Efficiency in classroom usage at the University of Montana.

Laura Wolverton. Hudson

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EFFICIENCY IN CLASSROOM USAGE

AT THE UNIVERSITY OF MONTANA

By

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B. A., University of Montana, 1963

Presented in partial fulfillment of the requirements

for the degree of

Master of Public Administration

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Approved by

[Signatures]

Chairman, Board of Examiners

Dean, Graduate School

[Signature]

Date

May 19, 1987
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Chapter 1

STUDENT NEEDS AND EFFICIENT USE OF RESOURCES

Class scheduling at a university is problematic because there are different actors with different goals which all demand attention in the process. Effective classroom allocation and course scheduling are described very well by Harold Temmer of the University of San Diego. According to Temmer, the purpose of scheduling is to bring students and faculty together in the most efficient manner possible. This recognizes both the needs of the students and the need to use resources wisely. The recognition of faculty resources is explicit and of physical facilities implicit in this statement. Mr. Temmer describes the situation in the context of a marketing problem. The students are buying the service but the suppliers (legislators and the public) insist on effective marketing. Effective marketing requires that students are enabled to earn degrees in a timely manner while facilities are used to a reasonable maximum.¹

This paper is a study of how efficient class scheduling is at the University of Montana. Its purpose is to determine whether students and faculty are being brought together in an efficient manner. This question is addressed through the analysis of class scheduling patterns which are a reflection of how effectively

¹Harold Temmer, "Facilities Utilization Analysis, Classroom Allocation and Course Scheduling," College and University 48 (Fall 1972):10–11.
physical facilities are being used.

Persons involved in classroom scheduling have attempted to maximize utilization of physical facilities in various ways. In one small college, the hours between nine and two o'clock are strictly controlled. Departments are limited in the number of courses they may offer during these hours. They must divide core courses between Monday–Wednesday–Friday and Tuesday–Thursday. Introductory courses must be spread throughout the day.² Limitations of a less restrictive sort are not uncommon among colleges.

Extreme examples of maximization of physical facilities occurred in some schools during the energy crises of the late 1970's. To save fuel, the University of Maine–Orono achieved 100 percent utilization during daytime hours in those buildings which were heated.³ Kent State University consolidated usage by rescheduling some classes into dorms and libraries.⁴ These extremes bring to mind James Blakesley's caution against equating improved space utilization with improved academic environment.⁵

Other schools emphasize meeting the students' curricular needs rather than utilizing resources. Miami–Dade Community College publishes a schedule of


⁴Ibid.:683.

classes without times, instructors or rooms. They ask students to request courses in major blocks of time. The college then attempts to schedule their physical facilities and faculty resources to satisfy the student requests.\footnote{6}

Recognizing the prospect of decreasing enrollments, the Carnegie Commission on Higher Education focused on increasing utilization of faculty resources. With their recommendations they hoped to find an answer to the anticipated stagnation or decline in numbers of faculty from lower enrollments resulting in decreased funding.\footnote{7} In times of declining enrollments, it is a challenge to meet the educational needs of the students and at the same time use physical facilities and faculty resources efficiently. Excessive restrictions on the use of classroom space should not be allowed to hamper the optimum use of faculty resources. At the same time, maximizing student–faculty ratios should not take precedence over the efficient use of facilities or the need of students to graduate in a timely manner.

Over the past several years the University of Montana has been faced with the challenge of using facilities efficiently and meeting students' curricular needs while resources have been restricted. Budget cuts and faculty layoffs beginning in 1977 have resulted in a faculty which is very concerned with student credit hour production and an administration which is not only concerned with student credit hours but questions whether resources are being used as efficiently as possible.

\footnote{6}{Terry L. Barnes, "Request Block Scheduling," \textit{College and University} 51 (Summer 1976):433.}

While the faculty requests more classes at the popular hours of the day, the managers of classrooms see a need for more rooms to accommodate this demand. Some administrators, feeling pressure for more space from many quarters, question whether we need more classrooms or if we need more efficient scheduling of existing space. Some also are concerned that condensing course offerings into popular hours may restrict students' selection of courses and delay graduation. This study addresses the issue of how efficiently classroom space is being utilized at the University of Montana.
Chapter 2

HISTORY OF CLASSROOM SCHEDULING
AT THE UNIVERSITY OF MONTANA

The scheduling of general classrooms at the University of Montana has been the responsibility of the registrar. From 1946 to 1970, the registrar was Leo Smith. According to his assistant, Emma Lommasson, he was a strong administrator who worked without a written scheduling policy but with a concern for avoiding unnecessary time conflicts among classes. He felt students should be able to register for courses they needed and wanted. He used firm persuasion to convince departments to widen the range of times that courses were offered.

Mr. Smith would begin a term’s room scheduling by listing all the 100- and 200-level courses by the hour of the day the departments planned to offer them. If he found that a disproportionate number of classes were being offered at a certain hour, he would contact some of those departments, explain his concern, and request them to change the hour of their class. Mrs. Lommasson confirms that the departments were cooperative in making adjustments. In addition to watching closely the 100- and 200-level offerings, Mr. Smith would look at the number of rooms being requested for any level of courses at particular hours of the day. For example, as he would begin to fill available spaces at 10:00, he would become concerned that there were too many course offerings crowded into that hour and would ask some departments if they could change some of their 10:00
classes to other hours of the day. Mrs. Lommasson believes his intention was to minimize time conflicts rather than to keep from using all the rooms or because all the rooms had been used already at that particular hour.

When Leo Smith retired, Emma Lommasson took over classroom scheduling. She monitored the distribution of 100-level courses as Leo Smith had. Sometimes she would prepare sample freshman curricula and check the schedule to see if any time conflicts were present among the courses. For example, preceding a winter quarter, she would look for courses that a typical freshman chemistry major should be taking his or her second quarter in school. If some of the courses were meeting at the same time, she would contact the departments and ask that they resolve this time conflict by changing the times of the offerings.

Mrs. Lommasson issued written instructions to the departments along with the request for their schedule copy. In the instructions, she urged them to spread course offerings throughout the day. She also asked them to notify other departments if the time of offering was changed for any course which served that other department's students.

Informally, Mrs. Lommasson practiced a first come, first served priority scheme for assigning rooms. Those departments turning in their schedules first were assigned rooms first, with some exceptions. Some departments were given priority in certain rooms, and they would be assigned to those rooms before any other department. This priority usually was established by some special need. Often it was for maps for history or foreign language courses. Sometimes audio-visual equipment or a certain type of seating was wanted or needed by the
department. After the departmental priority rooms were scheduled with that department's classes, the remainder of the classes were scheduled into available rooms. If a specific room was requested for a class, an attempt was made to schedule the class into that room. Other room assignments were based on anticipated enrollment and proximity to faculty offices. Just as Leo Smith had, Emma Lommasson also asked departments to change class times if she discovered an excess of classes at one particular hour.

In 1977, when Emma Lommasson retired, Phil Bain, who had been registrar since 1973, developed a new scheduling criterion to determine priority for his assistant to use in scheduling classrooms. A department had priority if it asked for the same room, for the same class, at the same time as the year before. This practice was followed unless another class had an overriding need for a particular room. For example, if the room had TV monitors which were not used by the class with priority but were needed by a different class, that need would override the priority. After the classes with priority from the previous year were given rooms, the remaining courses were assigned according to departmental preference, departmental priority in certain rooms, anticipated enrollment, and proximity to faculty offices. Courses were scheduled at the times requested. Only when there were no more rooms available at the hour requested were departments asked to change the time of a course offering.

In 1980, in response to the growing concern over University funding based on enrollment, an ad hoc committee was formed to look at the scheduling of classes. The committee was composed of people who were involved in, or
interested in, scheduling. Included were two mathematics professors, the dean and associate dean of the College of Arts and Sciences, the registrar, assistant registrar, and a systems analyst. This committee felt that careful class scheduling would increase the efficiency of classroom use and would minimize time conflicts. This would assist students in registering for more credits. Recent reports on the distribution of student credit hours showed that many students were paying the standard fees for 12 to 18 credits but were taking fewer than 15, which is the undergraduate full-time equivalent for funding. These students were paying full fees but were not taking enough credits to be full-time equivalent students or to graduate within four years. In autumn of 1979, the report showed that 690 undergraduate students were enrolled for 12 credits, 732 were enrolled for 13 credits, and 865 were enrolled for 14 credits. If each of these students were enrolled for only one more credit, it would result in another 152 full-time equivalent students. The committee felt some of these low credit loads may have been the result of too many classes conflicting with each other. They defined certain preferred patterns of scheduling throughout the week to avoid conflicts and asked departments to follow them. They requested that course offerings be spread throughout the day. They encouraged departments to develop and offer one- and two-credit courses in hopes that students would be inclined to increase credit loads by taking these abbreviated courses.

The registrar and assistant registrar decided to encourage compliance with the accepted patterns of scheduling by assigning rooms first to those classes following them. Classes which did not follow an accepted pattern were last to be
assigned rooms.

These scheduling guidelines were thoughtfully developed and were endorsed by the academic vice president. Each quarter since 1980 they have been circulated to departments. How effective this has been in increasing the efficient use of classrooms is reflected in information presented later in this paper.
Chapter 3

METHODS OF DETERMINING EFFICIENCY

The question regarding how efficiently classrooms are being used at the University of Montana was approached by comparing class scheduling patterns for autumn quarters in 1965, 1975, and 1985. Scheduling charts or room boards were used to gather this information. Every general classroom is listed on a room board and each quarter both a daytime board and an evening and weekend board are used for assigning rooms for that quarter. The daytime board is used for all room assignments for Monday through Friday from 8:00 A.M. to 5:00 P.M. Evening and weekend room boards are for after 5:00 P.M., Monday through Friday, and all day Saturday and Sunday. The daytime board is designed so that each classroom has a rectangular space for each hour of the day from 8:00 until 5:00 in which classes or activities assigned to the room can be written. The day of the week is noted after the class or activity. The evening and weekend board is designed so that each classroom has a rectangular space for each day of the week. Assignments are written in by day with the time of day noted after the class or activity.

Using the two room boards for each autumn quarter in 1965, 1975, and 1985, the number of times during the week that classes were scheduled during each half-hour time period between 8:00 A.M. and 7:30 P.M. was compared to the total available time periods at each half-hour. The total available time periods at each
half-hour was determined by multiplying the number of general classrooms by the five days of the week, Monday through Friday, during which classes normally meet. In the autumn quarter of 1965, there were 87 general classrooms. The number of available half-hour time periods was 435 (87 classrooms X 5 days = 435 available time periods). In 1975, there were 92 classrooms on the room board with 460 available time periods. In 1985, there were 465 available time periods in 93 classrooms. The half-hour increment was chosen to accommodate the courses which begin or end on the half-hour and usually meet for an hour and a half.

The classes written on the room board at each half-hour of the day for the entire week were counted. The total half-hour time periods being used were compared to the total time periods available as a percentage. For example, in 1965, from 8:00 A.M. until 8:30 A.M., Monday through Friday, there were 435 available time periods. Of these available time periods, 250 were being used by classes, or over 57 percent of the available time periods were being used. Percentages were calculated for each time period for each of the three autumn quarters. This was done to determine if the pattern of class scheduling had changed. Optional discussion sections were not counted in room usage, but required section meetings were counted. Law courses and Montana State University Nursing courses were not counted as their use of rooms is minimal and restricted to a small student population. One-time class meetings, special meetings of organizations and clubs, and other miscellaneous activities were not included.

A second check on efficiency was undertaken by applying some of the
scheduling guidelines developed in 1980. The guidelines which could be applied to the courses appearing on the room boards from the past were those which addressed the preferred patterns of scheduling. The guidelines advised that courses meeting a certain number of hours per week should be scheduled on specific days of the week and for a certain number of minutes. Five-credit classes were to meet for one hour each of the five days of the week. It was assumed that one hour meant the 50 minutes classes normally meet. Three-credit classes were to meet on Monday, Wednesday and Friday for one hour or Tuesday and Thursday for an hour and a half. The guidelines specified the required beginning times throughout the day for the classes which met for an hour and a half. There were preferred schedules for classes of fewer than three credits and for laboratories which require twice the contact hours of lectures. After 3:00, classes were not expected to follow these guidelines because there were fewer offerings and fewer potential time conflicts.

Beginning with the 1965 room board, all the classes appearing on the board between 8:00 A.M. and 3:00 P.M. were perused. Those appearing to violate one of the preferred patterns of scheduling were tallied. The total classes violating guidelines were calculated as a percentage of the total number of classes on the room board between 8:00 A.M. and 3:00 P.M. Next, the percentages of violations of the guidelines to total classes offered between 8:00 A.M. and 3:00 P.M. were calculated for autumn of 1975, and autumn of 1985. Percentages for the three quarters were compared to see how courses were fitting together in their scheduling patterns over time. Of special interest were the percentages which
revealed scheduling patterns before and after the guidelines were issued. A third approach to efficiency was from the student viewpoint. Traditional students working toward an undergraduate degree generally will earn their diplomas in twelve quarters. In 1965 this required an average credit load of 15.5 credits per quarter. In 1975 and 1985 this required an average credit load of 16.25 credits per quarter because the total credit requirement changed from 186 to 195 credits. The question of whether students are finding it difficult to attain these credit loads each quarter because of class scheduling conflicts was approached with the use of a questionnaire. The questionnaire was handed out to 3,125 of 4,400 students who turned in course requests during the two week advising period for autumn quarter, 1986, advance registration. A total of 1,100 students responded by leaving the questionnaire in the drop-box provided.

Table 3-1 is a comparison of the sample population to the total University population by class level. It should be noted that the sample population reported their perceived class levels. Sometimes their perceptions are not the same as the computer record of credits earned. The percentage of the sample shown as undergraduate nondegree represents those students who did not give a class level on their questionnaire and were assumed to be undergraduate nondegree. The high participation of juniors in the advance registration may have been due to anxiety over their final year in school and graduation. Lower participation by seniors probably was due to their graduation in the spring without plans to return autumn quarter. Low graduate student participation in advance registration may have been because many are not concerned about getting classes or are night
students who usually wait and register later during Night Registration.

Table 3-1: REPRESENTATIVENESS OF SAMPLE BY CLASS LEVEL

<table>
<thead>
<tr>
<th>Class Level</th>
<th>Percentage of Total Sample</th>
<th>Percentage of Total University Population</th>
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<tbody>
<tr>
<td>Undergraduate Nondegree</td>
<td>2.5</td>
<td>2.7</td>
</tr>
<tr>
<td>Freshmen</td>
<td>18.5</td>
<td>18.9</td>
</tr>
<tr>
<td>Sophomores</td>
<td>23.2</td>
<td>17.7</td>
</tr>
<tr>
<td>Juniors</td>
<td>26.4</td>
<td>18.6</td>
</tr>
<tr>
<td>Seniors</td>
<td>22.0</td>
<td>25.1</td>
</tr>
<tr>
<td>Graduates</td>
<td>7.5</td>
<td>18.2</td>
</tr>
</tbody>
</table>

Table 3-2 is a comparison of the sample population to the total University population by major school or college. Again, the students in the sample were reporting their perceived majors. The computer record may be very different because students don’t always officially declare their new majors before they begin working on them and identifying with them. For example, some General students reported in the College of Arts and Sciences may have identified themselves as Business or Education students.

In making these comparisons, the enrollment figures for spring of 1986 were used, as those figures represent the primary population having the opportunity to advance register in the spring quarter. Enrollment in the School of Law and the AFIT MBA Program at Malmstrom AFB were not included in the total University population as those students register at different times.

Following are the data acquired by each method and analysis of those data. The results of the comparison of scheduling patterns and adherence to scheduling guidelines along with the findings from the student questionnaire provide an insight into the efficiency of classroom utilization. From the analysis, some
Table 3-2: REPRESENTATIVENESS OF SAMPLE BY SCHOOL OR COLLEGE

<table>
<thead>
<tr>
<th>Major School or College</th>
<th>Percentage Of Total Sample</th>
<th>Percentage Of Total University Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nondegree (undergraduate and graduate)</td>
<td>4.7</td>
<td>9.1</td>
</tr>
<tr>
<td>College of Arts and Sciences</td>
<td>36.5</td>
<td>40.0</td>
</tr>
<tr>
<td>Business Administration</td>
<td>26.7</td>
<td>19.5</td>
</tr>
<tr>
<td>Education</td>
<td>14.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>3.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Forestry</td>
<td>5.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Journalism</td>
<td>3.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Pharmacy and Allied Health Sciences</td>
<td>5.7</td>
<td>5.9</td>
</tr>
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</table>

recommendations can be developed.
Chapter 4

PATTERNS OF SCHEDULING

Figure 4-1 on page 17 illustrates with a line graph the different patterns of class scheduling which occurred during autumn quarters of 1965, 1975, and 1985. These are shown as the percentage being used of the total time periods available weekly at each half-hour. The half-hour periods are identified by their beginning times starting with 8:00 A.M. and ending with 7:00 P.M. The percentage of utilization is shown as ranging between 0 percent and 100 percent. The graph also reflects the lower ratio of classrooms to students in 1975 and 1985 from what it was in 1965. There was a higher percentage overall of time slots being used in 1975 and 1985 because there were fewer rooms compared to total enrollment than in 1965. It is the configuration of the lines which is important. The configuration reflects how the classes were distributed throughout the day for each of the years reported.

The solid line illustrates room utilization in 1965. In 1965, there were 5,919 students enrolled at the University of Montana. Of these, only 254 or 4.3 percent were part-time students. Part-time students were defined as those registered for six or fewer credits. The full-time equivalent enrollment was at 5,856. The difference between headcount and full-time equivalent enrollment was only 63. There was little emphasis on evening courses as the Night School Program was not yet in existence. Taking into account the low part-time enrollment, the small
TIME OF DAY

FIGURE 4-1: CLASSROOM UTILIZATION
difference between headcount and full-time equivalent count, and the few evening offerings, most students were probably traditional, full-time, day students.

The graph shows that 57.5 percent of the available time periods were being utilized at 8:00 and 8:30 in 1965. At 9:00, 68.7 percent of the available time periods were being used. This was the highest percentage of utilization during the day. Room use was relatively even from 8:00 until after 3:00 except for a sharp dip at the noon hour. Utilization at 4:00 and 4:30 was at 21.1 percent after which room use declined to 2.3 percent. At 6:00 and 6:30 there were no course offerings at all. At 7:00 P.M. there was 5.1 percent utilization.

The dotted line reflects 1975 utilization. In 1975, headcount enrollment was at 8,826 and the full-time equivalent was 8,258. The definition of part-time student had been changed to enrollment in fewer than twelve credits for undergraduates and fewer than nine for graduates. There were 1,409 students classified as part-time under this definition. This was 16.0 percent of the enrollment. The difference between headcount and full-time equivalent was 568. There were slightly more evening offerings, but there was still no night program.

In 1975, the 8:00 usage was at 49.3 percent. The highest usage was at 10:00 and 10:30 with 86.3 percent of available space being used. The distribution of use between 8:00 and 3:30 was not very even. There was a marked jump from 9:30 to 10:00. The sharp dip at noon was still present. Peak usage in the afternoon was only 7.2 percent lower than peak usage in the morning, but there was a very sharp dip after 2:30. Utilization at 4:00 was 27.0 percent and at 6:00 it was .4 percent. This increased to 8.3 percent at 7:00.
The dashed line on the graph represents 1985 utilization. In 1985, headcount was 8,840 and the full-time equivalent was 7,850. This is a difference of 990. The part-time enrollment of 1,719 students was 19.4 percent of the total headcount. The Night School Program had been developed and accounted for some of the increased utilization of the after 4:00 hours.

The graph shows that in 1985 the utilization of space at 8:00 was down to 38.5 percent. The highest use came later at 10:30 with 95.1 percent room use. This is a difference of 56.6 percentage points. The graph reflects the peaks and valleys of usage in 1985. In the morning there is a sharp increase in use at 9:00, a high at 10:30, and the usual dip at noon. The afternoon peak is not nearly so high as the morning one and it begins dropping off quite early. By 3:00, the usage is down to 35.1 percent. Room use between 4:00 and 7:00 is slightly improved, with 12.5 percent in use at 7:00.

In comparing the three quarters, it is immediately obvious that the scheduling of classes at 8:00 A.M. declined over the years. While over half the time periods were used in 1965, less than 40 percent were used in 1985. In 1965 and 1975, the percentage points between 8:30 usage and 9:00 usage were 11.2 and 9.1 respectively. In 1985, this difference was 34.0 percentage points.

The difference of 11.2 percentage points between 8:30 and 9:00 in 1965 represented the difference between the highest and lowest room usage in the morning hours. In 1975, the difference between the lowest which was at 8:00 and the highest which was at 10:00 and 10:30 was 37.0 percentage points. The difference between lowest morning usage and highest morning usage in 1985 was
56.6 percentage points. This was between 8:00 and 10:30. These differences illustrate the increasing concentration of classes at the popular hours of the day.

All three quarters show a slight drop in room use at 11:00. In 1965, the drop in use between 10:30 and 11:00 was 4.6 percentage points. In 1975, the drop was the same at 4.6 percentage points. In 1985, the decline in use was much sharper at 16.6 percentage points.

The noon hour has not been well utilized for classes. Most faculty apparently still prefer to break for lunch at this time. In 1965, room use dropped 18.0 percentage points at noon from what it was at 11:30. In 1975 and 1985, this same drop at noon was 19.1 and 19.4 percentage points respectively. This slightly sharper drop in usage at noon in 1975 and 1985 from that in 1965 reflects again a less even distribution of room utilization through the day in those later years.

In 1965, the difference between the highest usage in the morning and the highest in the afternoon was 12.6 percentage points. In 1975, this difference between afternoon high and morning high was 7.2 percentage points. The difference between the morning highest usage and afternoon highest usage in 1985 was 17.5 percentage points. In relation to these figures, it is important to look at the utilization of afternoon hours as a whole as well. In 1965, the utilization was nearly constant from 1:00 until 3:00. Even at 3:00, 44.4 percent of available space was still being utilized. Afternoon utilization was also relatively constant in 1975. At 3:00, the usage was at 53.7 percent. The overall use of afternoon hours was not as good in 1985. Utilization at 2:00 dropped 12.9 percentage points from 1:30. By 3:00, usage was down to 35.1 percent. Use of
space in the afternoon was declining.

In 1985, even with the Night School Program, the utilization at 4:00 was less than in 1975 and only .4 percentage points better than in 1965. At 7:00, the figures for 1985 show an improvement over room use in 1975 of 4.2 percentage points and 7.4 percentage points over 1965. The Night School Program has provided an opportunity for some increase in efficiency of classroom usage.
Chapter 5

SCHEDULING GUIDELINES AND VIOLATIONS

In February of 1980 the scheduling guidelines developed by the ad hoc committee on scheduling were distributed to departments along with the request for 1980 autumn schedule copy. These were accompanied by a memo from the academic vice president which endorsed the guidelines and asked departments to use them. Only one department contacted the registrar in response to the new guidelines. This department was Chemistry. They were deeply concerned that they could not meet these guidelines because the scarcity of laboratory stations forced them to schedule labs of more than one hour throughout the day rather than after 2:00. The department was assured that their circumstances could be considered extenuating and their violations would be excused.

The lack of reaction from the campus community to the guidelines may reflect their fairly innocuous nature. The eight guidelines were:

1. Spread offerings throughout the nine periods of the day. Schedule some offerings in the evening.

2. Five-credit classes must meet at least five hours per week for one hour each day, Monday through Friday. Deviations from one hour per day meetings should occur after 3:00. Departments are cautioned that five-credit courses starting at 9:00 and 12:00 eliminate two Tuesday/Thursday time blocks for students.
3. Three-credit classes must meet at least three hours per week for one hour on Monday, Wednesday, and Friday or one and one-half hours on Tuesday and Thursday. Beginning times for Tuesday–Thursday classes must be 8:00, 9:30, 11:00, 12:30, 2:00 and 3:30.

4. Two-credit classes are encouraged and must meet at least two hours per week on Tuesday and Thursday beginning at 8:00, 10:00, 11:00, 1:00, 2:00 or 4:00 or, if not Tuesday–Thursday, meet after 3:00 or in the evening. Avoid starting times of 9:00 and 12:00 for two credit classes since this eliminates two other time blocks for Tuesday and Thursday.

5. One-credit classes are encouraged and must meet at least one hour per week on a Tuesday or Thursday beginning at 8:00, 10:00, 11:00, 1:00, 2:00 or 4:00 or, if on a Monday, Wednesday or Friday, meet after 3:00 or in the evening. Avoid starting times of 9:00 and 12:00 for one-credit classes since this eliminates two other time blocks each week.

6. Consider scheduling large lecture courses at 8:00, 2:00, 3:00 or 4:00. Attempt to schedule recitation sections on Tuesday or Thursday at 8:00, 10:00, 11:00, 1:00, 2:00 or 4:00.

7. When scheduling labs, keep in mind the need to avoid conflicts with other courses the students need or want to take. Attempt to schedule four-hour labs from 2:00 to 6:00.

8. If a class must meet more than four hours in one day, a Saturday meeting is suggested.

Using the room boards for autumn quarter of 1965, 1975, and 1985, courses
scheduled into general classrooms between 8:00 A.M. and 3:00 P.M. were reviewed for compliance with guidelines number 2, 3, 4, and 5. These hours were selected because the guidelines allowed any odd pattern of class meeting to occur after 3:00 or on Saturdays. The ad hoc committee had found that most course offerings occurred between 8:00 and 3:00, so this time was considered prime time and needed the control provided by the guidelines. This review for compliance with the approved pattern of days of the week and hours in the day described in the guidelines was an effort to determine how well classes were fitting together and minimizing conflicts in each of the three quarters.

The other guidelines numbered 1, 6, 7, and 8 were not applied to the courses on the room board for several reasons. Guideline number 1 could not be applied because many times not all of a particular department's offerings appear on the room board. Some departments have their own space, such as seminar and laboratory rooms, in which their classes meet. It would not be possible to see from the use of general classrooms only if they were spreading their offerings throughout the day. Guideline number 6 was applied indirectly through guideline number 5. Recitation sections were counted as though they were one-credit courses which should meet Tuesday or Thursday at times other than at 9:00 or 12:00. Guidelines 7 and 8 were applied indirectly through 2 and 3 as much as possible. Because laboratories with special equipment do not appear on the room boards, not all labs could be checked.

In autumn of 1965, there were 681 individual classes scheduled into general classrooms between 8:00 A.M. and 3:00 P.M. Of these individual classes which met
on various days for various lengths of time, there were 80 which violated one of the 1980 guidelines. While there were no violations of guideline number 2 for five-credit classes, there were twelve three-credit courses which did not follow the accepted pattern of Monday-Wednesday-Friday one hour meetings or Tuesday-Thursday one and one-half hour meetings at the specified beginning times. There were thirty-five classes which violated the guideline for two-credit classes by not meeting on Tuesday-Thursday for one hour other than 9:00 or 12:00. There were thirty-three one-credit or one-day class meetings which did not meet on a Tuesday or Thursday for one hour other than at 9:00 or 12:00. These violations represented 11.7 percent of the total classes offered between 8:00 and 3:00.

In 1975, the total number of classes on the room board between 8:00 and 3:00 was 799. Of these, there were 141 classes in violation of one of the guidelines. There were thirteen five-credit classes which were not meeting five days per week for an hour. Most commonly these classes were meeting three days a week for one and one-half or two hours. These patterns took two time periods for one class. Three-credit classes not meeting for the accepted Monday-Wednesday-Friday or Tuesday-Thursday pattern numbered eighteen. Thirty-nine two-credit classes violated the Tuesday-Thursday one hour pattern and seventy-one one-credit classes or one-hour classes did not meet Tuesday-Thursday other than at 9:00 and 12:00. The violations had increased to 17.6 percent of the total classes offered in the prime times, between 8:00 and 3:00.

Total classes between 8:00 and 3:00 in autumn of 1985 was 751. Classes
violating guidelines numbered ninety-one. Only five five-credit classes were not meeting one hour each day, five days per week. Twenty-four three-credit classes were not following one or the other of the two approved patterns. Of the two-credit and one-credit or one-hour classes appearing on the room board, thirty-two and thirty respectively were in violation of guidelines 4 and 5. The percentage of violations to total prime time offerings had gone down to 12.1 percent.

In comparing the three quarters, the schedule of classes in 1965 had the lowest percentage of violations of the 1980 guidelines. In 1975, the percentage of violations had increased to nearly one-fifth of the total 8:00 to 3:00 offerings. The 1985 violations dropped back to within .4 percentage points of the 1965 violations. This reduction would seem to support the belief that the 1980 guidelines had some impact on the way departments were scheduling their courses.
The questionnaire distributed to students advance registering for autumn quarter of 1986 included two questions about possible class conflicts and their impact on the students' registrations. These questions were:

1. Were you unable to request a class you wanted because it met at the same time as another class you needed or wanted?

2. Did you request fewer credits than you originally intended to take because classes you wanted or needed were meeting at the same time?

Of the 1,100 responses collected, slightly over half answered yes to question one. There were 553 students who indicated they did experience class time conflicts. There were 545 students who answered no to question one and two students did not answer the question. Of the 1,090 students who answered question two, 810 indicated they did not take fewer credits than they had originally intended to take. However, 280 answered yes, they did take fewer credits because of class time conflicts. Ten students did not answer question two.\footnote{Of the 1,100 responses, fifteen students answered no to question one and yes to question two. This seemingly illogical response may have come from the phrase in question one, "a class you wanted". This may have been interpreted quite strictly as referring to a class the student had an interest in taking only for personal enjoyment rather than a class wanted in order to fill a class schedule. Of these fifteen, only two did not indicate times of conflicts and/or departments in which conflicts were experienced. For this reason, it seemed that the fifteen could be included with the other yes responses to question two.}
The 280 students who indicated they took fewer credits than they intended represented 25.6 percent of the total sample. If each of the 280 students, 269 undergraduates and 11 graduates, would have requested and received just one more credit, it would have represented an additional nineteen full-time equivalent students. This would have represented approximately $22,800 in state subsidies to the University, as the state's contribution per full-time equivalent student is about $1,200 a quarter. If the sample is representative of the total University population and 25 percent of the undergraduate student body would have been able to take one more credit, the full-time equivalent enrollment would have increased by 116. This would have represented $139,200 in additional state subsidies. These subsidies are potential because state funding is based on enrollment projections derived primarily from past enrollments. The increased full-time equivalent enrollment, therefore, would affect future subsidies rather than subsidies for the quarter in which the increase would be experienced.

On the questionnaire, students were asked for the following information:

3. If you answered yes to 1. or 2. above, write below the department or departments in which you found the time conflicts.

The data gathered were difficult to analyze, but it seemed important to try to determine if there were academic areas in which time conflicts were occurring frequently. The number of times a particular course offering area in a school or the College was listed was tallied. Each school and the College total was compared as a percentage of the total times course offering areas were mentioned as producing conflicts. For example, specific course offering areas were listed a
total of 939 times on the questionnaires reporting time conflicts. Course offering areas in the College of Arts and Sciences were listed 572 times as being involved in a time conflict. This represented 60.9 percent of the total times course offering areas were listed for time conflicts.

In order to give these data some meaning, the percentage of the student credit hours produced autumn quarter of 1986 in each school and the College to the total University student credit hours was calculated. This provided a measure of the percentage of the total classes that each school and the College offered. In turn, this provided a guideline to determine whether a particular school or the College had a disproportionate number of time problems. The results are shown in Table 6-1.

<table>
<thead>
<tr>
<th>School or College</th>
<th>Percentage of Unit Problems of Total Problems in Sample</th>
<th>Percentage of Unit’s Credit Hours of Total University Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Arts and Sciences</td>
<td>60.9</td>
<td>64.1</td>
</tr>
<tr>
<td>Business Administration</td>
<td>15.9</td>
<td>11.9</td>
</tr>
<tr>
<td>Education</td>
<td>12.1</td>
<td>11.0</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>5.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Forestry</td>
<td>2.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Journalism</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Pharmacy and Allied Health Sciences</td>
<td>1.8</td>
<td>3.0</td>
</tr>
</tbody>
</table>

This comparison reveals that the conflicts are distributed fairly proportionately among the schools and College. The slightly higher percentage of problems in Business could result from the slightly higher response to the
questionnaire by students identifying themselves as business majors. The same can be said for Education. Forestry and Journalism may have slightly more problems with time conflicts and Pharmacy fewer, than the other schools.

The questionnaire included a fourth question for the students who experienced time conflicts. This was:

4. If you answered yes to 1. or 2. above, write below the time (beginning hour and days of the week) of the conflict or conflicts.

The results were tallied for time of day and the primary problem times were identified as 9:00, 10:00, 11:00 and 1:00. The days of the week were not tallied as they did not seem to provide any meaningful information. The results for time of day are shown in Table 6-2.

Table 6-2: NUMBER OF CONFLICTS BY TIME OF DAY

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Number of Times Conflicts Were Reported</th>
<th>Time of Day</th>
<th>Number of Times Conflicts Were Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>22</td>
<td>12:00</td>
<td>38</td>
</tr>
<tr>
<td>9:00</td>
<td>135</td>
<td>12:30</td>
<td>13</td>
</tr>
<tr>
<td>9:30</td>
<td>21</td>
<td>1:00</td>
<td>73</td>
</tr>
<tr>
<td>10:00</td>
<td>167</td>
<td>2:00</td>
<td>35</td>
</tr>
<tr>
<td>10:30</td>
<td>1</td>
<td>3:00</td>
<td>6</td>
</tr>
<tr>
<td>11:00</td>
<td>109</td>
<td>4:00</td>
<td>7</td>
</tr>
<tr>
<td>No Time Given</td>
<td>165</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The questionnaire also asked the students for their majors and years in school. Their answers were tallied to determine if some majors experienced more time problems than others or if the students’ years in school affected how many of them had time conflicts. The results are shown in Tables 6-3 and 6-4.

These figures seem to indicate that problems with time conflicts are not
Table 6-3: CONFLICTS BY SCHOOL AND COLLEGE

<table>
<thead>
<tr>
<th>School or College</th>
<th>Number in Sample</th>
<th>Number in Sample With Time Conflicts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nondegree (undergraduate and graduate)</td>
<td>52</td>
<td>27 (51.9%)</td>
</tr>
<tr>
<td>College of Arts and Sciences</td>
<td>401</td>
<td>208 (51.9%)</td>
</tr>
<tr>
<td>Business Administration</td>
<td>294</td>
<td>154 (52.4%)</td>
</tr>
<tr>
<td>Education</td>
<td>159</td>
<td>74 (46.5%)</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>37</td>
<td>20 (54.1%)</td>
</tr>
<tr>
<td>Forestry</td>
<td>61</td>
<td>31 (50.8%)</td>
</tr>
<tr>
<td>Journalism</td>
<td>33</td>
<td>16 (48.5%)</td>
</tr>
<tr>
<td>Pharmacy and Allied Health Sciences</td>
<td>63</td>
<td>30 (47.6%)</td>
</tr>
</tbody>
</table>

Table 6-4: CONFLICTS BY YEAR IN SCHOOL

<table>
<thead>
<tr>
<th>Year in School</th>
<th>Number in Sample</th>
<th>Number in Sample With Time Conflicts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Nondegree</td>
<td>28</td>
<td>16 (57.1%)</td>
</tr>
<tr>
<td>Freshmen</td>
<td>203</td>
<td>91 (44.8%)</td>
</tr>
<tr>
<td>Sophomores</td>
<td>255</td>
<td>147 (57.6%)</td>
</tr>
<tr>
<td>Juniors</td>
<td>290</td>
<td>168 (57.9%)</td>
</tr>
<tr>
<td>Seniors</td>
<td>242</td>
<td>129 (53.3%)</td>
</tr>
<tr>
<td>Graduates</td>
<td>82</td>
<td>18 (22.0%)</td>
</tr>
</tbody>
</table>

experienced inordinately in any particular department or among particular class levels. Instead, they are spread quite evenly throughout the units and classes. The graduate students seem to have the fewest problems with time conflicts, although their underrepresentation in the sample may have resulted in a lower percentage of reported conflicts.

In summary, the data collected by the questionnaire indicate that as high as 50 percent of the student body may be experiencing time conflicts because too
many classes are being offered during the popular hours of the day. As many as 25 percent of the students may not be getting as many credits as they want because of this overutilization of popular hours. This overutilization of certain time periods appears to be a campus-wide problem which affects students in all majors.
Chapter 7

CONCLUSION AND RECOMMENDATIONS

Room utilization studies in the past have focused on the percentage of available seats being occupied in each classroom during each week. In 1970, the last time the Office of Institutional Research conducted such a study, 100 percent utilization of classrooms was defined as 30 hours per week at 60 percent student station occupancy or 18 hours of use per week per student station. This study has not focused on the filling of some percentage of available seats to determine efficiency. Rather, it has focused on the use of available rooms as a reflection of the efficient use of faculty and student time. The premise has been that it is not so important to fill some minimum number of seats in a given classroom for a minimum number of hours per week. What is important is that the rooms available are used in such a way that more classrooms are not constructed to accommodate an overdemand which exists during three or four hours out of a fourteen hour day. Also, it is important that students have a good selection of courses. An efficient use of classrooms should give students that selection. If more students take more classes, faculty time is used more efficiently, also.

Analysis of data gathered by each of the three methods in this study yields the same conclusion regarding the efficiency of classroom scheduling at the University of Montana. The conclusion is classrooms are not being used as efficiently now as in 1965. This inefficiency is causing scheduling problems for...
many students.

The comparison of room usage by time in 1965, 1975, and 1985 revealed the sharply increased use over the years of the mid-morning hours for scheduling of classes. There has been a corresponding decrease in early morning and mid and late afternoon offerings. The only improvement in efficiency of classroom scheduling has been the increased use of evening hours for the Night School Program.

The comparison of number of courses violating scheduling guidelines in each of the autumn quarters in 1965, 1975, and 1985 indicated decreased efficiency. In considering the percentage of total violations, the 1985 percentage dropped from 1975 to nearly as low a percentage of violations as in 1965. However, if the one- and two-credit course violations are excluded from the 1975 and 1985 figures, the remaining percentage of violations among five- and three-credit courses showed no improvement from 1975 to 1985. Violations among these courses, because they meet for more hours, have a more detrimental affect on efficiency than the one- and two-credit violations. They usually use at least two time slots for one course. This limits the number of courses students can fit into their time schedules.

The results from the student questionnaire supported the evidence of inefficiency found in the other data. The hours during which the classrooms were scheduled the most heavily were the same hours during which students reported time conflicts. Time conflicts were reported by more than 50 percent of the sample. More than 25 percent of the sample reported a decreased credit load for
the quarter because of time conflicts. This represents the devastating effect on both the students and the University of inefficiency in classroom usage and faculty time. Students feel the financial impact of a prolonged stay in school which keeps them out of the job market. The University loses funding from decreased enrollment figures.

Building more classrooms would clearly exacerbate the effects of inefficiency. The number of classrooms the University currently has probably would be adequate if scheduling were more controlled. The number of classrooms probably should not be decreased. In 1965, there were 67.3 full-time equivalent students per general classroom. In 1985, there were 84.4 full-time equivalent students per general classroom. While the number of general classrooms increased by six between 1965 and 1985, the student full-time equivalent increased by 1,994. The last time the room utilization study was conducted by Institutional Research, there were 101 full-time equivalent students per classroom. Using the formula for 100 percent occupancy described at the beginning of this chapter, Institutional Research found an alarming 124.6 percent classroom utilization rate for autumn of 1970. The administrative vice president considered the class scheduling problem to be approaching the critical stage. This seems to indicate that the University's current ratio of students to general classrooms probably should not be increased.

Some recommendations were developed to increase the efficiency of scheduling. These recommendations were shared with six department chairs in the College of Arts and Sciences, the dean of a professional school, a department chair in a professional school, and a faculty advisor. After the recommendations

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were sent to them, they were interviewed to determine if they thought the recommendations were reasonable and feasible. The recommendations were to retain the current scheduling guidelines with the following additions and modifications:

1. Guideline a. would be changed to read: Spread course offerings throughout the nine periods of the day. Fifty percent of the classes offered between 8:00 and 5:00 must be scheduled after 12:00. Schedule some offerings in the evening.

2. Two-, three-, and five-credit courses which violate the current scheduling guidelines (guidelines b., c., d.) will not be assigned a general classroom unless the instructor can demonstrate a compelling pedagogical reason for the violation. If justified, these courses will be scheduled into general classrooms after all others on a space available basis.

3. One-credit courses and recitation sections violating guidelines e. and f. will be scheduled last on a space available basis.

4. Scheduling practices in the Registrar’s Office would be changed. Priority would not necessarily be given if the same class were scheduled for the same time, into the same room as the year before. The status quo must be changed to effect an improvement in efficiency.

5. After classes are scheduled on the room board, a quick analysis would determine if some hours of the day are being overused in comparison with others. If they are, departments with the most classes scheduled during that hour would be contacted first to see if they could change the time of some of their offerings.
The goal would be to achieve a fairly even use of 9:00, 10:00, and 11:00 hours or the 1:00, 2:00, and 3:00 hours. The use of 8:00 and 4:00 would be encouraged.

The recommendations are flawed somewhat in that they don’t address very well the problem of an even distribution over the morning and afternoon hours. With course offerings which vary from one or two courses in some departments to 60 and more in others, it is impossible to establish a required minimum percentage of offerings by hour. The requirement that 50 percent of daytime offerings must be scheduled after 12:00 is an attempt to force some offerings out of the morning hours. By doing so, departments probably will have to spread course offerings throughout the afternoon in order to fit in all of their offerings. For example, departments scheduling four courses in the afternoon probably will not offer all four at one hour, but will offer them at three or four different hours.

In the interviews, the reaction to the recommendations were generally positive. The associate dean of the College of Arts and Sciences had recently taken on the task of looking for scheduling conflicts among the high enrollment freshman level courses being scheduled for the autumn quarter of 1987. The department chairs seemed to be receptive to this effort and to the efforts reflected in the guideline modifications. Some chairs interviewed were very interested in obtaining copies of the data collected in this study to assist them in their own efforts to change their faculty’s scheduling patterns of the past. Although one department chair suggested it would be politic to obtain the endorsement of the Faculty Senate for these guidelines, most people interviewed thought the Council of Deans should be asked to endorse and enforce the recommendations. This
would be appropriate under the faculty collective bargaining agreement currently in force.

While reaction was generally positive, there were some concerns expressed. Adequate time for research was one of these. One interpersonal communication professor preferred to teach four-credit classes in two hour blocks on Tuesday and Thursday, leaving Monday, Wednesday, and Friday free for research. With some adjustments, the department chair felt that the courses could be scheduled to minimize impact on prime time.

Another concern was expressed regarding forestry labs. They usually meet in the afternoons because it is difficult for students and faculty to spend two to four hours in the field and come back to sit in a classroom. They are usually quite fatigued and don't do well. For this reason, the dean was concerned about meeting the 50 percent after 12:00 requirement.

Some courses in education are partly lab and need to be taught in two hour blocks rather than in one hour increments. Some education courses require meeting longer than one hour because students go out to the schools. The department chair, who also teaches, felt he needed blocks of time to meet his responsibilities as chair. He believed this required some deviation from the recommended scheduling pattern.

According to the chair of the department, some upper division philosophy courses deviate from recommended patterns for pedagogical reasons. The chair felt that extra time is needed for thorough discussion in class and a break between classes is needed for digestion of ideas. This has resulted in Monday, Wednesday,
Friday, one and a half to two hour meetings for five-credit courses.

Another department chair pointed out that afternoons are sometimes needed for other activities, like departmental meetings. His experience has been that students don’t ask for 3:00 classes, although he conceded that could change if more courses were offered University-wide in the afternoon. He suggested that departments could be given a choice. Instead of requiring 50 percent of the daytime classes in the afternoon, each department could be given two of three choices for scheduling: more classes at 8:00, more at 12:00, or more in late afternoon hours.

Two people interviewed, who have considerable experience advising students, attested to the prevalence of course conflicts. They both felt if departments had more information in advance about each other’s offerings, they would avoid some of these conflicts. One of them suggested that large enrollment General Education courses could be taught in the afternoon. The courses would still draw large enrollments and the morning hours would be free for other courses that might not draw enough enrollment in the afternoon.

After these interviews, it seemed that the proposed modification of the scheduling guidelines required two changes. In addition to exceptions allowed for legitimate pedagogical reasons, exceptions should be made for “other compelling reasons”. This would allow some exceptions which have academic legitimacy outside of pedagogy. The legitimacy of exceptions should be determined by the appropriate dean. The other modification would address the scheduling of 8:00 classes. Because 50 percent of offerings must be after 12:00, departments may
choose to move classes normally meeting at 8:00 to an afternoon hour to increase their number of afternoon classes. Their morning classes would remain concentrated at 9:00, 10:00, and 11:00. To address this problem, the recommendations would be modified to require that before scheduling any other morning hour twice, the 8:00 hour must be scheduled.

The concern expressed by the Forestry dean in meeting the after 12:00 requirement seemed unfounded after reviewing their course offerings for spring of 1987. Well over 50 percent of the class meetings were after 12:00. For this reason, it does not seem necessary to modify this recommendation.

Other concerns expressed had to do with reduced enrollments with afternoon scheduling. This can be alleviated by scheduling required classes and high demand General Education classes in the afternoon. Also, if more classes are available in the afternoons, many students may request more afternoon classes.

Acceptance of the recommendations by the University community as a whole would be very helpful in effectively implementing them. It is important that faculty beleaguered by budget cuts and budget uncertainties do not view new scheduling guidelines as another form of restriction or harassment. If the Faculty Senate endorses new scheduling guidelines, it would help to dispell these fears that the guidelines are a tool developed by the administration to manipulate faculty. Because the deans have scheduling authority according to the faculty bargaining agreement, the Council of Deans must agree to any new scheduling guidelines and must accept responsibility for enforcing them. Also, the acceptance and endorsement of guidelines by the academic vice president would reinforce their
legitimacy and the University's commitment to them.

If these recommendations for modifying and adding to the current scheduling guidelines are approved by faculty and the deans, efficiency in classroom usage should increase. The Registrar's Office personnel will need to assist the deans in the enforcement of the guidelines. As more sophisticated computer-assisted scheduling is made available in the future, the increase in information will benefit all actors in the process, including department chairs, deans, and Registrar's Office personnel.
Bibliography

Barnes, Terry L. "Request Block Scheduling." *College and University* 51 (Summer 1976): 432-434.


