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A survey of the classroom capacities, conditions, and utilization at Indiana State Teachers College

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A SURVEY OF CLASSROOM CAPACITIES, CONDITIONS, AND UTILIZATION AT INDIANA STATE TEACHERS COLLEGE

by

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I. THE INTRODUCTION

A. General Statement

1. The Early Situation. Until the last few years little attention was given in school building construction to the health and happiness of the student. In fact, the early architects, often called "barn architects," scarcely realized that the school is for the student. When the construction plans were made, little or no attention was given to the relationship of construction, usability of the building, and the health of the child. For the sake of artistic design, classrooms of every conceivable shape, size, and structure were constructed in the older school buildings. Buildings of this type in great numbers are still in use. It is common to find little relationship between floor space, natural light, and air in the instructional rooms.

2. A New Field in Education. In recent years, however, that division of education related to the physical plant has developed and come to the front rapidly. Certain educators and architects have become outstanding authorities in the field of school house construction. They have set up standards for building construction which are generally accepted the country over. Notable in this field are Strayer, Engelhardt, and Evenden of Columbia University. The leading school architects are now men of high ability and special training in their own field and stand as authorities in school house planning and construction. Included among the group of nationally

known school architects are Parsons, Itner, Boutelle, and Donovan. The last named has contributed much to this field of education through his studies and writing.

3. Application of Scientific Standards. Since the older college buildings were not planned according to scientific standards, it is evident that the classrooms in such buildings are, in varying degrees, unsatisfactory. Such college plants are so numerous and building costs so high that the various states have trying situations to meet. New buildings, of course, cannot be erected at once. The old ones must be used until such time as they can be replaced. Standards can, however, be applied to the school plant, regardless of its age or condition. In this manner the classrooms limitations can be discovered. In fact, it seems imperative that scientific standards should be applied if the student's health and general welfare are to be safeguarded.

B. The Choice of Problem

1. Interest Aroused. The writer's interest came about through frequent references which were made to classroom conditions at Indiana State Teachers College during a course in "Buildings, Grounds, and Equipment" at that school. Inadequacies, according to good classroom standards, as actual examples, were noted from time to time. The question was aroused in the writer's mind as to what the actual classroom conditions were for the entire plant.

2. Definite Choice. It was found that no study had been made of the instructional space conditions at Indiana State Teachers College. In fact, during further investigation, it was learned that little had been done in this field for colleges and normal schools in general, although such surveys in secondary education were numerous. A study was made of the theses written in the field of education within the last six years as published by the United States Department of Interior, and only one was found dealing with college classrooms. This was written by Mr. Ray L. Hamon of Columbia University upon the utilization of college instruction rooms.[1] Since the field of college classroom standardization is so new and the subject so important in the field of education, it is believed that such a survey as the one undertaken will prove to be of service and value.

C. The Purpose and Aims

1. The General Purpose. The writer expects to reveal and make available facts which will be of value in the utilization of classroom space in the institutions of higher learning in this country.

2. Specific Aims. The following aims are set up to be

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[1] Mary Wilson MacNair, A List of American Doctoral Dissertation, (Washington, D. C.: Government Printing Office, 1932) P.70

developed and carried out in this study:

a. To set up standards for college and normal school classrooms.

b. To measure the classrooms at Indiana State Teachers College by such standards.

c. To compile tables and set forth information to indicate the actual conditions of the classrooms at the above named school as to floor space, natural light, and amount of air space.

d. To reveal to what extent student accommodations are provided in the rooms.

e. To indicate how fully the classrooms at Indiana State Teachers College are utilized daily by student population and class periods.

f. To make comparative studies of possible room use according to the standards and the actual utilization of the rooms at Indiana State Teachers College.

g. To make comparative studies of the classrooms by different buildings of the plant.

h. To discover changes that might be made to benefit in the administration of instruction.

i. To organize all findings in such ways that they will be easy of access at any time.

j. To draw any general conclusions from the findings,

based upon the data discovered, that prove to be significant for classroom utilization in institutions of higher learning.

D. Methods of Procedure

1. First Steps in the Study. A study was first made of all available materials upon surveys dealing with or including classroom measurements. Studies for high schools, elementary schools, and city schools were very numerous; but studies for normal schools and colleges were infrequent. Apparently little has been done in this field. One of the best studies made in this field was that by Arthur B. Moehlman, A Survey of the Needs of the Michigan State Normal Schools.[2] A complete chapter was given to classroom capacities, conditions, and utilization at these schools, which proved to be of invaluable service in this survey.

Many standards for classroom measurements were located and studied. Those by Strayer, Engelhardt, and Evenden were given special consideration. It was found that John J. Donovan had compiled in the form of a table the standards favored by all the outstanding architects of the country for elementary

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[2] Arthur B. Moehlman, A Survey of the Needs of the Michigan State Normal Schools. (Lansing, Michigan: Department of Public Instruction, 1922), Pp. 54-82.

and secondary building construction.[3] That portion of his table dealing with instructional space proved valuable to the writer in evolving classroom standards for institutions of higher learning.

2. Methods of Measuring. As the first step in the survey proper, tape-line measurements of each classroom in the entire plant at Indiana State Teachers College were made. The blue prints of the various buildings could not be employed because of the fact that that of the main building was not obtainable, while changes in the other buildings had made the blue prints unreliable. Offices had been cut out of certain rooms; and equipment, especially in the laboratories, took up part of the space. Partitions had been removed between rooms in one building, while some of the smaller rooms had been given over entirely to administrative purposes. The tape-line measurements included all those needed to obtain the floor space, natural light area, and air space conditions. At the same time, pupil accommodations in each room were recorded by actual count or, in case of doubt, by conference with the teacher in charge.

3. Other Data Obtained. Through the kindness of the school administrators, the records of classes were obtained and from these the information needed to find the actual use

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[3]John J. Donovan, "Classroom Standards of Leading School Architects and School Construction Specialists," American School Board Journal, LXXIX (1929), PP. 50-51.

of the classrooms of each building was gathered. This information included the number of students accommodated in each classroom, throughout each period of the day, extending over a regular school year of three terms. It included, also, totals of students and periods by buildings.

4. Interpretation of Data. All data gathered were weighed and judged according to the standards employed. Different methods were used to set out the findings. Tables proved to be outstandingly helpful in making the findings clear, concise, and easy of access. Every effort was employed throughout the study to obtain accurate data, to use scientific procedure, and to arrive at reliable conclusions.

II. PRESENTATION AND ANALYSIS OF DATA

A. The Problem

1. Definition. The study is a survey of classroom capacities, conditions, and utilization at Indiana State Teachers College, based upon actual classroom measurements and student use of such rooms. The problem is to discover what the actual conditions are and to interpret them in the light of standards set up for classroom utilization. The study seeks to reveal all facts concerning the classroom conditions at Indiana State Teachers College which will aid in determining the extent of the use of classrooms not only at that school but also for other institutions of higher learning.

2. Delimitation. School plants are usually divided into natural parts according to the amount of floor space. Such divisions are usually designated as (1) instructional space, (2) administrative space, (3) assembly space, (4) operative space, and (5) accessory space. This study does not attempt to deal with all plant space but takes into consideration only that portion of the instructional space designated as classrooms. The Training School Building is treated in the general measurements as a part of the college plant, since it will be used probably in a short period of time for college classes only. It is also given consideration as an elementary and secondary school.

For the sake of clearness and simplicity in this study, all classrooms are divided into two types. One group is designated as recitation or lecture rooms; the other is called special rooms and includes all laboratories and shops. In interpreting the data and arriving at the findings, the rooms will be listed as recitation rooms and special rooms.

B. Classroom Standards

1. General Explanation. In order to make the measurements of the classrooms meaningful and useful, it was found necessary to interpret them in terms of certain, definite standards for the factors controlling the capacities, conditions, and usability of the rooms in question. Such standards should be based, as far as possible, upon research and findings by experts in the field of school building, construction, and use. The work, therefore, of such men as Strayer, Engelhardt, Evenden, Moehlman, Sears, and Donovan was studied. No definite standards for normal schools or college classrooms were available, although such standards are in the process of making at the present time at Columbia University by Evenden, Strayer, and Engelhardt, who have previously set up such standards for elementary and secondary school buildings. Every effort was made to obtain these standards for college classrooms, but due to the fact that such standards are not ready for publication the writer was not able to make use of them. The writer, therefore, found

it necessary to set up arbitrary standards for this study.

2. The Manner of Adoption. After a survey of classroom standards had been made, standards necessary to this study were set up which, although considered only arbitrary in nature, have a basis which makes them somewhat reliable measuring sticks. The study of standards revealed the fact that school building experts are very well agreed upon general classroom measurements as applied to grade and secondary schools. Since Strayer-Engelhardt's Standards for High School Buildings is representative of expert standards, it is used as a foundation to a great extent, for the standards adopted in this study.[1]

Since there is only a brief space of time between high school graduation and college entrance, and since most high school students have completed their physical growth while in high school, the writer feels that the standards adopted, although closely based upon high school building standards are reasonably correct. Steps have been taken in setting up the standards, however, to make them fit the classrooms for more mature students than high school pupils are. For instance, standards for floor, air, and light space in the secondary school standards are not placed at one number; but the amount of each

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[1] G. D. Strayer and N. L. Engelhardt, Standards for High School Buildings. (New York: Bureau of Publications, Teachers College, Columbia University, 1924) Pp. 40-76.

is placed within certain limits. In all computations for floor and air space, in this study, the higher secondary school limits are used which allow a maximum amount of space to the student or, in other words, set the standards for college students at the upper limit of standards for high school students. Natural light standards are computed upon the basis of one-fifth of the floor area.

Certain departures from high school standards were found necessary and, therefore, taken in case of the special rooms. Because of the greater size and amount of equipment in colleges over high school special rooms, and the more physical freedom allowed college students over high school pupils, the floor space per college student is placed at 25 to 30 per cent higher than that for secondary special rooms. College shops are so much more elaborately equipped and so much more specialized than high school shops that 40 per cent more floor space is allowed per student than is provided by the secondary standards. Because of the high amount of floor space allowed for the special rooms, there should be at least 1,100 to 1,200 feet of floor space in all laboratories and shops.

3. Maximum Capacity Defined. When standards are applied, it is found that there is a limit to the number of students that can be safely accommodated in a classroom at one time. This limit is designated as the maximum capacity of the room. By maximum capacity is meant the total number of students who can

be cared for in the classroom at any one time upon the basis of a proper relationship of individuals to the square feet of floor space, cubic feet of air space, and amount and adequacy of natural light. This maximum capacity is applied to determine the possible safe use of the classrooms and to show the relationship of actual use to the possible use of any room.

4. List of Standards Set Up. The standards adopted and applied to the data gathered in this study are set out as follows:

a. 15 to 18 square feet of floor space per student in the recitation rooms.

b. 40 to 50 square feet of floor space per student for all special rooms not controlled by special rules.

c. 50 to 55 square feet of floor space per student for shops.

d. 200 to 250 cubic feet of air space per student in all classrooms.

e. Rooms rectangular in shape.

f. Natural light area 1/5 to 1/4 the floor space per student for recitation rooms.

g. Natural light for special rooms equal to 1.5 that of recitation rooms.

h. Windows located on long axis of room and in most cases for left hand lighting.

i. Heads of windows square and within 8 inches of ceiling.

j. Windows from 35 to 38 inches from floor and grouped symetrically.

k. Distance between windows not more than 12 inches and at front of window side of room 4 to 6 feet of dead wall space.

l. Room width not more than 24 feet and not to exceed approximately twice the length of windows.

m. Light may well be bilateral in the food, cookery, and dressmaking laboratories and should be bilateral in the print shop.

C. Classroom Size and Capacity by Building

1. General Situation. A careful personal survey was made of every classroom in the entire plant of Indiana State Teachers College including the six buildings known as the Main Building, Science Hall, Vocational Building, Physical Education Building, Training School, and the Library Building. The survey reveals that there are, in the entire plant, one hundred rooms used definitely as classrooms. These are distributed by building as follows:

Main Building	39
Science Hall	20
Vocational Building	18
Training School	16
Physical Education Building	6
Library Building	1

Of these classrooms sixty-seven are used primarily as recitation rooms and thirty-three as special rooms.

The Main Building houses the Art, Commerce, Education, English, Latin and German, Mathematics, Music, Romance Languages, and Social Studies Departments, while the other buildings care for the departments which their names imply. The Training School houses both the grades and high school. Two training school classes, however, meet in the Main Building, and the training school industrial arts classes are held in the Vocational Building. Eighteen of the one hundred rooms are given over entirely to training school classes while two rooms in the Vocational Building are used primarily for such classes.

The rooms measured are referred to throughout the study by their actual numbers. The letters as applied to the rooms A, B, C, and D, indicate the floors upon which the rooms are located. "A" represents the first floor; "B", the second floor; "C", the third floor; and "D", the fourth floor. Numbers are used with the letters to designate the different rooms. The letters M, S, V, PE, T, and L are used to designate Main Building, Science Hall, Vocational Building, Physical Education Building, Training School Building, and Library Building respectively. For example, SC-50, represents room 50 of the third floor of the Science Hall.

2. Measurements Made. Nothing was taken for granted in the measurements of the classrooms, every measurement being made with the greatest possible accuracy. The fact that certain

rooms were supposed to be exactly the same in dimensions was ignored after it was discovered that many changes have been made since the time of the erection of the older buildings. In the Main Building and Training School especially, a very small amount of uniformity among rooms was found. The study of classrooms in the Main Building shows every conceivable shape, size, and form of room. The Science Hall, Vocational Building and Physical Education Building, however, have a much higher degree of likeness among the various rooms.

Measurements of length and width of the rooms were taken to one-tenth of a foot, while room heights were computed to the nearest one-half foot. Window lengths and widths were measured to the fractional part of an inch. All other room measurements were made to the nearest one-tenth of a foot or to the nearest inch.

3. Floor Space. One of the principal factors in classroom utilization is the amount of floor space provided. In this study, the floor space for each room is computed to the nearest one-tenth of a square foot. It is found that the classrooms at Indiana State Teachers College range in amount of floor space from 321.9 square feet for Room A-45 of the Science Hall to 1,948.8 square feet in Room D-50 of the Science Hall. The recitation rooms vary from 438.8 square feet to 1,781 square feet of floor space. The special rooms range from 321.9 square feet to 1,948.8 square feet of floor space per room.

4. Air Space. The amount of air space is equal to the cubic dimensions of the room. The air space for the classrooms in this study is computed to the nearest cubic foot. The rooms are found to vary in air space from 25,832 cubic feet in Room D-33 of the Main Building to 3,380 cubic feet in Room A-45 of the Science Hall. The recitation rooms vary from 25,832 to 4,607 cubic feet, while the special rooms vary from 3,380 to 25,584 cubic feet of air space.

The classroom length, width, square feet of floor space and cubic feet of air space are revealed by Tables I-VI, inclusive, pages 17-22.

TABLE I

GENERAL MEASUREMENTS FOR THE CLASSROOMS OF THE MAIN BUILDING

Room Number	Room Length in Feet	Room Width in Feet	Room Height in Feet	Square Feet of Floor Space	Cubic Feet of Air Space
M-A-1	42.1	21.1	10.5	896.7	9,415
A-4*	48.0	21.9	10.5	1,001.0	10,511
A-14*	48.0	21.9	10.5	1,001.0	10,511
A-21	21.3	20.6	10.5	438.8	4,607
B-1	22.1	21.2	14.0	468.5	6,559
B-3	22.1	21.2	14.0	468.5	6,559
B-7	29.9	21.9	14.0	654.8	9,167
B-9	29.9	22.9	14.0	684.7	9,586
B-11	29.9	21.9	14.0	654.8	9,167
B-17	22.2	20.8	14.0	461.8	6,465
B-33	37.2	22.3	17.0	825.6	14,035
B-34	36.9	21.1	17.0	778.6	13,326
B-36*	29.0	27.4	17.0	735.0	12,495
B-37	36.9	21.0	17.0	774.9	13,173
B-39*	30.0	27.4	17.0	749.0	12,773
C-1	22.2	21.0	14.0	466.2	6,527
C-2	30.6	22.1	14.0	676.3	9,468
C-3	22.2	21.0	14.0	466.2	6,527
C-4*	36.0	33.9	14.0	966.0	13,524

TABLE I (Continued)

C-6	53.0	21.6	14.0	1,148.8	16,027
C-7	22.2	21.0	14.0	466.2	6,527
C-8*	36.0	33.9	14.0	966.0	13,524
C-10	30.1	22.2	14.0	668.2	9,355
C-31	31.5	26.5	12.5	834.8	10,435
C-33	29.1	23.2	12.5	675.1	8,439
C-34	21.5	20.8	12.0	447.2	5,366
C-35	40.1	20.1	12.5	806.0	10,075
C-36*	35.8	29.0	12.5	875.0	10,938
C-37*	39.0	37.0	12.5	1,120.0	14,000
D-1	56.6	30.2	14.5	1,709.3	24,785
D-2	29.0	22.5	15.0	652.5	9,788
D-8	36.0	21.5	15.0	774.0	11,610
D-9	57.1	30.9	14.5	1,764.4	25,584
D-33	53.5	33.3	14.5	1,781.6	25,832
D-34	36.6	33.3	14.5	1,218.8	17,673
D-35	37.5	17.6	14.5	660.0	9,570
D-36	38.8	19.4	14.5	752.7	10,914
D-37	24.8	16.7	14.5	414.2	6,026
D-38	28.6	17.0	15.0	486.2	7,293

* All rooms marked thus are not rectangular and, therefore, do not have areas which can be computed by the means employed for the rectangular rooms.

TABLE II

GENERAL MEASUREMENTS FOR THE CLASSROOMS OF THE SCIENCE HALL

Room Number	Room Length in Feet	Room Width in Feet	Room Height in Feet	Square Feet Floor Space	Cubic Feet Air Space
S-A-41	34.5	27.1	10.5	935.0	9,818
A-45	22.2	14.5	10.5	321.9	3,380
A-48	25.4	23.5	9.0	596.9	5,372
A-51	33.7	27.1	11.0	913.3	10,046
B-41	34.3	25.8	13.0	884.9	11,504
B-43	30.6	24.4	13.0	746.6	9,706
B-45	31.6	24.4	13.0	771.0	10,023
B-49	33.4	26.0	13.0	868.4	11,289
B-50	25.5	24.7	13.0	629.9	8,189
B-52	33.4	24.7	13.0	825.0	10,725
C-41	34.5	25.0	13.0	862.5	11,213
C-43	28.7	25.0	13.0	717.5	9,328
C-44	34.5	26.7	13.0	921.2	11,076
C-47	33.7	25.6	13.0	862.7	11,215
C-48	32.8	25.0	13.0	820.0	10,660
C-50	33.4	25.0	13.0	835.0	10,855
D-41	46.8	27.0	13.0	1,263.6	16,427
D-42	30.0	26.0	13.0	780.0	10,140
D-44	24.5	22.3	13.0	546.4	7,103
D-50	81.2	24.0	13.0	1,948.8	25,334

TABLE III

GENERAL MEASUREMENTS FOR THE CLASSROOMS OF THE VOCATIONAL BUILDING

Room Number	Room Length in Feet	Room Width in Feet	Room Height in Feet	Square Feet Floor Space	Cubic Feet Air Space
V-A-1	52.6	30.0	14.0	1,578	22,092
A-2	30.0	19.2	14.0	576	8,064
A-3	30.0	24.0	14.0	720	10,080
A-4	63.9	28.2	14.0	1,802	25,228
A-5	44.2	31.2	14.0	1,379	19,306
A-6	38.0	31.0	14.0	1,178	16,492
B-1	32.9	30.0	12.5	987	12,338
B-2	58.2	30.0	12.5	1,746	21,825
B-3	63.9	29.6	12.5	1,891.4	23,630
B-4	32.7	27.5	12.5	899.2	11,240
B-5	63.9	29.6	12.5	1,891.4	23,630
C-1	46.9	30.0	12.0	1,407	16,884
C-2	46.9	30.0	12.0	1,407	16,884
C-3	38.3	27.4	12.0	1,049.4	12,593
C-5	38.3	27.4	12.0	947.4	11,369
C-6	25.4	15.6	12.0	396.2	4,754
C-7	47.9	29.7	12.0	1,422.6	17,071
C-8	38.3	27.4	12.0	1,049.4	12,593
*Kitchenette	14.5	11.2	12.0	162.4	1,949

*The kitchenette is considered a part of the dining room, C-6, in the classroom computations.

TABLE IV

GENERAL MEASUREMENTS FOR THE CLASSROOMS OF THE PHYSICAL EDUCATION BUILDING

Room Number	Room Length in Feet	Room Width in Feet	Room Height in Feet	Square Feet Floor Space	Cubic Feet Air Space
PE-B-5	28.0	25.0	10.0	700.0	7,000
B-6	34.5	28.0	10.0	966.0	9,660
B-53	28.0	18.9	10.0	529.2	5,292
B-54	54.0	28.0	10.0	1,512.0	15,120
O-58	32.0	20.0	10.0	640.0	6,400
O-59	32.0	20.0	10.0	640.0	6,400

TABLE V

GENERAL MEASUREMENT FOR THE CLASSROOM OF THE LIBRARY BUILDING

Room Number	Room Length in Feet	Room Width in Feet	Room Height in Feet	Square Feet Floor Space	Cubic Feet Air Space
L-A-1	29.8	25.5	12.5	461.9	5,774

TABLE VI

GENERAL MEASUREMENTS FOR CLASSROOMS OF THE TRAINING SCHOOL

Room Number	Room Length in Feet	Room Width in Feet	Room Height in Feet	Square Feet Floor Space	Cubic Feet Air Space
T-A-2	31.4	28.4	11.0	891.8	9,810
A-4	31.4	28.4	11.0	891.8	9,810
A-6*	44.5	31.0	11.0	1,219.0	13,409
A-8*	44.5	31.0	11.0	1,219.0	13,409
B-12	32.0	28.8	14.0	921.6	12,902
B-14	32.0	28.8	14.0	921.6	12,902
B-16*	35.8	33.0	14.0	1,015.0	14,210
B-18*	35.8	33.0	14.0	1,015.0	14,210
C-22	32.5	29.0	14.0	942.5	13,195
C-23	27.5	22.5	14.0	618.8	8,663
C-24	32.5	29.0	14.0	942.5	13,195
C-26*	35.8	31.0	14.0	971.0	13,594
C-28*	35.8	33.0	14.0	1,015.0	14,210
D-36*	36.6	33.0	14.0	1,038.0	14,532
D-37	20.5	14.8	14.0	303.4	4,248
D-38*	36.4	33.0	14.0	1,038.0	14,532

*The rooms marked thus have rounded ends and, therefore, are not computed as rectangular areas.

5. Light Area and Conditions. Window measurements were taken for each classroom, together with the number of windows. From this data, the light area for each room was computed. The results of the computations reveal the fact that the rooms vary in the amount of natural light from 554 square feet in Room B-5 of the Vocational Building to 33 square feet in Room D-37 of the Main Building. Attention is here called to the fact that the amount of natural light is important only in its relationship to the amount of floor space.

The amount of light is only one factor, however, in judging the light conditions of the classroom. The location and placement of the windows within the room are as important as are their areas. Many factors are involved in determining the adequacy of natural light for a classroom.

The data gathered in this study reveal the fact that the natural light conditions in most of the classrooms at Indiana State Teachers College are poor. Many of the standards for good classroom lighting are not met in a majority of cases. Some of the more serious conditions revealed by the study are set out as follows:

a. 57 per cent of the one hundred classrooms have windows on two or more sides of the room.

b. Only 18 per cent of the rooms have purely left hand lighting.

c. 31 per cent of the rooms have windows located much too far from the floor. An extreme case of this is Room B-33 of the Main Building, a room used for

social studies recitation. The windows are located 6.7 feet from the floor. Because of this condition, a high percentage of the student sittings receives no direct light rays.

d. 81 per cent of the rooms have windows that do not reach close enough to the ceiling. The windows throughout the classrooms vary from 8 inches to 48 inches from the ceiling. The worst cases were found in the Main Building and Training School.

e. 39 per cent of the one hundred rooms have less than four feet of dead wall space at the front of the window side of the room. (Shops and other rooms in which the students move about are not included in this number)

f. 30 per cent of the rooms have window mullion widths of more than 12 inches. The Main Building and Training School combined have 17 rooms with mullion widths as much as 36 inches. The Science Hall, Vocational Building and Physical Education Building have all window mullions of 12 inches or less in width.

g. Four rectangular rooms in the Main Building have windows on one side only, located on the short axis of the room. These rooms are MB-33, MB-34, MB-37 and MC-35. An outstanding example of this is room MB-37, an education recitation room. The room is 36.9 feet long and 21 feet wide, with the

windows, four in number, on the short axis. According to the standards, the light axis should not exceed 24 feet. This leaves 12.6 feet of the length of the room unsafe for use because of poor light. The measurements show 778.6 square feet of floor space. If the part of the floor space that is unsatisfactory is eliminated from use, the computations show only 504 square feet of usable floor space, enough for 28 students. The actual floor space is sufficient for 43 students.

h. 56 per cent of the classrooms are as much as one foot or more wider than the standards set for classroom widths. These rooms are distributed as follows by buildings: Main Building, 11; Science Hall, 12; Vocational Building, 15; Training School, 14; Physical Education Building, 3; and the Library, 1.

i. 16 of the rooms, eight in the Main Building and eight in the Training School, offer a real problem in the natural light situation. These rooms each have one end curved into the form of a semi-circle. Most of the light in each room is located on the curved wall with a lesser amount of light located on one adjacent side of the room. The windows in these rooms have mullion widths from 24 to 36 inches. The windows, being on a curved surface, cause many

cross-rays of light. Four of these rooms in the Main Building; namely, MA-4, MA-14, MC-4, and MC-8, have the light located on the short axis of the room as well as on the curved surface. Rooms MB-4 and MB-14 are 48 feet long. The light, being located on the curved end, is adequate for only 36 feet of the length. In these two rooms, the 12 feet of the length of the rooms, located farthest from the windows, should not be used for student occupancy. Rooms MC-4 and MC-8 have lengths of 36 feet. The light on the curved surface is adequate for only 27 feet of the length, leaving 9 feet of the length of the rooms unsafe for student use.

Tables VII-XII, inclusive, pages 27-34, indicate the light area and light conditions for each classroom of the entire plant.

TABLE VII

LIGHT AREA AND CONDITIONS FOR MAIN BUILDING

Room No.	No. of Windows	Location from Students	Location by Direction	Window Dist. From Floor	Window Dist. from Ceiling	Window Mullion Width Inches	Dead Wall Spade at Front	Square Feet of Light Area
M-A-1	6	L-F*	S-E**	3.7'	10"	8"	5'	99
A-4	7	Varies	S-W	4.0	14	36		169
A-14	7	"	N-W	4.0	14	36		169
A-21	2	R	N	3.6	10	8	6	69
B-1	4	F-L	E-S	3.2	16	8	5	72
B-3	3	R	E	3.2	16	8	4	54
B-7	7	L-B	E-S	3.1	36	8	5	126
B-9	3	L	E	3.1	12	8	5	54
B-11	3	L	E	3.1	12	8	6	54
B-17	4	R-B	E-N	3.3	16	8	10	48
B-33	4	R	S	6.7	16	36	1.1	67
B-34	4	R	W	2.6	30	8	1.1	79
B-36	8	R-B-L	N-W	2.6	30	36	.1	218
B-37	4	L	E	2.6	30	8	1.1	76
B-39	7	F-L-B	N-E	2.6	30	8		218
C-1	4	R-B	S-E	3.6	16	8	5	97
C-2	6	L-B	W-S	3.6	16	8	4	141
C-3	3	L	E	3.6	16	8	5	59
C-4	7	L	W-S	3.6	16	36	0	198
C-6	5		W	3.6	16	8		201

TABLE VII (Continued)

C-7	3	R-B	E-N	3.6	16	8	10	59
C-8	7		W-N	3.6	16	36		198
C-10	6	R-B	W-N	3.6	16	8	4	156
C-31	5	R-B	S	3.6	16	30	10	68
C-33	8	R-B	E-S	3.6	16	16-30	10	142
C-34	4	L	W	3.6	16	10-30	5	45
C-35	4	L	E	3.6	14	10-30	4	65
C-36	11	B-R	N-W	3.6	16	30	2	253
C-37	11	B-L	E-N	3.6	16	10-30	2	242
D-1	8	B-L-R	W-S-E	3.0	36	30		166
D-2	3	L	W	3.0	60	10	3	124
D-8	5	L	S-W	3.0	16	10		124
D-9	9	B-L-R	W-N	3.0	36	30		132
D-33	3	R	W	3.6	36	10	2	68
D-34	3	L	E	3.6	36	10	2	68
D-35	3	B-L	S	3.2	36	10		59
D-36	3	B-R	S	5.3	16	10	2	47
D-37	3	B-L	N	3.7	16	10	2	33
D-38	5	B-L	S-W	3.0	6	10	1/2	161

*B, F, L, and R represent light location from students, back, front, left, and right respectively.

** N, S, E, and W indicate the light direction from the student, north, south, east, and west respectively.

Blank spaces indicate light from all directions because of student arrangement.

TABLE VIII

LIGHT AREA AND CONDITIONS FOR THE SCIENCE HALL

Room No.	No. of Windows	Location from Students	Location by Direction	Window Dist. From Floor	Window Dist. From Ceiling	Window Mullion Width Inches	Dead Wall Space at Front	Square Feet of Light Area
A-41	7		S-W	4.5'	10"	9"	2'	117
A-45	2	L-R	W	4.5	10	9	2	40
A-48	3	L-R	E	4.5	10	9	1/6	60
A-51	7	B-L	N-W	4.5	10	9	3	164
B-41	7	B-L-R	S-W	4.3	8	9	1 1/2	194
B-43	4	L-R	W	4.3	12	9		96
B-45	4	L	W	4.3	16	9	1/3	111
B-49	7	B-L-R	N-W	4.3	8	9		194
B-50	3	L	E	4.3	8	9	1/3	86
B-52	7		N-E	4.3	8	9		215
C-41	7	R-B	S-W	4.3	10	9	1 1/2	209
C-43	6	F-B	W	4.3	8	9	3 1/2	166
C-44	7	L-B	S-E	4.3	10	9	1 1/2	209
C-47	7	L-F-B	N-W	4.3	8	9		197
C-48	4	B-F	E	4.3	8	9	3 1/2	120
C-50	7		N-E	4.3	8	9		209
D-41	9	L-B	S-W	4.3	40	9	1	250

TABLE VIII (Continued)

D-42	6		S-E	4.3	40	9		178
D-44	3	L-R	E	4.3	8	9	3 1/2	103
D-50	16		E-N-W	4.3	40	9		384

Blank spaces indicate light from all directions because of student arrangement.

B, F, L, and R represent the directions back, front, left, and right, respectively.

N, S, E, and W represent the directions North, South, East, and West, respectively.

TABLE IX

LIGHT AREA AND CONDITIONS FOR THE VOCATIONAL BUILDING

Room No.	No. of Windows	Location from Students	Location by Direction	Window Dist. from Floor	Window Dist. from Ceiling	Window Mullion Width inches	Dead Wall Space at Front	Square Feet of Light Area
A-1	8		N-S	4.2'	12"	10		258
A-2	2	R	N	4.2	12	10	1'	64
A-3	3		N	4.2	12	10		97
A-4	16		W-S	3.8	12	3		526
A-5	9		S-E	3.8	12	3		286
A-6	5		E	3.8	12	3		154
B-1	6	L-R	N-S	3.0	12	10	1/3	208
B-2	7	L-F	N	3.0	12	10	1/3	254
B-3	14		S-W	2.8	12	3		517
B-4	5		S	2.8	12	3		201
B-5	15		E	2.8	12	3		554
C-1	8	L	N-S	2.8	12	8	4	287
C-2	8	L-R	N-S	2.8	12	8	4	287
C-3	5	L-R	W	3.0	12	3	3	144
C-5	10		S-W	3.0	12	3		240
C-6	3		S	3.0	12	3		93

TABLE IX (Continued)

C-7	12		S-E	3.0	12	3		403
C-8	12	L-R	E	3.0	12	3	1/3	144
Kitchenette 2			S	3.0	12	3		62

Blank spaces indicate light from all directions because of student arrangement.

B, F, L, and R represent the directions, back, front, left, and right, respectively.

N, S, E, and W represent the directions north, south, east, and west, respectively.

TABLE X

LIGHT AREA AND CONDITIONS FOR THE PHYSICAL EDUCATION BUILDING

Room No.	No. of Windows	Location from Students	Location by Direction	Window Dist. From Floor	Window Dist. From Ceiling	Window Mullion Width Inches	Dead Wall Space at Front	Square Feet of Light Area
B-5	3	L	W	2.5'	14"	5"	7'	74
B-6	6	R	W	2.5	14	5	1	148
B-53	3	L	E	2.5	14	3	1	74
B-54	9	L	E	2.5	14	3	1	222
C-58	2		N	2.3				42
C-59	2		N	2.3				42

TABLE XI

LIGHT AREA AND CONDITIONS FOR THE LIBRARY

Room No.	No. of Windows	Location from Students	Location by Direction	Window Dist. from Floor	Window Dist, from Ceiling	Window Mullion Width Inches	Dead Wall Space at Front	Square Feet of Light Area
A-1	4	L-B	W-S	5.7	14	12	3	65

Blank spaces indicate light from all directions because of student arrangement.

B, F, L, and R represent the directions, back, front, left, and right, respectively.

N, S, E, and W represent the directions north, south, east, and west, respectively.

TABLE XII

LIGHT AREA AND CONDITIONS FOR THE TRAINING SCHOOL

Room No.	No. of Windows	Location from Students	Location by Direction	Window Dist. From Floor	Window Dist. From Ceiling	Window Mullion Width Inches	Dead Wall Space at Front	Square Feet of Light Area
A-2	7	B-R	E-N	4.7'	10"	36"	2'	112
A-4	7	B-L	N-W	4.7	10	36	2	112
A-6	9	B-L	S-W	4.7	20	36	3	162
A-8	9		S-E	5.8	10	36		162
B-12	7	B-L	N-E	2.9	24	36	2	230
B-14	7	B-L	N-W	2.9	24	36	2	230
B-16	9	B-L	S-W	2.9	24	36	12	298
B-18	9	R-B-L	S-E	2.9	24	36		298
C-22	7	B-L	N-E	2.9	30	36	1	214
C-23	3	L	N	2.9	30	36	1	109
C-24	7	B-L	N-W	2.9	30	48	1	196
C-26	9		S-W	2.9	30	36	1	315
C-28	9	B-F-L	S-E	2.9	30	36		315
D-36	6		S-W	2.9	48	24	2/3	137
D-37	3	L	S	2.9	48	24	1	51
D-38	6	R-B	S-E	2.9	48	24	2/3	101

Blank spaces indicate light from all directions because of student arrangement.

B, F, L, and R represent the directions, back, front, left and right, respectively.

N, S, E, and W represent the directions north, south, east, and west, respectively.

D. Classroom Utilization

1. General Statement. A study was made of classroom student population and daily period use at Indiana State Teachers College. The period of one regular school year of three quarters was used as a basis for the study. The school year consisted of the fall quarter of 1933 and the winter and spring quarters of 1934. The results are thus representative of the regular yearly situation. Because of the fact that the Training School Building will, probably in the near future, be used for college classes, it is treated as far as possible as a college building. Since, however, it is used at present as an elementary and secondary training school, the standards set up for actual college classroom utilizat ion are not applicable to the training school classrooms.

2. Possible and Maximum Classroom Use. A comparative study was made of possible room use as to floor area, air space, and light area in their relationship to one another, to sittings provided, and maximum room capacity. This was done for each classroom of each building and for the entire plant. Since the maximum capacity is the number of students who can be accommodated at any one time upon the basis of a proper relationship of individuals to square feet of floor space, cubic feet of air space and square feet of light area, the maximum capacity coincides with the smallest of the three factors for any room. If the rooms were ideally built, the possible use by floor area, air space, light area, and maximum capacity would be equal. This

condition does not exist in most classrooms, however, and is far from true for the classrooms surveyed in this study.

In case of the Main Building, the usability of the classrooms is lowered greatly by the lack of light. Twenty-five of the 39 classrooms have an insufficient amount of light to equal the floor area and air space. The 39 classrooms of the Main Building show a total possible use of 1,622 students as to floor area, 1,751 as to air space and 1,177 as to light area.

Possible room use in the Science Hall and Vocational Building is largely controlled by the amount of floor space. This is due to the fact that the science laboratories and vocational laboratories and shops demand a greater amount of floor space per pupil than the recitation rooms.

The Physical Education Building shows a rather low correlation between the controlling factors. Light is the lowest, providing for 165 students, while floor space is highest, providing for 238 students. The lack of light is due to the small amount of light provided in rooms PEC-58 and PEC-59 which are used as wrestling and apparatus rooms.

The Training School shows an extremely close correlation between the amount of floor space, air, and light, in comparison with the other buildings, possible use by floor space being 733 students, by air space 789 students and by light area 797 students. The library room, being a basement room can

accommodate only 18 students because of the small amount of light.

Possible classroom use by floor area, air space, light area, sittings provided, and maximum capacity, and also the relationship of maximum capacity to sittings are shown in Tables XIII-XIX, inclusive, pages 38-45.

TABLE XIII

POSSIBLE AND MAXIMUM CLASSROOM USE OF THE MAIN BUILDING

Room No.	Possible Room Use by Floor Area	Possible Room Use by Air Space	Possible Room Use by Light Area	Sittings Provided	Maximum Room Capacity by Standards	Index of Relation (6) : (5)
1	2	3	4	5	6	7
MA-1	49	38	28	52	28	54
A-4	56	42	47	58	42	72
A-14	56	42	47	43	42	98
A-21	24	19	19	34	19	56
B-1	26	26	20	50	20	40
B-3	26	26	15	34	15	44
B-7	36	37	35	40	35	88
B-9	38	38	15	40	15	43
B-11	36	37	15	50	15	30
B-17	26	26	14	45	14	31
B-33	46	56	19	59	19	32
B-34	43	53	22	47	22	47
B-36	41	50	60	46	41	93
B-37	43	53	21	47	21	45
B-39	32	51	60	30	32	107
C-1	26	26	27	58	26	50
C-2	37	38	40	60	37	62

TABLE XIII (Continued)

C-3	26	26	16	47	16	34
C-4	54	54	55	70	54	77
C-6	64	64	56	60	56	93
C-7	26	26	16	50	16	32
C-8	54	54	55	40	54	135
C-10	37	37	43	48	37	81
C-31	46	42	19	60	19	32
C-33	38	34	39	50	34	68
C-34	25	21	13	37	13	35
C-35	45	40	18	48	18	46
C-36*	22	44	51	43	22	51
C-37*	28	56	48	46	28	63
D-1*	43	99	33	80	33	41
D-2	36	39	21	40	21	53
D-8	43	46	34	50	34	68
D-9	98	102	37	65	37	57
D-33	99	103	19	36	19	53
D-34	68	71	19	25	19	76
D-35	37	38	16	21	16	76
D-36	42	44	13	36	13	36
D-37	23	24	9	7	9	129
D-38	27	29	45	18	27	150

*Rooms marked thus are special rooms. All others are recitation rooms.

TABLE XIV

POSSIBLE AND MAXIMUM CLASSROOM USE OF THE SCIENCE HALL

Room No.	Possible Room Use by Floor Area	Possible Room Use by Air Space	Possible Room Use by Light Area	Sittings Provided	Maximum Capacity of Room by Standards	Index of Relation (6) ÷ (5)
1	2	3	4	5	6	7
SA-41	52	39	33	36	33	92
A-45*	8	14	8	8	8	100
A-48*	15	21	12	33	12	36
A-51	51	40	46	56	40	72
B-41	49	46	54	32	46	144
B-43	41	39	27	32	27	84
B-45	43	40	31	56	31	55
B-49*	21	45	39	32	21	66
B-50	35	33	24	48	24	50
B-52	46	43	57	32	43	134
C-41	48	45	58	65	45	69
C-43	40	37	46	49	37	76
C-44	51	44	58	48	44	92
C-47*	22	44	39	28	22	79
C-48	46	43	33	48	33	69
C-50*	21	43	42	28	21	75
D-41	70	66	70	98	66	69

TABLE XIV (Continued)

D-42*	20	41	36	24	20	83
D-44*	14	28	21	25	14	56
D-50*	49	101	77	80	49	49

*Rooms marked thus are special rooms or laboratories. All others are recitation rooms.

TABLE XV

POSSIBLE AND MAXIMUM CLASSROOM USE OF THE VOCATIONAL BUILDING

Room No.	Possible Room Use by Floor Area	Possible Room Use by Air Space	Possible Room Use by Light Area	Sittings Provided	Maximum Room Capacity by Standards	Index of Relation (6) ÷ (5)
1	2	3	4	5	6	7
V-A-1	32	88	52	30	32	107
A-2	32	32	18	32	18	56
A-3	18	40	19	14	18	129
A-4	36	101	105	18	36	200
A-5	28	73	57	18	28	156
A-6	24	66	31	12	24	200
B-1	55	49	58	32	49	153
B-2	44	87	51	32	44	138
B-3	38	94	103	8	38	475
B-4	18	45	40	16	18	112
B-5	38	94	111	28	38	136
C-1	35	68	57	20	35	175
C-2	35	68	57	25	35	140
C-3	26	50	29	24	26	108
C-5	24	46	48	16	24	150
C-6	14	27	31	26	14	54
C-7	36	68	81	24	36	150
C-8	58	51	40	24	40	167

TABLE XVI

POSSIBLE AND MAXIMUM CLASSROOM USE OF THE PHYSICAL EDUCATION BUILDING

Room No.	Possible Room Use by Floor Area	Possible Room Use by Air Space	Possible Room Use by Light Area	Sittings Provided	Maximum Room Capacity by Standards	Index of Relation (6) : (5)
1	2	3	4	5	6	7
PEB-5	39	28	21	30	21	70
B-6	54	39	41	20	39	195
B-53	29	21	21	30	21	70
B-54	84	60	62	67	60	90
B-58	16	26	10	0	10	0
B-59	16	26	10	0	10	0

TABLE XVII

POSSIBLE AND MAXIMUM CLASSROOM USE OF THE LIBRARY BUILDING

Room No.	Possible Room Use by Floor Area	Possible Room Use by Air Space	Possible Room Use by Light Area	Sittings Provided	Maximum Room Capacity by Standards	Index of Relation (6): (5)
1	2	3	4	5	6	7
LA-1	26	23	18	40	18	45

TABLE XVIII

POSSIBLE AND MAXIMUM CLASSROOM USE OF THE TRAINING SCHOOL

Room No.	Possible Room Use by Floor Area	Possible Room Use by Air Space	Possible Room Use by Light Area	Sittings Provided	Maximum Room Capacity by Standards
A-2*	50	39	31	**	31
A-4	50	39	31		31
A-6*	30	54	32		30
A-8	68	54	45		45
B-12	51	52	64		51
B-14	51	52	64		51
B-16	56	57	83		56
B-18	56	57	83		56
C-22	53	53	60		53
C-23	34	35	30		34
C-24	53	53	54		53
C-26*	24	54	63		24
C-28	56	57	87		56
D-36	26	58	28		26
D-37	17	17	14		14
D-38	58	58	28		28

*Rooms marked thus are scored as special rooms.

**This building now used primarily for elementary and secondary classes, therefore, it is not provided with college sittings or accommodations.

TABLE XIX

POSSIBLE CLASSROOM USE IN TERMS OF FLOOR AREA, AIR SPACE, AND LIGHT AREA

Building	No. of Rooms	Possible Room Use by Floor Area	Possible Room Use By Air Space	Possible Room Use By Light Area	Maximum Capacity
Main	39	1,622	1,751	1,177	1,177
Science Hall	20	742	852	811	742
Vocational	18	591	1,147	988	591
Physical Ed.	6	238	200	165	165
Training School	16	733	789	797	733
Library	1	26	23	18	18
TOTAL	100	3,952	4,762	3,956	3,426

3. Classroom Student Population. The average size of class for each college classroom in the entire plant was found. This was computed by dividing the total population for each classroom, over the period of the designated year, by the number of periods the classroom was used over the same period of time. Certain special rooms, however, which did not have regularly scheduled classes, but served as laboratories or work shops for students scheduled for other rooms, could not be included in the study. The classes were found to vary in yearly average size from six students for VB-4, a shop, to 34 students for MC-2, a social studies recitation room. Class sizes ranged between these two extremes, according to the types of classes.

The study reveals that the average classroom attendance for the school year of all 80 college classrooms equaled 58 per cent of the maximum capacity of such rooms. The index of relation betwen the maximum capacity and average classroom attendance by buildings for the year was as follows: Main Building, 79; Science Hall, 47; Vocational Building , 27; Physical Education, 50; and Library, 283. Numbers below 100 in the index of relation show that the rooms are used below the maximum capacity, while numbers over 100 indicates that the rooms are over used.

The average classroom use of the Main Building, then for the year was 79 per cent of the maximum capacity. Moehlman points out in his survey of the Michigan State Normal Schools that a classroom should be used to within 80 per cent of

its capacity.[1] This building reaches, approximately, his standard. The low percentage of relation between the maximum capacity and average classroom population for the Science Hall is due largely to the number of laboratories without regular class schedule.

The low relationship for the Vocational Building is due to extremely small classes throughout the entire building, the classes ranging in average size for the year from six to sixteen students. The over use of the library room is due, partly to the low relationship of floor space and light area and, perhaps, also to the fact, that the library science classes meeting there, were divided into sections which met on different days.

The average size of class for each room is especially significant in showing the actual use of the classroom when compared with the maximum capacity, sittings provided, and average classroom period use. This is shown in Tables XX-XXIV, inclusive, pages 48-52. The relationship of average classroom attendance to the maximum classroom capacity by building and for the entire plant is given in Table XXV, page 53.

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[1] Arthur B. Moehlman, A Survey of the Needs of the Michigan State Normal Schools. (Lancing, Michigan: State Board of Education, 1922), p. 54.

TABLE XX

MAIN BUILDING CLASSROOM USE BY CLASS AVERAGE AND PERIODS

Room No.	Maximum As to Standards	Sittings Provided	Average Size of Class	Average Period Per Day
M-A-1	28	52	*	
A-4	42	58	22	4.0
A-14	42	43	*	
A-21	19	34	23	1.7
B-1	20	50	20	4.7
B-3	15	34	9	3.0
B-7	35	40	21	3.7
B-9	15	40	23	3.7
B-11	15	50	17	3.7
B-17	14	45	14	5.0
B-33	19	59	26	5.7
B-34	22	47	17	3.3
B-36	41	46	20	4.0
B-37	21	47	21	3.7
B-39	32	30	17	3.7
C-1	26	58	30	4.7
C-2	37	60	34	5.7
C-3	16	47	23	4.7
C-4	54	70	32	3.0
C-6	56	60	27	4.7
C-7	16	50	21	4.7

TABLE XX (Continued)

C-8	54	40	25	6.0
C-10	37	48	24	4.3
C-31	19	60	20	5.3
C-33	34	50	21	4.0
C-34	13	37	30	3.0
C-35	18	48	19	6.0
C-36	22	43	19	3.0
C-37	28	46	14	4.0
D-1	33	80	17	1.7
D-2	21	40	19	1.7
D-8	34	50	27	3.0
D-9	37	65	32	5.3
D-33	19	36	24	5.3
D-34	19	25	19	4.0
D-35	16	21	0	0.0
D-36	13	36	21	3.3
D-37	9	7	19	2.0
D-38	27	18	0	0.0

*Used as Training School Classroom

TABLE XXI

SCIENCE HALL CLASSROOMS USE BY CLASS AVERAGE AND PERIODS

Room No.	Maximum As to Standards	Sittings Provided	Average Size of Class	Average Period Per Day
SA-41	33	36	21	3.0
A-45	8	8		
A-48	12	33		
A-51	40	56	25	3.3
B-41	46	32	27	3.7
B-43	27	32	21	1.7
B-45	31	56	18	2.7
B-49	21	32	21	2.0
B-50	24	48	19	3.7
B-52	43	32		
C-41	45	65	28	3.3
C-43	37	49	33	4.3
C-44	44	48	26	2.3
C-47	22	28	10	0.3
C-48	33	48	22	2.3
C-50	21	28		
D-41	66	98	25	4.7
D-42	20	24		
D-44	14	25		
D-50	49	80		

Blank spaces indicate laboratories without record of room utilization.

TABLE XXII

VOCATIONAL BUILDING CLASSROOM USE BY CLASS AVERAGE AND PERIODS

Room No.	Maximum As to Standards	Sittings Provided	Average Size of Class	Average Period Per Day
VA-1	32	30	7	4.3
A-2	18	32	6	1.0
A-3	18	14	0	0.0*
A-4	36	18	10	4.7
A-5	28	18	8	1.3
A-6	24	12		
B-1	49	32	8	3.0
B-2	44	32	10	3.3
B-3	38	8	8	1.3
B-4	18	16	6	2.0
B-5	38	28	10	3.3
C-1	35	20	14	2.7
C-2	35	25	14	2.0
C-3	26	24	11	1.7
C-5	24	23		
C-6	14			
C-7	36	0	14	4.7
C-8	40	24	16	2.0

*Indicates rooms used primarily by Training School

Blank spaces indicate special rooms without regular class schedule.

TABLE XXIII

PHYSICAL EDUCATION BUILDING CLASS-ROOM USE BY CLASS AVERAGE AND PERIODS

Room No.	Maximum As to Standards	Sittings Provided	Average Size of Class	Average Period Per Day
PEB-5	21	30	17	3.3
B-6	39	20	18	1.3
B-53	21	30	24	4.0
B-54	60	67	21	0.7
C-58	10			
C-59	10			

Blanks indicate special rooms without regular class schedule.

TABLE XXIV

LIBRARY BUILDING CLASSROOM USE BY CLASS AVERAGE AND PERIOD

Room No.	Maximum As to Standards	Sittings Provided	Average Size of Class	Average Period Per Day
LA-1	18	40	51	3.0

TABLE XXV

PERCENTAGE OF AVERAGE CLASSROOM USE FOR ONE PERIOD BY BUILDING ON THE BASIS OF ATTENDANCE FOR ONE YEAR

Building	No. of Class-rooms	Maximum Capacity For One Period	Average Classroom Attendance	Index of Relation (4) ÷ (3)
1	2	3	4	5
Main	37	968	767	79
Science Hall	20	636	296	47
Vocational	16	517	142	27
Physical Ed.	6	161	80	50
Library	1	18	51	283
TOTAL	80	2,300	1,336	58

4. Utilization by Periods. Period use is an important factor in actual utilization of a classroom. That is, the amount of time during the school day that a room is in use is as important as the sizes of the classes meeting there. The student population of a classroom indicates to what extent its capacity is used; the periods it is used per day indicate the amount of time the room is in use. These two factors determine the actual daily utilization of a classroom.

The daily program at Indiana State Teachers College is based upon an eight hour day, during the three regular quarters. The average daily period use for each college classroom was computed for the three quarters studied. The average for each room was found by adding the number of periods that a room was in use each day for the three quarters and dividing the sum by three, the number of quarters. For example, room MC-33 was in use four periods per day during the fall quarter, four periods per day during the winter quarter, and four periods per day during the spring quarter, a total of twelve periods daily for the year, which divided by three, the number of quarters covered, equals four periods a day, the average for the year.

The average period use per day for the 80 rooms was found to vary from no periods for MD-38 to 6.0 periods for MC-8. Special rooms for which class schedules were not given were not included in the computations. Rooms VA-2 and VA-3 are given over primarily to Training School use and are, therefore, seldom used by college classes. They were not, then, included

in the study of college classroom period use.

The average period classroom use at Indiana State Teachers College in its relationship to other classroom usability factors for each college room is indicated in Tables XX-XXIV, inclusive, previously given on pages 48-52.

The study of the classroom period use by buildings discloses the fact that of the 640 daily periods available for the 80 college classrooms, 225 periods are actually used. The actual period use for the entire plant equals 35 per cent of the periods available. The percentages of periods utilization by buildings is as follows: Main, 47; Science Hall, 23; Vocational, 29; Physical Education, 19; and Library, 38.

These percentages may seem extremely low; but it will be recognized, of course, that it would be practically impossible for college classrooms to be utilized to anything like 100 per cent of the actual periods. Variation in programs and the wide range of college subjects make rooms satisfactory for only certain types of subjects. This often leads to rooms being necessarily unoccupied during certain periods of the day.

Reeves, Kelly, and Russell in their survey of university plant facilities made a study of classroom period use of fifteen buildings at Chicago University. Their study was made for the fall term of 1931. The term chosen was that of highest attendance for the year. The study revealed the fact that the percentage of period use for the fifteen buildings ranged from 12.5 per

cent to 96.9 per cent. The average period use for all the buildings was 59.3 per cent.[2]

Room utilization by periods at Indiana State Teachers College, then compares rather favorably with period utilization at Chicago University, especially since this study covers a regular school year of three quarters, during a year of low college student attendance.

The relation of the actual period use to the possible period use is present in Table XXVI, page 57.

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[2] F. W. Reeves, F. J. Kelly, and J. D. Russell, University Plant Facilities, (Chicago: University of Chicago Press, 1933) Pp. 59-110.

TABLE XXVI

PERCENTAGE OF DAILY CLASSROOM USE BY PERIODS OVER A PERIOD OF ONE YEAR

Building	No. of Class-rooms	Total Periods Available	Total Periods of Actual Use	Index of Relation (4) : (3)
1	2	3	4	5
Main	37*	296	139	47
Science Hall	20	160	37	23
Vocational	16**	128	37	29
Physical Ed.	6	48	9	19
Library	1	8	3	38
TOTAL	80	640	225	35

*Two of the 39 rooms of the main building are used for training school classes.

**Two of the 18 rooms of the vocational building are used primarily for training school classes.

E. Classroom Sittings or Student Accommodation

1. General Explanation. The number of students provided for in the various classrooms was computed upon the basis of the number of chairs, desks, tables, or work benches in each of the rooms. Student sittings in case of the science laboratories were decided by the number of equipment drawers. Two drawers were allowed for each student. The student provisions or accommodations are referred to throughout the study as student sittings. Attention is called here to the fact that most student sittings are movable which makes possible changes in the number of sittings from one day to another. The data compiled for student sittings were taken during the spring of 1934.

2. Sittings Provided. The survey reveals that there are 3,030 college classroom sittings at Indiana State Teachers College. These are distributed among the buildings as follows: Main, 1,675; Science Hall, 868; Vocational, 310; Physical Education, 147; Library, 40. The classroom sittings for the five buildings equal 730 more than the number of students for which they provide.

The relationship of the maximum capacity to the sittings provided was found in percentages for the five buildings. This was computed by dividing the maximum classroom capacity of a building by the sittings provided for that building. Per cents

below 100 indicates that the maximum capacity is less than the sittings provided. Over 100 per cent indicates that the maximum capacity is greater than the number of sittings provided. The index of relation between student sittings and maximum capacity by building is as follows: Main, 58; Science Hall, 74; Vocational, 167; Physical Education, 110; Library, 45. These figures indicates that the Main Building, Science Hall, and Library Building have more sittings provided than the maximum capacity of each, while the Vocational Building and Physical Education Building could carry a heavier load of sittings. The college classroom maximum capacity is 76 per cent of the sittings provided.

There is a very close relationship displayed for the 80 college classrooms between the maximum standard for floor space and the number of sittings provided, the sittings provided being 3,030 and the floor space maximum standard being 3,064. The percentage of relationship is 98.8.

Table XXVII, page 60, indicates the relationship of classroom maximum capacity to the sittings provided for each building containing college classrooms.

TABLE XXVII

COMPARISON OF SEATING AND MAXIMUM CAPACITIES OF CLASSROOMS BY BUILDINGS

Building	No.of Rooms	Sittings Provided	Maximum Capacities	Index of Relations (4) ÷ (3)
1	2	3	4	5
Main	37	1,675	968	58
Science Hall	20	868	636	74
Vocational	16	310	517	167
Physical Ed.	6	147	161	110
Library	1	40	18	45
TOTAL	80	3,030	2,300	76

F. The Training School

1. The General Situation. The Training School Building at Indiana State Teachers College houses the elementary and secondary school students. The school is organized upon the six-six plan of administration. The building contains sixteen classrooms, four on each of the floors, including the basement. Training School classes are also held in rooms MA-1, MA-14, VA-2, VA-3, and certain shops of the Vocational Building. Rooms TA-2 to TB-14, inclusive, are used for the elementary grades, and the remainder are used primarily to house the high school students. Five rooms are used definitely as special rooms. These are TA-6, TC-26, TD-36, VA-2 and VA-3. All other rooms are classed as general recitation rooms in this study.

2. Classroom Standards. The maximum standards set up for the elementary classrooms are based upon the amount of floor area, air space, and light area of each room. The standards used are those favored by Strayer and Engelhardt for Elementary schools.[3]

The maximum standards used for the high school classrooms are based upon Strayer and Engelhardt's standards for high school classrooms.[4] These, also, are confined to the amount of floor space, air, and light. Rooms MA-1, MA-14, VA-2, and VA-3, although

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[3] G. D. Strayer and N. L. Engelhardt, Standards For Elementary School Buildings. (New York: Bureau of Publication, Teachers College, Columbia University.)

[4] G. D. Strayer and N. L. Engelhardt, Standards For High School Buildings. (New York: Bureau of Publications, Teachers College, Columbia University, 1924.) Pp. 39-76.

not in the Training School Building, are included in the study, since they house primarily, training school students.

3. Room Capacities and Conditions. The survey reveals that the Training School classrooms vary in length from 20.5 feet in TD-37 to 48.5 feet in MB-14. The room widths range from 14.8 feet in TD-37 feet in TB-16 and TB-18. According to classroom standards, elementary and secondary school classrooms should not exceed 24 feet in width. Fourteen of the classrooms in the Training School Building exceed this number. The rooms range in height from 11 to 14 feet.

Ten of the rooms have sufficient light area to meet the standards for floor area and air space without waste. Two other rooms have sufficient light area to reach within four students the capacity of that for floor area and air space. Four rooms, TA-2, TA-4, TA-8, and TD-38 are greatly handicapped because of the amount of light. Rooms MB-1 and MB-14 are long and narrow, having the light located on the short axis, leaving a portion of each without sufficient light. The light in these two rooms is also located on a curved surface which causes cross-rays which are unsatisfactory for classroom lighting.

4. Classroom Utilization. The class program for the school year of 1933-34 was obtained from the Training School office through the courtesy of the administrators of the school. From this program, a study was made of classroom utilization in terms of student population and daily period use. The program

provides for seven, fifty-five minute periods per day. The computations were based entirely upon the program obtained from the office and do not take into account any changes made during the year, either in size or re-distribution of classes. In case a period was divided between two classes, a proper average between the two was made for that period in computing classroom population. Physical Education classes are not included in the study of the Training School, since they did not meet in regular classrooms.

The total daily classroom population for the twenty classrooms was 2,404 students for the year. The classroom population ranged from 240 individuals during the seventh, or last hour, to 388 the fifth, or one o'clock hour. The individual classroom attendance varied from 48 students for room TA-2 to 234 students for room TB-12.

In terms of the hourly periods, the classrooms were utilized 72 per cent of the time for the year. Out of a total of 133 daily periods, 96 periods were actually used. These figures include activity sessions and study groups held in classrooms.

Table XXVIII, page 64, shows the capacities, conditions, and utilization of the Training School classrooms at Indiana State Teachers College.

TABLE XXVIII

TRAINING SCHOOL DAILY CLASSROOM USE BY PERIODS FOR THE SCHOOL YEAR OF 1933-34

Room No.	Maximum Capacity	Sittings Provided	Classroom Use by Periods For School Year of 1933-34							Total Daily Use
			8:00 8:55	9:00 9:55	10:00 10:55	11:00 11:55	1:00 1:55	2:00 2:55	3:00 3:55	
A-2	37	30			25	19			4	48
A-4	37	32	28	26	26		26	26		132
A-6	35	20					18	33	8	59
A-8	54	36		20		36	26	26	36	144
B-12	62	40	39	39	39	39	39	39		234
B-14	62	36	26	28	26	26	26	45		177
B-16	68	24	21	21	21		21	21		105
B-18	68	26	21	21	21	21	21	21		126
C-22	63	40	25	22	23		40	21	26	157
C-23	36	30		14	20	55	26	19	23	157
C-24	63	34	13	27	15	44		14		113
C-26	28	36	45		13	44	22	16	15	155
C-28	68	56	18	14		15		20	50	117
D-36	30	26	14		20		13		12	59
D-37	17	32		24	14			9	24	71
D-38	34	36	27	26	27	27	36	27		170
MA-1	33	52	27		36		21	27		111
MA-14	56	43	36		26	51	12		27	152
VA-2 & 3	36	46	19	21	14		26	22	15	117
TOTAL	887	675	359	303	366	362	388	386	240	2,404

G. Conclusions

The study proper began with the setting up of the problem as to the classroom capacities, conditions, and utilization at Indiana State Teachers College. In order to evaluate and interpret the data found, it was necessary to set up classroom standards. This was done in terms of floor area, air space, and natural light conditions and area.

The standards were applied to the measurements taken of the classrooms, and maximum standards for every classroom of the entire plant were set up. The classrooms were found to be 100 in number, including 80 rooms used for college classrooms and 20 used primarily for Training School classes.

The maximum standards for floor area, air space, and light area were interpreted in their relationship to actual classroom utilization. Factors of actual utilization were sittings provided, classroom student population, and period use. Lack of proper relationship between the various factors was found from time to time, but a comparison with like studies revealed that classroom utilization at Indiana State Teachers College compares favorably with room utilization as revealed by such other studies.

It was found necessary to study the utilization of the Training School as a separate unit under standards for elementary and secondary schools. Certain classrooms were found to be somewhat unsatisfactory because of their shape, size, and light conditions. The study revealed, however, a rather high

correlation between the maximum capacity, sittings provided and classroom utilization for the Training School

IV. FINDINGS AND RECOMMENDATIONS

A. Conclusions Based Upon Findings

The study discloses the fact that little has been done to standardize classrooms for institutions of higher learning. Surveys of such institutions have been made in great numbers in which classroom utilization has been given close consideration; but the relationship of room capacity, condition and utilization has usually received little or no attention. This is probably due to the fact that generally accepted college classroom standards have not been adopted. Scientific standards for college classrooms, developed by experts in the field of school building construction, are, therefore, needed very much, not only for use in the construction of satisfactory classrooms, but also as a basis for proper utilization of those already constructed. This has been done in the field of elementary and secondary education and has proved highly successful.

The survey of classrooms at Indiana State Teachers College brings to light the fact that the rooms have not, in many cases, been properly planned from the viewpoint of economy and health. There is a great amount of wasted space because of the poor relationship of floor area, air space, and light area and conditions. This is especially true for the Main Building. The placement and arrangement of windows are contrary to good classroom lighting conditions in many instances, the worst cases being found in the Main and Training School Buildings. The

application of arbitrary classroom standards to the classrooms at Indiana State Teachers College indicates that, although student sittings exceed the maximum capacity for the Main Building, Science Hall, and Library Building, and for the college classrooms of the entire plant as a unit, the classrooms are used on an average to a reasonable degree of the maximum capacity, both as to daily student population and daily periods.

B. Recommendations

The following recommendations are set forth by the writer in the light of the findings with the sincere hope that they may prove to be of value in the field of college schoolroom construction and utilization in general, and to classroom utilization at Indiana State Teachers College in particular.

1. Other studies of this nature should be made for the sake of securing necessary data for the comparative study of classrooms of different institutions of higher learning.

2. The Main Building at Indiana State Teachers College should be replaced as soon as possible.

3. Use should be made of the findings toward the future utilization of the classrooms surveyed.

4. The sittings should be so planned that they will not exceed, for each classroom, the maximum capacity.

5. The rooms, having a high degree of healthful conditions,

as was shown by the application of the standards to such rooms, should be used to a high percentage of the daily periods.

6. Rooms showing poor conditions as to floor, air or light, should be used as little as possible.

7. In the case of rooms, having windows located on more than one side of the room, the student sittings should be arranged always with extreme care as to light.

8. Only approximately 24 feet of the length of those rooms with the light on the short axis should be used for student occupancy.

9. Room MB-33 should be discontinued as a classroom.

10. One of the large departments of the Main Building should be located in the Training School Building as soon as it is vacated by the training school pupils.

11. With the removal of one department to the Training School Building, the departments remaining in the Main Building should be carefully grouped. This should be done by floors as far as possible.

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