A STUDY OF ELEMENTARY SCHOOL BLACKBOARDS

A THESIS

SUBMITTED TO THE DEPARTMENT OF EDUCATION AND THE GRADUATE COUNCIL OF THE KANSAS STATE TEACHERS COLLEGE OF EMPORIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

KIELLOD BY
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Approved for the Graduate Council
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Myron A. Fields
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"No better training in the democracy of learning can be furnished our school children than the give-and-take criticism afforded by the proper use of a blackboard."

---Dresslar
CHAPTER I

INTRODUCTION

History of Blackboards

"Nowhere in the world, I believe, are blackboards used so extensively in the schools as they are in America," states Dresslar. Even so, it was not until the middle of the nineteenth century that the educational leaders in this country began to see the possibilities of the blackboard as an educational device.

Blackboards were used in Europe for nearly three hundred years before they found their way into America.\(^1\) Mann in his educational report of 1843 says, "The blackboard is a universal appendage to the schoolroom, and is much more used [meaning Europe] than with us. Indeed, in no state or country have I ever seen a good school without a blackboard, nor a successful teacher who did not use it frequently."\(^2\) Mann found the blackboard to be more widely used in Germany than in any other country in Europe.

Even though blackboards were not soundly accepted in this country until the middle of the nineteenth century, they were used and references were made to them prior to that time.

One of the earliest of all references was found in an old arithmetic published in Philadelphia\(^3\) in 1809. Another early use of the blackboard was


\(^2\) Horace Mann, *Annual Reports on Education, Boston, Horace B. Fuller, 1866, pp. 274-75.

made by Professor Claude Crozet, who used the blackboard for instructional purposes in the United States Military Academy at West Point.4

In the "Documentary History of North Carolina Schools and Academies, 1790-1840," there were only two references made to the blackboards and their use. The first was to the use of the blackboard in Raleigh Academy in 1856. An observer reported,

To see young boys, not more than ten or twelve years of age, before the Black Board, solving statements in interest and 'The Rule of Three,' with the readiness and accuracy of a skilled accountant, was what I have never seen; nor indeed, had I not witnessed it at the present examination, could I have believed it possible.5

The other reference, also by a visitor to the Ashebora Academy in 1839, reads: "She does not use the black board teaching Arithmetic, the only material defect I observed or heard of in the management of the school. It is the best method of teaching arithmetic."6

These two reports constitute the major part of the written history of blackboards. Very little or no mention is given to blackboards during the last two decades of the nineteenth century when the educational philosophies of the country were undergoing radical changes. In the biennial report of 1800-02 of North Carolina a reference was given to blackboards in regard to the amount which should be placed in each room.


5 W. F. Credle, "You May Go to the Board," The Nation's Schools, 17:57, February, 1936.

6 Ibid, p. 58.
Early Kinds of Blackboards

 Probably one of the earliest, if not the earliest, kinds of blackboards was just as the name implies; they were boards painted black. They usually consisted of two twelve-inch soft pine boards placed edge to edge around the room. The boards were painted a soft black and proved to be fairly good blackboards if they were washed every day. These painted boards took chalk nicely but were rather difficult to erase. It was necessary to paint the boards once or twice a year as they obtained somewhat of a whitish cast from the chalk. These boards were widely used in the early schools as they were very inexpensive and yet fulfilled all the requirements of a blackboard.

Another kind of early blackboard was merely a portion of the wall that was to be used for board space painted black. This was from the standpoint of an efficient blackboard the poorest of all the known kinds. The plaster on which the board or writing surface was painted was rough and uneven which caused writing to be poor and disfigured. Plaster also has a tendency to draw moisture which makes for writing difficulty. The school using this kind of board was likely to be cheaply constructed and when settling took place the walls would crack and destroy a portion of the writing surface as peeling off of the paint would follow the cracking of the walls. Also if the painted area was struck with a hard object another portion of the paint would chip or peel off, so that by the time school was over in the spring the boards would have a number of places where writing could not be done.

The use of slate as a blackboard material brought forth a new era in blackboards and their uses. No longer was it necessary to repaint the black-
board surface as was the case with the earlier boards. The only attention which was needed for slate boards was the cleaning process which was done about once a week.

Just when slate came into use for blackboards is difficult to say, but in general during the last two or three decades of the nineteenth century. Slate had many advantages over the other boards; mainly, it had a hard smooth writing surface. This surface would not wear off as paint would; rather than that, if a slate board was given a moderate amount of care and attention it would likely outlast the schoolhouse. When slate was once placed on the walls there was little fear that settling would ever cause slate to crack. Where there were two slabs of slate butted together there was often unsightly joints, but this could be easily taken care of by placing metal binders between the joints.

Today slate is still the leading blackboard material of this country. Although there have been marked advancements in composition boards they have not as yet taken the place of natural slate.

The latest development in the field of blackboard materials has been the use of glass. Glass is widely used in Europe today for blackboards. Dr. Kerr of England in discussing the difficulty caused by light absorption by slate boards believed that the evil could and might be overcome by the use of glass.  Woodbridge found frosted glass in use in the schools of Stuttgart, Germany, where blackening material was red and green paint. This gave the children a positive color to look at rather than a negative color.

The major drawback to glass at the present time is the cost, although should the supply of natural slate ever be exhausted—and there is reason to


8 Ibid, p. 15.
believe that some day it will be—then glass will be the most logical and economical material to use in place of natural slate.  

The comparatively slow development in blackboards has been due largely to the lackadaisical attitude taken by the general run of school administrators. It must not be understood that blackboards are thought to be the only thing that was neglected; in fact, the whole of the American schoolbuilding has grown up like Topsy. The general feeling among the masses seems to have been "Leave them alone and they will come home, dragging their tails behind them," and that has been the development of the American schoolbuildings, just dragging along, slow, but not too sure.

CHAPTER II

BLACKBOARDS: THEIR HEIGHT AND WIDTH

"Among the thousand and one problems and queries which confront the school architect and administrator in planning schools judiciously and economically are those concerning blackboards, their placement, widths, heights, etc."¹

For long years blackboards were considered to have an important place among the school-room accessories and were given a permanent place in the school construction. In fact, the question seldom if ever arose as to whether there was too much board space in a room. Rather, it became a problem to find room enough to place all the blackboard thought to be necessary for class-room instruction. Fairchild says, "A class-room cannot have too much blackboard space."² An early study by Chapman states, "An abundance of blackboard surface is necessary in every room."³ While Moore also says, "Where an appropriation will allow, all available space should be so occupied."⁴ Oftentimes school officials would leave the problem entirely in the hands of some manufacturer who would place blackboard over every portion of the wall that was possible, even to the extent of spaces one foot wide between windows as was found to be the case in the older buildings of the Emporia City Schools.

But with the mounting cost of school construction, and new conceptions in education, there was less and less demand for a vast amount of blackboard. Studies were made as to the sizes of boards and relation to the necessary amount needed per pupil. From these studies manufacturers have been confronted with the problem of stocking many sizes to meet the statements of the various investigations.

The Simplified Practice Committee of the United States Bureau of Standards has had this matter before them, and as a result the manufacturers of artificial blackboards have agreed to curtail their manufacture to two widths and five lengths; it is believed that other manufacturers have agreed to the recommendations of the Committee. 5

From time to time different studies and statements have been made regarding the height and width of blackboards. In many instances these various sizes have been accepted as standard and are being used by many architects.

At several national meetings which Schmidt attended this problem was discussed informally and the opinion expressed that a study might be made to determine what actually happens when children write at the boards. Among other things even casual observation will show that in nearly all cases the upper portion of the blackboards devoted mainly to pupils' use is not used so that nearly one-fourth of the blackboard is "virgin soil." 6

In the study herein presented it was found that about 15% of the rooms studied in the Emporia City Schools had the upper portion of the slate boards covered with either a nine- or a twelve-inch strip of bulletin board.

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6 Ibid, p. 43.
Data for this Study

The data for this study were collected by the writer. The data were based upon a survey of 51 school rooms and the recording of handwriting of 718 pupils. The survey was carried on in the Emporia City Schools as a means of convenience and economy. In securing data no distinction was made between A and B groups in the class rooms. No random sampling or selection was taken; instead each pupil was given a chance to write.

It was found that several of the rooms had boards whose chalk rail was too high to obtain the lowest possible writing point of the children (see Table I, p. 9). It was therefore necessary to construct a portable board which could be adjusted to varied heights for use in all grades.

How Children Wrote

The children were first given general instructions as to what was desired of them. They were told to write only their first name three times—first, as high as they could reach without standing on their tiptoes and still write with a definite degree of clarity; second, to write their name again even with their eyes, this being the most nearly desired writing position; and third, to write their name as low as possible without bending over or bending their knees and still write with some clarity. If any pupil was found to be writing under difficulty, he or she was at once instructed to drop down or to raise the writing place to such a place as writing would come easily. If any pupil was found to be standing on tip-toes or bending the knees while writing, the work was erased and the person was told to begin over. Three pupils were permitted to write at the board at one time.
each was carefully watched to see that all instructions were carried out. When each group of three had finished writing the heights at which they had written were measured. There were no fractional measurements recorded. In the case of the low and "middle" writing the inch marking which fell nearest the lowest portion of the word was recorded, while for the high word the inch marking nearest the highest point of the word was recorded. Table II, p. 10, shows medians and modes for high, middle, and low writing. Tables III to VIII inclusive show medians, Q₁, Q₃, and modes for high, middle, low, and range for each grade, e.g., Table III, first grade, Table IV second grade, etc.

TABLE I

MEAN BLACKBOARD SIZES AS FOUND IN THE EMPORIA SCHOOLS

<table>
<thead>
<tr>
<th>Grades</th>
<th>Old Buildings</th>
<th>New Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height of Chalk Rail</td>
<td>Width of Blackboard</td>
</tr>
<tr>
<td>I</td>
<td>29.25&quot;</td>
<td>43.50&quot;</td>
</tr>
<tr>
<td>II</td>
<td>30.50&quot;</td>
<td>43.20&quot;</td>
</tr>
<tr>
<td>III</td>
<td>32.50&quot;</td>
<td>43.50&quot;</td>
</tr>
<tr>
<td>IV</td>
<td>30.75&quot;</td>
<td>43.50&quot;</td>
</tr>
<tr>
<td>V</td>
<td>31.20&quot;</td>
<td>43.20&quot;</td>
</tr>
<tr>
<td>VI</td>
<td>30.75&quot;</td>
<td>43.50&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The mean height of chalk rails for old buildings is 29.25 inches, the mean width of boards 43.50 inches. The mean height of chalk rails for new buildings is 25.75 inches, the mean width of boards 39.75 inches. Read in like manner for other grades.

Table I shows the mean blackboard heights and widths as exist in the Emporia City Schools. In gathering data for the table the blackboard area
of 31 class rooms was measured, the heights of chalkrails, width of boards, and linear feet were recorded. It was found that in most cases in the older buildings that the same width and heights of chalkrails prevailed in each room regardless of the grade occupying the room. In the newer buildings some consideration was given as is shown by the table, but even at that much board space could have been saved by reducing the widths of boards in the first two or three grades.

In the setting up of Table I, the measurements of all the first grade rooms were lumped together; the same was done for second, third, etc. The means were found and tabulated into the table as is shown. Because of the small number of rooms per grade it was not necessary to construct a frequency table for finding a true mean, rather a finding of the aggregate areas and division by the number of cases was used.

TABLE II

| MEDIAN HEIGHTS AND MODE DIFFERENCES FOR EACH GRADE |
|-------|-------|-------|-------|-------|-------|
|       | I     | II    | III   | IV    | V     | VI    |
| High  | 53.77"| 53.30"| 55.21"| 55.71"| 68.82"| 70.56"|
| Middle| 41.26"| 44.35"| 48.33"| 49.33"| 51.95"| 54.03"|
| Low   | 28.28"| 25.34"| 26.34"| 28.24"| 26.76"| 28.91"|
| Mode  | 41.0" | 45.0" | 49.0" | 52.0" | 51.0" | 56.0" |

Read table thus: The median height at which first grade children write when told to write as high as they can comfortably, is 53.77 inches; height for second grade is 53.30 inches; the height at which the median third grade child can write comfortably is 55.21 inches. Read in like manner for other grades and for "middle" height and "low" height.

Table II shows the median, high, middle, low, and mode of pupils'
handwriting for each grade. The data as shown were borrowed from Tables III to VIII inclusive. It is for convenience that, rather than having to read through the six following tables for medians, they are compiled under one heading.

TABLE III

HEIGHTS OF WRITING FOR GRADE I

<table>
<thead>
<tr>
<th></th>
<th>&quot;Low&quot;</th>
<th>&quot;Middle&quot;</th>
<th>&quot;High&quot;</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>26.29&quot;</td>
<td>41.25&quot;</td>
<td>56.77&quot;</td>
<td>30.08&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>24.14&quot;</td>
<td>39.62&quot;</td>
<td>54.10&quot;</td>
<td>26.66&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>29.32&quot;</td>
<td>43.44&quot;</td>
<td>58.54&quot;</td>
<td>33.90&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>25.0&quot;</td>
<td>41.0&quot;</td>
<td>57.0&quot;</td>
<td>29.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for first grade is 26.29 inches; median "middle" handwriting comfortable for first grade is 41.25 inches; the median high handwriting for first grade is 56.77 inches; the median range at which first graders write comfortably is 30.08 inches. Read in like manner for Q₁, Q₃, and the mode.

TABLE IV

HEIGHTS OF WRITING FOR GRADE II

<table>
<thead>
<tr>
<th></th>
<th>&quot;Low&quot;</th>
<th>&quot;Middle&quot;</th>
<th>&quot;High&quot;</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>25.90&quot;</td>
<td>44.98&quot;</td>
<td>59.30&quot;</td>
<td>34.00&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>25.90&quot;</td>
<td>43.04&quot;</td>
<td>58.22&quot;</td>
<td>31.12&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>28.70&quot;</td>
<td>46.88&quot;</td>
<td>60.00&quot;</td>
<td>33.20&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>25.0&quot;</td>
<td>45.0&quot;</td>
<td>59.0&quot;</td>
<td>33.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for second grade is 25.90 inches; median "middle" handwriting comfortable for second grade is 44.98 inches; the median high handwriting for second grade is 59.30 inches; the median range at which second graders write comfortably is 34.00 inches. Read in like manner for Q₁, Q₃, and Mode.
handwriting for each grade. The data as shown were borrowed from Tables III to VIII inclusive. It is for convenience that, rather than having to read through the six following tables for medians, they are compiled under one heading.

**TABLE III**

**HEIGHTS OF WRITING FOR GRADE I**

<table>
<thead>
<tr>
<th>Height</th>
<th>&quot;Low&quot; Height</th>
<th>&quot;Middle&quot; Height</th>
<th>&quot;High&quot; Height</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>28.29&quot;</td>
<td>41.25&quot;</td>
<td>56.77&quot;</td>
<td>30.08&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>24.14&quot;</td>
<td>39.62&quot;</td>
<td>54.10&quot;</td>
<td>26.66&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>29.32&quot;</td>
<td>43.44&quot;</td>
<td>58.54&quot;</td>
<td>33.90&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>26.0&quot;</td>
<td>41.0&quot;</td>
<td>57.0&quot;</td>
<td>29.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for first grade is 28.29 inches; median "middle" handwriting comfortable for first grade is 41.25 inches; the median high handwriting for first grade is 56.77 inches; the median range at which first graders write comfortably is 30.08 inches. Read in like manner for Q₁, Q₃, and the mode.

**TABLE IV**

**HEIGHTS OF WRITING FOR GRADE II**

<table>
<thead>
<tr>
<th>Height</th>
<th>&quot;Low&quot; Height</th>
<th>&quot;Middle&quot; Height</th>
<th>&quot;High&quot; Height</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>25.90&quot;</td>
<td>44.93&quot;</td>
<td>59.50&quot;</td>
<td>34.00&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>23.90&quot;</td>
<td>43.04&quot;</td>
<td>56.22&quot;</td>
<td>31.12&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>28.70&quot;</td>
<td>46.88&quot;</td>
<td>60.68&quot;</td>
<td>33.20&quot;</td>
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<tr>
<td>Mode</td>
<td>25.0&quot;</td>
<td>45.0&quot;</td>
<td>59.0&quot;</td>
<td>35.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for second grade is 25.90 inches; median "middle" handwriting comfortable for second grade is 44.93 inches; the median high handwriting for second grade is 59.50 inches; the median range at which second graders write comfortably is 34.00 inches. Read in like manner for Q₁, Q₃, and Mode.
### TABLE V

**Heights of Writing for Grade III**

<table>
<thead>
<tr>
<th></th>
<th>&quot;Low&quot; Height</th>
<th>&quot;Middle&quot; Height</th>
<th>&quot;High&quot; Height</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>26.34&quot;</td>
<td>48.33&quot;</td>
<td>65.21&quot;</td>
<td>36.72&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>25.10&quot;</td>
<td>46.32&quot;</td>
<td>60.13&quot;</td>
<td>32.33&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>28.65&quot;</td>
<td>49.97&quot;</td>
<td>65.86&quot;</td>
<td>39.58&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>25.0&quot;</td>
<td>49.0&quot;</td>
<td>63.0&quot;</td>
<td>37.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for third grade is 26.34 inches; median "middle" handwriting comfortable for third grade is 48.35 inches; the median high handwriting for third grade is 65.21 inches; the median range at which third graders write comfortably is 36.72 inches. Read in like manner for Q₁, Q₃, and Mode.

### TABLE VI

**Heights of Writing for Grade IV**

<table>
<thead>
<tr>
<th></th>
<th>&quot;Low&quot; Height</th>
<th>&quot;Middle&quot; Height</th>
<th>&quot;High&quot; Height</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>28.24&quot;</td>
<td>49.63&quot;</td>
<td>66.71&quot;</td>
<td>38.27&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>26.03&quot;</td>
<td>48.20&quot;</td>
<td>65.63&quot;</td>
<td>33.42&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>30.92&quot;</td>
<td>51.63&quot;</td>
<td>68.76&quot;</td>
<td>41.88&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>25.0&quot;</td>
<td>50.0&quot;</td>
<td>65.0&quot;</td>
<td>39.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for fourth grade is 28.24 inches; median "middle" handwriting comfortable for fourth grade is 49.63 inches; the median high handwriting for fourth grade is 66.71 inches; the median range at which fourth graders write comfortably is 38.27 inches. Read in like manner for Q₁, Q₃, and Mode.
### TABLE VII

**Heights of Writing for Grade V**

<table>
<thead>
<tr>
<th></th>
<th>&quot;Low&quot; Height</th>
<th>&quot;Middle&quot; Height</th>
<th>&quot;High&quot; Height</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>26.76&quot;</td>
<td>51.95&quot;</td>
<td>66.62&quot;</td>
<td>40.96&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>25.25&quot;</td>
<td>50.28&quot;</td>
<td>66.48&quot;</td>
<td>37.53&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>29.63&quot;</td>
<td>53.54&quot;</td>
<td>70.61&quot;</td>
<td>43.83&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>25.0&quot;</td>
<td>51.0&quot;</td>
<td>69.0&quot;</td>
<td>42.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for fifth grade is 26.76 inches; median "middle" handwriting comfortable for fifth grade is 51.95 inches; the median high comfortable handwriting is 66.62 inches; the median range at which fifth graders write comfortably is 40.96 inches. Read in like manner for Q₁, Q₃, and Mode.

### TABLE VIII

**Heights of Writing for Grade VI**

<table>
<thead>
<tr>
<th></th>
<th>&quot;Low&quot; Height</th>
<th>&quot;Middle&quot; Height</th>
<th>&quot;High&quot; Height</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>28.91&quot;</td>
<td>54.03&quot;</td>
<td>70.56&quot;</td>
<td>42.04&quot;</td>
</tr>
<tr>
<td>Q₁</td>
<td>26.90&quot;</td>
<td>51.68&quot;</td>
<td>68.88&quot;</td>
<td>38.50&quot;</td>
</tr>
<tr>
<td>Q₃</td>
<td>31.86&quot;</td>
<td>55.69&quot;</td>
<td>71.80&quot;</td>
<td>44.79&quot;</td>
</tr>
<tr>
<td>Mode</td>
<td>28.0&quot;</td>
<td>55.0&quot;</td>
<td>71.0&quot;</td>
<td>45.0&quot;</td>
</tr>
</tbody>
</table>

Read Table thus: The median comfortable low handwriting for sixth grade is 28.91 inches; median "middle" handwriting comfortable for sixth grade is 54.03 inches; the median high handwriting comfortable for sixth grade is 70.56 inches; the median range at which sixth graders write comfortably is 42.04 inches. Read in like manner for Q₁, Q₃, and Mode.
Tables III to VIII inclusive give data showing the height from the
floor of pupil's handwriting at the blackboard for the first six grades.
Such data as is found in the tables were compiled from the handwriting
heights measurements collected as is explained on page 4 of the chapter.
For each grade used, four frequency tables were set up, one for the "low"
height, "middle" height, "high" height, and the range. From each of these
tables the medians, Q1, Q3, and mode were obtained. In finding the four
heights for each writing position and grade an accepted formula was used.

For clarity, Figure 1, page 15, shows graphical distribution curves
for low, middle, and high handwriting for each grade. Figure 2, page 16,
shows graphical distribution curve for range only. In each case the data
used was secured from the tables sighted above. No modes were used, only
medians, Q1, and Q3 for Figure 1, and ranges for Figure 2.
FIGURE 1

Graphical Distribution Curves for
Low, Middle, and High Handwriting
Recommended Blackboard Heights

As was stated earlier in this chapter, studies have been made and opinions expressed as to the correct height of blackboards for respective grades. The problem as to how high from the floor blackboards should be never seemed to trouble the minds of the school architect or administrator of a few years back. If the problem did present itself very little attempt was ever made to try to correct it. In the Cleveland Educational Survey it was noted that in many rooms the boards were found to be 36 inches above the floor. Ayres says in his report that boards should not be over 24 to 26
inches above the floor. Mills believes that blackboard heights should be as follows: primary grades, 20 inches; intermediate grades, 22 inches; and grammar grades 26 inches. Moore says to place the boards 26 inches above the floor for primary grades and 25 inches for all others. Lee's work recommends 25 inches for first and second grades; 27 inches for third and fourth, and 28 inches for fifth and sixth grades. Lookhart expresses nearly the same figures as Lee in that primary grades should be 24 inches above the floor and intermediate grades 26 to 28 inches. The conditions which Ayres found in Cleveland in regard to board heights is a very common finding. In one rural school in Lyon County, Kansas, it was found that the bottom of the chalk rail was 40 inches above the floor and in another rural school a condition almost identical, as the bottom of the chalk rail was 39 inches above the floor. In both of these schools there were several first and second grade children, each of whom were forced to stand on a bench in order to reach the board at all for writing purposes.

7 Leonard P. Ayres and Mary Ayres, Cleveland Educational Survey School Buildings and Grounds, 1916, p. 44.


The Findings for this Study

The findings of blackboard heights for this study may be found in table form on page 10, under the list marked "low." These findings are as follows: for first grade, 26.29 inches; second grade, 25.34 inches; third grade, 26.34 inches; fourth grade, 28.24 inches; fifth grade, 26.78 inches; and for sixth grade, 28.31 inches. It will be noted that the handwriting height for the second grade is lower than that of the first grade and the handwriting height of the fifth grade pupils is lower than that for the fourth grade. As to just what the cause for such drops was is not definitely known. It may have been due to some class, for those grades mentioned, having smaller children than the mean size of children for respective grades. In one first grade room which was surveyed the instructor called to the attention of the writer that the children in that classroom at that time were larger than any other first graders which the instructor had had for over a period of ten or fifteen years. If this was true, then the reverse might possibly have been true in the two grades in question. Although the more probable answer to the question is that in those two grades a large number of pupils in one room may have tried to out-do those who had written just before them by trying to write just a little lower and therefore have something to talk about with the rest of their classmates.

Recommendations by this Study

Comparative data on three studies will be noted in Table IX, page 19. This study recommends three different heights: these are, 26 inches from the floor for first, second, and third grades, 28 inches for fourth and fifth grades, and 30 inches for sixth grade. The recommendations for this study are similar to those recommendations made by Dresslar.
As has been stated earlier in this chapter the handwriting heights of 718 grade-school children were measured. Since no random sampling was made, but each child was asked to write, it is therefore believed that the figures stated above are valid and carry some degree of authority as they are similar to another study, that being Dresslar.

TABLE IX

COMPARATIVE RECOMMENDATIONS OF BLACKBOARD HEIGHTS AND WIDTHS

<table>
<thead>
<tr>
<th>Grades</th>
<th>This Study</th>
<th>Strayer &amp; Engelhardt</th>
<th>Dressler</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Height of Chalkrail</td>
<td>Width of Blackboard</td>
<td>Height of Chalkrail</td>
</tr>
<tr>
<td>I-III</td>
<td>26&quot;</td>
<td>30&quot;(1) 34&quot;(2)</td>
<td>26&quot;(1 &amp; 2)</td>
</tr>
<tr>
<td>IV-VI</td>
<td>26&quot;(4 &amp; 6)</td>
<td>36&quot;(2) 38&quot;(4)</td>
<td>26&quot;(3 &amp; 4)</td>
</tr>
<tr>
<td></td>
<td>30&quot;(8)</td>
<td>40&quot;(5) 42&quot;(6)</td>
<td>28&quot;(5 &amp; 6)</td>
</tr>
</tbody>
</table>

Read Table thus: The median height of the chalkrail for blackboards used by first to third grade children inclusive in this study is 26 inches, the width of blackboard for first grade 30 inches and for second grade 34 inches. Strayer and Engelhardt found the median height of the chalkrail in their study for first and second grade children to be 26 inches. Read in like manner for other findings.

Blackboard Widths

For years blackboards of too great a width for economy have appeared in school rooms. Table IX shows that none of the three studies cited made recommendations of over 42 inches in blackboard width for sixth grade, while two of the studies recommended 38 inches for the same grade. Yet Mills says that blackboards should be at least 42 inches in width and 48 inches is better, and Moore also makes the same kind of a statement as Mills regard-

ing the width with no mention what-so-ever to grades.\textsuperscript{13} Whether there is any factual material or not it is a known fact that no average primary grade school child has a handwriting range from "high" to "low" of 48 inches. In gathering data for this study it was found that only four first grade pupils had a handwriting range at the blackboard as great as 42 inches and for the sixth grade only five pupils had a handwriting range as high as 50 inches. In each of these cases the child was overly large or was much older than the average for the class that he or she represented. A board with any greater width than 30 inches for first grade and over 42 inches for sixth grade is merely an unnecessary expenditure on the part of the school administrators. It was found by the writer that 15\% of the grade school rooms in Emporia had covered the upper portion of the blackboard with either a nine or twelve inch strip of bulletin board because the upper portion was useless as no pupil could reach high enough to bring that portion of the board into use.

In one first grade room alone there was found to be a blackboard width of 48 inches. Had any of the three named studies been used or had been available for use at the time of the building's construction a possible saving of 101.25 square feet of board material could have been made by merely reducing the blackboard width and paying no attention to the saving that was possible in the linear feet of board material. This would have been a saving of about $29.35 for the cheapest grade of blackboard material or $45.50 for the best grade of board, using the figures found in Table X, page 27. If an entire building was being contemplated it would be valuable indeed to make use of such a study as this.

\textsuperscript{13} Joseph A. Moore, \textit{The School House Its Heating and Ventilation}, Boston, 1905, p. 42.
KINDS AND TYPES OF BLACKBOARDS

There are several kinds of blackboards on the market today, that is, natural slate and manufactured boards of numerous makes. Which of these kinds are the best to use will depend largely upon the situation arising for the need of blackboard.

Slate

For permanent wall blackboards slate is by far the best of all the blackboard materials.\(^1\) One reason for this is that natural slate is always in repair.\(^2\) Natural slate has several advantages over manufactured blackboard, as shown by Table I, page 27. One of the important factors and one that is the first asked is, "How much will it cost?" To manufacture a blackboard with as many years of wear and other qualifications of natural slate would cost a great many times more than the present cost of natural slate blackboard. The second important advantage with natural slate is the fact that it will stand almost any kind of weather conditions without warping, blistering, or peeling. Thirdly, natural slate may be obtained in two colors, black and green. It also has a hard sleek surface which is easily written upon and is free from excess noises and unnecessary chalk squeaks. Fourthly, natural slate may be obtained in several different sizes and thick-

\(^1\) J. Virgil Chapman and Mrs. V. O. Gilbert, School Architecture Kentucky, Vol. 10, No. 2, Frankfort, Superintendent of Public Instruction, p. 77.

nesses depending upon the amount of wall space to be covered and the grade of slate to be used.

Natural slate may be obtained in thicknesses varying from three-sixteenths of an inch to five-eighths of an inch with a price range from 29 to 45 cents per square foot in lots of less than one-hundred square feet. Slate may also be had in linear sizes in lengths from four to twelve feet and with widths of three, three and one-half, and four feet.

The weight of natural slate also varies greatly in accordance with the thickness. It may be had in weights as low as one pound per square foot or as great as six pounds per square foot. The heavier board is generally the much better grade of material.

Composition Blackboards

"Much of the effort has seemingly been to produce a cheap, marketable substitute instead of something 'just as good as slate.' In this, the producers have erred. Even if slate were economical enough for wider use, there would still be a field for other boards."  

In general composition blackboards are of some form of pressed wood, fiberwood, or a high grade of pressed paper. This base material is covered either with a very thin veneer of natural slate or with a good grade of composition or imitation surface. While this may or may not be as advantageous to use as natural slate, nevertheless the composition blackboard has a number of advantages. Creede cites several advantages as stated below:

---

3 W. F. Creede, "You May Go to the Board," The Nation's Schools, 17:57, February, 1936.
1. It is economical.
2. It is at present produced in green and black.
3. It is easily cleaned.
4. The fiber part of the board is so fabricated that it can be readily resurfaced (a remote necessity).
5. This particular board—if properly installed—does not absorb moisture.
6. It is not noisy.
7. The bothersome joints are practically eliminated.
8. It comes or can be cut in sizes to fit any situation.
9. It lends itself to experimentation in the use of colors other than slate black or green.
10. Its light weight makes it adaptable to a variety of installations.

The one-time disadvantage of fiber boards was that the early boards buckled, warped, peeled off, or were easily broken. This no longer becomes a problem if proper installation is carried out. By moisture-proofing the back, it can readily be made useful for permanent wall blackboard.

Reversible Boards

Reversible boards are very advantageous for class room work. They may be moved from one part of the room to another thus avoiding the movement of pupils who are not so located that they are able to read a portion of the permanent wall board. The second advantage, and likely the most important, is that the reversible blackboard offers two writing surfaces.

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This is by all means an important factor in a small room where space is limited.

Reversible blackboards may be obtained on the market with either slate or composition writing surface. Which material, slate or composition, is best would be only a matter of opinion as both have advantages and disadvantages for use in the reversible boards. Composition has the greatest advantage due to the fact that it is much lighter than slate and therefore more easily moved around. Also there is less likelihood of breakage as composition board has less brittleness than slate.

Reversible boards may be had in several sizes with a varied price range; see Table I, page 27. The weights of these boards range from seventy to one-hundred and five pounds.

Swinging-Leaf Boards

The swinging-leaf blackboard is the latest development in the field of schoolroom boards. Its advantages are great; namely, it requires only a very small amount of wall space in the schoolroom yet it offers a large number of square feet of writing surface. This type of blackboard has, in most cases, four leaves, each having a double writing surface. The boards are hinged on one side, making their use similar to the opening and closing of a book. This gives each leaf a free swinging motion. Each leaf is surrounded on all four edges with a molding which prevents the writing surfaces from touching when the leaves are closed, thus preventing the smearing of that writing which is desired to be saved. The leaves of some sets may be taken out of the set and moved to different parts of the room for close-up instruction. The blackboard material used is composition for lightness in

---

weight to remove as much strain as possible from the hinges. Some swinging-leaf blackboards contain as much as ninety-six square feet of writing surface.\(^6\) This is oftentimes as much board space as covers the walls of a school room. Swinging-leaf boards give ample board space for many class rooms and yet leave the walls clear for a large amount of bulletin-board space.

**Slate Cloth Blackboards**

Slate cloth blackboards have only about one advantage over other boards and that is that they may be rolled up in the manner of a window shade. The greatest disadvantage with slate cloth is that it offers no solid writing surface and when rolled up it causes smearing of writing.

This kind of blackboard material may be had in two widths and varied prices; see Table X, page 27.

**Glass Blackboards**

Glass blackboards have gained very little ground in this country, but in Germany and England (cf. ante, page 4) they are widely used. The preparation of colored background is done by merely painting the back some dark color. Glass blackboards have nearly the same physical conditions as slate, that is, their long wearing ability, brittleness, and similar thickness and weight.\(^7\) In some future time glass boards may become more economical to use than slate should the natural supply ever become exhausted.

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\(^7\) "Glass Blackboards," *Literary Digest*, 115:24, June 16, 1932.
The one great disadvantage with glass at the present time is the cost. Earlier disadvantages have readily been done away with. Some of these were, improper background coloring or the need for wetted chalk for writing.3

<table>
<thead>
<tr>
<th>Kinds</th>
<th>Approximate Costs</th>
<th>Particular Excellency</th>
<th>Greatest Objections to</th>
</tr>
</thead>
</table>
| Slate        | Price range from $.29 per square foot in lots of less than 100 square feet to $.45 per square foot; price depending upon grade, thickness, and color | 1. Simple to install  
2. Available in several grades  
3. Few repair bills  
4. Non-absorbent  
5. Will not warp  
6. Easily cleaned  
7. Long wear  
8. No scaling or peeling  
9. No dust pockets  
10. Even surfaces  
11. Available in green or black | 1. Brittleness, easily broken if dropped  
2. Heavy in weight  
3. Expensive to ship  
4. Obtainable in standard lengths and widths  
5. Difficult to cut  
6. Difficult to joint |
| Composition  | About $.35 per square foot in lots of less than 100 square feet                   | 1. It is economical  
2. Available in green or black  
3. Easily cleaned  
4. Easily resurfaced  
5. Does not absorb moisture  
6. Not noisy  
7. Can easily be cut to fit any situation  
8. Lends itself to experimentation in the use of color  
9. Light in weight | 1. Easily cracked  
2. Will not wear as well as slate  
3. Easily damaged  
4. Will peel or scale if once cracked or broken |
| Glass        | No prices available in general school catalogs                                   | 1. Smooth surface  
2. Easily cleaned  
3. Non-absorbent of grease or oils  
4. May be frosted in positive colors  
5. Even surfaces  
6. Easily jointed  
7. No scaling or peeling | 1. Very expensive  
2. Easily broken  
3. Expensive to ship  
4. Difficult to cut |
| Slate Cloth  | Per yard 36 in. wide one side $.95; per yard 48 in. wide $1.16, Roll-up boards--$1.45 to $4.85 depending upon size | 1. May be rolled and put away  
2. Material may be saved without fear of erasing | 1. Hard to clean  
2. Difficult to write upon  
3. Checks easily |
| Swing-Ing Boards | No available prices in standard school supply catalogs                            | 1. Large area of writing surface in minimum amount of space  
2. Material may be saved  
3. Leaves may be detached  
4. Easily cleaned  
5. Minimum Amount of light absorbed | 1. Not easily seen from all parts of the room  
2. Difficult to write upon as surfaces are not permanent  
3. Less writing surface exposed at one time for use by a number of pupils |
### TABLE X - CONTINUED

<table>
<thead>
<tr>
<th>Kinds</th>
<th>Approximate Costs</th>
<th>Particular Excellency</th>
<th>Greatest Objections to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversible</td>
<td>Prices range from $15.50 to $20.75 for</td>
<td>1. Movable</td>
<td>1. Heavy if made of slate</td>
</tr>
<tr>
<td>Boards</td>
<td>a board 3x4 feet—</td>
<td>2. Double writing surface</td>
<td>2. Takes up floor space</td>
</tr>
<tr>
<td></td>
<td>$22.50 to $27.75 for</td>
<td>3. Easily cleaned</td>
<td>3. Difficult to write upon revolving surface</td>
</tr>
<tr>
<td></td>
<td>a board 4x6 feet.</td>
<td>4. Available in several</td>
<td>4. Less writing surface exposed at one time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sizes</td>
<td></td>
</tr>
</tbody>
</table>

Read Table thus: Slate, prices range from $.29 per square foot in lots of less than 100 square feet to $.45 per square foot; prices depend on grade, thickness, and color. Particular excellency: simple to install, available in several grades and so forth. Read in like manner for other information.
CHAPTER IV

CARE OF BLACKBOARDS

"If proper care is given to blackboards there is no reason why they should not give good and efficient service over a period of years. Blackboards should be given as much attention as floors, walls, desks, and other classroom equipment. Improper care is an important factor resulting in schoolroom inefficiency." A lack of information and instruction regarding the care of blackboards has brought about large expenditures for new boards and the upkeep of old ones.

Regardless of the material or the make of blackboards the boards need the same general care and treatment; that is, manufactured blackboards of presswood may be given the same care as that given to natural slate. Blackboards that are improperly cared for gradually become rough and scaly and acquire a whitish coating which gives rise to eye strain.

Breaking-in Blackboards

Blackboards when new do not take chalk well and erase with some degree of difficulty; therefore a process of breaking in should be undertaken to get the best early usage from the boards.

The breaking-in process is a simple one and requires very little time.

1 The Care of Blackboards, Bulletin, National School Supply Association, Chicago, p. 4.

2 Ibid., p. 5.
Assuming that all the plaster and dirt, which had collected on the board during installation, has been removed the first step in the breaking-in is to remove all dust from the board by wiping the blackboard with a soft dry cloth. Special attention must be given to see that there is no moisture on the board at this time. The second step is to cover the entire surface of the board with chalk. This is done by first scraping the glazed surface off the chalk to prevent scratching and then by using the flat side of the chalk cover the entire board area. The chalk is then worked into the blackboard with an eraser being certain that every portion of the board has had the treatment. This makes for a good writing surface and reduces the blackboard glare as the blackboard will have a slight grey color after it has been erased with a clean eraser. If a dark surface is desired wipe the board clean, with an untreated soft cotton cloth or a chamois skin. 3

"Do not use any of the so-called 'Blackboard Cloths,' which invariably contain oil in some form." 4 Oil in any form reduces the efficiency of the blackboard writing surface. Do not break-in a blackboard and leave the chalk on over night as the chalk has a tendency to draw moisture; that is, the moisture unites with the binder in the chalk and leaves a slick spot which will not take the chalk. 5

Cleaning Blackboards

According to Frostic a blackboard should be cleaned with water and

3 Ibid., pp. 8-9.
4 Ibid., p. 9.
5 Ibid, p. 9.
a sponge.

1. Keep the erasers clean and remove all dust and marks from the board.

2. Wash the boards often, at least once weekly.

3. Avoid wax, oil, paste and paints of any kind.

4. Use a good grade of crayon.

5. Avoid so-called ‘Blackboard dressings.’

Dry cleaning is by far the best method of cleaning blackboards.

Washing of any kind of blackboards is the cause of most blackboard trouble. Water applied to a board leaves the surface streaked and smeared.

Blackboard Cleaners and Oils

There are a number of these so-called cleaners and dressings on the market today. In nearly every case they contain caustic soda, oils, and other substances more or less harmful to any blackboard surface. Oil treatments must be avoided as nothing puts a board in bad condition more quickly than oil. Once treated with oil blackboards must be entirely re-conditioned before they become normal again. Oil on the blackboards causes the board to become glassy and makes good blackboard teaching impossible.

"Much of the eye-strain that is prevalent among the school children of today is directly caused by improperly cared for blackboards."

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8 Ibid., p. 12.

9 Frostic, op. cit., p. 59.

10 The Care of Blackboards, op. cit., p. 12.
As to what the future holds in store for blackboards will depend largely upon the educational program of the school itself. The ideology of the past was to fill all of the available space with blackboards, while the theory of today has changed that a great deal through new modes of study and research studies made upon the question. "Our teaching technique and increased knowledge of mental processes has led many educators, in fact most, to believe that the need for drill work at the blackboard, especially in the elementary schools, does not exist in the same measure as in the past."\(^1\) The mimeograph has made it possible to produce a large number of work sheets at a very low production cost. This gives to the pupil the chance of working a number of problems at his desk rather than one or two at the blackboard.

The blackboards in the class rooms of the older buildings take up much of the wall space which could otherwise have been used for bulletin boards. The walls need not be covered with permanent blackboard, but rather the use of swinging-leaf boards has been found to be more useful as a number of boards may be used in the same place.\(^2\) The importance of either the swinging-leaf or reversible boards does not rest primarily in the fact that they leave more wall space for other uses, but that they do not present such


a large amount of writing surface exposed to the light at any one time. In a study by Basquin and Scott it was found that 50 per cent of all the light which came in contact with the slate blackboard was absorbed.3

In the Emporia City Schools it was found that only one-third the amount of writing chalk was used during the past year as was used for a one-year period five years ago. It was also found that in one room 58 per cent of the blackboard had either been taken out and replaced with or had been covered with bulletin boards. The greatest median percentage of blackboards covered for any one grade was that for the second grade, while the least was for the fifth grade (see Table X, page 27). It was found that the newer buildings had fewer feet of blackboard space than the older buildings and therefore no boards were covered or removed. In the first grade alone only 55 per cent of that amount of blackboard found in the older buildings was found to be present in the new buildings (see Table XII, page 35). It was also observed that a portion of the remaining board space in many rooms was not in active use because color drawings had been placed there by the students or teacher and had remained there over an indefinite period of time.

The belief is general that blackboards will never go out completely, but the day may be near at hand when the pupil will be seldom if ever called upon to show his or her work at the board. If this condition should arrive, then the only blackboard which will be needed is that for instructional purposes only by the teacher.

3 Ibid.
### TABLE XI

AMOUNT AND PERCENT OF BLACKBOARD COVERED AS FOUND IN THE EMPIRIA SCHOOLS

<table>
<thead>
<tr>
<th>Grade</th>
<th>Square feet of &quot;original&quot; blackboard area *</th>
<th>Square feet of blackboard space covered with bulletin boards</th>
<th>Percent of original blackboard space covered with bulletin boards</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>183</td>
<td>35</td>
<td>19%</td>
<td>0% -- 47%</td>
</tr>
<tr>
<td>II</td>
<td>193</td>
<td>45</td>
<td>22%</td>
<td>0% -- 36%</td>
</tr>
<tr>
<td>III</td>
<td>179</td>
<td>29</td>
<td>16%</td>
<td>0% -- 58%</td>
</tr>
<tr>
<td>IV</td>
<td>162</td>
<td>14</td>
<td>9%</td>
<td>0% -- 39%</td>
</tr>
<tr>
<td>V</td>
<td>179</td>
<td>0</td>
<td>0%</td>
<td>0% -- 29%</td>
</tr>
<tr>
<td>VI</td>
<td>186</td>
<td>9.5</td>
<td>6%</td>
<td>0% -- 36%</td>
</tr>
</tbody>
</table>

* Read Table thus: Column 1 shows median square feet of blackboard space for all rooms of each grade; column 2, medians for room of each grade as buildings are now; with amount covered with bulletin boards; column 3 shows percent of range using columns 1 and 2; column 4, range in percents of amounts of blackboard area covered, no medians used.

* Time buildings were constructed
### TABLE XII

**COMPARISON OF BLACKBOARD AREAS OF OLD AND NEW BUILDINGS IN EMPORIA**

<table>
<thead>
<tr>
<th>Grade</th>
<th>1 Mean square feet of blackboards in old buildings uncovered</th>
<th>2 Mean square feet of blackboards in new buildings</th>
<th>3 Percentage of blackboards in new buildings compared with old buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>206</td>
<td>114</td>
<td>56%</td>
</tr>
<tr>
<td>II</td>
<td>205</td>
<td>139</td>
<td>68%</td>
</tr>
<tr>
<td>III</td>
<td>198</td>
<td>139</td>
<td>70%</td>
</tr>
<tr>
<td>IV</td>
<td>195</td>
<td>157</td>
<td>81%</td>
</tr>
<tr>
<td>V</td>
<td>194</td>
<td>151</td>
<td>78%</td>
</tr>
<tr>
<td>VI</td>
<td>192</td>
<td>139</td>
<td>72%</td>
</tr>
</tbody>
</table>

Read Table thus: Column 1 shows mean areas in square feet for all buildings; Column 2 shows mean areas in square feet for new buildings; Column 3, percent of boards used in new buildings using Columns 1 and 2.

Some conclusions may be drawn in regard to the future use of blackboards from Table XII, page 35. Under column 1 for grade I it will be noted that the mean area of blackboard space for old buildings is 206 square feet, while for new buildings, column 2, there is a mean area of 114 square feet, which is a reduction of 56%. By sighting column 3 the percentages of reduction by grades will be seen.

This reduction in the area of blackboard space is based on a period of about thirty years. That is the approximate elapsed time between the old and new buildings. As to what the next thirty years will bring in the use of the blackboard is not definitely known but the writer believes that at least as great a reduction if not more will be forthcoming.
CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This investigation has, as its main objective, a study of elementary school blackboards. The purpose is:

1. To present the size and height of blackboards now in use in an average second-class Kansas City.

2. To make comparisons with the findings of other studies of like nature.

3. To make recommendations which should aid school administrators in selecting the size, height, and kind of blackboards for elementary schools.

The scope of this study includes the testing of handwriting heights at the blackboard of 718 Emporia elementary school children representing 51 classrooms.

The following types of data were assembled from various sources:

1. The height of chalkrails of old buildings.

2. The width of blackboards of old buildings.

3. The height of chalkrails of new buildings.

4. The width of blackboards of new buildings.

5. The median, "high," "middle" and "low" handwriting heights for all children in the first grade; all children in the second grade; etc., up to and including grade six.

6. The median, Q1, Q3, and range in handwriting heights at the
blackboard for each of the pupils in the six grades.

7. Amount of blackboard removed or covered with bulletin board as being unnecessary, per grade.

8. Comparative blackboard areas for old and new buildings in Emporia, Kansas.


In summarizing, there were many topics which the writer has considered:

1. Many authors, prior to 1915, believed it necessary to fill all of the available space within the classroom with blackboard.

2. With the ever mounting costs of education and school buildings, studies were made to try to find ways of reducing the ever increasing costs.

3. It was found that 15% of the rooms studied in the Emporia City Schools had the upper portion of the slate boards covered with either a nine- or twelve-inch strip of bulletin boards. Because of the existing width of boards the children were unable to reach the upper portions of boards, and in 15% of the rooms every board had been covered to some extent.

4. Data for this study were based upon a survey of 51 classrooms and the testing of handwriting heights at the blackboard of 718 elementary grade school children.

5. Children were asked to write at three different heights at the board. First, as high as they could write without standing
on their tip-toes; second, even with their eyes; and third, as low as they could without bending the knees.

6. Some measure of improvement has been made to eliminate excess blackboard heights from the floor and widths (see Table I, page 9), which gives comparative data between old and new school buildings in Emporia.

7. After the testing of all grades had been completed, the findings for each grade were lumped together to find the median "high," median "middle" and median "low" handwriting heights for each grade. The same data were found for each of the other five grades in like manner as for grade one (see Table II, page 10).

8. Median, Q₁, Q₃, mode, and range for each of the three handwriting positions as found by this study were compiled.

Data are presented in Tables III to VIII inclusive, page 11 through 13 respectively.

Conclusions

1. The leading blackboard material at the present time is slate and probably will remain so for an indefinite period of time. The latest development and the most widely used in Europe is glass (page 4).

2. At the present time most of the older school buildings have more blackboard area than is necessary for the present needs of the children. Much of it has either been removed or has been covered with bulletin boards. (Table II, page 34.)

3. The new buildings which have been constructed since 1930 have had the amount of blackboard area greatly reduced when compared with the
areas of the older buildings. (Table XII, page 35.)

4. The widths of blackboards in older buildings are much greater than those widths for the newer buildings. (Table I, page 9.)

5. The chalkrails of the older buildings are much higher from the floor than are the chalkrails of the newer buildings and are too high for usable service. (Table I, page 9.)

6. Articles 2 to 5 inclusive indicate that there is a definite trend towards less blackboard area in the classroom through the use of less linear feet and smaller widths; also that the chalkrails are being lowered so that children may write with greater ease.

7. Composition boards, while they may never replace slate, have many advantages in their favor over slate. (Table X, page 27; page 29.)

8. Reversible and swinging-leaf boards are advantageous for small rooms where wall space is limited and is needed for other purposes. (pages 23-24).

9. The new teaching technique and increased knowledge of the mental processes of children has led to a reduction of blackboard usage in the schools.

10. Blackboards of the future will tend to the swinging-leaf type rather than the permanent wall board of the past and present. (Page 32)

11. The future blackboard material may be glass should the present supply of slate become exhausted. (Page 25.)

12. Other proof of the decreasing use of blackboards may be found in the amount of chalk being used, in the Emporia City Schools. There was only one-third the amount of chalk used during the past year as was used in 1932-33 for a one-year period (page 33).
13. There is evidence to support the conclusion that blackboards will never go out completely, but the time may come when the pupil will seldom if ever be called upon to do school-work at the blackboard (page 33).

Recommendations

There are several recommendations which seem justified by this research:

1. Ayres says that blackboards should not be over 24 to 26 inches above the floor. (Pages 16-17.)

2. Mills recommends the following heights: primary grades, 20 inches; intermediate grades, 22 inches; and grammar grades, 26 inches. (Page 17.)

3. Moore says to place the boards 28 inches above the floor for primary grades and 30 inches for all the rest. (Page 17.)

4. Lee's recommendations are 26 inches for first and second grades; 27 inches for third and fourth grades; and 28 inches for fifth and sixth grades. (Page 17.)

5. Strayer and Engelhardt recommend 24 inches for first and second grades, 26 inches for third and fourth grades, and 28 inches for fifth and sixth grades. (Table IX, page 19.)

6. Dresslar recommends 26 inches for first and second grades; 27 inches for third and fourth grades; and 30 inches for fifth and sixth grades. (Table IX, page 19.)

7. This study recommends 26 inches for first, second, and third grades; 28 inches for fourth and fifth grades; and 30 inches
for sixth grade. (Table IX, page 19.)

8. In regard to blackboard widths, Mills says that blackboards should be at least 42 inches wide and 48 inches is better. (Page 19.)

9. Recommendations by Moore are the same as those of Mills. (Page 19.)

10. Strayer and Engelhardt recommend boards 28 inches wide for first, second, and third grades; 32 inches for fourth and fifth grades; and 36 inches for the sixth grade. (Table IX, page 19.)

11. Dresslar recommends boards of 38-inch width for all grades. (Table IX, page 19.)

12. This research indicates 30-inch boards for first grade, 34-inch for second, 36-inch for third, 38 for fourth, 40-inch for fifth, and 42-inch for sixth grade. (Table IX, page 19.)

13. It is recommended that moveable boards, such as reversible or swinging-leaf types, be used as they not only take up less space but they can be moved to different parts of the room. They also reduce the amount of board surface which is exposed to the light at any one time. (Page 35.)

14. In the older buildings now in use there is too much blackboard area for the needs of the children and the teacher. (Page 35.) It is recommended that much consideration be given to this section of classroom equipment. Some reductions have been made in the newer buildings, but there is still more board space than is necessary for the upper grades. (Table XII, page 35.)

15. It is recommended that the blackboards in rural schools be
lowered. At the present time they are much too high for practical use. (Page 17.) This change can be made at a very little cost.

16. The recommendations of blackboard area for new buildings should depend largely upon the organization and educational program of the school system. Although as to location of boards within the room they should never be placed on the same side of the room in which windows are located. If the room is well supplied with windows then it is advisable to use some kind of movable board. (Page 24.)

17. In general the amount of blackboard space should, as other school equipment, be dependent upon the subject or subjects taught in that particular room. This is especially true for junior and senior high schools.
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