the pioneering effort undertaken in the study of cost in Central America it is necessary to consider first various small segments of the larger research and use the tools of analysis presently used in the United States, adapting them to the special circumstances found in Central America. Because of the foregoing this study is necessarily exploratory in nature and not intended to test hypotheses, but will generate relevant questions for the consideration of Central American university officials.

Introductory Courses

For purposes of this research introductory courses are considered to be those courses offered that are comparable to the General Studies course offerings at University B. These courses are introductory courses usually taught during the first year of study and are found in the following subject matter areas:

1. Biology
2. Chemistry
3. History of Culture
4. Language
5. Mathematics
6. Philosophy
7. Physics
8. Sociology

An analysis of the organization of each of the General Studies programs at the three universities being considered is found later in this chapter. In general, however, an analysis of the course organizational pattern of General Studies or introductory programs in these three

institutions shows University B to be the most centralized pattern and University C to have the most decentralized pattern of organization leaving University A as a moderately centralized operation. It should be pointed out that University A could be considered the most centralized program when consideration is taken of the fact that all students at University A must take all General Studies courses whereas at University B and University C this is not the case. However, for purposes of this financial study course organization is used as the basis for determination of centralization and not how many students are required to take certain courses.

BACKGROUND OF THE STUDY

Education requires a large expenditure on the part of the public in a developed country such as the United States, but this is even more true in the emerging nations such as those found in Central America. It is necessary to allocate financial resources that are limited at best in these emerging countries not only to education but to sanitation, health facilities, etc. It is due to this lack of unlimited resources that it is intolerable for a society to permit unnecessary expenditures in any of the public sectors and it is imperative that institutions of higher learning examine all phases of their programs to improve the quality of their output as well as the efficiency of the program operation. Because there is no objective way to assess quality at the present time for which data is available for these introductory courses

the assumption is made that the quality of the output by each institution is relatively equal. This assumption may or may not have real basis in fact and it should be pointed out that the highest consideration in any attempt to do comparative cost analysis must be given to an assessment of the quality of the product produced. However, at this stage of development in Central American higher education it would appear necessary to ascertain where they are at the present time. This will allow them to establish an accurate fiscal picture from which they can attempt to improve the efficiency of operation. This accurate financial picture will also allow financial resources to be distributed on an equitable basis between courses taking into account the desire for efficiency of operation and improvement of the instructional effectiveness.

Student Personnel Practices and Procedures

Anticipating some of the findings in advance it seems that some special problems develop as to the nature of admission to the universities as well as of matriculates and those who take the examinations during the period of the course enrollment. A discussion of these factors at this point will tend to clarify the various categories as they are considered throughout the study.

Admissions

In Central America students and faculty believe that admission to the university is a right and not a privilege. It is closely

entwined with the Central American concept of autonomy.[1] In fact anyone is admitted to the university that applies and in reality this is accomplished simply by enrolling in a particular group of courses. The students in almost all cases enroll for a full course load and the reasons for this phenomena are treated in more detail in this section in the discussion of matriculation.

Testing devices that have already been developed for students applying for admission to Central American universities are never used in selecting students for admission, but only as a placement device within the university and even this action is seldom taken by university officials. However, there is a trend among Central American educators to consider the use of a more selective procedure in the admission of students as a device to increase productivity of courses and as a means to allocate spaces to those who can do the work as the competition for the use of limited facilities becomes more acute.(1)

It is clear that until now high productivity has not been sought in Central American higher education and the university posture on determining instructional unit cost has been one of disinterest. But this lack of interest is changing and there is a growing recognition

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[1]This concept includes the ideas that no regulation of government or any other group should impinge upon the rights of the university. In the same way the student is considered to have rights that are inherent and cannot be abrogated by anyone or any institution. One of these rights is admission to university courses and another is participation in the governing of the university.

that the university is not only a center of learning but is a public institution with limited resources that must improve its efficiency and effectiveness.(10)

Output of Higher Education

Consistent with many other areas in the world more people in Central America are demanding an education and the number of those in higher education is growing. This increase keeps accelerating at a rather rapid pace. It seems appropriate that at least one of the universities should be examined as well as a consideration of its growth pattern in order to formulate some idea of the growth in student population that is taking place throughout Central America. The example chosen was the University of San Carlos of Guatemala and the following table lists the number of students that have matriculated and the number of students that have graduated and the percentage of students graduating of matriculates from the year 1950 through 1962.

Table I

University of San Carlos Guatemala

Year	No. Students Matriculating	No. Graduating	Percent Graduating
1950	2373	69	2.9
1951	2824	115	4.1
1952	3083	122	4.0
1953	3233	100	3.1
1954	3368	103	3.1
1955	3245	102	3.1
1956	3809	97	2.5
1957	4336	107	2.5
1958	4867	179	3.7
1959	4963	155	3.1
1960	5229	122	2.3
1961	5447	143	2.6
1962	5854	137	2.3

Figures obtained from IIME and confirmed by Registrar of University of San Carlos, Guatemala in February 1964.

As Table I is examined it is clear that the enrollment of the University of San Carlos has more than doubled in the last thirteen years. In that sense the growth of the institution is typical of other institutions of higher education in Central America. It is noteworthy, however, that the number of graduates in all areas at the University of San Carlos was sixty-nine in 1950. This number has also doubled by becoming 137 graduates in 1962. Although this represents an increase in the number of graduates the percentage of graduates has decreased from 2.9% in 1950 to 2.3% in 1962. There is no reason to believe at this time that this percentage will markedly increase in the near future according to work done by the UNESCO Commission in their survey of education in Central America in the past year.(24)

Matriculates

At this point it is appropriate to present some special problems regarding the nature of matriculation at these selected Central American universities. The information was obtained through interviews with responsible officials of these selected universities as well as with appropriate governmental officials. The number of people who matriculate for a course are really only enrollees and may or may not attend the course. This is due to the fact that there are many reasons for enrolling apart from a desire to attend the course and gain advanced academic standing. An example is seen in the students who work for various government agencies in one country and who are granted time off to attend

college courses. These workers do not lose any time for pay purposes. In this way a worker can register as a student and never attend the course and not take an examination and still go home early from his place of work with no decrease in pay. This has, however, recently been eliminated in this particular country and the definition of a student by the government in question is being changed. Another reason relates to the fact that a student may wish to participate in student government. He can only do this if he is a full-time student. Therefore he registers for enough courses to allow him to be termed "full-time" and then attends only one or two courses at the very most. Some of those who fall into this category are the "professional students" so active in the political activities of the Latin university. One further example is seen in the student who registers for courses because he views being a student as a status symbol and never intends to complete his degree. Because attendance is not checked or required it is never possible to confirm how many attend a course for which they have matriculated. This is a very evident problem as any attempt is made to assess the productivity for a class or institution. It should, however, be understood that funds are allocated by national governments on the basis of these matriculation figures and class loads are also assigned on the basis of enrollments and not attendance.

Examinations

The problem of determining the composition of those who take the examination in a given course is another problem. It is never possible to determine with the available data that all of those students who enroll for a course examination actually enrolled for the course in the same term that they took the examination. It is only certain that they have matriculated for the course in which they take the examination at one time or another. For example a student could enroll for a course in 1960 and not take the examination in that same course until the second examination offered in 1962. Therefore in 1962 it would appear that one more student who had enrolled in 1962 had taken the examination in 1962. In reality this would be an incorrect assumption, but because of a lack of attendance records there is no way to control this factor. A student also has several opportunities to pass the examination. At University C, for example, a student has an opportunity to take an examination for a course three times and if he does not successfully complete it in the three allotted tries he must re-enroll in the course and then he is eligible for three more opportunities to successfully complete the course. It may be assumed that the number of students who matriculate and later take the examinations during different enrollment periods will remain rather constant and that the two-year period with which this study concerns itself (1961-1962) will be reasonably accurate for any comparable period of university operation. In addition, course examinations are not given in all cases by the same instructor who taught the course. In fact, in many cases the examination was found to be a separate undertaking and the instructor who administered the

course examination was paid a separate fee by the students who presented themselves for the examination. These factors account for the absence of data for the 1963 examinations because in most instances the examinations for the 1963 courses would not have been given until sometime in 1964 when the instructor offers the examination and the students feel ready to take the examination. Throughout the remainder of this study the students who present themselves for the examination will be termed "examinations" and those who successfully complete the examinations will be termed "passes".

ORGANIZATION OF INTRODUCTORY COURSES

As previously mentioned it was necessary to ascertain the nature of the introductory courses which is often called a General Studies or Basic Studies program in Central America. This was done by an examination of these General Studies or Basic Studies programs where they existed and by a search of the literature regarding General Studies in both Central America and the United States.

It has been pointed out that there is no concensus as to what actually constitutes General Education, Basic Studies or General Studies. Because of the foregoing University B was chosen as a standard that would be appropriate to use in Central America if this study was to be of actual use. The study could then be of value as information in the decision making process as attempts are made by Central American educators to broaden the base of Central American education.

Since there was general agreement among Central Americans that General Studies courses must be instituted[1] it was clear that any cost study would have to be related to the problem as perceived in Central America. By an analysis of the organization charts of the University A and University C and a study of the organization of General Studies at University B it was clear that the standard to be used for this investigation would most appropriately be University B for the following reasons:

1. It contained all the introductory course areas perceived by Central Americans to constitute General Studies.
2. It had an on-going and expanding university-wide introductory course program that was in operation during the period for which data was available.
3. It was possible to use the introductory course taught as a base and find comparable courses in both University A and University C.
4. Administratively it could be typed as a Centralized Type of Organization and this was useful in administrative analysis.
5. No other Central American institution had an introductory or General Studies program with as many courses involved under centralized control.
6. Unlike introductory programs or General Studies courses in the United States the program at University B faced the same type of problems and operated in a similar culture to that found in the other Central American countries.

7. It can be assumed that the degrees produced at University B are roughly comparable to those produced in the other four Central American Republics and that the quality of instruction is reasonably equal.

On the basis of the foregoing it was decided to use the courses in University B's "University Center for General Studies" as the base from which to select comparable courses at the other institutions.

The investigator feels it necessary to report that on the basis of interviews and observation in the field that there may be a difference in the quality of degrees and in the general level of instruction among the three institutions. However, on the basis of present data, there does not appear to be another way in which to measure unit cost at this time. It would be interesting, however, to examine the graduates from each of these institutions with some common instrument and to determine the variance in quality of output. This would improve the cost analysis, but until more information is available by means of well conceived research it seems unlikely that such an improvement is possible. The organization of the various programs for introductory courses and the nature of each institution and its relationship to administrative decision making are described briefly below to provide necessary background for the inter-comparisons which are made in the analysis of the data.

University B

University B has all of its introductory courses located in the "University Center for General Studies". The Center is under the

direction of a Director of General Studies and it has a few full-time faculty members. The Center also uses faculty people from throughout the University and in effect has people on joint appointments teaching advanced courses in chemistry, for instance, and also teaching the general chemistry course in the "University Center for General Studies". The Director of the Center is directly responsible to the Rector of the University and operates at the pleasure of the Rector.

The courses taught in the General Studies program are as follows:

1. General Biology
2. General Chemistry (Inorganic)
3. History of Culture
4. Language (Spanish)
5. Mathematics (College level Algebra, Trigenometry, and Geometry)
6. Philosophy (Logic, Problems of Philosophy, Ethics, etc.)
7. General Physics
8. Sociology

Each of the aforementioned courses is a one-year course and purports to deal in a general way with the subject matter so that all the students, regardless of their major, will be able to gain some knowledge of each of the General Studies areas. In many cases a General Studies course will be the only course in a particular area that a student will ever take.

Every student entering University B, however, is not required to take each of the courses in the General Studies area before he

can embark on the training of his chosen profession. This means that, although University B has one Center for General Studies, all students are not required to pass through all of the introductory courses prior to their professional training. The students are required to take only those introductory courses required by their chosen faculty.

It is also interesting to note that University B is doing some "team teaching" in the various introductory courses. The Director believes[1] that it permits some advantage by allowing larger classes and yet providing a large amount of individual attention. University officials also feel that this is an economic advantage to their system.

University A

The organizational pattern of General Studies found in University A is different from the pattern seen in University B or for that matter University C. However, it is operated as a department located in the College of Science and Letters. There is a Department Head who reports to the Dean of the College. The Dean of the College reports to the Rector of the University. This differs from the case of University B considered previously. The faculty teaching the General Studies courses is very likely to be full-time personnel, not differing greatly from University B. There are only six courses taught as a part of the General Studies program in University A. They are:

1. General Biology
2. History of Culture

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[1] Interview with the Director, March, 1964.

3. Language (Spanish)
4. Mathematics (Algebra, Trigenometry and Geometry)
5. Philosophy (Logic, Problems of Philosophy, etc.)
6. Sociology

The other two courses taught at University A that are equivalent to the basic subjects physics and chemistry taught in University B are taught in the same College of Science and Letters, but are found in different departments. This still leaves these courses under the same dean, but under different department heads. In fact, the physics class is under the Department of Physics and mathematics and chemistry are taught under the Department of Chemistry. The organization of University A can still be characterized as centralized, but not to the same extent as University B. In one respect, however, it is more centralized; every student entering University A is required to take the six courses in the General Studies Program, although some of them will not be required to take chemistry or physics or both.[1]

University C

There is at present (July 1964) a new Basic Studies program at University C. This is called the Department of Basic Studies. It was formed in February of 1964 and is under the auspices of the University. However, at the present time several of the University faculties are not involved in the program, so it is only the beginning

[1] Interview with the Registrar of University A in March 1964.

of a University-wide program of Basic Studies. This new Basic Studies Department is presently offering the following courses:

1. General Biology
2. Culture (Similar to History of Culture)
3. Physics
4. Language (Spanish)
5. Mathematics
6. Chemistry

It should be noted that philosophy is not offered and the Faculty of Humanities is not participating. Sociology also is not offered. Sociology would again have been under the auspices of the faculty members from Humanities. Other than these two exceptions the pattern fits the general pattern of introductory course programs in Central American universities. Administratively the Department of Basic Studies has a Director, an academic council and is generally under the control of the Rector of the University.

University C Before 1964

Before 1964 and the inauguration of the new Basic Studies Department and at the time the data were collected (1961, 1962 and 1963), University C had a very different pattern of introductory course offerings. The General Studies program was completely decentralized and under the direction of each faculty on an individual basis. In fact, in no faculty of University C was any student required to take all the courses that presently constitute the new Basic Studies program. There were, however, many students who took several equivalent courses offered in the various faculties.

In order to provide the eight courses taught in one department at University B and in one faculty at University A, University C was offering 62 courses. For example, there were six courses offered in various faculties in order to provide introductory biology courses for students desiring to take biology.

There was some "cross-over" where a student could take a course in another faculty besides his own, but it was very common for a student to take no courses outside the faculty in his program. This is evident from an examination of the catalog of offerings at University C. This meant that there was a great duplication of course offerings and many classes were very large and many were very small.

CURRENCY FACTOR

In each of the three universities in question a different national currency is used as a medium of exchange. Fortunately each of the currencies of the countries involved are "pegged" currencies and have a standard relationship to the United States dollar. For purposes of this study each of the monetary figures used is converted into dollar equivalents when the instructional unit cost comparison is made between universities.

It becomes necessary to have a common monetary standard when instructional unit costs are compared in two or more countries having different currencies. It should be pointed out that the foregoing discussion of standard monetary units should in no way lead one to

construe that by converting the currency the cost factor has been totally equalized. Other factors are very important although extremely difficult if not impossible to measure.

For purposes of this study the national currency is converted to its equivalency in United States dollars and it is assumed that the instructional cost factor is a function of the number of equivalent United States dollars spent for instructional purposes. The equivalencies used are as follows:

One United States Dollar is equal to:

6.625	Colones	in Costa Rica
1.000	Quetzales	in Guatemala
1.998	Limpiras	in Honduras
7.14	Cordobas	in Nicaragua
2.5	Colones	in El Salvador

USEFUL TERMINOLOGY

In order to provide a basis of common understanding throughout the study the following definitions are included. The concepts <u>functional</u>, <u>effective</u>, <u>efficient</u>, <u>economical</u>, and <u>legitimate</u> are considered. The first four were taken from the writings of Dr. Burton D. Friedman[13] and the concept <u>legitimate</u> was developed independently.

<u>The Concept "Functional"</u>

"Society created and society supports its educational system in the belief that operation of this system will produce effects or results that will be useful and helpful to the development of society.

To produce such results, the educational system conducts a series of activities that are thought to be means appropriate to the ends that are specified. Any result produced by virtue of the activities undertaken is a function of those activities. The functions are not always evident or identifiable, to be sure. Moreover, those functions that are observed may or may not be the ones that were sought when the activities were undertaken, and they may or may not prove in fact to be useful and helpful to society. If the outcomes are useful and helpful to the development of society they may be said to be 'functional'. Otherwise, they are not. If they positively interfere with the development of society, the educational system and its activities, they may be said to be disruptive or 'dysfunctional'.

Thus one dimension of the frame of reference is the concept 'functional'. It is appropriate to examine the results produced by any educational system in order to determine whether the system is in fact 'functional' within its society. It is equally appropriate, but perhaps much more difficult to review the plans and programs of any educational system in order to judge in advance whether the system would or would not prove to be functional as those plans and programs were acted upon."(13)

The Concept "Effective"

"An educational system attempts to produce specified outcomes or 'functions' by conducting a series of activities. Whether the outcomes sought are 'good' or 'desirable' or 'useful', of course, is a question of social philosophy. However, the activities undertaken require the performance of a series of tasks. Without philosophical or ideological complications, it is feasible to determine to what extent each task is being performed. That is the sole question raised by the concept 'effective'".(13)

The Concept "Efficient"

"To achieve the intended outcome of a course of action is to be effective. To achieve only such outcomes is to be efficient. If a course of action brings about one or more unintended or unanticipated outcomes, it is to that extent not efficient. It is irrelevant, in this context, whether an unintended or unanticipated outcome proves to be salutary and desirable or malignant and undesirable; these are accidental matters of good and bad fortune, hence should not intrude upon the evaluation of planning, policy or management. The verdict of an evaluation must be 'not efficient' to the extent that actual outcomes are unintended or unanticipated. An activity may be effective, but not efficient; unless it is effective, however, it cannot be efficient."(13)

The Concept "Economical"

"Every educational system expends human material and financial resources. If two systems are similar in other respects, it is obvious that a very large system is almost certain to expend more than the very small one. Their total budgets constitute a gross measure of relative size of course, but they do not offer a useful evaluative measure. For evaluative purposes, it is necessary to compare expenditures with results.

The concept 'economical' considers the relationship between (a) the resources that are invested in an educational system and (b) the results that are produced through their use. Results are measured in terms of the unit cost of satisfactory production. An educational system, or any identifiable aspect of the system, is 'economical' when it operates at a low cost per unit of production of satisfactory quality: (1) the system cannot be 'economical' unless it is first proved to be effective, i.e., unless it actually does deliver a suitable 'product'; and (2) the system is not 'economical' if its costs are high per unit of production."(13)

The Concept "Legitimate"

"Every educational institution must be 'legitimized'. By the term 'legitimized' is meant that the product that is produced by the organization in question must be acceptable to the consumer or the user of the particular product. When this product or the production of this particular organization ceases to be acceptable, the organization no longer has the right to exist. Therefore, every organization that depends on a clientel must be 'legitimized'. It can be acceptable by its clientel to a greater or lesser extent, but it must be acceptable or it will no longer exist. This is true of businesses, universities, or any other large scale organization that demands certain kinds of public acceptance for its support. A university achieves 'legitimization' as it produces a certain type and quality of student. As long as these students are in demand and are able to achieve better job positions, and more status in the community due to their college or university education then the product that is produced by this particular institution is 'legitimized' and the organization continues to exist. However, when the average graduate becomes a misfit and does not perform in an effective fashion it will inevitably initiate the demise of the university, at least as it is then organized."

ORGANIZATION OF THE STUDY

This study is organized to allow the presentation of the data regarding productivity and instructional unit cost separately for each of the three institutions. The present chapter contains the statement of purpose and the background of the study as well as some definitions of terminology. The second chapter states the methodology used to examine the data and the third chapter is devoted to the presentation of the data and findings related to the three measures of productivity. The fourth chapter is concerned with six measures of instructional unit cost. It presents the unit cost for each of the three institutions and then relates these unit costs to the two variables of organization and productivity as defined in chapter two. Chapter five is designed to present questions for Central American university administrators based on the findings of the study.

CHAPTER II

METHODOLOGY

General Statement

The purpose of this chapter is to describe the methodology used in this study in order to gather and analyze the data considered. These data, as stated in chapter one, were gathered by the IIME organization and the collection procedures used are herein described. The study is formulated basically in two parts. The first part is considered under the general heading of Course Productivity and the second part is concerned with Instructional Unit Costs. Under the instructional unit costs only those costs for salaries and wages for instruction are considered. According to authorities on cost analysis[1] the one best measure of comparative costs for institutions or for courses within institutions is the instructional salary comparison.

Productivity is measured by three different measures and then each one of these measures are related to three organizational and administrative variables that may be modified by administrative action. Instructional Unit Cost is then measured by six different measures and subsequently these six measures are individually related to two variables. One of these two variables id directly modifiable by administrative action and the variable, productivity, is indirectly modifiable.

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[1]The authority for this statement is Dr. Floyd Reeves, Distinguished Professor, Michigan State University. The statement was made on July 6, 1964.

This chapter is organized into five sections under the following general headings:

1. The Population participating in the study.
2. The Instrumentation used in the inventory in the collection of data.
3. The Procedure used in the collection of data and in the analysis of these data.
4. The Design of the study including the formulas.
5. The Projected Outcome which details the type of outcomes expected and the method in which they will be presented.

Population

The population used in this study is made up of students at three Central American universities who enrolled in introductory courses during the years 1961 and 1962 in the following course areas:

1. Biology
2. Chemistry
3. History of Culture
4. Language
5. Mathematics
6. Philosophy
7. Physics
8. Sociology

At University A enrollment was in the Department of General Studies as well as in physics and chemistry located in the same faculty but in a different department. At University B enrollment was in the Center for General Studies which included all eight courses. At University C enrollment was in these same eight course areas but there was no Center or Department of General Studies so the courses were scattered throughout the various faculties of the University. Consult Appendix A for a list of the course descriptions of the courses selected for this study.

Instrumentation

The inventory used to gather the data used in this study was developed by the IIME staff and a copy of the instrument is found in Appendix F of this study. Data found on the completed inventory allows one to appraise the institution, class size, type of course, class hours, instructional hours, instructional cost, number of matriculates, number of passes, examinations taken, professor teaching the course, as well as the year in which the class was taught and the term or terms in which it was taught. By utilization of the aforementioned data it was possible to construct measures of Productivity and Instructional Unit Cost.

Procedure

The procedure followed by the IIME staff in the collection of data was as follows. Teams of IIME staff members went to each of the five Central American National Universities and stayed from seven to ten weeks during which time they consulted all primary sources and documents available in offices of University Registrars and Faculty Secretaries. When the data was not sufficient to allow complete information to be obtained on a course the staff conducted personal interviews with the various faculty members in order to ensure the accuracy and the completeness of the data sought. These inventories (Appendix F) were coded for punch cards and they were transferred to IBM cards for analysis. These data were then listed by course, department, university, year, etc. It is from these

listings that the information for this study was obtained. These listings of data concerning course information were then verified faculty by faculty in each university for accuracy and completeness by the IIME staff. After an examination of the various listings for the total universities it was seen that it was necessary to determine which courses were the introductory courses at University C that would allow a comparative analysis with introductory courses at Universities A and B. This was due to the fact that all pertinent introductory courses at University A were found in two departments of one faculty. At University B all relevant courses were located in the Center for General Studies. At University C a search was made of the catalog of the university and by interviews in the very few questionable cases with faculty members of University C to confirm the choices.

The data for these selected courses at the three institutions were brought together on tables for analysis. See Appendixes B, C, D, and E of this study for these tables covering the years 1961, 1962, and 1963. It was not possible, however, to use the 1963 data as they were not complete due to the fact that in many of the courses final examinations will not be concluded until the end of 1964. For this reason the study was delimited to data for the academic years 1961 and 1962. In order to develop a representative picture of student behavior during these years information for 1961 and 1962 was summed and then averaged as a basis of course productivity and instructional unit cost.

Design

This study was designed to consider two basic areas of interest, Course Productivity and Instructional Unit Cost. Course Productivity was examined according to the following three measures of productivity:

Measure 1: Percent of students enrolled (matriculates) who present themselves for final examination (examinations).

Measure 2: Percent of students enrolled (matriculates) who successfully complete the final examination (pass).

Measure 3: Percent of students who successfully complete the final examination (pass) who present themselves for the final examination (examinations).

From the foregoing measures the following formulae were constructed in order to provide the information desired on course productivity:

Measure 1:	$\frac{\text{Examination}}{\text{Matriculation}}$	=	Percent of Examinations to Matriculations.
Measure 2:	$\frac{\text{Passes}}{\text{Matriculation}}$	=	Percent of Passes to Matriculation.
Measure 3:	$\frac{\text{Passes}}{\text{Examinations}}$	=	Percent of Passes to Examinations.

Each of the three formulae were then related to three variables that can be modified in practice by administrative action. These variables are:

1. Organization: University organization for introductory courses typified by University B with the most centralized organization and University C as the most decentralized and with University A as a moderately centralized pattern

of organization. In this sense the criteria used for the pattern of organization centered only around grouping of introductory courses.

2. Class Size: This refers to class matriculation as defined in chapter one.

3. Class Hours: Class hours are the number of required hours of student attendance in a course.

The second major area considered was Instructional Unit Cost. In this particular study Instructional Unit Cost is measured by the average of the salaries and wages paid during 1961 and 1962 to the instructor(s) for each of the courses considered in this study. When the instructor(s) salary was paid on other than a course basis as in University C the total salary for all courses was divided by the number of courses taught and the resulting salary per course was the amount employed in the study. At this point Instructional Unit Costs were determined by each of the following measures:

Measure 1: Salary cost per class hour.

Measure 2: Salary cost per instructional hour.

Measure 3: Salary cost per student who presents himself and successfully completes the examination.

Measure 4: Salary cost per matriculate.

Measure 5: Salary cost per instructional hour per student (contact hour).

Measure 6: Salary cost per instructional hour per student who successfully completes the examination (contact hour with pass).

On the basis of the above measures the following formulae were constructed to ascertain these instructional unit costs.

Measure 1:	$\frac{\text{Cost}}{\text{Class Hours}}$	=	Unit Cost per Class Hour.
Measure 2:	$\frac{\text{Cost}}{\text{Instructional Hour}}$	=	Unit Cost per Instructional Hour.
Measure 3:	$\frac{\text{Cost}}{\text{Passes}}$	=	Unit Cost per Pass.
Measure 4:	$\frac{\text{Cost}}{\text{Matriculates}}$	=	Unit Cost per Matriculate.
Measure 5:	$\frac{\text{Cost}}{\text{Contact Hour}}$	=	Unit Cost per Contact Hour.
Measure 6:	$\frac{\text{Cost}}{\text{Contact Hour with Pass}}$	=	Unit Cost per Contact Hour with Pass.

At this point an analysis by instructional unit cost as it relates to the following administratively modifiable variables was undertaken.

1. Organization: University organization for introductory courses which is exactly the same as the organizational variable for course productivity.
2. Productivity: The variable of productivity refers to the second measure of productivity previously discussed under the productivity analysis in this chapter. In other words the productivity variable as it relates to instructional unit cost refers to the percent of matriculates who enroll for a course and successfully complete the course examination. Since it is assumed that the desire of the university is for the student who enters a course to successfully complete the course it would appear that this measure of productivity is the most important of the three measures of productivity in terms of unit cost.

It was observed in chapter on that these universities have limited financial resources and high productivity has not been a desirable outcome in the perception of the educational leaders, but these views should be re-evaluated in the light of present needs for both manpower and skills.[1] Under these circumstances presently found in Central America it would be reasonable to assume that universities would want to be able to assess their present financial resources and to make every effort to produce enough graduates to satisfy the demands of the expanding Central American economies. On the basis of the foregoing it would seem appropriate for the Central American universities to investigate every available source of information in order to improve their efficiency and effectiveness in terms of both productivity and instructional unit cost.

Projected Outcome

The projected outcome of this study will be the formation of questions for consideration by the administrators of Central American universities. For example, if the findings were to show course productivity at one university totally different from all other courses at the same university and this difference is not found at the other two universities studied the administration would have valid reason to inquire into the causes of this difference. By the same token,

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[1] This is especially true in critical fields such as teacher preparation in which only 786 of the 7379 practicing secondary school teachers in Central America are qualified in terms of training and experience for their work. (A 11 p. 10).

if it were found that an institution or a course has many small classes and that the instructional unit cost per class and per matriculate is very high, and yet productivity is not markedly higher in the smaller class, the administration could take steps to increase class size, lower instructional unit cost per matriculate, and still maintain the former level of productivity.

On the basis of course productivity and instructional unit cost findings, questions will be formulated in chapter five that should be considered by the leaders of Central American universities. These questions can be of valuable assistance as they attempt to assess the productivity and instructional unit cost in their respective institutions and should lead to direct improvement in their efficiency, effectiveness and economy as defined in chapter one.

Chapter three considers the findings as they relate to productivity and chapter four is devoted to the presentation of findings involving instructional unit cost. In both of these chapters parallel treatments are given to each of the categories examined. In the case of chapter three each course is considered separately and related to the three measures of productivity plus the variables of organization, class size, and class hours. In chapter four each of the six categories of instructional unit cost is examined and they are related to the variables of organization and the second measure of productivity examined in chapter three. Chapter five is then concerned with general observations concerning productivity and instructional unit cost that can be used by administrators in Central America in the organization and implementation of introductory course offerings.

CHAPTER III

ANALYSIS OF PRODUCTIVITY

The purpose of this chapter is to present the findings concerning course productivity in three selected Central American universities. As stated in chapter two, course productivity will be assessed according to three measures which are expressed in the following formulas:

$\frac{\text{Examinations}}{\text{Matriculation}}$	=	Percent of students enrolled who present themselves for the course examination.
$\frac{\text{Passes}}{\text{Matriculation}}$	=	Percent of students enrolled who successfully complete the course examination.
$\frac{\text{Passes}}{\text{Examinations}}$	=	Percent of students who successfully complete the examination of those who presented themselves for the examination.

Appendix D contains the basic data from which the information relating to the above formulas was obtained. These data in Appendix D are in table form and cover the years 1961, 1962, and 1963.

Table II reports in percentages the averaged results of the three measures of productivity by university and course for the years 1961 and 1962. In this chapter each course is considered separately by examining the course in relation to the three measures of productivity and then by examing the course productivity in the light of three organizational and administrative variables discussed in chapter two. These variables were used for comparative purposes between the three Central American universities.

TABLE II

Analysis of Three Measures of Productivity Averaged for 1961 and 1962 for Introductory Course Offerings in Three Selected Central American Universities Reported in Percentages

	University A			University B			University C		
Productivity Measure*	1	2	3	1	2	3	1	2	3
Biology	81	53	66	55	55	98	76	43	56
Chemistry	96	50	52	53	35	66	48	15	31
History of Culture	69	39	56	67	67	100	56	49	87
Language	91	51	56	54	50	92	50	38	76
Mathematics	72	57	79	53	40	86	75	24	32
Philosophy	82	56	69	62	51	82	45	29	64
Physics	73	39	53	56	37	82	67	22	33
Sociology	92	63	68	71	66	94	62	43	70
Average for All Courses	83	49	60	57	49	86	59	30	50

*Productivity Measure 1: $\frac{\text{Examination}}{\text{Matriculation}}$ = Percent of students enrolled who presented themselves for examination.

Productivity Measure 2: $\frac{\text{Passes}}{\text{Matriculation}}$ = Percent of students enrolled who successfully completed the examination.

Productivity Measure 3: $\frac{\text{Passes}}{\text{Examinations}}$ = Percent of students who successfully completed the examination of those who presented themselves for examination.

Biology

Measures of Productivity

Measure 1: University A registered the highest percent of matriculates that presented themselves for the examination with 81%. At University B 55% of the matriculates presented themselves for the examination and at University C 76% of the matriculates took the examination.

Measure 2: University B had the highest percent of matriculates who successfully completed the examination in biology with 55% and University A had 53%. At University C 43% of the matriculates successfully completed the examination.

Measure 3: University B, according to measure three of productivity, registered 98% of its students who took examinations and passed. At University A this percent of passes of those who engaged in the examination was 66% and at University C the figure was 56%.

Organization

As pointed out in chapter one, University B was the most centralized university in terms of organization of introductory courses and University C was the least centralized. In each of the three measures of productivity examined, as they related to biology, University C had the lowest productivity. In measure two and measure three University B had the most productivity. However, University A, which was a

moderately centralized institution, was the most productive in terms of those who matriculated and then presented themselves for the course examination. On the basis of the findings no clear pattern emerges in regard to the relationship between productivity and the organizational variable. It must, however, be noted that there was a tendency present, at least in biology, for the more centralized institutions to be more productive.

Class Size

Class sizes at University B were the largest of the three universities in introductory biology. These classes at University B averaged between 151 and 200 students for the two-year period studied. At University C the classes were generally larger in biology than those classes found at University A. With this in mind, it is interesting to note that University B, although it had the largest class size, was the most productive in two of the three measures of productivity considered. The other measure of productivity was the percent of students who matriculated and then presented themselves for the course examination. On the basis of these findings the following conclusions seem to be in order. The small class size does not necessarily mean higher productivity in terms of all three measures of productivity. Second, the class size was not found to be related equally to all measures of productivity.

Class Hours

The required number of class hours as defined in chapter two at the three institutions differed greatly. At University A the required

class hours for biology during the period examined was 84 hours and at University B it was 168 hours and at University C class hours were found to number 134 hours. With this vast difference in the number of class hours required it was difficult to accept the fact that each of these introductory biology courses were actually the same course and that the same credit should be given for each class. It was found that the largest number of class hours were required at University B. Also, University B was found to have the highest productivity in two of the three measures of productivity examined. The fact that University B had more required class hours than University A and University C may have had a direct bearing on the productivity outcome. However, it should be noted that University C had over one and one-half times the required class hours of University A and still registered lower in all respects in regard to productivity.

Summary

On the basis of the three measures of productivity and the relationship of these three measures to the three variables of organization, class size, and class hours it was found that the most centralized institution with the most class hours and the largest average class size was more productive in terms of two of the three measures of productivity. However, University A, the moderately centralized university with the smallest classes and the fewest required class hours was more productive in terms of the percent of matriculates that presented themselves for the course examination. Therefore it can be concluded that in terms

of organization the two institutions that were more centralized were found to be more productive. It can also be concluded that class hours did not seem to be directly related to productivity and there was no evidence that class size was related in any uniform way to productivity.

Chemistry

Measures of Productivity

Measure 1: University A had the highest percent of matriculates who presented themselves for the course examination with 96%. At University B the percentage for the same measure was 53% and at University C it was 48%.

Measure 2: University A with 50% had the highest percent of matriculates who successfully completed the course examination. University C had the lowest percent in the same category with 15% and University B had 35% of its matriculates who completed the course examination successfully.

Measure 3: University B had the highest percent of those students who passed the course examination of those who had taken the examination at 66%. At University A the figure in this category was 52% and at University C it was found that 31% of those who had taken the examination passed the examination.

Organization

In chemistry it was found that there was no observable correlation between centralization of introductory courses and productivity. This was manifest in an analysis of University A which was moderately centralized, as defined in chapter two, and had a higher percent productivity in two of the three measures. University C was, however, the least centralized organizationally and also had the lowest percent productivity on the basis of the productivity measures stated above. Therefore, the two more centralized universities had the most productivity, but no direct relationship was found between organization and productivity.

Class Size

The classes were generally larger at University C as indicated on Table IV.[1] However, the one class per year offered at University B enrolled between 151 and 200 students. At University A there was no class larger than 80 students and generally the class size was from 21 to 40 students. It was found that chemistry was more productive as a course at University A and that it was least productive at University C. Therefore it was concluded that class size had an influence on productivity in chemistry for the two institutions with larger classes had less productivity than did University A with the smaller classes.

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[1]Chapter four, Table IV.

Class Hours

University B required the largest number of class hours with 258 hours as the required number. At University A the number of class hours was 192 and at University C the average number of class hours required was 171 hours. Since productivity measures indicated that University A had the highest productivity in two of the three measures examined no definite relationship was found to exist between more class hours and larger productivity.

Summary

In summary, University A had the highest productivity according to two measures of productivity and University B had the highest productivity as measured by the percent of those who present themselves for the examination and successfully complete the examination. It should be pointed out that a large difference was found between the three institutions in the two measures of productivity where University A was highest. There did not seem to be any direct relationship between organizational pattern and productivity, but there was some indication that class size could be a factor as the smallest classes were found at University A. Class hours did not seem to show any observable relationship to the measures of productivity with the exception of a possible relationship existing between the large number of class hours required at University B and the high productivity in terms of the third measure of productivity utilized in this study.

History of Culture

Measures of Productivity

Measure 1: University A with 69% and University B with 67% had nearly the same percent of matriculates in history of culture who presented themselves for the course examination. University C had 56% of its matriculates who presented themselves for the course examination.

Measure 2: University B with 67% had the largest percent of those who matriculated who successfully completed the course examination. It should be pointed out, however, that the extremely small enrollment (15 students) at University B in history of culture detracts from the utility of the productivity figures. At University A the percent of matriculates who successfully completed the course examination was the lowest (39% of the three universities. This was the only course at University A that had less productivity, based on measure two, than the other two institutions. University C according to this same measure of productivity had 49%.

Measure 3: University B had 100% productivity which was the highest of any course at any of the three universities for any of the three measures of productivity. However, the small number of

students involved again poses a problem in any evaluation of this measure of productivity. University C was next highest in measure three of productivity with 87% and University A was the lowest with 56%.

Organization

Organization did not seem to be a factor in the determination of course productivity as measured by the three formulas expressed in this study.

This failure to observe a relationship was not only due to the small enrollment at University B in this course but was also due to the fact that there was no clear pattern of organization that was consistently, directly orinversely related to the three measures of productivity considered.

Class Size

The largest classes and the smallest classes, as indicated on Table IV,[1] are both found at University C. However, at University B only one class was offered and this class had an enrollment of 15 students. At University C the classes ranged from less than 10 students in a section to classes as large as 200 and over. At University A class sizes were found to have from 20 to 80 students with most of the sections smaller than 50. On the basis of the foregoing class size was not consistently related to the productivity

[1] Chapter four, Table IV.

measures in this study. It was found that productivity in the smaller classes tended to be greater than productivity in larger classes.

Class Hours

University C required the largest number of class hours in history of culture with 108 hours. At University B 90 class hours were required and at University A the requirement was 80 class hours. Excluding University B, because of the small number of matriculates involved, it still appeared that University C and University A did not have productivity percentage increases in all areas of productivity due to more class hours being required. In fact, it was found that productivity was greater at University C in two of the measures of productivity and University A was found to have greater productivity according to measure number one.

It is noteworthy, however, that the one measure where University A exceeded University C in history of culture was the percent of matriculates who present themselves for the examination. Therefore it can be theorized that the number of hours spent in class may have some bearing on the fact that a larger percent of matriculates passed the course at University C than University A and a larger percent of those who took the examination passed the examination at University C. This implies that those who attended the course did, in fact, do better at University C while more students who matriculated at University A intended to actually pursue the course in which they were enrolled.

Summary

In summary it appears that history of culture was not a course that allowed comparison to the same extent as most of the other courses examined. This was due to the small enrollment in this course at University B. Productivity at University A was low compared to University C as it was related to the percent of matriculates that successfully completed the course examination. Productivity at University A was higher than at University C in these same terms. Organization did not appear to be a factor in productivity. Class hours did appear to have some noticeable relationship to productivity if University B was excluded from the analysis. It did appear that there was some relationship between productivity, as defined in this study, and class size. It was found that the smaller the class size the greater the tendency for higher productivity.

Language

Measures of Productivity

Measure 1: University A with 91% was the institution with the highest percent of matriculates that presented themselves for the course examination. In this measure of productivity University A was almost twice as high as the other two universities. University B had 54% of its matriculates that presented themselves for the examination and the percent found at University C was 50%.

Measure 2: University B with 50% and University A with 51% of their matriculates who successfully completed the course examination were high and University C with 38% of its matriculates who successfully completed the course examination was low.

Measure 3: University B, with 92 percent of those who presented themselves for the examination and successfully completed the examination, was higher than either of the other universities by a considerable amount. University C was second in this measure of productivity with 76% and University A was lowest with 56%.

Organization

Organization did not seem to be related directly or inversely to the three measures of productivity. The two universities that were more centralized seemed to be more productive in terms of two of the measures reported above, but in relation to the percent of those who presented themselves for the examination and successfully completed the examination this finding did not hold. Therefore it was found in language that organization did not have a strong influence on the three measures of productivity examined.

Class Size

The largest and the smallest classes are found at University C. These classes as indicated in Table IV[1] ranged from less than 10 matriculates to over 250 matriculates. Class size at University B

[1] Chapter four, Table IV.

ranged from 40 matriculates to 100 matriculates and at University A class size ranged from 21 to 80 matriculates with average class size less than 50 matriculates. It is indicated on Table V[1] that productivity at University C was very low in the large class that had over 250 students. Only 29% of the matriculates in that large class successfully completed the examination. However, further examination of Table V indicated that class size did not seem to consistently influence the productivity as measured by the percent of matriculates who presented themselves for the examination and successfully completed the examination. According to the three measures of productivity no pattern emerges that indicated direct or inverse relationships between class size and productivity in the language courses at the three universities.

Class Hours

University C with 138 class hours required in language had the most class hours required. University B had 90 class hours required and University A had the fewest class hours required with 80 hours. The findings indicate that University C, with the most class hours, also had the lowest productivity in two of the three measures of productivity reported in this study. Therefore the larger number of required class hours did not increase productivity.

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[1]Chapter four, Table V.

Summary

University A and University B seem to be more productive in terms of two measures of productivity in this study, however, University B was higher than University A in terms of the percent of students who presented themselves for the examination and successfully completed the examination. No relationship was found linking productivity to organization, class size, or class hours.

Mathematics

Measures of Productivity

Measure 1: University C had the highest percent of matriculates that presented themselves for the course examination at 75%. University A was second in this respect with 73% and University B had 53%.

Measure 2: University A had 57% of its matriculates that successfully completed the final examination whereas University B had 40% and University C had 24%.

Measure 3: University B had 86% of those who presented themselves for the examination successfully completing the examination. The percent for University A was 79% and University C was lower than either of the other two institutions with 32%.

Organization

Since each of the three universities had the highest level of productivity according to one of the three different productivity measures examined in mathematics it was found that organization did not strongly influence the productivity outcome in this course.

Class Size

Table IV[1] indicates that University C had both the largest and the smallest size classes in mathematics. University B offered only one class and it was over 200 in student enrollment. At University A the class size ranged from 21 to 60 students. In an analysis of Table V[2] it indicates that the students who matriculated for a course had a better chance of successfully completing the examination on a percentage basis when the class size was smaller. This was, however, only a trend and at University A it was found that productivity, as measured on Table V, was greater in the larger size classes than it was in the smaller classes. On the basis of the foregoing it appeared that no generalization covering all three institutions could be made regarding the impact of class size on productivity.

Class Hours

University B had 258 class hours required in mathematics. University C had 139 required class hours and University A had 84 class hours. This was a wide variation in class hours and yet it was not found, in the case of mathematics, to affect the three measures of productivity as defined in this study.

Summary

University C had the highest percent of matriculates that presented themselves for the final examination with 75% and

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[1] Chapter four, Table IV.

[2] Chapter four, Table V.

University A had the highest percent of matriculates who successfully completed the final examination. University B had the highest percent of matriculates that presented themselves for the final examination and successfully completed the examination. Organization was not found to be a factor in increasing productivity. An examination of class size indicated that the smaller the class size the better the probability of successful completion of the examination. Class hours did not seem to influence the three measures of productivity equally and there was little evidence to confirm that the number of required class hours acts in any specific way in these three institutions to increase productivity.

Philosophy

Measures of Productivity

Measure 1: University A had 82% of its matriculates in philosophy who presented themselves for the final course examination. University B had 62% of its matriculates in the same category and University C had 45%.

Measure 2: University A had 56% of its matriculates who successfully completed the final course examination while University B had 51% in the same category and Univer- C had 29%.

Measure 3: University B had 82% of its students who presented themselves for the examination and successfully completed the examination. University A registered 69% in this same category and University C had 64%.

Organization

The three measures used to measure productivity in this study indicated that the universities with centralized and moderately centralized patterns of organization are more effective in terms of these measures of productivity than University C with its decentralized pattern. However, University A was the most effective institution in terms of measures one and two whereas University B was the most effective university in terms of measure three. It should also be noted in measure three that University C had only 5% less productivity than University A which was not a significantly large difference. The organizational pattern was not found to be intimately related to productivity.

Class Size

Classes were smaller at University A than at University B or University C. At University A the average class had approximately 50 matriculates whereas the classes at the other two institutions generally had over 150 matriculates as indicated on Table IV.[1] An examination of Table V[2] indicated that the productivity in terms of the number of matriculates who successfully completed the course final examination tends to decrease at both University A and University C as class size increases, but at University B class size did not appear to affect the productivity measured in these same terms. In summary it was found that these data would not allow a meaningful generalization regarding productivity and class size.

[1]Chapter four, Table IV.

[2]Chapter four, Table V.

Class Hours

University B had the largest number of class hours required with 90 hours whereas University A had 80 class hours required and University C had 75 class hours required. Since each of the class hour requirements were so nearly the same it does not seem appropriate to generalize about relationships between the three measures of productivity and class size. However, it can be seen from the foregoing that University C had the least productivity according to all three measures of productivity and also had the fewest required class hours.

Summary

University A had the highest productivity according to the number of matriculates who presented themselves for the course examination. University A also had the highest productivity in terms of the number of matriculates who successfully completed the examination. Based on the number of those students who presented themselves for the examination who successfully completed the examination University B with 82% had the highest percentage. No clear pattern emerges as to the relationship between productivity as measured in this study and organization. The average class size at University A was considerably smaller than class size at the other two universities. It was found at University A and University C that productivity was related to class size so that the smaller the class size the larger the productivity will tend to be, especially in terms of matriculates that successfully complete the course examination. Class hours did not seem to be

related to productivity in this course in any definable way although it is noteworthy that University C had the least productivity and the fewest number of class hours.

Physics

Measures of Productivity

Measure 1: University A with 73% had the highest productivity in terms of the number of matriculates who presented themselves for the course examination. University C was found to have 67% and University B had 56% of their matriculates in physics who presented themselves for the course examination.

Measure 2: University A had the largest percent of matriculates who successfully completed the course examination with 39% followed by University B with 37% and University C with 22%.

Measure 3: University B, with 82% of those who presented themselves for the examination that completed the examination, was the highest in this measure of productivity. University A was second in this measure of productivity with 53% and University C was found to have 33% of its matriculates who presented themselves for the examination and successfully completed the examination.

Organization

University A, which was moderately centralized, had the highest productivity according to two of the three measures in this study. At University B, the most centralized in terms of organizational pattern, it was found that productivity was greater in terms of the matriculates who presented themselves for the course examination and successfully completed the examination. The least productivity was found in University C, the most decentralized institution in terms of organizational pattern. There was no finding that tended to support the proposition that increasing the centralization of organizational pattern will increase course productivity in physics.

Class Size

University C generally had the largest class sizes with most class sizes being larger than 60 students. At University A most of the classes were less than 60 students, but all classes had more than 40 students as indicated on Table IV.[1] University B had only one class offered and it had more than 150 matriculates. Productivity according to the measure utilized on Table V[2] indicated that at University C the percent course productivity dropped as class size increased. This was also true at University A, but at University B there was only one size of class so this relationship could not be assessed. In

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[1]Chapter four, Table IV.

[2]Chapter four, Table V.

general, productivity was not clearly and definitely related to class size in the case of physics although there are some indications that productivity was related to class size at University C.

Class Hour

University B had the largest number of class hours with 194 hours required. At University A 144 class hours were required and at University C 132 class hours were required. The least productivity was found at University C and it was also found that University C had the fewest required class hours. However, in two of the three measures of productivity University A had the highest percent productivity and this was in spite of the fact that University A had less required class hours than University B. Therefore, in physics there did not seem to be a relationship indicated between class hours and productivity as measured in this study.

Summary

University A had the highest percent of matriculates who presented themselves for the examination and also the highest percent of matriculates who successfully completed the course examination. University B had the highest percent of those who successfully completed the examination of those who took the examination. In two of the three measures of productivity University C was the lowest of the three universities. In the assessment of the variable organization and its relationship to productivity it was found that University C had the least overall productivity and was the most decentralized organizationally. As for

class size, it was found that at University C there seems to be some relationship between a smaller class size and at least one measure of productivity utilized in this study. Class hours were not directly or inversely related to productivity.

Sociology

Measures of Productivity

Measure 1: University A had 92% of those who matriculated for sociology engaging in the course examination. At University B 71% of those who matriculated presented themselves for the course examination and at University C 62% of those who matriculated wrote the course examination.

Measure 2: University B with 66% had the highest percent of matriculates who successfully completed the course examination. University A had 63% according to this measure of productivity and University C had 43% of its matriculates who successfully completed the course examination.

Measure 3: University B had 94% of its students who presented themselves for the course examination that completed the examination successfully. University C had 70% in this category and University A had 68% of its matriculates who presented themselves for the examination and successfully completed the course examination.

Organization

It would appear that in sociology the two universities that were the most centralized in organization, as defined in this study, had generally higher productivity. It must be pointed out that of the two centralized institutions University B, the most centralized, was slightly more productive in these terms. On this basis centralization of organization could be related to increased productivity, at least in terms of the sociology course.

Class Size

University C and University B both had very large classes in sociology. These classes ranged from 100 matriculates in the smaller sections to over 300 matriculates in the larger sections. University A, on the other hand, had no section with more than 60 matriculates. Productivity as indicated on Table V[1] tends to decrease as class size increase. In this case productivity was measured only in terms of the percent of matriculates who successfully completed the course examination. These findings did not indicate that productivity (all three measures) was related to class size. This statement was based on the finding that productivity was generally greater at University B than at University A although University A had the smallest classes. On the other hand, University C had large classes and low productivity.

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[1]Chapter four, Table V.

Class Hours

University C had 149 class hours. University B had 90 class hours and University A had 84 class hours in sociology. The findings led to the conclusion that the number of class hours required did not affect the course productivity as ascertained by the three measures of productivity in this study. It should, however, be pointed out that the lowest productivity was found at University C which had the highest number of required class hours. Therefore there was no relationship found between the large number of class hours and increased course productivity.

Summary

University A had the highest productivity in terms of those matriculates who presented themselves for the examination. University B had the highest percent of matriculates who successfully completed the course examination and also the highest percent of those who presented themselves for the examination and successfully completed the examination. Organization did not appear to be a major factor in course productivity and neither did the number of class hours. Class size did not indicate major influence on course productivity.

CHAPTER IV

INSTRUCTIONAL UNIT COST

Table III summarizes the findings of selected categories of instructional unit cost for each of the three selected Central American Universities. The unit cost findings are valuable to the administrators of the three Central American Universities in the evaluation of the financial aspects of their introductory course offerings. These findings are also valuable indirectly to all the Central American Universities as they provide a basis for comparing introductory course offerings.

Purpose and Organization

The purpose of this chapter is to set forth the findings for six measures of instructional unit cost chosen to represent instructional unit cost in this study. The means and standard deviations are useful within the three respective institutions, but are not as helpful in regard to comparative analysis between institutions. The chapter is organized in such a way as to permit analysis of each of the unit cost categories for each of the three institutions and then to present a comparative analysis of the three universities using the variables of organization and productivity. These variables are points on which to focus the comparison. Productivity as used in this instructional unit cost analysis means only the percent of matriculates who successfully complete the examination.

TABLE III

Instructional Unit Costs in Three Selected Central American Universities

Year 1961-2

Course	Instructional Cost			Cost Divided by Inst. Hours			Unit Cost Divided by Class Hour			Cost Divided by Matriculation		
	A	B	C	A	B	C	A	B	C	A	B	C
Biology	5641	5833	5640	7.46	9.72	5.97	67.16	34.72	42.08	13.40	35.14	11.70
Chemistry	69257	7984	10320	21.22	11.57	6.26	360.71	30.95	60.35	62.45	32.32	6.33
History of Culture	23657	851	5280	12.32	9.46	8.41	295.71	9.46	48.89	18.47	56.73	5.97
Language	17398	3303	8895	9.06	18.35	10.82	217.48	36.70	64.46	14.69	23.26	10.30
Mathematics	5101	10786	13704	12.88	15.63	6.61	60.73	41.81	98.59	25.63	43.67	7.45
Philosophy	15775	2553	6630	8.22	9.46	13.70	197.19	28.37	88.40	13.52	8.57	4.40
Physics	8622	25069	11400	8.87	39.79	6.15	59.88	129.22	88.64	16.55	151.02	8.92
Sociology	9817	2302	4440	17.04	12.79	6.95	116.87	25.58	32.21	34.69	8.40	4.67
Total	155308	58673	66309									
Mean	19413	7334	8229	12.13	15.85	8.11	171.96	42.10	65.45	24.93	44.88	7.47
Std. Deviation				4.6	9.5	2.6	10.8	34.14	22.68	15.7	43.00	2.41

TABLE III CONTINUED

Instructional Unit Costs in Three Selected Central American Universities

Year 1961-2

Course	Cost Divided by Passes			Cost Divided by Contact Hours			Cost Divided by Contact Hours with Pass		
	A	B	C	A	B	C	A	B	C
Biology	25.07	64.10	27.51	.16	.08	.09	.31	.14	.23
Chemistry	125.01	91.77	42.47	.65	.03	.09	1.30	.07	.17
History of Culture	47.13	85.10	12.22	.24	.63	.07	.58	.95	.14
Language	28.90	46.52	26.87	.19	.26	.07	.37	.52	.30
Mathematics	44.75	107.86	30.59	.29	.03	.11	.50	.07	.40
Philosophy	23.94	16.80	15.42	.17	.04	.08	.30	.08	.25
Physics	42.68	404.34	40.63	.23	.03	.09	.59	.26	.33
Sociology	55.46	12.65	10.81	.39	.05	.04	.63	.07	.09
Mean	49.12	103.64	25.82	.29	.14	.08	.57	.27	.24
Std. Deviation	30.6	118.1	11.5	.15	.19	.02	.30	.29	.10

The comparative analysis is continued by examination of the frequency of class size occurrence at the three universities, the average unit cost per matriculate by class size, and the percent of matriculates who successfully complete the course being reported by class size.

GENERAL COMPARISON OF INSTRUCTIONAL COST

At University A the greatest amoung of money in absolute terms was expended for the teaching of chemistry which was $69,257.00. This amount was three times as much as was spent for any other course in the General Studies course program at University A. This was in contrast to the other two universities where University B's largest expenditure was $25,069.00 for the teaching of physics and University C's largest expenditure was $13,704.00 for the teaching of mathematics. It should be noted that funds devoted to instructional cost at University A in absolute terms were more than two and one-half times the funds spent for instructional purposes at each of the two other universities. This difference, in absolute expenditure for instruction, is more striking when it is realized that University C had a much larger number of matriculates than either University A or University B. Actually University A had an average of 6,165 matriculates in all introductory courses for the years examined. University B had 1,555 matriculations during the same period and University C had 9,548 matriculations. University B, with the smallest number of matriculates, expended a total for all introductory

course instruction of $58,673.00. At University C, with a matriculation over six times as large as University B, the expenditure for instruction in all introductory courses examined was $66,309.00. University A with more than 3,000 less matriculates than University C spent approximately two and one-half times as much for instruction with a total of $155,308.00. The foregoing data seems to indicate that there is a wide disparity among salaries at the three institutions and it also indicates that University C, with the largest number of matriculates and the relatively low salary payments should be the least expensive operation in terms of unit cost unless productivity is considered and it compensates for these other factors. It was found that no one course was uniformly more expensive to teach at all of the universities and it was also found that laboratory courses in absolute terms were no more expensive in general than non-laboratory courses.

UNIT COST PER INSTRUCTIONAL HOUR

At University A and University C the unit cost per instructional hour for biology was less than for any other introductory course. At University B the biology cost per instructional hour was also low, but history of culture and philosophy were still lower. University A was found to have chemistry as the most expensive course in terms of unit cost per instructional hour. University B's most expensive course per instructional hour was physics and at University C philosophy was the most costly offering per instructional hour.

University A

In terms of unit cost per instructional hour no course at University A was found to be significantly different from the other courses examined. The mean cost per instructional hour at University A was $12.13. The only course that approximated two standard deviations from the mean was chemistry with a unit cost per instructional hour of $21.22. It was found that laboratory courses were not generally more expensive in terms of cost per instructional hour than were non-laboratory courses.

University B

At University B physics indicated a significant difference from the other introductory courses in terms of instructional unit cost per instructional hour. The unit cost per hour in physics was $39.79 and the mean for all introductory courses was $15.85. The only other course with a unit cost per instructional hour above the mean was language with a unit cost of $18.35. It was found that laboratory courses were not generally more expensive in terms of this measure than were non-laboratory courses.

University C

The unit cost per instructional hour at University C indicated that there was no significant difference between the courses examined. The mean cost per instructional hour was $8.11. The highest cost per instructional hour was found to be philosophy at $13.70 and the lowest cost per instructional hour was biology at $5.97.

Organization

At University C, the most decentralized university organizationally, the mean unit cost per instructional hour was $8.11. At University A, the moderately centralized institution, the mean unit cost was $12.13 and at University B, the most centralized, the mean unit cost per instructional hour was $15.85. Two observations appeared relevant to this finding. One observation was; the larger the gross number of matriculates in a university the less the mean unit cost per instructional hour. The other observation was; the more decentralized the pattern of organization of introductory courses the less the cost per instructional hour. It is, however, necessary to caution that these findings should be tempered by the realization that the salary schedule in introductory courses was found to be very low at University C relative to the other two universities and this could account for a large part of the difference in cost per instructional hour.

Productivity

The number of matriculates who successfully completed the course examination in all courses considered in this study at University C averaged 30%. At University A and at University B the average productivity was 49%. In considering unit cost per instructional hour it was necessary therefore to increase the unit cost per instructional hour by roughly 20% to compensate at University C for the lack of productivity. Therefore on this comparative basis the cost per instructional hour at University C should be considered to be $9.73

instead of the $8.11 found in this study. This amount was still less than the other two universities, but the low salary schedule accounts for at least part of the difference.

UNIT COST PER CLASS HOUR

The mean unit cost per class hour at University B was $42.10. At University C the unit cost per class hour was $65.45 and at University A the unit cost was $171.96. It is well to note that there was a large variation between the number of required class hours for each of the introductory subjects. These differences were often great between courses within one university, but there was also a very large difference between the mean number of class hours required for all courses at each of the universities. At University A the mean number of required class hours for all introductory courses considered in this study was 104 hours. At University B the mean of required class hours for all courses studied was 155 hours and at University C the figure was 131 hours. Therefore, it is clear that one reason for the high class hour cost at University A was the relatively high salaries paid and the fewer class hours required in most of its courses. At University B the number of class hours was larger, but even though salaries were relatively high the unit cost per class hour was relatively low. At University C the low salaries contributed to the low cost per class hour, but even this factor does not compensate enough to bring it into line with University B's cost per class hour.

University A

University A reflected the highest class hour unit cost in chemistry with a cost of $360.71. This cost in chemistry was more than twice the mean cost per class hour for all other introductory courses at University A. The only other course that even approached this high unit cost was history of culture at $295.71 per class hour. Physics, with a cost per class hour of $59.88, was the least expensive course per class hour at University A.

University B

The highest cost per class hour was found in the introductory physics course at University B. This cost was about three times higher than any other course at University B examined in this study. The lowest cost per class hour at University B was history of culture. The unit cost per class hour in history of culture was $9.46, but this cost must be considered in the light that only one small section of 15 students was involved. It would appear that history of culture may not be large enough to be comparable to the other courses considered. The next least expensive course at University B, in terms of unit cost per class hour, was sociology with a cost of $25.58 per class hour. Only physics was more than two standard deviations from the mean and therefore significantly different from the other courses in cost per class hour.

University C

The most expensive course at University C in terms of unit cost per class hour was mathematics with a cost of $98.59. The unit cost

per class hour was least in sociology at $32.21. It must be noted, however, that none of the courses were significantly different statistically in terms of unit cost per class hour.

Organization

In terms of organization it appeared that no pattern emerged. University B, the most centralized university, had the least mean cost per class hour and University A, which was moderately centralized, had the largest mean cost per class hour. This left University C, which was the most decentralized, in between University A and University B in terms of cost per class hour.

Productivity

Productivity at University A and University B as previously stated was roughly 20% higher than productivity at University C as measured by the percent of matriculates who successfully completed the course. Therefore, when productivity was taken into consideration and an additional 20% was added to the existing cost per class hour the unit cost changed from a mean of $65.45 per class hour to $78.54 per class hour. This did not change the rank order of the three institutions, but did point out that when a variety of variables are introduced in economic terms a more realistic comparison becomes possible.

UNIT COST PER MATRICULATE

There was a very strong relationship between unit cost per matriculate and unit cost per instructional hour. This was expected for both categories are concerned with the number of students involved in slightly different ways. On this basis the expectation would be to find very little difference between these two unit costs and this would be correct if class size were to remain relatively constant. However, at University C class size was not constant and at University B many exceptions were found. At University A there was found a very strong relationship between unit cost per matriculate and unit cost per instructional hour. The University A finding appeared to be the result of class sizes that were relatively equal.

University A

At University A the only course that was found to be significantly different from other courses at the University A was chemistry which had a unit cost per matriculate of $62.45. Biology, although not significantly different from the other courses, had the lowest unit cost per matriculate of $13.40.

University B

Sociology at University B was the least expensive course in terms of unit cost per matriculate at $8.40. Physics had the highest cost per matriculate at $151.02. The course in physics was significantly different statistically from the other courses in terms of unit cost

per matriculate. In fact, physics cost almost one and one-half times more per matriculate than any course studied in the three universities.

University C

At University C no course registered a significant difference from other introductory courses studied. However, biology was the most expensive course per matriculate with a cost of $11.70 and the philosophy course was least expensive at $4.40.

Organization

The lowest mean cost per matriculate was found at University C which was the most decentralized university organizationally. At University B the highest mean cost per matriculate was found to be $44.88. University A had a mean unit cost of $24.93 per matriculate. These findings tend to indicate that the cost per matriculate was least at the most decentralized university and most at the most centralized university. This should, however, be considered in the light of overall matriculation that finds over 9,000 matriculates at University C, 6,500 at University A and approximately 1,500 matriculations at University B. Therefore the differences noted may have been a function of total enrollment as much as it was of organization.

Productivity

When the number of matriculates that enroll and successfully complete the course are considered it does not notably change the findings in regard to matriculation and cost. It should be pointed

out that in absolute terms matriculation was largest at University C, but that in absolute terms productivity was largest at University A.[1] The mean unit cost per matriculate for all courses at University C was found to be $8.97 when the variation in productivity was included.

UNIT COST PER PASS

The instructional unit cost per pass is one of the most useful measures utilized in this study. This is because of its value in terms of planning for the Central American universities. It is reasonable to assume that the goal of any university is to have as many of the matriculates for a course as possible to pass the course and to maintain the quality of the graduate that is desirable. Therefore, it would appear that his measure is one test of the effectiveness of the instruction at the university and the administration of a university can assume that the cost per pass in a course is going to remain about the same in terms of long range planning unless some new changes are introduced that will allow increased productivity or will lower unit cost. As was noted in chapter one in the background information of this study, the Central American university has not been particularly interested in increased productivity in the past, but now this is changing and the desire is to not only increase productivity, but to increase the quality of the academic program.

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[1] See Appendix D, Table D of this study.

University A

The unit cost per pass in philosophy was $23.94. Philosophy had the lowest unit cost per pass at University A. The highest cost per pass was found in chemistry with a unit cost of $125.01. The mean unit cost for all courses at University A was $49.12. It seems well to note that the course with the highest cost next to chemistry was sociology at $55.46 per pass. It was very apparent that the mean was strongly influenced by one course, chemistry. In spite of the foregoing, chemistry was more than two standard deviations from the mean and it is significantly different in terms of instructional unit cost per pass.

University B

At University B the most expensive course in terms of unit cost per pass was physics with a unit cost of $404.34. Only mathematics, with a unit cost per pass of $107.86, was also over $100.00 per pass. It was also found that two courses had extremely low unit costs per pass. They were sociology with a unit cost of $12.65 and philosophy with a unit cost of $16.80. Physics was so much more expensive than any other course in terms of unit cost per pass at University B that it appeared that at least a partial explanation was necessary at this point. It would appear that the fact that eight instructors "team teach" physics at University B with only 166 matriculates that accounts for part of the high cost. An additional factor relates to the low productivity of the course which will be considered in more detail

later in the study. Only physics was significantly different from the other courses in terms of being more than two standard deviations from the mean.

University C

The mean cost at University C was $25.82 per pass. There was found to be no significant difference between courses at University C in terms of unit cost per pass. The highest unit cost per pass was found in chemistry at $42.47 and the lowest unit cost per pass was found in sociology at $10.81.

Organization

The mean unit cost per pass at University C, which was the most decentralized pattern of organization, was $25.82. The mean unit cost per pass at University B, which was the most centralized pattern of organization as defined in this study, was $103.64. On the basis of this course it would appear that a decentralized pattern of organization would tend to lower mean unit cost per pass. However, an examination of the individual courses studied at the three universities did not remain consistent with this finding. For example, in the case of biology, University C had a unit cost per pass that exceeded the unit cost per pass at University A. Again in philosophy, the unit cost per pass in philosophy at University A exceeded the unit cost per pass in philosophy at University B. In view of the foregoing examples it is cautioned not to over estimate the relationship between organization of introductory course programs and instructional unit cost per pass.

Productivity

The application of the 20% variation between University C and the other two universities did not materially affect their overall relationship in terms of unit cost per pass. It should, however, be pointed out that, in terms of individual courses, productivity differences can affect the relationships in a more striking way. An example is seen in language where the unit cost per pass and productivity were as follows:

	Cost	Productivity
University A	$28.90	51%
University B	$46.52	50%
University C	$26.87	38%

Before taking into account the productivity factor, University C had less unit cost per pass than the other two universities. By applying the factor of productivity the costs were changed as follows:

	New Cost
University A	$28.90
University B	$46.99
University C	$30.36

It is now found that University C had a higher unit cost per pass in language than did University A although it was still less than University B. These calculations are possible for each of the courses, but they are not within the specific purpose of this study.

UNIT COST PER CONTACT HOUR

The instructional unit cost per contact hour was very different from what one would expect based on the previous instructional unit cost findings. This variation may be partially due to the fact that University B used "team teaching" and this method of instruction produced a very large number of contact hours in relationship to the number of students involved. At University A the mean cost per contact hour was $.29. At University B the mean cost was $.14 per contact hour and at University C the mean cost per contact hour was $.08. The number of matriculates in a course ordinarily has a great deal to do with contact hours developed and this obviously would directly affect the cost per contact hour. Conversely the number of instructors present at the same class directly affects the number of contact hours developed. The measure of contact hours should be of use in planning, but it should be cautioned that it is extremely limited in the Central American situation due to the vast differences in required class hours, class size, instructional salaries, etc. It appears that contact hours are of greatest use in appraising cost within one university. This measure is of very limited use when comparing the three Central American universities.

University A

At University A only chemistry had a unit cost per contact hour that was significantly different from the other courses at University A. The unit cost in chemistry was $.65 which was the highest cost

per contact hour of any course at University A. The lowest cost per contact hour was biology with a cost of $.16. Sociology was also low with a cost of $.17 per contact hour.

University B

Five of the eight courses at University B had a unit cost per contact hour under $.06. They were chemistry, mathematics, physics, philosophy and sociology. The first three had a unit cost per contact hour of $.03 and the other two courses, philosophy and sociology, had a cost of $.04 and $.05 respectively. History of culture had the highest cost per contact hour at $.63 and language was also high in terms of unit cost per contact hour at $.26. History of culture was the only course that was significantly different from the other courses in terms of two standard deviations from the mean.

University C

At University C the highest cost per contact hour was found in mathematics at $.11 per contact hour. The lowest cost per contact hour was found in sociology at $.04 per contact hour. None of the courses were found to be significantly different statistically.

Organization

In terms of organization the most centralized pattern found at University B had a mean cost per contact hour for all courses of $.14. The most decentralized university in these terms, University C had the lowest mean unit cost per contact hour at $.08. The highest mean cost per contact hour for all courses studied was found at the moderately centralized institution University A.

There were no observable relationships found between organization of the introductory course programs and unit costs per contact hour.

Productivity

Generally speaking the unit cost per contact hour was not appreciably affected by the difference in productivity observed between University C and the other two universities. This lack of effect was also noted between individual courses at the three universities.

UNIT COST PER CONTACT HOUR WITH PASS

The mean cost per contact hour with pass for all courses at University C was $.24, at University B it was $.27 and at University A it was more than double at $.57. As pointed out in chapter two, the contact hour with pass was derived from the number of class hours with those matriculates who successfully completed a course times the number of instructors who were present during these class hours. This category of unit cost is more meaningful than unit cost per contact hour, but it is still derived from so many variables that comparison is much more difficult than with such measures as unit cost per matriculate and unit cost per pass. Therefore, this category must be considered with extreme caution.

University A

The only course at University A that differed significantly from other introductory courses at University A was chemistry with

a unit cost per contact hour with pass of $1.30. Philosophy had the lowest cost per contact hour with pass at University A with $.30. Biology was also very low with a unit cost per contact hour with pass of $.31.

University B

At University B the highest cost per contact hour with pass was history of culture with a cost of $.95. Physics, which had an extremely high cost per matriculate and per pass was still high in relation to all other courses except history of culture which had $.26 per contact hour with pass. Chemistry, mathematics and sociology were all found to share the lowest cost per contact hour with pass at $.07.

University C

University C did not have any course that registered more than two standard deviations from the mean of all courses examined in terms of contact hour with pass. Mathematics was the most expensive course in terms of a contact hour with pass with a cost of $.40 and sociology was the lowest unit cost per contact hour with pass at $.09.

Organization

University C, the most decentralized institution had the least mean cost per contact hour with pass at $.24. University B, the most centralized, was found to be more costly in these terms than University C with a mean cost per contact hour with pass of $.27 and yet less costly than the moderately centralized institution,

University A, which had a unit cost per contact hour with pass of $.57. It should be noted, however, that the mean unit cost at University B was dramatically affected by one course. This course was history of culture which was higher than any other unit cost per contact hour with pass of any course at University B. This was also true at University A where the chemistry unit cost per contact hour with pass had a very great effect on the mean. Good arguments can be given for eliminating these courses in determination of the mean for the other courses. However, this was not done for purposes of this study. No observable uniform relationship was found between the pattern of organization as defined in this study in chapter two and instructional unit cost per contact hour with pass.

Productivity

When the differential in productivity was considered University C had enough increase in unit cost per contact hour with pass to make its mean cost higher than University B although still lower than University A. The figures are as follows:

	Unit Cost	Unit Cost Plus Productivity Differential
University A	$.57	$.57
University B	$.27	$.27
University C	$.24	$.29

On the basis of these findings productivity was found to influence the rank order of the three universities in terms of unit cost per contact hour with pass.

TABLE IV

Frequency of Class Size Occurrence of Introductory Courses for 1961 and 1962

University	Course	1-10	11-20	21-40	41-60	61-80	81-100	101-150	151-200	201-250	251-300	301-↑
A	Biology			2	4.5	2.5						
A	Chemistry	.5	6	22	2.5	3.5						
A	History of Culture			2.5	16.5	5						
A	Language			4.5	16	3.5						
A	Mathematics			1.5	3							
A	Philosophy			5.5	16.5	2						
A	Physics		.5	7.5	5	.5						
A	Sociology			3.5	3							
B	Biology				5*				1			
B	Chemistry				5*				1			
B	History of Culture		1									
B	Language				1		1					
B	Mathematics				5*					1		
B	Philosophy							1				.5
B	Physics			5*					1			
B	Sociology									.5	.5	
C	Biology			1	2	.5		2.5				
C	Chemistry			1	1	3.5		4.5	1			
C	History of Culture	1	1	1.5	2			.5	1	2		
C	Language	2		1	2.5	1		1			2	
C	Mathematics		.5	3	1	5	4.5	5.5		1		
C	Philosophy					1.5	.5	2	.5		2	
C	Physics		.5	3	.5	1.5	1	3	3	.5		
C	Sociology	1						2	1	.5	2	

*Lab Sections at Honduras.

FREQUENCY OF CLASS SIZE OCCURRENCE

Table IV labled "Frequency of Class Size Occurrence" was designed to show the distribution of average class size for the years 1961 and 1962 in the three Central American University Introductory Programs. Instructional unit costs are related to the variable of class size as well as to the instructional salaries paid to the professors. This Table details the breakdown of class size offerings. It indicates the institutions as well as the courses and class sizes found within those courses.

University A

At University A no class taught had an enrollment larger than 80 students. Most of the classes in all courses, regardless of course content, fell into the range of 21 to 80 students enrolled. The only exceptions were found in physics and chemistry. Chemistry which had six sections with an enrollment of from 11 to 20 students and one section with less than 10 students enrolled. Physics had one section also with an enrollment of between 11 and 20 students.

University B

At University B most of the classes offered were much larger in spite of the fact that matriculation at University B was by far the smallest of the three institutions. Only two of the lecture sections offered at University B had less than 81 students enrolled and these were history of culture and a language section. History of culture had from 11 to 20 students enrolled and the language

section had an enrollment of from 41 to 60. The largest classes were found in philosophy, with an enrollment of over 300 students, and in sociology with an enrollment of from 251 to 300. Note that the laboratory sections at University B are marked with an asterisk and are not considered in productivity as they do not report grades. The students only receive a grade from the examination in the lecture section.

University C

Table IV indicates that there was a very large differential in the size of classes taught. Roughly one-half of the classes taught were larger than 81 students in enrollment and one-half were less than this number in enrollment. Obviously, this means that many more students at University C are in large classes than are found in the smaller classes. By an examination of Table IV it was found that every course at University C had at least one section with more than 100 students enrolled and most of the courses had sections with more than 200 students enrolled. It was found that sociology had all of its sections with one exception, a class with less than 10 students, with more than 100 students enrolled. Class size did not appear to be affected by the content of the subject matter taught. Therefore laboratory classes were just as large or as small as non-laboratory classes.

TABLE V

Average Unit Cost Per Matriculate by Class Size for 1961 and 1962

University	Course	1-10	11-20	21-40	41-60	61-80	81-100	101-150	151-200	201-250	251-300	301-/
A	Biology			18.90	15.86	8.71						
A	Chemistry	594.00	140.82	74.93	26.62	5.00						
A	History of Culture			11.91	17.40	19.47						
A	Language			22.54	14.63	10.23						
A	Mathematics			4.84	32.43							
A	Philosophy			12.97	12.99	6.94						
A	Physics		7.00	18.49	15.00	17.13						
A	Sociology			33.65	35.03							
B	Biology								35.14			
B	Chemistry									32.32		
B	History of Culture		56.73									
B	Language				28.36		20.26					
B	Mathematics									43.67		
B	Philosophy							6.31				10.07
B	Physics								151.02			
B	Sociology									6.41	10.07	
C	Biology			21.43	19.26	8.82		8.70				
C	Chemistry			66.21	18.21	13.90		4.41	4.31			
C	History of Culture	36.00	25.71	20.00	9.68			10.91	4.19	2.91		
C	Language	482.14		31.30	11.16	5.07		9.68			4.20	
C	Mathematics		40.00	23.18	11.32	9.06	8.46	5.31		2.64		
C	Philosophy					11.22	6.20	7.00	6.48		4.41	
C	Physics		30.00	36.59	11.54	15.31	6.32	7.34	3.51	1.81		
C	Sociology	60.00						5.83	3.75	3.43	3.37	

AVERAGE UNIT COST PER MATRICULATE BY CLASS SIZE FOR YEARS 1961 AND 1962 AND AVERAGE PERCENT PRODUCTIVITY BY CLASS SIZE FOR THE YEARS 1961 AND 1962

Table V was found to be more revealing as it related to unit cost when coupled with Table VI, the average productivity percentage by class size.

University A

At University A the overall average unit cost per matriculate in biology was $13.40. It can be seen that those classes of biology that have 21-40 students cost $18.90 per matriculate and those classes which have 41-60 students cost $15.86 per matriculate. However, the average unit cost per matriculate was brought to $13.40 by the larger number of students found in classes that had 61-80 students enrolled. It should also be noted from the percent productivity by class size table (Table VI) that the percent of productivity for biology was 61% in the larger class size and slightly less in a smaller size class.

In spite of the case of biology an examination of the data as compiled in Tables V and VI did not clearly indicate that the percent productivity was dramatically increased or lessened due to the class size factor. There did, however, seem to be a general tendency noted that the larger the class size, the less cost per matriculate. In fact, a class in physics of 11-20 students with 38% productivity had a unit cost of $7.00 and another class in physics, also at University A, had a class size of 41-60 and the productivity was 41.5% and the

TABLE VI

Average Productivity Percentage by Class Size for 1961 and 1962

University	Course	1-10	11-20	21-40	41-60	61-80	81-100	101-150	151-200	201-250	251-300	301-/
A	Biology			54.5	51	61*						
A	Chemistry	100*	50	43	42.5	48						
A	History of Culture			48*	40	32*						
A	Language			49.5	51	51*						
A	Mathematics			40*	62*							
A	Philosophy			62	57.5	41*						
A	Physics		38*	38.5	41.5	26*						
A	Sociology			59	65.5							
B	Biology								54			
B	Chemistry									35		
B	History of Culture		75									
B	Language				42*		55*					
B	Mathematics									36		
B	Philosophy							81*				83*
B	Physics								37			
B	Sociology									71*	63*	
C	Biology			80*	54	35*		36				
C	Chemistry			51*	24	28		17.5	10*			
C	History of Culture	83		70.5	51.5			78*	62	36.5		
C	Language	72		51	47.5	53		69*			29.5	
C	Mathematics		39*	50.5	13.5	31.5	19	27		13*		
C	Philosophy					55*	48*	41.5	56*		29	
C	Physics		75*	43	10*	56*	13*	17.5	16	17		
C	Sociology							47.5	78*	75*	29.5	

*This size of class taught only one year.

unit cost per matriculate was $15.00. It should be pointed out that chemistry at University A was a case where the smaller class had a larger cost per matriculate and the cost per matriculate did dramatically decrease with increase of class size. One would also expect the percent productivity to decrease as the classes grew larger, but this was not clearly the case. It was found in chemistry that the smallest class with 1-10 students did have 100% productivity and as the class size increased it dropped to 43% for a class size of 21-40 and for 41-60 it dropped still further to 42.5%. It then rose to 48% in a class size of 61-80. It still appears legitimate to generalize that productivity had a tendency to decrease as the size of the class increased, but this wan not a fact in all cases examined and is certainly not a rule. An examination of history of culture at University A showed the cost per matriculate increased as the class size increased, which would not be expected, and the Table VI for the same course pointed out that the percent of productivity decreased as the class size increased which would be expected. The reason for this unexpected pattern of increased unit costs with increased class size must be related to the fact that considerably larger salaries were paid to some instructors and it depended upon which size of class they taught as to how this instructional salary affected the cost per matriculate.

Another very good example of the foregoing was mathematics where it was found that the average unit cost per matriculate was $4.84 for a class of 21-40 students. However, for a class of 41-60 students,

also in mathematics, the average unit cost per matriculate was $32.43. Productivity was less, however, in the smaller class at 40% productivity and higher in the larger class at 62% productivity. In summary it was found that there was no consistent relationship at University A between cost per matriculate and class size or between percent productivity and class size.

University B

At University B the average unit cost per matriculate according to class size did not follow the pattern that one would ordinarily expect. That is, one would expect that the larger the class the less percent productivity would be found and the larger the class the less the average cost per matriculate. This was not the case as two of the three courses that have multiple size sections at University B indicate that productivity increased with class size and they further confounded the issue by indicating that two of the courses of the three examined report an increased cost per matriculate as class size increased. These latter two courses were philosophy with a cost of $6.31 per matriculate in a class of 101-150 students and when the class size rose to 300 and over the cost increased to $10.07 per matriculate. Sociology was another case in point with a cost of $6.41 for a class size of 201-250 and when the class size increased to the 251-300 range the cost became $10.07 per matriculate. In these particular cases what happened was the addition of another instructor to the "team" that taught these courses with a resulting rise in cost per matriculate.

In these same two courses it was noted on Table VI that productivity increased in philosophy from 81% in the smaller class size to 83% in the larger class size. In sociology, however, the productivity decreased as the cost rose and the class size increased from 71% productivity in the smaller class to 63% in the larger class. It was also indicated that the least expensive cost per matriculate was found in philosophy in a class size of 101-150 students which had an average cost of $6.31 per matriculate.

Table V indicated that the low overall costs in sociology and philosophy were due to the fact that the class sizes were large. One class in sociology was over 200 students and the other exceeded 250 students. The same was true in philosophy at University B where the classes are large and the salaries are low. Physics was a very different story. It had a cost of $151.02 per matriculate in a class size of 151-200. This was, as before mentioned, due to the fact that an average of eight instructors taught this class using "team teaching". This made a very large number of contact hours and one would expect high productivity, but physics was found to have only 37% of its matriculates who passed the course examination.

University C

University C was the only institution of the three universities studied that was found to conform to the pattern that one would generally expect regarding unit cost per matriculate by class size and average productivity by class size. The average cost per

matriculate was found to decline with only a few exceptions as the size of the classes grew larger and the productivity was found to decrease as the class size increased. There are some exceptions in each course, but it was found that the general trend was recognizable. This finding could be related to the finding that salaries followed a rather constant pattern at University C and there was little difference in salary, if any, between those who taught small classes and those who taught larger classes.

As to productivity it was clear that the very low productivity evidenced by University C was a consequence of the larger classes offered. An investigation of the chart points out clearly that the larger classes simply were not as productive as the same classes taught in smaller numbers. Of course it must be remembered that another variable that was implicit in the study was present. That was the number of faculties that were teaching the various subjects so that biology, language, or any other subject could be taught in various class sizes by various faculties. This meant that the productivity and the cost were at least partially related to the faculty in which the course was taught as well as being related to the class size. This was a limiting factor, but it appears that the very low cost per contact hour and per matriculate in general was due to the very large number of large classes.

Table V indicated that the lowest unit cost per matriculate was found in physics with a cost of $1.81 per matriculate in a class size of 201-250. The very highest cost per matriculate was

found in language with an average cost per matriculate of $482.14 in a class size of 1-10 students which was more than compensated for in the other language classes where unit costs were as low as $4.20 per matriculate in class sizes of 251-300.

CHAPTER V

OBSERVATIONS AND QUESTIONS

Chapter three of this study has presented the findings of three measures of productivity in the introductory course offerings in three selected Central American universities as they relate to the variables of organization, class size and class hours. In addition six measures of unit cost analysis were presented in chapter four for the three selected Central American universities and a comparison of these three institutions has been made by focusing on two variables, productivity and organization. It is the purpose of this chapter to bring together the implications of these findings for consideration by Central American university administrators. In addition, some questions that have been generated on the basis of these findings will be posed and various alternative methods of utilizing these data will be explored.

OBSERVATIONS ON PRODUCTIVITY

According to the three measures of productivity used, as described in chapter three, productivity was generally greater at both University A and University B than it was at University C.[1] It was found that University A and University B were very comparable in terms of the number of matriculates who successfully completed the course examination. The foregoing finding was reported as measure two of productivity and it was judged by the investigator

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[1]Chapter three, Table II.

as the most important measure of the three measures employed in the analysis of productivity. It was for this reason that in chapter four productivity was narrowly defined to mean only measure two. This does not exclude the other two measures of productivity from being useful and extremely enlightning to administrators, but it was apparent that the goal of each course at every university should be to produce a student who could successfully complete the course examination. Hence, measure two of productivity was by far the most crucial measure in the final analysis. For this reason those who administer programs in Central America would do well to pay particular attention to measure two of productivity and to consider the other two measures of productivity in the light of improving the percent of matriculates who successfully complete the course examination.

In general it would appear that productivity could be decidedly improved at both University B and University C if they were to institute a more systematic and sophisticated admissions program, however, as was pointed out in chapter one, the Central American view of admissions has heretofore not been consistent with good admissions practice as perceived in North America. It would be advisable on the basis of the evidence presented in this study, at least at University A and B, for a thorough examination of the whole admissions procedure to be made and the responsible officials, both student and faculty, should consider the possibility of a substantial increase in productivity through better admissions selection and placement. University A

could also profit by this same action, but the increase would not be as substantial due to the fact that University A had fewer students matriculating who did not present themselves for the course examination.

It was found that all three of the universities had very low productivity when it was taken into account that all the courses examined in this study were introductory courses. Actually, none of the three institutions had even fifty percent of the matriculates passing the course examination. On this basis alone, it would appear that either the courses are too demanding, or the students are not prepared, or the instructors have a policy that only a relatively small number of matriculates should pass in particular courses. In considering these possibilities an administrator may conclude that the students are not well enough prepared for the university level courses and in this case it would be necessary to consider the whole secondary educational program that sends large numbers of students to the university with inadequate preparation. If it was concluded that the courses are too demanding, administrative action could be taken to point this out to the instructors and in this fashion productivity could be improved and more space would become available for new students due to the fact that the length of time required for a student to graduate would be considerably lessened.

University B was found to have a considerably larger percent of its students who took the course examination and passed the examination. The reasons for this finding were not clear, however, it may be related to the fact that University B, in most cases, had

more class hours required per course than did University A or University C. It was found that in every course examined University B had the highest percent of matriculates who presented themselves for the examination and successfully completed the examination. One finding that did not tend to substantiate the theory that class hours required are a key factor in the number of those who take examinations and pass them was the fact that in several courses the other institutions had more required class hours and yet University B still had the highest productivity.

Salaries at the three universities did not appear to be the same. In fact, it was found that University C had a considerably smaller amount invested in instructional salaries whereas the salaries at the other two institutions were found to more nearly approximate one another. Since productivity was much higher at University A and University B it would appear that a very pertinent action for the responsible officials at University C would be an inquiry into the relationship at their own institution between salary cost and productivity in terms of the number of matriculates who pass the course examination. This inquiry should yield some very interesting and fruitful results.

Within each institution the administrators and other responsible interested parties should evaluate the findings of this study in terms of the productivity by class size, which for organizational clarity in this study was presented in chapter four on Table VI. By consideration of the percent productivity by class size (note that productivity was measure number two of the three productivity measures) a determination

can be made as to the desirability, in terms of productivity, of increasing or decreasing class size.

An example of this procedure would be to assess the findings as they concern the language course at University A. In language it was found that productivity was 49.5% for a class that had from 21 to 40 matriculates. Productivity in this same course was 51% for sections with from 61 to 80 matriculates. On this basis, considering no other factors, economic or academic, it would be wise for an investigation to be made of the course. If on the basis of this investigation, in academic terms, no new information is encountered it would then be wise to increase class size as the instructional cost would be less for the course and productivity would not noticeably decrease, and in fact, could possibly increase.

It was found in a consideration of the productivity measures that introductory courses in chemistry and physics were very difficult for students to pass. This was found to be true at all three of the universities. On this basis it can be concluded by the administrators that these courses need special attention as the students are either finding them difficult due to inadequate preparation in secondary school or the level of instruction is geared to a higher level than should be expected of students in an introductory course.

On the basis of the findings in this study it can be concluded that organization, as defined in this study, did not have any observable impact on the productivity as defined by the three measures of productivity in this study. Also, it would appear from the findings,

as they relate to productivity, that class size did appear to exert some influence on the course productivity. Although the observation was made that as class size grows larger the percent productivity tends to decrease there were enough exceptions to this pattern to justify only stating that this tends to occur. In regard to class hours, as a variable affecting productivity, it was found that no observable relationship existed between this variable and productivity.

OBSERVATIONS ON INSTRUCTIONAL UNIT COST

In chapter four of this study productivity was considered as one of the two variables that were presumed to affect instructional unit cost at the three Central American universities. In general, it was found that University C had the lowest cost per instructional unit in almost every category examined. The evidence pointed to the fact that this low unit cost was partially due to the low salaries paid at University C relative to those paid at the other two universities. It also was partially due to the fact that University C had considerably more matriculates than either University A or University B. With the foregoing in mind, it was still possible to note some interesting findings in relation to instructional unit cost. These findings should allow administrators insight into their own institutions and provide some basis on which they can compare their own institutional performance with other comparable universities.

Administrators and responsible officials at University A should make a complete examination of introductory chemistry to determine why the cost of chemistry was so much more in almost all categories than any other introductory course at University A. They should ask themselves whether or not salaries paid to those who teach chemistry are justifiable in the light of other salary payments. They should consider class size as a factor in this analysis and also consider why it was necessary to have a course like chemistry costing so much more than physics or biology. The most vital use of these unit cost figures appears to be for diagnostic purposes so that the administrator can identify which courses are costing more or less than other courses and attempt to assess the reason or reasons for these differences.

At University B it was observed that introductory physics was more costly than any other course taught at University B, or for that matter, any other course taught at any of the universities examined. This course accounted for one-half of the sum of all the unit cost for all the passes at University B. It was found that if this one course, physics, could be brought into line, as far as instructional unit cost per pass was concerned, that University B would then compare very favorably in unit cost per pass to University A although University C would still be substantially less than either of the other institutions.

Generally speaking, on the basis of the findings in this study, no significant difference in any unit cost was found between laboratory and non-laboratory classes. This, however, must be viewed in the light of the fact that this study only deals with instructional unit cost and not with total cost. It would be assumed that the laboratory classes would cost more in terms of additional facilities and equipment, but this was not within the scope of this study.

High matriculation was found to be very desirable in Central America. This was because money has been made available to the universities by the national governments on the basis of either matriculation or a percent of the gross tax receipts. Classes are also assigned on the basis of matriculation. Therefore, even though the matriculation figures have never been realistic in Central America they can be expected to remain high for some time. Also, since high matriculation is still desirable for various reasons it appears that many students will be allowed to attend the university in name only and this will make unit cost per matriculate appear to be rather low, but in terms of passes the cost per pass will continue to be higher. This matriculation factor directly affects both productivity and unit cost and unless there is a new admissions procedure accepted and/or a new method of distribution of funds apart from matriculation instituted it will remain a serious problem.

Generalizing on the basis of the findings reported in chapter four it would appear that organization was not in any directly observable way related to instructional unit cost. It was found that the most decentralized university, in terms of this study, University C, had the lowest unit cost in almost every category,

but it was also found that University C had an extremely low salary schedule in comparison with the other two institutions. Therefore, it was determined that these findings should at least temporarily cancel each other out.

The variable of productivity was considered as it related to instructional unit cost only as the percent of matriculates that successfully completed the course examination. The summary of the findings in this category allow the conclusion that the difference in productivity of approximately 20% between University C and the other two universities affected unit cost to some extent, but that this did not significantly change the unit cost comparisons between institutions.

It was therefore concluded that the most important usage of the instructional unit cost analysis was to indicate problem courses and possible sources of inefficiency within a university. Although the comparisons between institutions are interesting and provide a yardstick for limited comparison, they are not accurate and complete enough to allow total reliance on this process.

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APPENDIX A

APPENDIX A

BIOLOGY

FACULTY: Agriculture

COURSE NUMBER: B153 (002)

COURSE NAME: General Biology

DESCRIPTION: Introduction to biology: definition, importance, and history. The living system: concept, comparison. The changes of environment: past, present, processes-cycles. The living materials: chemical characteristics, physical and biological characteristics. Metabolism: nutrition, autotrofa and heterotrofa. Metabolism of energy and synthesis. The establishment of cells: the liquids of the body. The nervous system. Conservation of life: cellular reproduction, plant reproduction. Reproduction and development of animals. Adaptation: heredity, evolution, past and future.

FACULTY: Medicine

COURSE NUMBER: 30 (003)

COURSE NAME: General Biology

DESCRIPTION: Concept: Makeup of living material. Cellular Morphology. Cellular phyisiology. Notions of general embryology. Embryo development. Origin of sex. System of hormone coordination. Heredity. Genetics. Biology of species. Elements. Ensyms. Vitamins.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: CN 421 (002)

COURSE NAME: Plant Biology

DESCRIPTION: Obligatory course in the basic formation and examination for both phases: theory and practice. First part: Composition, anatomy and physiology of the plant cell. Second part: Organization, microscopic anatomy and description of the organs of the plants.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: CN 431 (003)

COURSE NAME: Animal Biology

DESCRIPTION: Obligatory course in the basic formation and examination of both phases: theory and practice. Living material. Cytology. Unicellular beings. Multicellular beings, their vital functions and their relations as well as reproduction. Heredity and genetics, species. Ecology and zoography.

FACULTY: Humanities

COURSE NUMBER: PS 3 (387)

COURSE NAME: Biological Problems

DESCRIPTION: Study of organisms, understanding the morphology, the embryology, the physiology, and the psychology as research is conducted.

FACULTY: Veterinary Medicine

COURSE NUMBER: C 40 (004)

COURSE NAME: General Biology

DESCRIPTION: Introduction: The living system; the changes of environment; cyclical processes, the living material, its characteristics; metabolism; nutrition; cellular stability; nervous system; conservation of life; reproduction and development of living beings, adaptability, heredity and evolution.

CHEMISTRY

FACULTY: Agriculture

COURSE NUMBER: Q 152 (004 and 010)

COURSE NAME: Chemistry

DESCRIPTION: Preliminaries: material, energy, phenomena, mixtures, combinations, etc. Definitions of chemistry. Laws of gravity. Gaseous states; laws of gases. Kinetic theory. Liquid state: general properties of liquids, solutions, osmosis. Solid state: properties, colloids, classification (periodic) nomenclature, radiation. Atomic theory. Valence. Oxygen reduction. Products of solubility. pH. Hydrolysis. Regular solutions.

FACULTY: Medicine

COURSE NUMBER: 10 (001)

COURSE NAME: Chemistry (General and Mineral)

DESCRIPTION: Body: generalities. History of chemistry, causes of the chemical nomenclature of the elements. Periodic table. Nomenclature of groups A and B of eight columns. Physical constitution of the body. The atom. Physical-chemistry radiation. Diverse philosophies. Generalities of inorganic chemistry. Electrovalence. Co-valence, notations, energy and quantity. Diverse laws. Isotopes, magnetism. Transformation of material. Different types of compounds and their laws. Study of diverse chemical phenomena. Individual study of each element.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: Q 1221 (005)

COURSE NAME: General Chemistry

DESCRIPTION: General concepts about chemistry, about its material, and its nature. Gaseous states, its laws. Liquid state, its general properties. Solid state, general properties. Colloidal state. Atomic theory. Chemical combinations. Theory of reactions: nomenclature. Calculation of chemical coefficients of chemical equations.

FACULTY: Engineering

COURSE NUMBER: 130 (005)

COURSE NAME: General Chemistry

DESCRIPTION: Giving the student the principles, fundamentals, theories and applications of chemistry, with the purpose of giving him in his preparation a general base that permits him to understand the courses that will prepare him in his professional discipline. This course is basic and ought to cover all the fundamentals of chemistry, with the content developed in such a fashion as to make it adequate for the functional pursuit of the profession of civil engineering. It is divided in: generalities, inorganic chemistry and organic chemistry.

FACULTY: Dentistry

COURSE NUMBER: CB 102 (003)

COURSE NAME: Inorganic Chemistry

DESCRIPTION: The course of Inorganic Chemistry constitutes the initial chemical information for the student. In it they study the fundamental principles of chemistry, they place emphasis in the experimental aspects of said science. They study the quantitive data that are the basis of modern theories and they put special attention to the resolution of problems of a chemical order. They also study in detail the chemical elements giving preference to all those that directly or indirectly are related to dentistry.

FACULTY: Veterinary Medicine

COURSE NUMBER: C 20 (002)

COURSE NAME: Inorganic Chemistry

DESCRIPTION: General notions, molecular volume, gaseous state, liquid state, solid state, colloidal state, solutions, studies of the periodic table. Valence, chemical nomenclature, oxidation and reduction, electrolysis and ion theory, radiations, radio-activity, isotopes, artificial radio-activity, atomic theory, chemical equilibrium, chemical catalysts, ionic equilibrium.

HISTORY OF CULTURE

FACULTY: Architecture

COURSE NUMBER: H 704 (046) and H 805 (047)

COURSE NAME: History of Architecture I and II

DESCRIPTION: Historical study and analytical study of the plastic arts from the prehistoric times until the present, with special attention to its relation and significance to the appropriate epoch. The course comprehends the study of Egypt, Asia, Greece, and Rome in the first term and during the second term studies both Europe and Asia from the 4th Century to the 16th Century. Europe is studied in addition from the 16th to the 18th Century.

FACULTY: Economics

COURSE NUMBER: E 160 (006)

COURSE NAME: History of Culture

DESCRIPTION: General study of the History of Culture from its origin in the pre-historic period until the contemporary age, passing through all its phases of its development to find the fundamental elements--material and spiritual--of the principal cultures of humanity and the share of each one of them in the universal culture.

FACULTY: Economics

COURSE NUMBER: E 230 (009)

COURSE NAME: Economic History

DESCRIPTION: Ancient economies; fuedalism. The maritime expansion. The commercial revolution and the integration of new economic areas. The new forms of slavery and the new forms of fuedalism in America. The agricultural revolution and the transition to capitalism. The first industrial revolution. Economic imperialism. The social revolution. The great conflicts of the 20th Century.

FACULTY: Juridicial and Social Science

COURSE NUMBER: G 70 (007)

COURSE NAME: Critical History of Central America

DESCRIPTION: The discovery of America (Central America in particular). The conquest. Organization of the expeditions. Conquest and organization of island territories. Conquest and discovery of Central America. Conquest of Guatemala. General aspects related to the conquest. Organization and establishment of the colony. Characteristics of the XVII Century. Characteristics of the XVIII Century. The earthquakes of 1773. Spain before the French Revolution.

FACULTY: Medicine

COURSE NUMBER: 60 (006)

COURSE NAME: History of Culture

DESCRIPTION: Concept and generalizations. Prehistoric culture. Egyptian-Mesopotamian culture. India and China. Semites and Iranians. Civilization in early America. Greece and Rome. Medieval Europe. Rennaisance and modern age in Europe. The contemporary epoch.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: CG 020 (081) and CG 021 (084)

COURSE NAME: Humanities I and Humanities II

DESCRIPTION: Course selected within a series of courses adequate for the goals of the professional formation that the Faculty of Humanities offer and oriented to the development of reflective thinking and in the formation of habits of study and research.

FACULTY: Humanities

COURSE NUMBER: H 108 (222)

COURSE NAME: History of Culture I

DESCRIPTION: Definition of culture and civilization. The science of culture and its problems. The history of culture. Genesis of culture from the pre-historic epoch until the appearance of the first civilizations. The civilizations of Mesopotamia, Egypt, India, China, of the Irarian peoples, of the Phonecian and Hebrew peoples. The pre-hellenic civilizations, the civilizations of Greece, Rome and Christianity.

FACULTY: Humanities

COURSE NUMBER: H 109 (223)

COURSE NAME: History of Culture II

DESCRIPTION: Modern concept about the medieval. The medieval European culture, the Islamic world, and the Byzantine world. The European rennaissance of the 16th Century, the discovery of America and the European expansion over other continents. The reformation and the counter-reformation. The appearance of the modern state and the absolute rule of monarch. Special emphasis on the Imperial Austro-Spanish and in the colonial Spanish American culture. The French Revolution, the Industrial Revolution, the Russian Revolution and the World Wars. The Bolivar Congress of Panama, the League of Nations, the Organization of American States, and the United Nations.

LANGUAGE

FACULTY: Agriculture

COURSE NUMBER: C 130 (006) and C 330 (012)

COURSE NAME: Spanish Language I and II

DESCRIPTION: Origin and formation of the Spanish language. Grammatical analysis. Rules, composition, description, narration, and lecture. Lecture and commentary on the following works: Peoma de Mio Cid; the greatest chapters of El Quijote, works of the generation of 98. El Senor Presidente, de Miguel Angel Asturias.

FACULTY: Juridical and Social Science

COURSE NUMBER: G 50 (005)

COURSE NAME: Introduction to Spanish Literature

DESCRIPTION: Spanish literature. Romanization. Visigoth period. Mohammedan invasion. Epic. Lyric. Provincial school. Galacian-Portuguese. Classicism. Neo-classical. Renniassance. Novel. Poetry. Theater. Age of gold. Culturism, conceptism, mysticism. Vanguardism. Nineteenth and 20th century. Colonial America. Universities. Romanticism and modernism of America. Novel. Poetry and theater in America.

FACULTY: Juridical and Social Science

COURSE NUMBER: G 60 (006)

COURSE NAME: Introduction to the Historical Study of Language

DESCRIPTION: Brief introduction to the study of the linguistic problems. History of the Spanish language. The Spanish of America. Morphology and syntax of Spanish. Notes characterizing the written and spoken language. Introduction to the study of the commentary and explanation of texts. Critical bibliography of texts on linguistics.

FACULTY: Medicine

COURSE NUMBER: 50 (005)

COURSE NAME: Spanish Language

DESCRIPTION: It has a fundamental goal to train the future doctors in their expression with the object that in their life as students and in the professional field they can translate their ideas with clarity employing all the shades and resources of the language. Therefore they need the clarity of written and oral exposition, but they must be able to adapt themselves to the diverse mentalities of the patients who in their diverse ways are not always in a condition to translate their instructions into words. With the object of making less emphasis on the study of grammar than on the means of knowing the national literature. Also one finds a magnificient illustration divulging itself more in the value content of the literature, also as it contributes to the self-formation of a civic conscience as an essential base in all medical vocations.

FACULTY: Humanities

COURSE NUMBER: L 3 (268) and L 4 (269)

COURSE NAME: Language I and Language II

DESCRIPTION: A base of constant exercises trains the student in the command of grammar, composition, spelling and in the analysis of texts. The second semester is merely a continuation of the first.

MATHEMATICS

FACULTY: Agriculture

COURSE NUMBER: M 150 (001)

COURSE NAME: Algebra

DESCRIPTION: Preliminary notions. Nature of numbers. Algebraic quantities. Use of parentheses. Products and quotients. Factoring. Algebraic fractions. Maximum common divider and minimum common multiplier. Complex fractions. Ratio. Proportions. Undetermined values, numerical and literal equations. First degree equations. Systems. Graphs. Problems. Powers and roots. Fractionary exponents. Imaginary quantities. Powers and roots of polynomials. Second degree equations. Arithmetic and geometric progressions. Logarithms. Dimensional equations. Auxilary methods of approximate calculations. Inequalities and non-equations. Simple and compound interest.

FACULTY: Agriculture

COURSE NUMBER: M 350 (007)

COURSE NAME: Plane and Spherical Geometry

DESCRIPTION: Plane geometry. Generalities. Space. Geometry and planes. Lines: projection of figures. Theorems on straight lines. Angles: projection and measuring systems. Complements, supplements and explements. Bisections, theorems, polygons, classification. Triangles: classification and relationships. Parallel straight lines. Cuadrilaterals, classification, relationships, diagonals, theorems. Circumference and circle: definitions and relationships. Ratio and proportion. Similarity of figures. Projections. Pythagoras theorem. Relationship between circumference and regular polygons. Areas of regular and irregular plane figures, relationships and scales. Solid geometry: generalities. Regular polyhedrons. Area and volume of geometric solids. Parallelepiped, prisms, cylinder, pyramid, cone, sphere, etc.

FACULTY: Architecture

COURSE NUMBER: M 101 (010)

COURSE NAME: Algebra

DESCRIPTION: Nature of numbers. Products and notable quotients. Factoring. Algebraic fractions. Maximum common divider and minimum common multiplier. Numerical and literal equations. Equations to the first degree. Powers and roots. Fractional exponents. Imaginary quantities. Powers and roots of polynomials. Second degree equations

FACULTY: Architecture

COURSE NUMBER: M 102 (011)

COURSE NAME: Geometry and Trigonometry

DESCRIPTION: Angles: triangles, perpendiculars, rectangles. Parallels. Polygons. Circle, tangency, inscribed angles. Proportions, similar figures. Area of plane figures. Solid geometry, area and volume of solids.

FACULTY: Economics

COURSE NUMBER: E 140 (004)

COURSE NAME: Applied Mathematics I

DESCRIPTION: The objectives of algebra and its differences from arithmetic. Symbols and signs. Algebraic, arithmetic, positive and negative quantities, algebraic expressions, reduction of like terms, numerical and algebraic operations, numerical values and algebraic expressions, products and special quotients. Divisability between x $\frac{1}{2}$ a, raising of powers. Algebraic operations with negative and fractionary exponents, finding roots, ratio and proportion, percentages, graphing of functions, solving equations of the first degree, second degree equations. Logarithms, exponential equations, notions about coordinates. Newton's binomial laws, arithmetic and geometric progressions, fractions. Factoring.

FACULTY: Economics

COURSE NUMBER: E 220 (008)

COURSE NAME: Applied Mathematics II

DESCRIPTION: Theory of numbers. Analysis of combinations. Introduction to the theory of wholes. Theory of probabilities. Functions, different types and their graphing. Matrix algebra. Straight lines, conicals, exponentials. Functions of two variables, cross-sections. Complex numbers, vectors.

FACULTY: Medicine

COURSE NUMBER: 40 (004)

COURSE NAME: Mathematics

DESCRIPTION: Review of elementary operations of arithmetic and algebra. Zero and negative exponents. Use of slide rule. Various problems. Metric system, varied measurements. Proportions. Percentages. Problems. Proportions applied to diagrams for graphing percentages. Probabilities. Averages and deviations. First degree equations. Use of arithmetic and algebraic formulas. Solving of problems. Second degree equations. Cartesian coordinates. Logarithms. Trigonometric functions.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: FM 121 (001)

COURSE NAME: Mathematics I

DESCRIPTION: Required basic course with examination but no laboratory. First part: elementary algebra. Algebraic operations. Notable products. Newton's binomial laws. Zero and negative exponents. Notable coefficients. Divisability between $x \neq a$. Factoring. Algebraic and complex fractions. Radical equations and fractionary powers. Imaginary quantities. Equations to the second degree. Progressions and logarithms. Second part: trigonometry. Circular measurements of angles. Trigonometric functions. General Trigonometric formulas. Natural functions and logarithms. Solving of right triangles.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: FM 122 (004)

COURSE NAME: Mathematics II

DESCRIPTION: Analytic geometry, generalities. Coordinates. Constants and variables. Isometric and heterometric scales. Straight lines, principal parameters. Tangents, symetrical and normal equations. Transformation of coordinates, conic section, central and general circle. Parabolas. Ellispe. Hyperbola. Asymtotes. General second degree equations.

FACULTY: Engineering

COURSE NUMBER: 100 (001)

COURSE NAME: Elementary Algebra

DESCRIPTION: Nature of numbers. Products and quotients, factoring. Algebraic fractions. Maximum common divider and minimum common multiplier. Numerical and literal equations. Equations to the first degree. Powers and roots. Fractional exponents. Imaginary quantities. Powers and roots of polynomial. Equations to the second degree. Progressions. Logarithms. Dimensional equations. Inequalities and non-equations.

FACULTY: Engineering

COURSE NUMBER: 110 (002)

COURSE NAME: Plane and Solid Geometry

DESCRIPTION: Angles. Triangles, perpendiculars, right triangles. Parallels. Polygons. Circles. Tangency, inscribed angles. Proportions, similar figures. Area of plane figures. Solid geometry, area and volume of solids.

FACULTY: Veterinary Medicine

COURSE NUMBER: C 70 (007)

COURSE NAME: Mathematics Applied to Medicine

DESCRIPTION: Generalities regarding arithmetic: elementary operations, primary and compound numbers; maximum common divider and minimum common multiplier; fractions; powers; ratios; logarithms; metric system; geometric figures; compounds; ratios and proportions; simple and compound interest; discount; averages; Newton's binomial law; probabilities; elementary statistics; populations and samples; graphs.

PHYSICS

FACULTY: Agriculture

COURSE NUMBER: M 550 (014)

COURSE NAME: Physics I

DESCRIPTION: Introduction. Units and measuring instruments. Purpose of physics. Matter. Substance. Bodies, phenomena. Mechanics: objectives and division. Force: characteristics, composition and decomposition, latent and active energy. Types of movement. Acceleration, free fall and vertical pull. Circular movement. Newton's laws. Compound motion. Parabolic motion. Friction. Equilibrium. Center of gravity. Inercia. Work: potential and energy. Simple machines. Static liquids. Properties of liquids. Pressure. Archimedes principal. Hydraulic press. Liquids in motion. Bernoulli's theorem. Torricelli's theorem. Gases. Kinetic theory. Manometer laws. Hydraulic pump. Thermometric scales. Heat and expansion.

FACULTY: Agriculture

COURSE NUMBER: M 750 (020)

COURSE NAME: Physics II

DESCRIPTION: Heat: thermometrics. Expansion of bodies. Calorometrics. Heat transmission. Changes in state. Thermodynamics: principles. Undulating motion: simple harmonic motion, elements, equations, propagation. Acoustics: fundamental concepts. Optics: reflection and refraction of light. Plane and curved mirrors. Flat glass, prisms and lenses. Optical instruments. Light dispersion. Heat and frequency,

wave lengths and refraction index. Photometry. Magnetism: magnets, magnetic fields. Earth magnetics: delineation and inclination. Electricity: electrostatics, lightning rods. Electric current. Electric batteries, intensity, energy, power and electric tension. Ohm's law. Joule's law. Electromagnetic induction. Faraday's law. Röentgen rays. Production of electromagnetic waves. Continuous current. Alternating current. Transformers. Thermoelectric currents.

FACULTY: Architecture

COURSE NUMBER: M 203 (012)

COURSE NAME: Physics

DESCRIPTION: Basic studies in physics for the architect: mechanics, sound, acoustics, temperature, electricity, magnetism, light and optics.

FACULTY: Medicine

COURSE NUMBER: 20 (002)

COURSE NAME: General Physics

DESCRIPTION: Generalities: matter, bodies, gravity. Static. Dynamics. Simple machines. Hydromechanics. Aeromechanics. Thermology. Motion. Radiation. Optics. Magnetism. Electricity. Ectrodynamics. Electricity and magnetism. Alternating current. Electrical waves. Discharging of gases. Electronic radiations.

FACULTY: Chemistry and Pharmacy

COURSE NUMBER: FM 132 (012)

COURSE NAME: General Physics

DESCRIPTION: This course includes the study of mechanics. Static. Dynamics, force, motion and rotation. Mechanic energy. Elasticity. Latent liquids. Gases and fluids in motion. Study of heat, its propagation. Quantities of heat and changes in state. Thermic properties of gases and thermodynamics. Electricity and electromagnetism. Electrostatics. Electrodynamics and electromagnetism. Wave lengths. Sound. Optics. Light. Lenses and mirrors. Optical instruments, spectrums and polarization. Emphasis is given to those aspects which are most important for pharmaceutical and biological chemistry.

FACULTY: Engineering

COURSE NUMBER: 121 (011)

COURSE NAME: Mathematical Physics I

DESCRIPTION: This course is designed to give the student a basis for other courses that will be required later. A spirit of observation and investigation is to be developed in the student. The course includes: considerations as to the nature of physics. Basic magnitudes. Approximate calculations. Measuring devices. Cinematics. Dynamics. Pneumatostatics and hydrostatics.

FACULTY: Engineering

COURSE NUMBER: 221 (017)

COURSE NAME: Mathematical Physics II

DESCRIPTION: Continuation of Mathematical Physics I. The objective of the course is to teach the fundamentals of: acoustics, optics, electricity and magnetism, using only elementary mathematics. Appropriate problems. The course includes basic materials in physical sciences based on Physics I and elementary mathematics and it should serve as a basis for studying acoustics and optics (phonometry, photometry, optical instruments, etc.) applicable to the career of the engineer.

FACULTY: Dentistry

COURSE NUMBER: CB 101 (002)

COURSE NAME: Applied Physics

DESCRIPTION: In this course general physical laws and phenomena are studied as they are related to dentistry.

PHILOSOPHY

FACULTY: Architecture

COURSE NUMBER: H 101 (001)

COURSE NAME: Elements of Logic

DESCRIPTION: Definition of the course, its relationships to all knowledge. Special relationships of logic to philosophy, psychology and to the theory of knowledge and epistomology. General characteristics of logical terms: concepts, judgments, reasoning and methods.

FACULTY: Architecture

COURSE NUMBER: H 202 (002)

COURSE NAME: Problems of Philosophy

DESCRIPTION: Definition of the study of philosophy through the ages, philosophical problems: relationships of philosophy to the sciences, the arts, man and society.

FACULTY: Economics

COURSE NUMBER: C 211 (045)

COURSE NAME: Elements of Logic and Language

DESCRIPTION: Discussion of logic: scientific objectives of logic. Brief historical survey. Logical forms: concepts, judgments, reasoning. Random methods. Fundamental laws of logic. Relationship of thought and language: the logic of proposition or symbolic logic (mathematical logic). Scientific exposition of a problem. Elements of language: oration, nouns, personal pronouns, verbs, adverbs, conjunctions.

FACULTY: Law

COURSE NUMBER: G 20 (002)

COURSE NAME: Introduction to Philosophy

DESCRIPTION: Historical references. System and topics to be studied. School of Mileto. The Sophists. Post-Socratic Schools. Neo-Platonic School. The fathers of the Church and Christian Philosophy. Origin and evolution of scholasticism. Rennaissance and humanism. Gnoseological fundamentals of philosophy. General idea of contemporary philosophy. Representative philosophers.

FACULTY: Humanities

COURSE NUMBER: F 1 (102)

COURSE NAME: Elements of Logic

DESCRIPTION: Language and its functions. Informal fallacies. Definition. Propositional calculations. Logic of classes. Functional logic.

FACULTY: Humanities

COURSE NUMBER: F 2 (103)

COURSE NAME: Problems of Philosophy

DESCRIPTION: General concepts of philosophy and science. Nature of philosophical and scientific problems. Analysis and criticism of principal metaphysical, gnoseological, esthetic, social and political problems.

SOCIOLOGY

FACULTY: Architecture

COURSE NUMBER: U 901 (050)

COURSE NAME: Urban Sociology

DESCRIPTION: This course, as a part of urban studies, introduces the motivations and formation of social groups from the age of the Greeks to present times, as a creative and autonomous phenomenon of civilization. Sociology, with its interpretation and methods of investigation, is applied to the techniques of contemporary planning. Lectures, discussions and round table discussions.

FACULTY: Economics

COURSE NUMBER: E 120 (002)

COURSE NAME: Sociology

DESCRIPTION: Universal and permanent characteristics of society. Historical development. Influence of environment, dynamics and social structure. Causes of social stratification, the family, the community, the population in general. Social integration. Precursors of sociology. Methods, society, cults and economics. Economic organization. Property. Dynamics of social change. Elements of social disintegration and integration. Social organizations, before and after the discovery of America. Analysis of sociological, ethnological and anthropological studies of the nation. The economist in social dynamics. Economic planning. (Emphasis will be placed on the study of national sociology.)

FACULTY: Law

COURSE NUMBER: G 40 (004)

COURSE NAME: Introduction to Sociology

DESCRIPTION: General concepts and history of sociology. Guatemalan sociology.

FACULTY: Law

COURSE NUMBER: G 61 (015)

COURSE NAME: Social Anthropology

DESCRIPTION: The reasons for including this subject in the curriculum are: (1) integrate social science in the faculty; (2) give a basis to specific subjects needed for the major; (3) extend the cultural panorama of the student, stimulating his cultural formation; (4) give the student an incentive for scientific investigation and preparation for the writing of a thesis; and (5) interest the student in the problems of Guatemalan anthropology.

FACULTY: Humanities

COURSE NUMBER: F 30 (115)

COURSE NAME: General Sociology I

DESCRIPTION: Justification of Sociology as a science. Methods and techniques of sociological investigation. Basic problems.

FACULTY: Humanities

COURSE NUMBER: F 31 (116)

COURSE NAME: General Sociology II

DESCRIPTION: Analysis of a sociological problem. Training in field investigations. Discussion of results and evaluations.

APPENDIX B

TABLE A

COMPARATIVE SUMMARY OF BIOLOGY BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	96	864	33504	200	237	130	148	349	$5369.00	14208	9	1
	1962	72	648	35496	366	444	255	302	493	$5912.00	21744	9	1
	1963	72	648	68904	---	---	---	---	957	$5343.00	-----	9	1
	1961-2	84	756	34500	283	341	193	225	421	$5641.00	17976	9	1
"B"	1961	168	600	52752	62	62	62	62	157	$5361.00	20832	6	1
	1962	168	600	87696	121	121	120	120	174	$6306.00	60480	6	1
	1963	168	708	179424	---	---	---	---	267	$12312.00	-----	7	1
	1961-2	168	600	70224	92	92	91	91	166	$5833.00	40656	6	1
"C"	1961	140	976	70405	292	370	182	224	546	$6060.00	27408	8	5
	1962	128	912	51134	244	359	138	185	417	$5220.00	21282	8	5
	1963	128	912	-----	---	---	---	---	---	$8070.00	-----	8	5
	1961-2	134	944	60770	268	365	160	205	482	$5640.00	24345	8	5

TABLE B

COMPARATIVE SUMMARY OF CHEMISTRY BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	192	2784	112608	890	1132	450	534	1173	$57674.00	51264	29	1
	1962	192	3744	100222	754	988	466	574	1044	$80840.00	55104	39	1
	1963	192	1536	31296	---	---	---	---	326	$ 6296.00	-----	16	1
	1961-2	192	3264	106415	822	1060	458	554	1109	$69257.00	53184	34	1
"B"	1961	258	690	282720	107	107	81	81	248	$ 7790.00	104490	6	1
	1962	258	690	280440	157	157	92	92	246	$ 8177.00	118680	6	1
	1963	258	798	421800	---	---	---	---	370	$ 9865.00	-----	7	1
	1961-2	258	690	281580	132	132	87	87	247	$ 7984.00	111585	6	1
"C"	1961	176	1713	130602	566	840	190	281	1102	$10200.00	36380	22	6
	1962	166	1585	109461	461	727	126	202	990	$10440.00	24391	22	6
	1963	157	1773	111262	---	---	---	---	1230	$11040.00	-----	23	6
	1961-2	171	1649	115032	516	785	160	243	1630	$10320.00	30386	22	6

TABLE C

COMPARATIVE SUMMARY OF HISTORY OF CULTURE BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	96	2304	110976	701	960	354	528	1156	$22634.00	50688	24	1
	1962	64	1536	89984	599	820	374	476	1406	$24528.00	30464	24	1
	1963	64	1472	103232	---	---	---	---	1613	$24966.00	-----	23	1
	1961-2	80	1920	100480	650	890	364	502	1281	$23657.00	40576	24	1
"B"	1961	90	90	1800	10	10	10	10	20	$ 800.00	900	3	1
	1962	90	90	900	10	10	10	10	10	$ 901.00	900	3	1
	1963	90	90	----	---	---	---	---	20	$ 2703.00	-----	3	1
	1961-2	90	90	1350	10	10	10	10	15	$ 851.00	900	3	1
"C"	1961	114	660	82283	475	540	394	446	897	$ 5520.00	42657	9	6
	1962	101	596	71116	416	454	380	413	868	$ 5040.00	32400	9	6
	1963	87	524	84802	---	---	---	---	1023	$ 4320.00	-----	7	6
	1961-2	108	628	76701	448	499	389	432	885	$ 5280.00	37579	9	6

TABLE D

COMPARATIVE SUMMARY OF LANGUAGE BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	96	2304	98784	798	1034	389	534	1029	$14369.00	51264	24	1
	1962	64	1536	85696	849	1109	526	669	1339	$20427.00	42816	24	1
	1963	64	1600	91136	---	---	---	---	1424	$19379.00	-----	25	1
	1961-2	80	1920	92240	834	1072	458	602	1184	$17398.00	47531	24	1
"B"	1961	90	180	9450	44	44	44	44	105	$ 3003.00	3960	2	1
	1962	90	180	16020	110	110	98	98	178	$ 3604.00	8820	2	1
	1963	90	180	13680	---	---	---	---	152	$ 3604.00	-----	2	1
	1961-2	90	180	12735	77	77	71	71	142	$ 3303.00	6390	2	1
"C"	1961	146	854	128756	397	538	256	383	855	$ 8460.00	36849	11	4
	1962	130	790	127125	292	328	249	276	870	$ 9330.00	22403	11	4
	1963	112	767	141575	---	---	---	---	985	$ 7980.00	-----	10	4
	1961-2	138	822	128121	347	435	254	331	864	$ 8895.00	29626	11	4

TABLE E

COMPARATIVE SUMMARY OF MATHEMATICS BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	96	576	28704	216	238	177	187	299	$ 9727.00	17952	6	1
	1962	72	216	7128	48	48	40	40	99	$ 474.00	2880	3	1
	1963	72	144	14040	---	---	---	---	195	$ 549.00	-----	2	1
	1961-2	84	396	17916	132	143	109	114	199	$ 5101.00	10236	5	1
"B"	1961	258	690	319920	75	75	67	67	248	$10639.00	86430	6	1
	1962	258	690	380808	157	157	133	133	246	$10916.00	205884	6	1
	1963	258	798	572760	---	---	---	---	370	$16603.00	-----	6	1
	1961-2	258	690	350364	116	116	100	100	247	$10786.00	146157	6	1
"C"	1961	139	1459	118403	933	1416	341	443	1741	$12720.00	36402	20	7
	1962	139	2687	138068	905	1348	352	447	1934	$14688.00	31750	36	7
	1963	137	1545	131475	---	---	---	---	2027	$13050.00	-----	34	7
	1961-2	139	2073	128237	923	1384	350	448	1840	$13704.00	34076	28	7

TABLE F

COMPARATIVE SUMMARY OF PHILOSOPHY BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	96	2304	106272	799	926	588	656	1107	$14189.00	62976	24	1
	1962	64	1536	78528	834	990	563	661	1227	$17360.00	42304	24	1
	1963	64	1536	82176	---	---	---	---	1284	$22707.00	-----	24	1
	1961-2	80	1920	92400	817	958	576	659	1167	$15775.00	52640	24	1
"B"	1961	90	270	32130	141	141	114	114	238	$ 1502.00	15390	2	1
	1962	90	270	96390	229	229	190	190	357	$ 3604.00	51300	2	1
	1963	90	360	66960	---	---	---	---	186	$ 3904.00	-----	2	1
	1961-2	90	270	64260	185	185	152	152	298	$ 2553.00	33345	2	1
"C"	1961	72	396	76878	534	703	366	454	1571	$ 4858.00	24606	10	2
	1962	77	484	79059	423	570	267	335	1368	$ 7680.00	21379	11	3
	1963	67	383	83359	---	---	---	---	1258	$ 6180.00	-----	7	4
	1961-2	75	484	77968	479	637	317	395	1508	$ 6269.00	22992	10.5	2.5

TABLE G

COMPARATIVE SUMMARY OF PHYSICS BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	144	1080	43848	402	488	252	282	609	$ 9315.00	20304	15	1
	1962	144	864	31176	185	260	93	122	433	$ 7929.00	8784	12	1
	1963	72	72	3096	31	17	31	17	43	$ 412.00	1224	1	1
	1961-2	144	972	37512	294	379	173	202	521	$ 8622.00	14544	13.5	1
"B"	1961	198	630	192168	62	62	46	46	157	$26735.00	72864	8	1
	1962	198	630	212976	90	90	77	77	174	$23403.00	121968	8	1
	1963	198	630	326808	---	---	---	---	267	$24790.00	-----	8	1
	1961-2	194	630	202572	76	76	62	62	166	$25069.00	97416	8	1
"C"	1961	125	1849	135534	522	962	146	299	1291	$11400.00	35227	26	6
	1962	139	1876	131505	444	774	132	262	1303	$11400.00	28080	26	6
	1963	157	1805	98398	---	---	---	---	1275	$13410.00	-----	24	6
	1961-2	132	1863	133521	484	869	140	281	1360	$11400.00	34510	26	6

TABLE H

COMPARATIVE SUMMARY OF SOCIOLOGY BY UNIVERSITY AND YEAR

Institution	Year	Class Hours	Instructional Hours	Contact Hours	Exams Taken		Exams Passed		Matriculation	Instructional Cost	Contact Hours With Pass	Num. Sec.	Num. Fac.
					1st	Tot	1st	Tot					
"A"	1961	96	864	36960	289	362	169	238	385	$12504.00	22848	9	1
	1962	72	288	13032	138	159	97	116	181	$ 7130.00	8352	4	1
	1963	72	504	23904	---	---	---	---	332	$ 7671.00	-----	7	1
	1961-2	84	576	24996	214	261	133	177	283	$ 9817.00	15600	6.5	1
"B"	1961	90	180	44820	188	188	176	176	249	$ 1602.00	31680	1	1
	1962	90	180	53820	199	199	188	188	299	$ 3003.00	33840	1	1
	1963	90	180	30780	---	---	---	---	171	$ 3003.00	-----	1	1
	1961-2	90	180	49320	194	194	182	182	274	$ 2302.00	32760	1	1
"C"	1961	130	638	131633	567	678	403	451	978	$ 4800.00	53419	9	4
	1962	168	584	143234	491	579	370	429	1063	$ 4080.00	49692	7	4
	1963	105	667	101372	---	---	---	---	885	$ 7440.00	-----	7	4
	1961-2	149	638	137583	529	678	387	440	1027	$ 4440.00	51623	8	4

APPENDIX C

TABLE A

INSTRUCTIONAL UNIT COSTS - 1961

	Instructional Cost			Unit Cost Per Instructional Hour			Unit Cost Per Contact Hour With Pass			Unit Cost Per Matriculation		
University	A	B	C	A	B	C	A	B	C	A	B	C
Biology	5369	5361	6060	6.21	8.94	8.63	.378	.257	.221	15.38	34.15	11.10
Chemistry	57674	7790	10200	20.72	11.29	5.95	1.13	.075	.28	49.17	31.41	5.96
History of Culture	22634	800	5520	9.82	8.89	8.36	.45	.889	.13	19.58	40.00	6.15
Language	13917	3003	8460	6.04	16.68	9.91	.27	.758	.23	13.53	28.60	9.90
Mathematics	9727	10639	12720	16.95	15.42	8.72	.54	1.23	.35	32.53	42.90	7.31
Philosophy	14190	1502	4858	6.16	5.56	12.27	.23	.098	.20	12.82	6.31	9.09
Physics	9315	26735	11400	8.63	42.44	6.17	.46	.37	.32	15.30	170.29	8.83
Sociology	12504	1602	4800	14.47	8.90	7.52	.55	.05	.09	32.48	6.43	4.91
Totals	145330	57432	64018									

TABLE A Con't.

INSTRUCTIONAL UNIT COSTS - 1961

	Unit Cost Per Pass			Unit Cost Per Contact Hour			Unit Cost Per Class Hour		
University	A	B	C	A	B	C	A	B	C
Biology	36.27	86.47	27.05	.16	.10	.09	55.93	31.91	43.29
Chemistry	108.00	96.17	36.30	.51	.03	.08	300.39	30.00	57.96
History of Culture	42.87	80.00	12.38	.20	.44	.07	235.77	8.89	48.42
Language	26.06	68.25	22.09	.14	.32	.07	144.97	33.37	57.95
Mathematics	52.07	158.79	28.71	.34	.03	.11	101.32	41.24	91.51
Philosophy	21.63	13.18	10.70	.13	.05	.06	147.81	16.69	67.47
Physics	33.03	581.20	38.13	.21	.14	.08	64.69	135.03	91.20
Sociology	52.54	9.10	10.64	.34	.04	.04	130.25	17.80	36.92

TABLE B

INSTRUCTIONAL UNIT COSTS - 1962

	Instructional Cost			Unit Cost Per Instructional Hour			Unit Cost Per Contact Hour With Pass			Unit Cost Per Matriculation		
University	A	B	C	A	B	C	A	B	C	A	B	C
Biology	5912	6306	5220	9.12	10.51	8.18	.27	.10	.26	11.99	36.24	12.52
Chemistry	80840	8177	10440	21.59	11.85	6.59	1.47	.07	.43	77.43	33.24	6.77
History of Culture	24528	901	5040	15.97	10.01	8.46	.81	1.00	.16	17.45	90.10	5.81
Language	20427	3604	9330	13.30	20.02	11.81	.47	.41	.42	15.12	20.25	10.72
Mathematics	474	10916	14688	2.19	15.82	5.47	.17	.05	.47	4.79	44.37	7.60
Philosophy	17361	3604	7680	11.30	13.35	15.87	.41	.07	.36	14.15	10.10	5.61
Physics	7929	23403	11400	9.18	37.15	6.08	1.90	.19	.41	18.31	134.50	8.75
Sociology	7130	3003	4080	24.76	16.68	6.99	.85	.09	.08	24.76	10.04	3.84
Totals	164601	59914	67878									

TABLE B Con't

INSTRUCTIONAL UNIT COSTS - 1961

	Unit Cost Per Pass			Unit Cost Per Contact Hour			Unit Cost Per Class Hour		
University	A	B	C	A	B	C	A	B	C
Biology	19.58	52.55	28.22	.17	.07	.10	82.11	37.54	40.78
Chemistry	140.84	88.88	51.68	.81	.03	.10	421.04	31.69	62.89
History of Culture	51.53	90.10	12.20	.27	1.00	.07	383.25	10.01	49.90
Language	30.53	36.78	33.80	.24	.23	.07	319.17	40.04	71.77
Mathematics	11.85	82.08	32.86	.07	.03	.11	6.58	42.31	105.67
Philosophy	26.27	18.97	22.93	.22	.04	.10	271.27	40.04	99.74
Physics	64.99	303.94	43.51	.25	.11	.09	55.06	118.20	82.01
Sociology	61.47	15.97	9.51	.55	.06	.03	99.03	33.37	24.29

TABLE C

INSTRUCTIONAL UNIT COSTS - 1963

	Instructional Cost			Unit Cost Per Instructional Hour			Unit Cost Per Contract Hour With Pass			Unit Cost Per Matriculation		
University	A	B	C	A	B	C	A	B	C	A	B	C
Biology	5343	12312	8070	8.25	17.39	12.65	----	----	----	5.58	46.11	-----
Chemistry	6296	9865	11040	4.10	12.36	6.23	----	----	----	19.31	26.66	8.98
History of Culture	24967	2703	4320	16.96	30.03	8.24	----	----	----	15.48	135.15	4.22
Language	19379	3604	7980	12.11	20.02	10.40	----	----	----	13.61	23.71	8.10
Mathematics	549	16603	13050	3.81	20.81	8.45	----	----	----	2.82	44.87	6.44
Philosophy	22707	3904	6180	14.78	10.84	16.14	----	----	----	17.69	20.99	4.91
Physics	412	24790	13410	5.72	39.35	7.43	----	----	----	9.58	92.85	10.52
Sociology	7671	3003	7440	15.22	16.68	11.15	----	----	----	23.10	17.56	8.41
Totals	87324	76784	71490									

TABLE C Con't.

INSTRUCTIONAL UNIT COSTS - 1963

	Unit Cost Per Pass			Unit Cost Per Contact Hour			Unit Cost Per Class Hour		
University	A	B	C	A	B	C	A	B	C
Biology	-----	-----	-----	.08	.07	---	74.21	73.28	63.05
Chemistry	-----	-----	-----	.20	.02	---	32.79	38.24	70.32
History of Culture	-----	-----	-----	.24	---	.05	390.11	30.03	49.65
Language	-----	-----	-----	.21	.26	.06	302.80	40.04	71.25
Mathematics	-----	-----	-----	.04	.03	.10	7.63	64.35	95.26
Philosophy	-----	-----	-----	.28	.06	.07	354.80	43.38	92.24
Physics	-----	-----	-----	.13	.08	.14	5.72	125.20	85.41
Sociology	-----	-----	-----	.32	.10	.07	106.54	33.37	70.86

APPENDIX D

TABLE A

PRODUCTIVITY ANALYSIS

YEAR 1961	UNIVERSITY A					UNIVERSITY B					UNIVERSITY C				
Course	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass
Biology	349	200	237	130	148	157	62	62	62	62	546	292	370	182	224
Chemistry	1173	890	1132	450	534	248	107	107	81	81	1713	566	840	190	281
History of Culture	1156	701	960	354	528	20	10	10	10	10	897	475	450	394	446
Language	1029	798	1034	389	534	105	44	44	44	44	855	397	538	256	383
Mathematics	299	216	238	177	187	248	75	75	67	67	1741	933	1416	341	443
Philosophy	1107	799	926	588	656	238	141	141	114	114	1571	534	703	366	454
Physics	609	402	488	252	282	157	62	62	46	46	1291	522	962	146	299
Sociology	385	289	362	169	238	249	188	188	176	176	978	567	678	403	451

TABLE B

PRODUCTIVITY ANALYSIS

YEAR 1962	UNIVERSITY A					UNIVERSITY B					UNIVERSITY C				
Course	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass
Biology	493	366	444	255	302	174	121	121	120	120	417	244	359	138	185
Chemistry	1044	754	988	466	574	246	157	157	92	92	1542	461	727	126	202
History of Culture	1406	599	820	374	476	10	10	10	10	10	868	416	454	380	413
Language	1339	849	1109	526	669	178	110	110	98	98	870	292	328	249	276
Mathematics	99	48	48	40	40	246	157	157	133	133	1934	905	1348	352	447
Philosophy	1227	834	990	563	661	357	229	229	190	190	1368	423	570	267	335
Physics	433	185	260	93	122	174	90	90	77	77	1303	444	774	132	262
Sociology	181	138	159	97	116	299	199	199	188	188	1063	491	579	370	429

TABLE C

PRODUCTIVITY ANALYSIS

YEAR 1963	UNIVERSITY A					UNIVERSITY B					UNIVERSITY C				
Course	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass
Biology	957	----	----	----	----	267	----	----	----	----	Inc.	Inc.	Inc.	Inc.	Inc.
Chemistry	326	----	----	----	----	370	----	----	----	----	1230	Inc.	Inc.	Inc.	Inc.
History of Culture	1613	----	----	----	----	20	----	----	----	----	1023	Inc.	Na.	Inc.	Na.
Language	1424	----	----	----	----	152	----	----	----	----	985	Inc.	Na.	Inc.	Na.
Mathematics	195	----	----	----	----	370	----	----	----	----	2027	Inc.	Inc.	Inc.	Inc.
Philosophy	1284	----	----	----	----	186	----	----	----	----	1258	Inc.	Inc.	Inc.	Inc.
Physics	43	31	17	31	17	267	----	----	----	----	1275	Inc.	Inc.	Inc.	Inc.
Sociology	332	----	----	----	----	171	----	----	----	----	885	Inc.	Inc.	Inc.	Inc.

TABLE D

PRODUCTIVITY ANALYSIS

YEAR AUG. 1961-2	UNIVERSITY A					UNIVERSITY B					UNIVERSITY C				
Course	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass	Matric-ulates	1st. Exam	Tot. Exam	1st. Pass	Tot. Pass
Biology	421	283	341	193	225	166	92	92	91	91	482	268	365	160	205
Chemistry	1109	822	1060	458	554	247	132	132	87	87	1630	516	785	160	243
History of Culture	1281	650	890	364	502	15	10	10	10	10	885	448	499	389	432
Language	1184	824	1072	458	602	142	77	77	71	71	864	347	435	254	331
Mathematics	199	132	143	109	114	247	116	116	100	100	1840	923	1384	350	448
Philosophy	1167	817	958	576	659	298	185	185	152	152	1508	511	673	347	430
Physics	521	294	379	173	202	166	76	76	62	62	1312	490	878	145	288
Sociology	283	214	261	133	177	274	194	194	182	182	1027	532	632	391	444

APPENDIX E

TABLE A

INSTRUCTIONAL COST BY CLASS SIZE - AUGUST 1961-62

University	Course	1-10	11-20	21-40	41-60	61-80	81-100	101-150	151-200	201-250	251-300	300+
A	Biology			983	3203	1455						
A	Chemistry	297	16335	47805	3567	1171						
A	Hist. Culture			1000	15297	6191						
A	Language			3088	11967	2343						
A	Mathematics			237	4864							
A	Philosophy			2243	11288	874						
A	Physics		49	4142	3900	531						
A	Sociology			4172	5570							
B	Biology								5833			
B	Chemistry									7984		
B	Hist. Culture		851									
B	Language				1503		1803					
B	Mathematics									10786		
B	Philosophy							751				1802
B	Physics								25069			
B	Sociology									801	1501	
C	Biology			600	1965	300		2775				
C	Chemistry			1920	1020	3420		3240	720			
C	Hist. Culture	360	360	900	900			600	720	1440		
C	Language	3375		720	1440	360		600			2400	
C	Mathematics		360	2225	600	3180	2945	3735		600		
C	Philosophy					1200	285	1695	570		2520	
C	Physics		300	3000	300	1500	600	2700	1800	300		
C	Sociology	360						1440	360	360	1920	

APPENDIX F

IIME INSTITUTO DE INVESTIGACIONES Y MEJORAMIENTO EDUCATIVO
UNIVERSIDAD DE SAN CARLOS DE GUATEMALA

RESUMEN DE CURSO ("ASIGNATURA" O "INTERN")

A

UNIVERSIDAD | FACULTAD | DEPARTAMENTO

IDENTIFICACION DEL CURSO (NOMBRE) | NUMERO [6-7] | NUMERO DE SECCIONES: CONF. | LAB. | TOTAL

CONTENIDOS [8-9]: CLASE: CONFERENCIA 1 | CONFERENCIA Y LAB. 2 | SEMINARIO 3 | LABORATORIO 4 | PRACTICA O CLINICO 5 | OTRA (ESP.) 6

CURSO CONSECUTIVO 1 | CURSO ALTERNO 2 | DURACION: PRIMER SEMESTRE 1 | SEGUNDO SEMESTRE 2 | AÑO COMPLETO 3 | CADA SEMESTRE 4 | DOS SEMESTRES 5 | OTRA (ESP.) 6

PERMANENCIA: PERMANENTE 1 | ANUAL 2 | TEMPORAL 3 | FRECUENCIA: CADA AÑO 1 | CADA DOS AÑOS 2 | CADA TRES AÑOS 3 | ESPORADICAMENTE (ESP.) 4

REUNIONES Y TIEMPO EN CLASE

CLASE	REUNIONES POR SEMANA	NO. DE SEMANAS	NUMERO TOTAL DE REUNIONES
CONFERENCIA O SEMINARIO	A [22] 1 2 3 4 5	B [23-24]	C [25-27]
LABORATORIO CLINICA O PRACTICA	D [28] 1 2 3 4 5	E [29-30]	F [31-33]

CLASE	MINUTOS POR REUNION	TOTAL DE MINUTOS
CONFERENCIA O SEMINARIO	G [34] 1 2 3 4 5 6 7 8 9 10	H
LABORATORIO CLINICA O PRACTICA	J [35] 1 2 3 4 5 6 7 8 9 10	K

COMPUTOS Y NOTAS
A × B = C
D × E = F
C × G = H
F × J = K

NOTA
REPRODUZCA COLUMNAS 1-35 EN CADA TARJETA A - M

COLUMNAS/CLAVES	
1	
2-3	
4	
5-7	
8-9	
10-11	
12-13	
14-16	
17	
18	
19	
20	
21	
22	
23-24	
25-27	
28	
29-30	
31-33	
34	
35	

	196[ ]	T	SEC.	HORAS DE CLASE	MATRICULA	HORAS-ESTUDIANTES	HORAS-INSTRUCTORES	HORAS DE CONTACTO	CATEDRAS O FRACCIONES	EXAMINADOS	APROBADOS	REPROBADOS	RETRASADOS	CREDITO AÑO	CREDITO SEM.	80
B	CONFERENCIA O SEMINARIO	2	1													
C	LABORATORIO CLINICA O PRACTICA	3	1													
D	TOTAL	4	1													
	1962	34	37	38 — 40	41 — 44	45 — 50	51 — 54	55 — 60	61 — 62	63 — 65	66 — 68	69 — 71	72 — 74	75	76	77	78	79	80
E	CONFERENCIA O SEMINARIO	2	2													
F	LABORATORIO CLINICA O PRACTICA	3	2													
G	TOTAL	4	2													
	1963	36	33	38 — 40	41 — 44	45 — 50	51 — 54	55 — 60	61 — 62	63 — 65	66 — 68	69 — 71	72 — 74	75	76	77	78	79	80
H	CONFERENCIA O SEMINARIO	2	3													
I	LABORATORIO CLINICA O PRACTICA	3	3													
J	TOTAL	4	3													

	ANALISIS	36 T	37 A	38 39 40 41 42 COSTO DE ENSEÑANZA	43 44 45 46 POR SECCION	47 48 49 50 POR HORA DE CLASE	51 52 53 54 POR ESTUDIANTE MATRICULADO	55 56 57 58 POR HORA-ESTUDIANTE	59 60 61 62 POR HORA-INSTRUCTOR	63 64 65 66 POR HORA DE CONTACTO	67 68 69 70 POR ESTUDIANTE APROBADO	71 72 73 74 75 76 77 POR HORA CREDITO	78-9	80
K	1961	9	1											
L	1962	9	2											
M	1963	9	3											

[26-79-7] [42-43-2] [38-40-3] [51-54-4] [45-50-4] [51-54-4] [54-60-4] [66-68-3] [75-77 o 78-79-4]

INSTRUCCIONES PARA COLUMNAS 36-80

TARJETA A	
36-79	NOMBRE DE CURSO
80	X

TARJETAS B-N	
36-80	INFORMACION QUE CORRESPONDE CON ELLA EN LAS LINEAS A LA IZQUIERDA