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ABSTRACT

This document comprises recommendations for the gathering of data concerning section or class size at the universities in Ontario. The objective of a section size analysis is to produce a consistent measure of one important element effecting the allocation of university resources. Three distributions are formed from the data by tallying the frequency of course sections in the appropriate average section size interval. The three distributions are: (1) unweighted; (2) weighted by teaching hours per week; and (3) weighted by student hours per week. See also HE 003 545. (HS)

METHODOLOGY OF SECTION SIZE ANALYSIS

Committee of Presidents of
Universities of Ontario,
Research Division,
March, 1971.

SECTION SIZE ANALYSIS

Introduction

At the 53rd meeting of the Committee of Presidents of Universities of Ontario on December 16, 1969 Dr. D. T. Wright, Chairman of the Committee on University Affairs, indicated that he "would like to see [measured] ... the spectrum of class sizes in the universities ranking the enrolment in classes of five and under, 5-15, 15-100 and over one hundred." In April 1970, at the 57th meeting of the Committee of Presidents it was agreed that this project should be undertaken and coordinated by the Research Division of the Committee of Presidents.

In the early months of 1970, members of the Research Division consulted representatives of the universities to determine the present state of information in this area, and also to devise appropriate means for collecting these data. In June a presentation was made to the Ontario University Registrar's Association outlining the proposed study and suggesting a form for the collection of data. The data collection form was subsequently modified and copies together with instructions were forwarded to each university in mid-July. Through the rest of July and August each of the universities was visited by a member of the staff of the Research Division. These visits provided the universities with an opportunity to present the particular problems that they foresaw in the study generally, and specifically in their preparation of the data. At the same time it enabled the Research Division to develop a first-hand knowledge of the limitations of the data base being accumulated.

A meeting of university personnel was held in October 1970 in response to a growing awareness of the limitations in the data. At that meeting it was agreed that the Research Division would prepare a report from the data collected over the summer and early fall for the 1969-70 session. Further, it was agreed that it was necessary to improve upon the definitions for data collection in the preparation of reports for future years. Accordingly, it was decided that personnel of the Research Division of CPUO would work with university personnel (Richard Caldwell, Assistant Registrar, McMaster University and Mario Creet, Office of Academic Planning, Queen's University) in producing a planning report which would define the purposes of the study and form of presentation of data elements for approval by the universities prior to continuing the studies in future years. On March 4, 1971, a draft of the proposed methodology of section size analysis was presented to university representatives. The recommendations arising from this meeting have been incorporated in this paper.

Objectives

The objective of a section size analysis is to produce a consistent measure of one important element effecting the allocation of university resources. It is not possible on the basis of an analysis of section size alone to render a complete accounting of the academic activities of the faculty or of the academic services available to students. The pattern of section sizes established at a university yields information on only one parameter of instructional activities; other parameters would include number of staff, average staff workload, number of students, number of courses (each course with its attendant parameters), and degree requirements.

This study is concerned with section size patterns only and will present a method for establishing a historical summary of this element of the instructional activities of a university.

The basic data of this study will allow each of the universities to conduct a more thorough periodic internal examination. It is anticipated that the results of the study will be useful in the internal management of the university for example, in the time-tabling process, for curriculum planning and staffing, and for the planning of new facilities and renovation of existing facilities. At the same time a system pattern can be defined for external reporting. Finally, by comparison of these profiles over a period of years it will be possible to trace the development of this element of the teaching process.

Data Collection Mechanism

This paper presents two data collection forms; the first is suggested as one possible format which the universities could use to organize their basic data; the second presents a format which the universities, if they choose, can use to aggregate their data from which, in conjunction with the submission of the other universities, a system report can be produced. It is the option of each university to decide which format they wish to use for presenting their section size data.

Basic Data Element

It is first necessary to establish a set of uniform definitions. The basic data for this study will be defined at the "course" level. For purposes of this paper, the term "course" is intended to describe the fundamental unit or building block from which a programme is formed. A course is a scheduled or timetabled instructional activity designated by a unique number and usually a descriptive outline in the faculty calendar and which may be offered to students enrolled in different programmes. For each course there exists a list of descriptors (such as total hours per week of instructional activity and course enrolment). All of the elements that will later be defined will relate to descriptors

of the course, not of the students who take the course or of the faculty who may teach the course. Thus, there may be some courses which will be excluded from this study for one or more of the following reasons;

(i) they do not fit the main pattern of instructional activity

(ii) the basis for comparison is not apparent or,

(iii) the cost of including the course is not warranted by the benefits gained (e.g. off-campus courses).

Measures of Section Size

Three distributions will be used to establish the pattern of section sizes. Because the unit of basic data is the course, it will be necessary to define an average section size for each type of activity "i" of each course.

$$\text{Average section size for activity "i" in a course} = \frac{\text{Course enrolment in activity "i"}}{\text{Number of sections of activity "i"}}$$

Three distributions will be formed from the data by tallying the frequency of course sections in the appropriate average section size interval. The three distributions are:

1) Unweighted (number of course sections) - For each activity of each course the number of sections is tallied in the section size interval containing the course average section size.

2) Weighted by Teaching Hours per Week (number of section hours) - In each activity of each course, the number of sections is weighted by the hours per week of scheduled activity and then tallied in the section size interval containing the course average section size.

3) Weighted by Student Hours per Week (number of student hours) - In each activity of each course the number of sections is weighted by the number of hours per week of scheduled activity and by the course average section size and then tallied in the section size interval containing the course average section size.

Therefore for each activity "i" of each course there exists a frequency distribution of the following values:

1) Number of sections required for activity "i"

2) $\left(\begin{matrix}\text{Number of sections required} \\ \text{for activity "i"}\end{matrix}\right) \times \left(\begin{matrix}\text{Number of scheduled hrs/wk} \\ \text{for activity}\end{matrix}\right)$

3) $\left(\begin{matrix}\text{Number of sections} \\ \text{required for} \\ \text{activity "i"}\end{matrix}\right) \times \left(\begin{matrix}\text{Number of scheduled} \\ \text{hours/week} \\ \text{for activity "i"}\end{matrix}\right) \times \left(\begin{matrix}\text{Average section} \\ \text{size for} \\ \text{Activity "i"}\end{matrix}\right)$

Each of these three types of distributions will be referenced in reports of section size analysis.

Basic Data

This part of the paper defines each of the basic data elements required to construct the above distributions. The data are to be based upon instructional activities at the universities during one week of the fall term. Two forms are presented; the first is a suggested format for use by universities in presenting their basic data and the second is a suggested form for summarizing these data and from which a total system report can be produced.

Figure 1 is suggested as the basic data collection form. As stated previously, the basic data are collected at the course level. The definitions of the parameters requested on this form follow. The week chosen is to reflect a typical week of the fall term and should be selected after most course transfers have occurred.

Column (1)

Course Identification: The course name and number as defined in the calendar or information system are sufficient. This element is solely for the purpose of tracing an error in the basic data.

If some or all of the activities of two separately identifiable courses are in fact combined, then all the descriptors of the two courses are to be combined as if there were one course only.

All scheduled credit courses except for the following courses are to be included:

i) All non-credit courses

ii) Courses for which the method of comparison is not appropriate or apparent. This group includes the following courses: all field work, research and essay courses, thesis papers, thesis supervision courses, reading courses, correspondence courses, open laboratory courses, clinic work and short courses (duration of less than eight weeks).

FIGURE 1

University _____ 19__

(1) Course Identification	(2) Discipline Group	(3) Course Level	Instructional Activities												Teaching Unit	Student Group
			(4) Type:			(4) Type:			(4) Type:			(4) Type:				
			(5) Hrs. /Wk.	(6) Enrol-ment	(7) No. Sect.	(5) Hrs. /Wk.	(6) Enrol-ment	(7) No. Sect.	(5) Hrs. /Wk.	(6) Enrol-ment	(7) No. Sect.	(5) Hrs. /Wk.	(6) Enrol-ment	(7) No. Sect.		

Column (2)

Discipline Group: the content of each course is to be associated with one of the following four discipline-groups: Humanities, Social Science, Biological Science, and Physical Science. These four groups are based upon the OCGS discipline list (Appendix A).

In our opinion the use of a category for "inter-disciplinary" or "multi-disciplinary" courses would be misleading. Such a category could easily develop into a sink catching any course which did not easily fit within the other categories. The term inter-disciplinary, while usually a descriptor of a programme, may also apply to a few courses. In such cases, the discipline group should be selected to reflect the main orientation of the content of the course.

Column (3)

Course Level: The course level is to reflect the degree of specialization of the material within a broad field of study, as determined by the content of course. The course level should not reflect the characteristics of the students or staff involved. Four levels are proposed:

a) Undergraduate - Introductory: an initial offering in a broad field of study or a first offering in a particular aspect of a discipline at the university level not requiring any prerequisite courses at the university level.

b) Undergraduate - Intermediate: the first stage toward specialization within a field of study, normally requiring prerequisite courses at the university level.

c) Advanced: to denote a course offering specialization in a particular field of study, which may be open to both undergraduate and graduate enrolment.

d) Graduate: a course offered at the graduate level, for graduate students only.

In some cases the universities will find it necessary to apply discretion because the level of a course may not align with one of the above categories. While a high degree of compatibility is desired, the nature of this descriptor is such that absolute rules cannot be formed. Only guidelines are suggested.

Under "Instructional Activities" Figure 1 presents four sets of the following four elements - type, hours per week, enrolment and number of sections.

Column (4)

Type: The instructional activity of each course may be described as a lecture, laboratory, tutorial seminar, or a combination of these forms. At the university level it may be meaningful to maintain the types indicated. However, the system report will recognize only two classifications:

i) "Classroom" - to describe those activities of a course which depend upon one-way or two-way communication of information and not generally involving experimentation or problem solving in the laboratory sense. Thus, lectures, seminars and tutorials would usually fall within this group.

ii) "Laboratory" - to describe those activities of a course in which the instructional activity is carried on through demonstration or experimenation and which normally demands additional experimentation equipment not available in the classroom. (In this case the use of closed circuit TV to communicate information would not necessarily indicate a laboratory activity.) Generally this would include art studio laboratory and language laboratory courses.

Column (5)

Hours per Week: The timetabled number of hours per week that each section participates in each type of course activity.

Column (6)

Course Enrolment: The number of students, irrespective of programme or status (except auditors), who enroll in each type of course activity for the purpose of completing a portion of a programme of studies approved by the university.

Column (7)

Number of Sections

The section size for any activity is defined to be equal to the enrolment for the activity divided by the number of instructors assigned to the activity (an instructor is one who is paid by the university for conducting the activity). If there are no instructors the section size is defined to

be equal to the enrolment. Therefore the number of sections is equal to the number of instructors; if there are no instructors the number of sections is one.

The four elements - type, hours per week, course enrolment, and number of sections should be reported for each instructional activity of each course.

Two additional elements have been provided for in the basic data collection form. These two elements are included solely for internal purposes of the university and will not be required for purposes of the section size analysis.

1) Teaching Unit - for the identification of the department or faculty offering the course.

2) Student Group - for the identification of the students enrolled in the course (for example, faculty of origin or programme of students).

These two factors would allow the calculation of inter-faculty loading factors which could be of significance for internal accounting purposes. Since these elements are not required for purposes of the section size analysis, it is the option of the individual universities to fill in these elements of the basic data. We would encourage the use of these elements in light of the valuable return that could be realized in the internal management of the universities.

Figure 1 is suggested as a form for presenting basic data for section size analysis. It is intended primarily for use within the university itself; the total system analysis is to be formed from aggregate data from each university. If any university wishes they may submit the basic data. Figure 2 is suggested for presenting the aggregate section size data. Each university would submit one such form for each discipline group and each course level (16 forms in all = 4 discipline groups x 4 course levels), and from this a total system report could be produced.

In Figure 2 the three distributions outlined above under Measures of Section Size have been shown under the two headings 'Lecture, Seminar, Tutorial' and 'Laboratory'. Each course listed on the basic data sheet would be examined to see in what ways it contributes to these three distributions under each of the categories of discipline group, course level and instruction type. The following example should clarify the process of translating basic data to the summary page.

Example

Assume a university offers the following courses only, all of which are introductory courses in the humanities.

1) English 100 - a one hour per week lecture course given to a single section of 100.

2) French 104 - a one hour per week lecture with a one hour laboratory period per week to an enrolment of 40 (1 lecture section and 4 laboratory sections).

3) French 105 - a course in which 5 students are enrolled but which attend the lectures of French 104 in completing the requirements of French 105.

Figure 3 shows how these courses would appear on the basic data sheets. Note that French 104 and 105 have been combined since a part of their activities are offered together.

The steps necessary to translate the basic data of each course to the summary page are the following:

1) Identify the discipline group of each activity of the course.

2) Identify the course level of each university of the course.

3) Identify the type of instructional activity.

4) Define the average section size of each activity and identify the interval on the summary page containing this average section size.

5) Calculate the number of course sections, number of section hours and number of student hours for each activity.

6) Include these values on the summary page under the appropriate Discipline Group, Course Level, Instruction Type and Section Size Interval.

Following these steps for English 100:

a) Discipline Group - Humanities

b) Course Level - Introductory

c) Instruction Type - Lecture, Seminar, Tutorial

d) Average Section Size - 100 (100 1)

e) Number of Course Sections = 1

Number of Section Hours = 1 = (1 x 1)

Number of Student Hours = 100 = (100 x 1)

FIGURE 2

COMPOSITION OF DISCIPLINE GROUPS

Discipline Group for Section Size Analysis		OCGS Discipline Groups
1.	Humanities	Humanities (Languate and Literature) Humanities (History, Philosophy, Arts)
2.	Social Sciences	Social Science (General) Social Science (Regional, Geographical, Planning) Education Business Other
3.	Biological Sciences	Life Sciences Health Sciences
4.	Physical Sciences	Physical Science Mathematical Science Engineering

FIGURE 2

SUMMARY OF SECTION SIZE DATA
ONE WEEK OF FALL TERM
19

University_____

Discipline Group_____

Course Level_____

Section Size Interval	Lecture, Seminar, Tutorial			Laboratory		
	No. of Course Sections	No. of Section Hours	No. of Student Hours	No. of Course Sections	No. of Section Hours	No. of Student Hours
1-3						
4-10						
11-20						
21-40						
41-60						
61-80						
81-100						
101-150						
151-250						
251+						
TOTAL						

NOTES:

These course data are represented in summary form in Figure 4.

The same steps have been followed for the other courses. Figure 5 shows the final summary page for the three courses that our hypothetical university offers.

In conclusion the methodology presented here attempts to define (through definitions, rules and assumptions) that subset of instructional activities which is common to all the universities. The analysis at the system level then is to be based upon this subset of the instructional activities. For the analysis to be complete, each of the universities should be capable of indicating how representative the system analysis is relative to its own pattern of instructional activities.

SUMMARY OF SECTION SIZE DATA
ONE WEEK OF FALL TERM
1969

University ABCD

Discipline Group HUMANITIES

Course Level INTRODUCTORY

Section Size Interval	Lecture, Seminar, Tutorial			Laboratory		
	No. of Course Sections	No. of Section Hours	No. of Student Hours	No. of Course Sections	No. of Section Hours	No. of Student Hours
1-3						
4-10						
11-20						
21-40						
41-60						
61-80						
81-100	1	1	100			
101-150						
151-250						
251+						
TOTAL						

NOTES: Indicating effects of English 100

EXAMPLE

FIGURE: 5

SUMMARY OF SECTION SIZE DATA
ONE WEEK OF FALL TERM
1969

University ABCD

Discipline Group HUMANITIES

Course Level INTRODUCTORY

Section Size Interval	Lecture, Seminar, Tutorial			Laboratory		
	No. of Course Sections	No. of Section Hours	No. of Student Hours	No. of Course Sections	No. of Section Hours	No. of Student Hours
1-3	-	-	-	-		
4-10	-	-	-	4	4	40
11-20	-	-	-	-	-	-
21-40	-	-	-	-	-	-
41-60	1	1	45	-	-	-
61-80	-	-	-	-	-	-
81-100	1	1	100	-	-	-
101-150	-	-	-	-	-	-
151-250	-	-	-	-	-	-
251+	-	-	-	-	-	-
TOTAL	2	2	145	4	4	40

NOTES:

EXAMPLE

APPENDIX A

FIGURE 1

O.C.G.S. LIST OF DISCIPLINE GROUPS

HUMANITIES (Language and Literature)

1 Classics
2 Classical Studies
3 Comparative Literature
4 East Asian Studies
5 English
6 French
7 German
8 Italian and Hispanic Studies
9 Islamic Studies
10 Latin and Greek
11 Linguistics
12 Medieval Studies
13 Modern Languages
14 Modern Languages and Linguistics
15 Near Eastern Studies
16 Romance Languages
17 Russian
18 Slavic Studies
19 Spanish
20 Spanish and Italian

HUMANITIES (History, Philosophy and the Arts)

30 Ancient History
31 Drama
32 Fine Art
33 History
34 History of Art
35 History of Religions
36 History and Philosophy of Science and Technology
37 Music
38 Philosophy
39 Religious Studies
40 Theology

SOCIAL SCIENCES (General)

50 Agricultural Economics
51 Anthropology
52 Culture and Technology
53 Economics
54 International Affairs
55 Law
56 Political Economy
57 Political Science
58 Political Studies
59 Psychology
60 Social Work
61 Sociology

SOCIAL SCIENCES (Regional, Geographic and Planning)

70 Canadian Studies
71 Geography
72 Geography/Planning
73 Planning
74 Russian and East European Studies
75 Urban and Regional Planning

PHYSICAL SCIENCES

80 Aerospace Studies
81 Architecture
82 Astronomy
83 Chemistry
84 Experimental Space Studies
85 Geological Science
86 Geology
87 Geophysics
88 Landscape Architecture
89 Materials Science
90 Metallurgy and Materials Science
91 Physics
92 Soil Science
93 Textiles, Clothing and Design

MATHEMATICAL SCIENCES

100 Applied Mathematics
101 Computer Science
102 Mathematics
103 Mathematics and Statistics

ENGINEERING

110 Agricultural Engineering
111 Chemical Engineering
112 Civil Engineering
113 Electrical Engineering
114 Mechanical Engineering
115 Engineering
116 Engineering Materials

LIFE SCIENCES

120 Animal Studies
121 Apiculture
122 Biochemistry
123 Biology
124 Biophysics
125 Botany
126 Crop Science
127 Forestry
128 Horticulture
129 Poultry Science
130 Zoology

HEALTH SCIENCES

140 Anatomy
141 Avian Pathology, Wild Life Diseases and Virology
142 Bacteriology
143 Bio-Medical Electronics
144 Clinical Studies
145 Dentistry
146 Epidemiology
147 Histology and Embryology
148 Hygiene
149 Medical Biophysics
150 Medicine
151 Microbiology
152 Microbiology and Immunology
153 Paediatrics
154 Pathology
155 Pathological Chemistry
156 Pharmacology
157 Pharmacy
158 Physiology
159 Physiology and Pharmacology
160 Radiology
161 Surgery
162 Veterinary Bacteriology

EDUCATION

170 Education
171 Educational Theory
172 Extension Education

BUSINESS

180 Business
181 Business Administration
182 Public Administration

OTHER

190 Food Science
191 Foods and Nutrition
192 Home Management
193 Hospital Administration
194 Library School
195 Library Science
196 Nursing
197 Nutrition
198 Physical Education
199 Physical & Health Education