

T H E S I S

----

A S E R I E S

O F

M A N I P U L A T I V E T E S T S

I N

H A N D C O M P O S I T I O N

----

Submitted by

Harry Linton Crockett

In partial fulfillment of the requirements

for the Degree of Master of Science

Colorado Agricultural College

Fort Collins, Colorado

June 16, 1930

LIBRARY OF THE  
STATE AGRICULT'L COLLEGE  
FORT COLLINS, COLO.

378.788  
a0  
1930  
7

COLORADO AGRICULTURAL COLLEGE

-----  
GRADUATE WORK

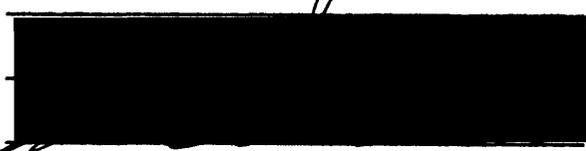
July 7, 1930

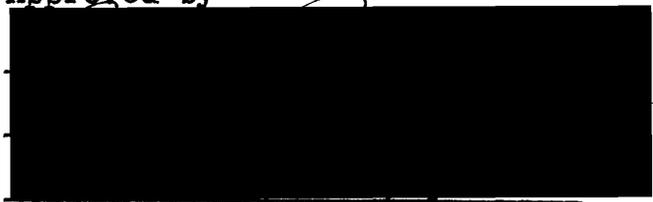
I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY SUPERVISION BY Harry Linton Crockett ENTITLED A SERIES OF MANIPULATIVE TESTS IN HAND COMPOSITION, BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE DEGREE OF Master of Science in Vocational Education, Majoring in Trade and Industrial Education.

  
In Charge of Thesis

  
Head of Department

Recommendation concurred in  

Approved by  


Committee on  
Advanced Degrees

#### ACKNOWLEDGEMENT

For the guidance and suggestions of Mr. H. A. Tiemann, Mr. D. W. Rockey, Mr. Sidney Owen, and Miss Marie Bartlett, I am sincerely grateful.

To Mrs. Crockett, public acknowledgement is made for the continuous assistance and encouragement throughout this study.

## TABLE OF CONTENTS

	Page
INTRODUCTION	
Need and Purpose -----	1
DEVELOPMENT	
Basis of Mechanics -----	3
Scoring -----	4
Present Forms -----	4a
Group Tested for Scores -----	5
Other Printing Tests -----	5
TECHNIQUE OF GIVING TESTS	
Distribution Tests -----	6
Form for Scoring -----	7
Composition, Distribution Tests -----	8
Record Sheet -----	8
Procedeuere -----	12
Font Charts -----	16
TEST ONE	
Differentiation of Similar Characters ----	17
Purpose -----	17
Materials Needed -----	17
Presentation-----	18
Scoring -----	18
Utilization -----	19
Table I, Scores for Test 1 -----	20

TEST TWO	Page
California Job Case -----	21
Purpose -----	21
Materials Needed -----	21
Presentation -----	22
Scoring -----	22
Utilization -----	23
A Comparison with a Written Test -----	24
Discussion -----	26
Table II, Scores for Test 2 -----	28
 TEST THREE	
A Single Sentence Quotation -----	31
Purpose -----	32
Presentation -----	32
Materials Needed -----	32
Utilization -----	33
Scoring -----	33
Discussion -----	33
Table III, Scores for Test 3 -----	35
Font Proportion for Test 3 -----	36
 TEST FOUR	
Short Paragraph Including Ligatures and Factual Information -----	37
Purpose -----	38
Materials Needed -----	38
Presentation -----	39

Utilization -----	39
Source -----	39
History -----	40
Table IV -----	41
Font proportion for Test 4 -----	42

TEST FIVE

Longer Paragraph Stressing Division of

Words and Punctuation -----	43
Purpose -----	44
Materials Needed -----	44
Presentation -----	44
Utilization -----	45
Discussion -----	45
Table V, Scores for Test 5 -----	47
Font proportion for Test 5 -----	48

TEST SIX

Capital Letters -----	49
Purpose -----	50
Materials Needed -----	50
Presentation -----	51
Utilization -----	51
Table VI, Scores for Test 6 -----	52
Font proportion for Test 6 -----	53

TEST SEVEN

Centering, Alinement of Words

Arabic Numerals, and Roman Numerals -----	54
---	----

Purpose -----	55
Materials Needed -----	55
Presentation -----	55
Utilization -----	56
Discussion -----	56
Table VII, Scores for Test 7 -----	59
Font proportion for Test 7 -----	60
<b>TEST EIGHT</b>	
Mixed Type and Multiple Justification ----	61
Purpose -----	62
Materials Needed -----	62
Presentation -----	62
Utilization -----	63
Discussion -----	63
Table VIII, Scores for Test 8 -----	64
Font proportion for Test 8 -----	65
<b>SUMMARY</b> -----	66
<b>CONCLUSIONS</b> -----	67
Table IX, Relative Standing of	
Students by Groups -----	69
<b>BIBLIOGRAPHY</b> -----	70

## INTRODUCTION

### Need and Purpose

This study is the result of several years observation involving an analysis of the elements which should be taken into consideration in developing manipulative speed in hand composition in high school and trade courses of printing.

Hand composition has been practiced since the middle of the fifteenth century. It has been considered an art, a craft, and a trade. Printing today involves many highly developed machines and a specialization in workmanship which points to a revolution of the apprentice system. Yet, through all these changes, hand composition remains the basis of instruction for the typographer, and the elements of accuracy and speed are of paramount importance. Accuracy has been considered a factor in teaching composition, but speed has been neglected to a great extent in teaching. This paper proposes to give proper stress to the development of speed.

Experimentation and observation brought the conclusion that written tests could not be made to cover phases of manipulative work.

The practicability of the typewriter tests for determining skill on the typewriter has been demonstrated and there seemed a possibility of developing a similar method

for testing skills in hand composition in printing. The problem is more complex in printing for there are more factors to be tested. Some of these factors are accurate speed in composition and distribution, use of ligatures, use of capital letters, centering, use of leaders, multiple justification and mixed sizes of type.

Five years have been spent in developing the definite material for accurately checking each factor. During this time progress was made toward simplification, to allow each test to be presented during time allotted, and maintain student interest at its best. Repetitions were eliminated and steps were made more gradual. The series as finally developed checks in easy steps the elements of composition beginning with knowledge of where the letters lie in the case to multiple justification.

The scores have been checked and re-checked against grades for class-room accomplishments in the light of teaching and trade experience and the material presented in this paper shows eight tests which are based on a common procedure. This consists of composition under time, distribution under time, an accurate checking of each for errors and a penalty assigned to each error.

Though handled with small groups it is believed that these groups were representative and nearly average so that it is felt that the tests would be of equal value for

larger groups or in different sections of the country.

The tests have stimulated rivalry in a wholesome way and it is believed that they will do the same elsewhere.

The teacher could also use these as a teaching device for it is believed that the test fixes attention upon accuracy and speed, at the same time focuses attention on the factual information of the test.

During the development of this method this book "Instruction Manual for Young Printers" by Mr. R. W. Selvidge and Mr. Harvey Arthur Witt (7) was published (in 1926) which carried manipulative tests but these were not along parallel lines with the work of this paper so this study was continued along the original lines.

#### Development

From typing teachers and the published material of the typewriter manufacturers such as "Underwood Expert Typing Awards" (p. 17-23), with the series mentioned in the bibliography (1) on page 70, some ideas were gained of the mechanics which might be involved. From the printing trade came the three dominant notes, speed, accuracy, and factual trade experience. The first two, speed and accuracy, were things which could be worked into the idea of the manipulative tests, but speed had to be changed to accurate speed, for there is no speed in hand composition unless the work is absolutely accurate.

### Scoring

Similar to the typing tests a penalty of 5 for each error in composition or distribution was added (the typing tests used 10). The matter of penalty bothered the students, who thought the penalties as first given too high, so after some discussion it was decided in composition it should be a figure representing the time it took to correct the average error. This was done in a series of tests by having each boy correct his errors and having the time noted. Taking an average of all the errors corrected into all the time consumed the figure was found to be nearly 3 minutes, therefore, 3 became the penalty on each composition error.

It was not so easy to determine the penalty for distribution errors, in fact, a basis of check for distribution has even yet not been determined. The error in distribution is usually found before the line is justified in the stick, but cases are known of an error going to press and delaying a whole plant while it was corrected. Discussion and agreement, finally, arbitrarily set the penalty for distribution errors at 2. This gives the following basis for scoring: time of composition plus 3 for each error in composition, plus time for distribution, plus 2 for each error in distribution. The best score is the lowest, for it represents the most perfect work, with accurate speed as

the standard. Figure 4 shows the scoring using this method.

During the period of development it seemed that factual information contained in the material became established in the mind of the student more readily than if he heard it or read it while not under the stress of a test or with the necessity of using the information thrust upon him. This led to the selection of material which was progressive, step by step. After much using, changing, and re-arranging, five tests were developed that were considered as covering some of these steps. With the actual problem of putting this material on paper it was found that it had been started in the middle and worked to the top and later only started toward the bottom. To make a more complete series, with a good solid foundation, the material under Tests 1, 2, and 6 was added this year. The material in the remaining tests has been in use several years and presented in this form, in some cases after modification.

Group Tested for Scores

In order to give a set of scores, which were comparable, the series of tests was given to all the students enrolled in composition in Phoenix Union High School during the fall term of the school year 1929-30. This enrollment consisted of 21 students, four of whom were dropped through school routine, leaving a class of 17 which was divided into 3 groups. Group I, seniors who had been in the shop taking composition two years or more previously; Group II, students who had been in the shop taking composition one year previously; and Group III, students beginning composition. The range of scores is great enough to show what is expected of the tests and shows comparisons of the same students. The name of the student was not used, but a letter was given to represent him. The same student's work always carries the same letter, as John Doe was student A in all cases.

When comparisons, correlations, scores or information from previous tests seem of value this material will be noted under the test where it is felt a relation exists.

Other Printing Tests

Since this study was started the school print shop has been subjected to the same test and measurement movement which has covered all fields of education. The true-false tests, the completion tests, and manipulative tests

have been devised by teachers of printing as generally as in the other lines of teaching. Some of these have been published and in two cases steps to standardize them have been taken. This list includes Industrial Art Tests, Printing by Mr. George K. Wells and Mr. M. L. Laubach, which is a series of 100 true-false questions and 25 completion questions. They are taking steps to standardize these. (2) Mr. William L. Hunter developed a series of 25 completion questions. (3) The Typographical Union's correspondence course on teaching devotes a lesson to writing tests and gives some examples. (4) Job sheets, that have the manipulative idea with a grade, are used in an exercise form by Mr. Ralph W. Polk in his Elementary Job Sheets. (5) Much the same idea is used by Mr. R. Randolph Karch in his Junior High School Printing. (6)

Manipulative tests in the most complete form consisting of 12 tests which are set up, corrected, locked up, made up in the press and an O. K. received under time, are described by Mr. R. W. Selvidge and Mr. Harvey Arthur Witt in their book, Instruction Manual for Young Printers. (7) (p. 21-40) This series has the advantage of standardization "after testing about 200 students on them". (p. 21)

#### Technique of Giving Tests

#### Distribution Tests

Tests 1 and 2 are distribution tests. The student is

given a collection of type that has been thoroughly mixed and placed on a galley. He is given a composing stick and told to pick this type up, placing it in the stick nick up as in setting type, then to distribute it into an empty California Job Case provided for this purpose.

One point must be carefully guarded in giving tests, that none of the cases used to hold type for composition or cases used to receive type in distribution have any of the boxes marked with the characters they are to contain. Experience indicates that boxes marked are usually wrong, for people who know the case do not need to mark the boxes, and those who do not know the case mark the boxes incorrectly.

In these two tests the time is taken from the instant he picks up his first piece of type until he calls time. If he does not throw back some pieces he is penalized 2 for each, the same as an error.

Form for scoring The form found most convenient for recording these tests is shown in Tables I and II following Tests 1 and 2. Ruled paper is more convenient.

The first column is for the student's name; the second, the time it takes him to pick up the letters and distribute them; the third is to be filled out as the case is check and his errors found. They are written w/W, meaning w in W box. In instances where there are more

than one of a character in the box the error is written 3.w/W--5.z/x, meaning respectively three w's in the W box and five z's in the x box. The fourth column is for the total number of errors listed in the previous column. The last column is for the score which is found by taking the time in column 2, plus two for each error in column 4, or time plus (2 times No. of errors) equals score.

#### Composition-Distribution Tests

Tests 3, 4, 5, 6, 7, and 8 are combination composition-distribution tests. The copy for these tests is prepared by setting it up in imitation of typewriter type using typewritten copy as a sample, then marked with colored pencil as copy is marked in a job shop. These marks indicate the measure for stick and the size or sizes of type.

An example of copy as it is given to the student in Test 8 is shown in figure 1. This material is printed on news stock 6 by 9 inches. The actual copy is shown with each test.

Record sheet The record of the test is also a printed form on news stock 6 by 9 inches, a reproduction of which is shown in figure 2. At the top is a line for the date and the student's name. The central portion is blank and a proof of the test is pulled on this space. At the bottom are spaces to record the number of minutes used in

25 Picas

CONTENTS - 12 pt. Century Bold

8 pt.  
Century  
Roman

Page - 6 pt.  
Century  
Roman

Chapter I.....	A Brief History of Printing	1
Chapter II.....	The Great Industry of Printing	19
Chapter III.....	Type	27
Chapter IV.....	Type Cases	36
Chapter V.....	Spacing Material	54
Chapter VI.....	The Process of Setting Type	89
Chapter VII.....	The Handling of Type Forms	106
Chapter VIII.....	Proofing and Correcting Forms	125
Chapter IX.....	The Distribution of Type	135
Chapter X.....	The Printers' System of Measurement	147
Appendix.....	Printing Equipment for High Schools	287
Glossary.....	Technical and Trade Terms	289
Index.....		300

-6-

Figure 1

Copy for Test 8 as printed on 6" by 9" news stock and marked to show sizes and faces of type.

25 Picas

CONTENTS - 12 pt. Century Bold

8 pt.  
Century  
Roman

Chapter I.....	A Brief History of Printing	Page 1
Chapter II.....	The Great Industry of Printing	19
Chapter III.....	Type	27
Chapter IV.....	Type Cases	36
Chapter V.....	Spacing Material	54
Chapter VI.....	The Process of Setting Type	89
Chapter VII.....	The Handling of Type Forms	106
Chapter VIII.....	Proofing and Correcting Forms	125
Chapter IX.....	The Distribution of Type	135
Chapter X.....	The Printers' System of Measurement	147
Appendix.....	Printing Equipment for High Schools	287
Glossary.....	Technical and Trade Terms	289
Index.....		300

Page - 6 pt.  
Century  
Roman

Figure 1

Copy for Test 8 as printed on 6" by 9" news stock and marked to show sizes and faces of type.

Date.....Name.....

Figure 2  
Record sheet of test, front side  
This is on 6" by 9" news stock.

Minutes Composition.....

Errors in Composition \_\_\_\_\_ at 3 \_\_\_\_\_

Minutes Distribution.....

Errors in Distribution \_\_\_\_\_ at 2 \_\_\_\_\_

Score.....



composition, errors in composition at 3, errors in distribution at 2, and total score.

The reverse side of this record, figure 3, shows four ruled columns; first, No. denoting the number of errors; second, letter that was misplaced; third, the box they were in, and fourth, remarks. Below is space for the total errors which number is transferred to the front side. The person who inspects the case signs in space marked "checked by".

Procedure In giving tests 3, 4, 5, 6, 7, a standard procedure was used. Four cases of 10 point Century Roman type were used for this purpose only, and when errors were reported from any of these cases the "dirty case" was gone through and put in order. In short, an effort was made to keep these four cases in as good order as possible.

In all instances, as many students as possible were given the test the same day and an attempt was made to keep physical conditions uniform. Tests 3 to 8 inclusive were given to the students of the specified group the first day of the week for successive weeks. Holidays and absence prevented absolute adherence to this rule.

In the routine of giving a test, four boys were designated to take it at one time. Each boy took out one of the four cases mentioned above and put it on a stand where he would not be disturbed by other students in the

class or interfere with their progress. They were given the measure of the test to set their sticks and to procure leads and slugs. Copy for each boy was laid face down on a large galley which served as a copy holder.

At this point the students were called to attention and given the information for the specific test. This material was in the form of notes, and the same set of notes used for each group; so no point was omitted or added. When the person in charge was assured that everyone understood the test, the word to go was given and time started.

After the test was started, the person giving the test filled in the record sheet, figure 2, with date and the student's name, and held it in readiness. As the student finished he called "time", and the time used to set the material was put in the line "minutes composition".

The student brought his stick of type to the person in charge of the test and had it inspected for lines that were too loose or too tight. If such were found, the student justified them and the time consumed was added to the "minutes composition". Only two students submitted work with unjustified lines on the first composition test, and none thereafter.

After the stick was inspected for justification only, the student took the record sheet with his composition to

Date JAN - 9 1930

Name Student N.

### CONTENTS

	Page	
Chapter I..... A Brief History of Printing	1	9
Chapter II..... The Great Industry of Printing	19	
Chapter III..... Type	27	
Chapter IV..... Type Cases	36	
Chapter V..... Spacing Material	54	
Chapter VI..... The Process of Setting Type	89	
Chapter VII..... The Handling of Type Forms	106	
<sup>p</sup> Chapter VIII..... Proofing and Correcting Forms	125	#
Chapter IX..... The Distributi <sup>o</sup> n of Type	135	n
Chapter X..... The Printers' System of Measurement	147	
<sup>slug</sup> → Appendix..... Printing Equipment for High Schools	287	
Glossary..... Technical and Trade Terms	289	a
Index.....	300	

Figure 4  
Record of Test 8 as set by student  
N marked to show scoring.

Minutes Composition..... 62:50  
Errors in Composition..... 7 at 3 21:00  
Minutes Distribution..... 23:15  
Errors in Distribution..... 13 at 2 26:00  
Score..... 133:05

the proof press and pulled a proof. This proof was turned in, proof read and the number of errors noted under "errors in composition".

The type was then wiped off with a soft cloth slightly dampened with gasoline, as an excess of gasoline runs between the type causing it to adhere and slows up distribution. This completed the first section of the work and the students were allowed to relax and put their cases away.

Each student then took a blank California Job Case to his stand, fixed a card bearing his name in the label holder and placed the composition on a galley in preparation for distribution. When all was in readiness, time was called and each student picked up a line or lines of type and distributed in his blank case. As each one finished his time was noted under "minutes distribution" on his record sheet and his case put in a stand where it was protected from type being carelessly thrown into it.

The inspection of distribution cases was very carefully and accurately done, and the errors found were noted on the reverse side of the record sheet, figure 3.

The record sheets were put in a big paper clip, as soon as all were completed, and hung on a nail near the door where the students congregated waiting for the dismissal bell. There the students could and did look them

over, wagering they would beat one another on the next test and chiding some one for some simple error.

#### Font Charts

With Tests 3, 4, 5, 6, 7, 8, will be found an outline of the California Job Case showing in printed red figures the number of each character letter or symbol as found in the Font Scheme for a 15A--30a Job Font. A 15A--30a Job Font is the unit of purchase of small complete collections of type and the number of each letter is proportioned to its use. The number, in ink below the letter, is the number of times it occurs in this test. An X indicates spaces are used or present in the case, but in a variable quantity. The outline is a copy of one put out by the Educational Department of The American Type Founders Company and the Fonting Scheme is from Type (8) (p. 11) from the United Typothetae Library.

TEST ONE

Differentiation of Similar Characters

Purpose

The necessity in printing of casting type in reverse makes several combinations of characters that are most confusing to the beginner and require much drill and visualization. Mr. Ralph W. Polk calls the b, d, p, q, group "The four demons". (9) (p. 43) In Elements of Composition u and n, 6 and 9 are added to the list with the warning, "One of the greatest difficulties that the student will encounter in the beginning is distinguishing between the types of certain similar letters". (10) (p. 16) Mr. R. Randolph Karch says of the same eight characters, "These letters are the most puzzling in the type case". (6) (p. 23) The chart "Characters Difficult to Distinguish" printed by the Educational Department, American Type Founders Co. adds comma and apostrophe, lower case l, number one, and capital I, lower case o, capital O, and cipher. (11) (chart 7)

An instructor in printing realizes that much time and effort is put on these sixteen characters without much proof that the student has visualized them. The following test is offered to check this work.

Materials Needed

The materials necessary are one empty California Job

Case, one small galley, one composing stick, and five pieces of ten point type each of: b, d, p, q, u, n, 6, 9, comma, apostrophe, lower case l, numeral one, and capital I, lower case o, capital O, and cipher, of the same font, preferably the face used as a body type in the shop which would be the face most familiar to the student.

### Presentation

Tell the student you have a collection of type from one font, there are no wrong font or odd sized letters to bother him. Thoroughly mix them before him, pouring them from one hand to the other. Place them on the galley and handing him the stick tell him to place the type in the stick with the nick up as if he were setting type, then to distribute the type in the empty case. This he can do after each line is picked up or after the whole collection is picked up. Carefully observe the time it takes him and note this on the form, Table I.

### Scoring

Inspect the case, or have it done by a dependable person, noting errors in spaces provided as in Table I. A convenient symbol is b/d, meaning b in the d box, n/u meaning n in the u box.

In this test each error is counted 2. Multiply the number of errors by 2 and add the time used to complete the test for a score. The lowest score is the best, for

it represents the most perfect work.

Table I is a convenient method of recording this test and shows the data collected while giving it to an enrollment of seventeen students in mixed classes in printing. This enrollment is divided into three groups: Group I, advanced students; Group II, students having had one year of experience in the school print shop; and Group III, beginners.

The order has been arranged to have the student doing the best work in each group at the top of that group.

#### Utilization

This test has value in that it checks the student in differentiation between the sixteen characters considered. This checking causes him to realize his deficiency, and he will be ready to remedy this when an opportunity is offered. It affords practice in differentiation between the sixteen characters. It affords practice in assembling type in the composing stick. It affords practice in distributing type into the case.

TABLE I

A FORM USED TO RECORD DATA COLLECTED IN TEST ONE

Student Name	Time	Errors Made	No. Errors	Score
GROUP I.				
A	5	b/d	1	7
B	5	q/p	1	7
GROUP II.				
C	5		0	5
D	7		0	7
E	10	u/n - '/, - 1/one	3	16
F	9	5.1/one - '/, - q/p	7	23
G	9	p/b - 5.q/d - 3.b/p - d/p '/, - 2.d/q - 2.9/6	15	39
H	8	b/d - u/n - 4.1/I - I/1 6/9 - 3.,/. - 2.'/: - 2.'/, 1/I	16	40
I	6	p.b - q/d- u/n - 4.q/p 5.,/' - '/, - I/1 - 2.9/6 1/I	17	40
J	11	p/b - 4.q/d - 2.b/d - 5.d/a 1/I - u/n - 2.'/, - b/a	17	45
GROUP III.				
K	6	q/p - p/q	2	10
L	10	I/1 - 1/I	2	14
M	12	2.1/I	2	16
N	11	b/q - 1/one - 5.'/, - 6/9	8	27
O	15	u/n - p/q - '/, - 5.6/9 0/cipher	9	33
P	11	5.b/d - 5.d/b - 5.q/p 5.p/q - 5.'/, - 5.,/' 3.1/one - u/n- 2.n/u	36	83
Q	24	19 not distributed - 3.p/b 2.d/b - 5.q/d - 5.b/p 3.d/q - 5.'/. - 5.,/. - 0/P 4.I/B - 5.0/H	57	138
			Total	193

TEST TWO

California Job Case

Purpose

There is no greater handicap to speed and accuracy in hand composition than not knowing the type case perfectly. Knowing the case perfectly, from the printer's point of view, means that the student has studied, practiced and handled type to the extent that when he reads a word his hand automatically reaches into the box of the first letter of that word, and so on to each succeeding letter. In composition, if he does not know the case perfectly, he will lose time locating the letters wanted. In distribution, if the case is not absolutely known, he will throw type in the wrong box and delay the person who uses the case following him.

The case in common use today is called the California Job Case which contains capital letters, lower case letters, marks and signs, numerals, and spaces. The letters are arranged in this case so the most used are in the larger and most convenient boxes to reach, figure 5. This case serves as a storage cabinet and work bench.

In order to find how well the student knows his case the following test may be used.

Materials Needed

The materials necessary are one empty California Job

Case, one small galley, one composing stick, and three pieces from each box, except four-to-em spaces of which there are four pieces and five-to-em spaces of which there are five pieces. The reason for using a greater number of the spaces specified (four-to-em and five-to-em) is to put into the hands of the student a means for verifying his decision on these two sizes of spaces in addition to eye estimation. This type should be of the same font, ten point, and preferably the face used as a body type.

#### Presentation

As in Test 1 tell the student you have a collection of type from one font, there are no wrong font or odd sized letters to bother him. Thoroughly mix them before him, pouring them from one hand to the other. Place them on the galley and handing him the stick tell him to place the type in the stick with the nick up as if he were setting type, then to distribute the type in the empty case. This he can do after each line is picked up or after the whole collection is picked up. Carefully observe the time it takes him and note this, as in Test 1, on the form, Table II.

#### Scoring

Inspect the case, or have it done by a dependable person, noting errors in spaces provided as in Table II. A convenient symbol is b/d meaning b in the d box, n/u

meaning n in the u box.

In this test each error is counted 2. Multiply the number of errors by 2 and add the time used to complete the test for a score. The lowest score is the best.

The Table II, which follows, is similar to Table I and is a convenient method of recording this test. It shows the data collected while giving Test 2 to the same seventeen students who took Test 1 recorded in Table I.

The order has been arranged so that the student doing the best work in each group is at the top of that group. The student letter in Table I represents the same student in Table II.

#### Utilization

This test has value in that it determines the student's ability to differentiate between all the letters, characters, marks and signs, numerals and spaces of the California Job Case. It points out to the student that he does not know certain characters or their places, which he must learn in order to go on with composition. It affords practice in assembling type in a compositor's stick. It affords practice in distributing type into the case. It offers a review of the sixteen characters in Test 1. This makes a double check on these sixteen characters which will continue to give trouble if they are not completely mastered in the intervening time between Tests 1 and 2.

### A Comparison with a Written Test

In order to find the correlation between a manipulative test and a written test on the California Job Case, all the students in the class taking composition were given a written test. This was written three weeks before the manipulative test was given.

For this written test a card was designed as in figure 6, which is a line drawing of the California Job Case, and the group of students, cited in this discussion, were asked to fill it out as follows:

1. Do not use test time to fill in your name and number.
2. On the face of this card is an outline of the California Job Case. Write in each box the character, mark, letter, or space which belongs there.
3. As soon as you have finished raise your hand, and the time it has taken you to complete it will be recorded on your card.
4. After time is stopped, write your name and number in the spaces provided.
5. Start.

In checking these cards they are compared to figure 5 and each error noted. Each letter or mark omitted or in the wrong box was an error. The score on these cards was

ff	fi	5 Em	4 Em	3 k		1	2	3	4	5	6	7	8	\$		Æ	Œ	æ	œ	
j	b	c	d	e	i	s	f	g	ff	9				A	B	C	D	E	F	G
?									fi	0				H	I	K	L	M	N	O
!	l	m	n	h	o	y	p	w	En Quad	Em Quad				P	Q	R	S	T	V	W
Z					a	r	:	:	Quads					X	Y	Z	J	U	&	ff
X	v	u	t	3 Em Spaces			.	-												
q																				

CALIFORNIA JOB CASE

Figure 5

Name..... No.....


Time..... Errors..... Score.....

Figure 6  
Card used in giving written test on California Job Case

found by counting two for each error, and this was added to the time it took the student to fill out the card, which is the same method used in scoring the manipulative test. The correlation was found to be .72.

### Discussion

Manipulative tests have value as a teaching device. In Test 1 (Differentiation of Similar Characters) there were five each of sixteen characters and seventeen students taking the test, making a total of 1360 possible errors. Referring to Table I we find that all except two students made errors in numbers ranging from 1 to 57, with a total of 193 errors or 16%.

Test 2 (California Job Case) was given ten days later to the same seventeen students. This test included the sixteen characters from Test 1, three each, making a total of 816 possible errors in these sixteen characters. Referring to Table II we find eight students out of seventeen made 64 errors in these characters or 8% which is a reduction of 50% in errors.

Manipulative tests check to a greater degree than do written tests in this case. The written test used in conjunction with Test 2 (California Job Case) was given ten days before the manipulative Test 1 (Differentiation of Similar Characters), the cards in the seventeen cases show two boys made four errors in these sixteen characters but

when the manipulative Test 1 was given these seventeen boys made 193 errors, indicating they could write about it but could not distinguish the actual type.

TABLE II

A FORM USED TO RECORD DATA COLLECTED IN TEST 2

Student Name	Time	Errors Made	No. Errors	Score
GROUP I				
A	13	3.z/x - x/z	4	21
B	19	C/B - w/W	2	23
GROUP II				
C	20	!/? - 5sp./4sp. - ./-	3	26
E	31	3.!/j - 3.?! - 3.j/? 3.ffl/ffl	12	55
D	23	3.φ/§ - 3.&/oe - 3.oe/ae 3.oe/AE - 3.OE/AE - 3.§/ffl 3.fl/ff - !/z - 3.ffl/ffl 3.ff/fl	28	79
F	26	q/b - J/j - 3.z/x - 3x/z		
(q/b - 2.6/9)		2.6/9 - 3.fl/ff - 3.ff/fl		
3		0/G - 3.φ/§ - 3.ae/oe 3.oe/ae - 3.AE/OE - 3.OE/AE	32	90
I	30	K/k - 3.ff/fl - 3.fl/ff -		
( I/1 )		B/A - i/s - 3.fl/ff -		
1		3.ffl/ffl - 3.§/ffl - I/1 2/5 - G/G - 5sp./4sp. - 3.L/K - 2.K/L - 3.AE/K 3.Oe/Ae - 2.AE/OE - 2.ae/oe	37	104
G	24	J/j - w/p - z/x - n/m w/W - 4sp./3sp. - 5sp./4sp. 3.ffl/ffl - 2.;/: - 3.:/; 3.φ/§ - 3.AE/φ - oe/φ 2.ffl/ffl - 3.ae/K - 2.oe/ae 3.§/AE - 2.fl/ff - 3.fl/ff 3.ff/fl	40	104

TABLE II - Continued

Student Name	Time	Errors Made	No. Errors	Score
J	31	3.p/b - 3.q/d - !/j (3.p/b - 3.q/d 3.d/p - 3.b/q 3.n/u - 2.u/n I/1 - 3.9/6 3.6/9)	61	153
H	35	3.9/5sp. - ;/j - 2.I/1 ( 2.I/1 - I/1 ) 3 2.ff/ffl - ff/3.fl/fl 5sp./4sp. - 2.rsp./3sp. 2.:/; - 3.OE/oe - R/S T/S - 3.X/Y - ffl/Y - 2.Y/Z 2.J/Z - j/J - 3.Z/& - Y/& 3.l/1 - I/1 - -/:	60	155
GROUP III				
K	21	5sp./4sp.	1	23
O	36	5sp./4sp. - 3sp/a - 3.9/K E/F - j/J	7	50
M	35	4sp./5sp. - 2sp./3sp. 3.fl/fl - '/, - 3.OE/ae 3.oe/ae - 3.AE/oe - 2.F/G 2.w/W - 3.ffl/ffl	22	79
L	29	r/a - q/b - Y/y - 3.ffl/ffl ( q/b - l/I ) 2 2.ff/fl - fl/ff - 2.fl/fl 3.oe/K - 3.OE/AE - 3.ae/OE 3.AE/ae - l/I - 3.ffl/ffl	27	83

TABLE II - Continued

Student Name	Time	Errors Made	No. Errors	Score
N ( q/b - b/q q/p) 3	33	q/b - b/q - q/p - 2.9/0 !/? - 4sp./5sp. - v/V 2.4sp./3sp. - 2.6/5 3.fl/ff - 3.ffl/fl - 2.'/, - 3.:/; - 3.-/; 3.ae/K - 2.φ/AE - 3.ff/Oe 3.oe/ae - φ/ae - 3.OE/oe 3.AE/ffl	44	121
P ( 3.q/b - 3.p/d 2.d/p - 3.6/q 3.n/u - 3.'/, 3.6/9 - 3.9/6 23	42	3.q/b - 3.p/d - 2.p/d J/j - 3.o/n - 2.d/p - P/p 3.b/q - 3.n/u - m/w - d/w 2.z/x - 3.5sp./4sp. - K/L 2.4sp.3sp. - 2.Z/X 5sp./3sp. - 3sp./2sp. 2.ffl/ffl - 3.ffl/fl ffl/fl - 3.'/, - -/; -/: - 2.:/- - 2.:;/- 3.2/5 - 3.9/6 - 3.6/9 3.φ/§ - 3.fl/ff - 3.fl/fl 3.ff/fl - 3.φ/φ - 3.&/K	77	196
Q ( q/d - d/q 1/1 - 2.0/4sp.) 5	57	45 not distributed. - q/d 3.g/f - 3.f/g - J/j - d/q n/u - ?/Z - ?/! - 3.y/, !'/fl - 3sp./5sp. - 4/' 2.0/4sp. - 2.5sp/3sp. 3.2sp./3sp. - 3.1sp/2sp. 3.quads/lsp. - !'/lsp - 1/1 3.'/; - 3.,/. - :/; - 3../- 3.-/. - ?/§ - OE/K - 8/Ae ff/OE - fl/OE - fl/oe - φ/ae ffl/ae - 3.U/J	109	275

“The quick brown fox jumps over the lazy dog.”

Figure 7  
Copy for Test 3

“The quick brown fox jumps over the lazy dog.”

Figure 8  
Test 3 set in 10 point Century Roman

TEST THREE

A Single Sentence Quotation

Purpose

The quotation "The quick brown fox jumps over the lazy dog" is familiar to everyone as a sentence including all the letters of the alphabet and is used in this test for that reason. It is used as a quotation in order to forcibly convey the information of how to set quotation marks in type.

Presentation

The information for setting quotation marks should have been given at a time previous to the use of this test. Tell the students to take cases for a test, and in order to bring out the point more forcibly, ask the question, "Do all of you know how to set quotation marks in type?" This will cause every boy to question himself, and it rarely fails that at least one boy will say, "No". This gives an opportunity to review quotation marks by saying, "Turn two commas over at the beginning and use two apostrophes at the end".

Materials Needed

The materials necessary for this test are a California Job Case containing a font of 10 point body type, an empty California Job Case, a composing stick set at 24 picas, and 2 slugs 24 picas long. The copy for this test

is the quotation above, either typewritten or set in typewriter type as in figure 3. A record sheet as figure 4, dated and named, for each student taking the test.

### Utilization

This test has value in that it checks the student on all the letters of the alphabet in composition and distribution. It offers a check in justification.

In this one line test is found all the mechanics of the five tests which follow. It serves to acquaint the student with the routine of this method of testing, and being short allows time for the person giving the test to supervise the mechanics and operation.

### Scoring

A discussion of the method of scoring and the forms used will be found on pages 7 to 16.

### Discussion

This test was given to a group of nine beginning students on April 6, 1928, and then repeated with the same students on April 10, 1928, except one student who took it on April 11. Comparing their first scores with their second scores gives a correlation of .69.

This test has been used several times, April 6 to 11, 1928, as mentioned in preceding paragraph, nine students took it twice showing composition time 3 to 11 minutes; composition errors 0 to 6; distribution time  $1\frac{1}{2}$  to 4 min-

utes; distribution errors 0 to 18. November 26 and 27, 1928 the test was given to thirteen students showing a range in composition time  $3\frac{1}{2}$  to 8 minutes; composition errors 0 to 6; distribution time 2 to 3 minutes and errors in distribution 0 to 16. March 8, 1929, three students took it within the ranges of the last series. The scores included in this paper for Test 3 show it was given seventeen times, November 25 and 26, 1929, with a composition range of 2 to 11 minutes; composition errors 0 to 8; distribution time 55 seconds to 2:40; distribution errors 0 to 7.

This gives a total of 51 scores for Test 3 which were compared, composition time against distribution time, and the correlation was found to be .59.

TABLE III

DATA COLLECTED IN TEST 3

Student	Composition Time	Errors	Distribution Time	Errors	Score
<b>Group I</b>					
A	1:50	0	:55	0	2:45
B	2:12	0	1:09	0	3:21
<b>Group II</b>					
D	2:25	0	1:12	0	3:37
E	2:45	0	2:00	0	4:45
G	2:50	0	1:10	1	6:00
F	3:30	0	1:43	1	6:13
I	4:15	1	1:15	0	8:30
H	3:55	0	1:18	2	8:53
J	3:10	1	1:17	1	9:27
C	2:00	3	1:08	0	12:08
<b>Group III</b>					
K	2:50	0	1:16	0	4:06
N	4:30	0	3:30	1	10:00
P	5:30	1	2:20	0	10:50
L	10:30	0	1:55	0	12:25
M	4:12	0	2:15	4	14:27
O	4:05	3	3:00	4	24:05
Q	9:00	8	2:40	7	49:40

November 25 to 26, 1929

<sup>2</sup> ñ	<sup>3</sup> ñ	<sup>5</sup> Em	<sup>2</sup> ñ	<sup>13</sup> ñ	<sup>3</sup> ñ	<sup>40</sup>	<sup>5</sup> 1	<sup>4</sup> 2	<sup>4</sup> 3	<sup>4</sup> 4	<sup>4</sup> 5	<sup>6</sup> 6	<sup>7</sup> 7	<sup>8</sup> 8	\$			Æ	Œ	æ	œ
<sup>8</sup> J	<sup>12</sup> b	<sup>16</sup> c	<sup>18</sup> d	<sup>18</sup> e	<sup>30</sup> i	<sup>30</sup> s	<sup>12</sup> f	<sup>12</sup> g	<sup>3</sup> ff	<sup>5</sup> 9	<sup>15</sup> A	<sup>6</sup> B	<sup>10</sup> C	<sup>8</sup> D	<sup>18</sup> E	<sup>7</sup> F	<sup>7</sup> G				
<sup>8</sup> ?	/	/	/	<sup>3</sup>	/	/	/	/	<sup>3</sup> fi	<sup>6</sup> 0	<sup>8</sup> H	<sup>15</sup> I	<sup>5</sup> K	<sup>10</sup> L	<sup>8</sup> M	<sup>15</sup> N	<sup>15</sup> O				
<sup>9</sup> !	<sup>20</sup> l	<sup>16</sup> m	<sup>30</sup> n	<sup>20</sup> h	<sup>30</sup> o	<sup>12</sup> y	<sup>12</sup> p	<sup>12</sup> w	<sup>6</sup> ^	<sup>6</sup> EmxQuad	<sup>8</sup> H	<sup>15</sup> I	<sup>5</sup> K	<sup>10</sup> L	<sup>8</sup> M	<sup>15</sup> N	<sup>15</sup> O				
<sup>6</sup> Z	/	/	/	<sup>2</sup>	<sup>4</sup>	/	/	/	<sup>2</sup>	<sup>6</sup> EmxQuad	<sup>8</sup> P	<sup>3</sup> Q	<sup>16</sup> R	<sup>16</sup> S	<sup>15</sup> T	<sup>5</sup> V	<sup>6</sup> W				
<sup>6</sup> X	<sup>8</sup> v	<sup>16</sup> u	<sup>30</sup> t	<sup>x</sup> 3Em Spaces	<sup>30</sup> a	<sup>30</sup> r	<sup>6</sup> ;	<sup>6</sup> :	<sup>x</sup> Quads	<sup>x</sup>	<sup>8</sup> P	<sup>3</sup> Q	<sup>16</sup> R	<sup>16</sup> S	<sup>15</sup> T	<sup>5</sup> V	<sup>6</sup> W				
<sup>6</sup> g	/	<sup>2</sup>	/	<sup>x</sup>	/	<sup>2</sup>	/	<sup>31</sup> .	<sup>8</sup> -	<sup>x</sup>	<sup>3</sup> X	<sup>6</sup> Y	<sup>6</sup> Z	<sup>6</sup> J	<sup>2</sup> U	<sup>2</sup> &	<sup>2</sup> ff				

American Type Founders Company

CALIFORNIA JOB CASE

Figure 9  
Font proportion for Test 3

Justification is the practice of evenly spacing and making flush lines of type. Each line should fit the stick, but not so tightly that it is difficult to push in the last spacing material.

**Figure 10**  
**Copy for Test 4**

Justification is the practice of evenly spacing and making flush lines of type. Each line should fit the stick, but not so tightly that it is difficult to push in the last spacing material.

**Figure 11**  
**Test 4 as set in 10 point Century Roman**

TEST FOUR

Short Paragraph Including Ligatures  
and  
Factual Information

Purpose

People rarely notice ligatures until brought in contact with the mechanics of printing, where they are in common use, and much drill and cautioning is required before the student recognizes their utility. Ligatures are used for two reasons, first, the letter f is kerned or over-hangs at the top loop and when followed by i, l or another f, this kerned or over-hanging portion is broken off; second, the ligatures fi-fl-ffi-ff-ffl are made up of letters which occur together and present a pleasing appearance when so used. Modern casting has eliminated most of the danger of breaking off the loop of the f, but the use of ligatures is a mark of a craftsman and one of the characteristics of good composition.

Materials Needed

The materials needed for this test are a California Job Case containing 10 point body type, an empty California Job Case, a composing stick set at 20 picas, 2 slugs and 5 leads 20 picas long. The copy, set in typewriter type and marked as presented to the student, is shown in figure 10 on the preceding page.

### Presentation

This test is conducted as the previous one, recording the proof and data on a record sheet. The special fact to be mentioned is that this test offers several opportunities to use ligatures, failure to use them at any of these points will constitute an error.

### Utilization

The points of value of this test are: the factual information regarding justification which is essential; stresses ligatures for the period of the test and offers an opportunity to use fi - fl - fi - ffi; affords practice in the letters of the alphabet, both for composition and distribution which are verified under time; gives four lines which are inspected for justification.

The information offered in the test is given under stress, read and re-read by the student for his errors and those that might have been overlooked in the other fellows' work, thus focusing his attention on it for the period of the test.

### Source

Though not a direct quotation the source of factual information for the material in this test is found in Mr. Ralph W. Polk's book, The Practice of Printing, (9) (p. 44), "Justification is the practice of spacing out lines of type so that each line will be firm in the stick,

and all lines will be set to exactly the same width. Each line must be spaced in such a way that it will be snug and firm, but not tight", and in his other book, Vocational Printing (12) (p. 25), "Every line must be set firm in the stick. It should be tight enough that the types cannot be moved from side to side, but not wedged so tightly that it is difficult to push in the spacing material."

### History

The first sentence from Mr. Polk's definition "Justification is the practice of spacing out lines of type so that each line will be firm in the stick, and all lines will be set to exactly the same width" has been used several years as a test. In early December 1927 it was given to a group of thirteen students and repeated to the same students a short time after. The correlation was found to be .46. In this form it offered the use of fl twice, so was rewritten in the present form, offering the addition of fl and ffi.

TABLE IV

DATA COLLECTED IN TEST 4

Student	Composition		Distribution		Score
	Time	Errors	Time	Errors	
Group I					
A	7:00	0	3:00	2	14:00
B	8:12	0	4:30	2	16:42
Group II					
E	12:30	1	6:00	1	23:00
C	10:30	3	4:45	0	24:15
H	15:50	0	7:10	1	25:00
I	12:00	2	5:10	1	25:10
D	14:00	1	4:45	3	27:45
G	11:00	3	5:00	2	29:00
J	15:00	4	6:00	1	35:00
F	15:00	6	5:40	2	42:40
Group III					
K	14:00	0	4:40	2	22:40
L	14:00	2	7:20	1	29:20
M	14:00	4	7:30	2	37:30
N	23:15	2	8:20	7	51:35
P	25:20	2	9:10	7	54:30
O	25:00	5	10:30	2	54:30
Q	21:20	5	11:00	12	71:20

December 3 to 5, 1929

<sup>2</sup> fi	<sup>3</sup> fi	<sup>3</sup> Em	<sup>3</sup> Em	<sup>18</sup> 3	<sup>8</sup> k	<sup>40</sup>	<sup>5</sup> 1	<sup>4</sup> 2	<sup>4</sup> 3	<sup>4</sup> 4	<sup>4</sup> 5	<sup>4</sup> 6	<sup>4</sup> 7	<sup>4</sup> 8	\$			Æ	Œ	æ	œ
<sup>8</sup> J	<sup>12</sup> b	<sup>16</sup> c	<sup>18</sup> d	<sup>18</sup> e			<sup>30</sup> i	<sup>30</sup> s	<sup>12</sup> f	<sup>12</sup> g	<sup>3</sup> ff	<sup>5</sup> 9			<sup>15</sup> A	<sup>6</sup> B	<sup>10</sup> C	<sup>8</sup> D	<sup>18</sup> E	<sup>7</sup> F	<sup>7</sup> G
<sup>8</sup> ?	<sup>8</sup> /	<sup>8</sup> 8	<sup>3</sup> 3	<sup>10</sup> 10			<sup>16</sup> 16	<sup>12</sup> 12	<sup>2</sup> 2	<sup>4</sup> 4	<sup>3</sup> g	<sup>5</sup> fi	<sup>5</sup> 0		<sup>8</sup> H	<sup>15</sup> I	<sup>5</sup> K	<sup>10</sup> L	<sup>8</sup> M	<sup>15</sup> N	<sup>15</sup> O
<sup>9</sup> !	<sup>20</sup> l	<sup>16</sup> m	<sup>30</sup> n	<sup>20</sup> h			<sup>30</sup> o	<sup>12</sup> y	<sup>12</sup> p	<sup>12</sup> w	<sup>6</sup> ;	<sup>6</sup> ˆ	<sup>6</sup> Quads		<sup>8</sup> H	<sup>15</sup> I	<sup>5</sup> K	<sup>10</sup> L	<sup>8</sup> M	<sup>15</sup> N	<sup>15</sup> O
<sup>6</sup> Z	<sup>8</sup> 8	<sup>2</sup> 2	<sup>10</sup> 10	<sup>9</sup> 9			<sup>7</sup> 7	<sup>3</sup> 3	<sup>5</sup> 5	<sup>1</sup> /	<sup>6</sup> Em	<sup>6</sup> Quads	<sup>6</sup> Quads		<sup>8</sup> P	<sup>3</sup> Q	<sup>15</sup> R	<sup>15</sup> S	<sup>15</sup> T	<sup>6</sup> V	<sup>6</sup> W
<sup>6</sup> X	<sup>8</sup> v	<sup>16</sup> u	<sup>30</sup> t	<sup>X</sup> 3Em Spaces			<sup>30</sup> a	<sup>30</sup> r	<sup>6</sup> ;	<sup>6</sup> ˆ	<sup>6</sup> Quads	<sup>6</sup> Quads	<sup>6</sup> Quads		<sup>8</sup> P	<sup>3</sup> Q	<sup>15</sup> R	<sup>15</sup> S	<sup>15</sup> T	<sup>6</sup> V	<sup>6</sup> W
<sup>6</sup> q	<sup>6</sup> /	<sup>6</sup> 6	<sup>20</sup> 20	<sup>X</sup> X			<sup>11</sup> 11	<sup>2</sup> 2	<sup>2</sup> 2	<sup>31</sup> ˆ	<sup>8</sup> -	<sup>8</sup> Quads	<sup>8</sup> x		<sup>3</sup> X	<sup>6</sup> Y	<sup>3</sup> Z	<sup>5</sup> J	<sup>5</sup> U	<sup>6</sup> &	<sup>6</sup> fi

American Type Founders Company

CALIFORNIA JOB CASE

Figure 12  
Font proportion for Test 4

For the beginner in printing, it is more important that he master accuracy, speed will develop with practice. In order to master accuracy and develop speed several points must be noted particularly and they are: first, select a clean case; second, reach in the right box; third, do not examine the letters as they are placed in the stick; fourth, when the end of a line is reached read this line for errors in spelling and wrong letters; fifth, examine the nicks for wrong fonts; sixth, justify carefully making the spaces between words as nearly uniform as possible.

**Figure 13**  
**Copy for Test 5**

For the beginner in printing, it is more important that he master accuracy, speed will develop with practice. In order to master accuracy and develop speed several points must be noted particularly and they are: first, select a clean case; second, reach in the right box; third, do not examine the letters as they are placed in the stick; fourth, when the end of a line is reached read this line for errors in spelling and wrong letters; fifth, examine the nicks for wrong fonts; sixth, justify carefully making the spaces between words as nearly uniform as possible.

**Figure 14**  
**Test 5 as set in 10 point Century Roman**

TEST FIVE

Longer Paragraph Stressing

Division of Words and Punctuation

Purpose

"One of the strictest rules of grammar is that no word shall be divided at any other place than between syllables, and that words of one syllable must not be divided". This statement by Mr. Ralph W. Polk on page 70 of his book, *The Practice of Printing*, is a fundamental factor in Test 5. The test is long enough that it is unusual for a boy to finish without the necessity of dividing a word.

Materials Needed

The materials necessary for this test are a California Job Case containing a font of 10 point body type, an empty California Job Case, a composing stick set at 21 picas, 2 slugs and 11 leads 21 picas, copy as in figure 13.

Presentation

Students are warned that a wrong division of a word constitutes an error and will be penalized 3. The dictionary is placed in a central position and students advised to use it if in doubt about the syllabication of a word.

This test includes the marks: comma, period, semi-colon, and colon which are collectively used sixteen times. This does not include the hyphen which was used from one to three times by all but one boy in the seventeen records

submitted in 1929-30.

It includes factual information, the result of several years careful observation of students in high school print shops, noting their errors and the things they do to inhibit their speed. Offered as a series of positive statements, it is hoped it will be fixed in their consciousness by being read and re-read in the setting of this test, then read and re-read in correcting the proof, and read again in the work of their fellow students looking for their errors.

With these points stressed, the test is straight composition a little above the average degree of difficulty.

#### Utilization

This test offers a check on division of words, and composition of a long paragraph which includes punctuation. It furnishes practice in composition and distribution of a long paragraph, and justification of 11 lines.

#### Discussion

This material <sup>was</sup> ~~has been~~ presented several times in this exact form and generally considered a good test. In January 1928 with a mixed group of twenty-two students it was given and repeated so the students had the same test a week later. The correlation was figured from these two tests and found to be .87.

In this double use of Test 5, the composition time

in all cases was compared with the distribution time, and the correlation was found to be .86.

The material presented at this point in this series will have the highest reliability or correlation of any test in the series, as it furnishes very little new material at a time when the students are familiar with straight matter composition.

TABLE V

DATA COLLECTED IN TEST 5

Student	Composition Time	Errors	Distribution Time	Errors	Score
Group I					
A	24:50	0	10:10	4	43:00
B	31:40	0	11:45	2	47:25
Group II					
C	34:10	1	14:00	2	55:10
E	33:40	2	26:00	3	71:40
D	34:30	5	16:55	11	88:25
I	46:00	5	15:30	6	88:30
G	44:00	4	16:50	13	98:50
J	68:50	7	20:30	4	118:20
H	42:50	9	19:56	20	128:46
F	50:10	20	18:20	5	138:30
Group III					
K	36:30	6	13:45	5	78:15
M	49:00	4	22:40	9	101:40
O	68:40	1	37:40	1	111:20
L	54:00	11	20:00	3	113:00
N	49:30	16	21:30	7	132:00
P	82:30	8	27:00	19	171:30
Q	57:20	20	33:00	47	244:20

December 9 to 13, 1929

<sup>2</sup> m	<sup>3</sup> n	<sup>5</sup> Em	<sup>2</sup> Em	<sup>12</sup> 3	<sup>8</sup> k	<sup>40</sup>	<sup>5</sup> 1	<sup>4</sup> 2	<sup>4</sup> 3	<sup>4</sup> 4	<sup>4</sup> 5	<sup>4</sup> 6	<sup>7</sup> 7	<sup>8</sup> 8	\$		Æ	Œ	æ	œ	
<sup>8</sup> J	<sup>12</sup> b	<sup>16</sup> c	<sup>18</sup> d	<sup>18</sup> e			<sup>30</sup> i	<sup>30</sup> s	<sup>12</sup> f	<sup>12</sup> g	<sup>8</sup> ff	<sup>6</sup> 9		<sup>16</sup> A	<sup>6</sup> B	<sup>10</sup> C	<sup>8</sup> D	<sup>18</sup> E	<sup>7</sup> F	<sup>7</sup> G	
<sup>8</sup> ?	<sup>5</sup>	<sup>20</sup>	<sup>17</sup>	<sup>62</sup>			<sup>31</sup>	<sup>31</sup>	<sup>8</sup>	<sup>8</sup>	<sup>8</sup>	<sup>8</sup>	<sup>8</sup>	<sup>8</sup>	<sup>15</sup> H	<sup>15</sup> I	<sup>5</sup> K	<sup>10</sup> L	<sup>8</sup> M	<sup>15</sup> N	<sup>15</sup> O
<sup>9</sup> !	<sup>20</sup> l	<sup>16</sup> m	<sup>30</sup> n	<sup>20</sup> h			<sup>30</sup> o	<sup>12</sup> y	<sup>12</sup> p	<sup>12</sup> w	<sup>6</sup> ;	<sup>6</sup> ;	<sup>6</sup> ;	<sup>6</sup> ;	<sup>8</sup> P	<sup>3</sup> Q	<sup>15</sup> R	<sup>15</sup> S	<sup>15</sup> T	<sup>5</sup> V	<sup>6</sup> W
<sup>6</sup> Z	<sup>20</sup>	<sup>9</sup>	<sup>34</sup>	<sup>21</sup>			<sup>30</sup> a	<sup>30</sup> r	<sup>6</sup> .	<sup>6</sup> .	<sup>6</sup> .	<sup>6</sup> .	<sup>6</sup> .	<sup>6</sup> .	<sup>8</sup> P	<sup>3</sup> Q	<sup>15</sup> R	<sup>15</sup> S	<sup>15</sup> T	<sup>5</sup> V	<sup>6</sup> W
<sup>6</sup> X	<sup>8</sup> v	<sup>16</sup> u	<sup>30</sup> t	<sup>3</sup> Em	<sup>3</sup> Em	<sup>3</sup> Em	<sup>30</sup> a	<sup>30</sup> r	<sup>31</sup> .	<sup>8</sup> .	<sup>8</sup> .	<sup>8</sup> .	<sup>8</sup> .	<sup>8</sup> .	<sup>6</sup> X	<sup>6</sup> Y	<sup>6</sup> Z	<sup>6</sup> J	<sup>6</sup> U	<sup>6</sup> &	<sup>6</sup> m
<sup>6</sup> q	<sup>3</sup>	<sup>8</sup>	<sup>29</sup>	<sup>x</sup>			<sup>34</sup>	<sup>37</sup>	<sup>2</sup> x	<sup>2</sup> x	<sup>2</sup> x	<sup>2</sup> x	<sup>2</sup> x	<sup>2</sup> x	<sup>6</sup> X	<sup>6</sup> Y	<sup>6</sup> Z	<sup>6</sup> J	<sup>6</sup> U	<sup>6</sup> &	<sup>6</sup> m

American Type Founders Company

CALIFORNIA JOB CASE

Figure 15  
Font proportion for Test 5

CAPITAL LETTERS HAVE BEEN IN USE LONGER THAN LOWER CASE LETTERS. THEY ARE OF MORE FORMAL SHAPE AS WOULD BE EXPECTED WHEN WE REALIZE AN EARLY USE WAS FOR INSCRIPTIONS ON STONE MONUMENTS, SUCH AS THE TRAJAN COLUMN COMMEMORATING A ROMAN CONQUEST.

Figure 16  
Copy for Test 6

CAPITAL LETTERS HAVE BEEN IN USE LONGER THAN LOWER CASE LETTERS. THEY ARE OF MORE FORMAL SHAPE AS WOULD BE EXPECTED WHEN WE REALIZE AN EARLY USE WAS FOR INSCRIPTIONS ON STONE MONUMENTS, SUCH AS THE TRAJAN COLUMN COMMEMORATING A ROMAN CONQUEST.

Figure 17  
Test 6 as set in 10 point Century Roman

TEST SIX

Capital Letters

Purpose

In the preceding three composition tests the five capital letters used, are probably near the proportion of capital letters to lower case letters in average composition, but many pieces of work are set entirely or a great portion in capital letters which bring into use the right third of the California Job Case.

A look at this case as outlined in figure 18 shows us the capital side is laid out very differently than the lower case side, as it is alphabetical with the exception of J and U which follow Z.

Capital letters have been in use longer than the lower case letters which were developed to save time in writing. The capitals have a use which the lower case letters can not fill, and it is essential that every student know how to use them. This test is submitted to check the use of capital letters.

Materials Needed

The materials necessary for this test are a California Job Case containing a font of 10 point body type, and an empty California Job Case, a stick set at 21 picas, 2 slugs and 8 leads 21 picas long, copy as in figure 16.

Presentation

The material in this test is to be set entirely in capital letters, they are taller and straighter than lower case letters so require more space between words. The division of words in capital letters should be avoided as they take a great deal of space between words, but when a division is necessary be sure this break is on a syllable or it will be counted as an error.

Utilization

This test offers a check in composition and distribution of the entire capital alphabet with the exception of K, in rather close comparison to a 15A Font of capital letters as will be seen by referring to figure 18.

The information given to the students with this test will be immediately put into use, thereby, more liable to be made a part of the neural pattern.

TABLE VI

DATA COLLECTED IN TEST 6

Student	Composition Time	Errors	Distribution Time	Errors	Score
Group I					
A	12:20	1	5:55	0	21:15
B	17:20	0	11:20	0	28:40
Group II					
E	19:10	0	10:50	0	30:00
C	20:35	1	8:20	1	33:55
I	23:00	0	8:45	3	37:45
J	27:20	2	9:25	0	42:45
D	18:10	4	9:40	3	45:50
F	32:40	4	8:00	0	52:40
H	23:05	9	11:15	9	79:20
G	21:10	12	10:25	8	83:35
Group III					
K	22:50	0	7:15	1	32:05
M	24:00	0	12:50	2	40:50
L	23:40	5	9:45	2	51:85
N	24:00	4	11:30	8	63:30
O	33:15	6	14:40	3	71:55
P	44:15	3	14:30	15	97:45
Q	42:00	8	20:00	21	128:00

December 14 to 19, 1929

fi	fl	Em	Em	18	8	40	1	2	3	4	5	6	7	8	\$		Æ	Œ	æ	œ	
12	16	18					30	30	12	12	3	5			16	6	10	8	18	7	7
J	b	c	d	e			i	s	f	g	ff	9			A	B	C	D	E	F	G
?											g	fi	0		19	2	3	2	30	3	2
9	20	16	30	20			30	12	12	12	6	EnQuad	EmQuad		8	16	5	10	8	16	16
!	l	m	n	h			o	y	p	w	^	/			H	I	K	L	M	N	O
8												EnQuad	EmQuad		7	7		10	9	17	16
Z															8	3	16	16	16	5	6
6	8	16	30	X			30	30	6	6	X				P	Q	R	S	T	V	W
X	v	u	t	3Em Spaces			a	r	;	:	Quads				4	1	14	15	15	1	5
6				x					31	8					X	Y	Z	J	U	&	fi
q									2	x					3	6	2	6	6	6	6

American Type Founders Company

CALIFORNIA JOB CASE

Figure 18  
Font proportion for Test 6

CENTERED

	Page
Chapter I.....Name of Chapter	1
Chapter II.....Also Name of Chapter	29
Chapter III.....Chapter Name	136
Chapter V.....This Chapter's Name	274
Chapter XI.....Name of This Chapter	310

Figure 19  
Copy for Test 7

CENTERED

	Page
Chapter I.....Name of Chapter	1
Chapter II.....Also Name of Chapter	29
Chapter III.....Chapter Name	136
Chapter V.....This Chapter's Name	274
Chapter XI.....Name of This Chapter	310

Figure 20  
Test 7 as set in 10 point Century Roman

TEST SEVEN

Centering, Alinement of Words,  
Arabic Numerals, and Roman Numerals

Purpose

The practice of multiple justification, which means the alinement of several columns of figures or words across the set of the stick, with one or two final pieces of spacing material placed in the unalined section, is a very common and simple method of setting a table of contents, program, index or tabular matter of that nature. This method is usually learned before the student justified each column separately to build a table and is more important.

This test, a skeletonized table of contents, offers ample verification of multiple justification as it involves the alinement of chapter, Roman numerals, the end of the name of the chapter and Arabic numerals.

Materials Needed

The materials necessary for this test are a California Job Case containing a font of 10 point body type, an empty California Job Case, a leader case of 10 point leaders, a composing stick set at 21 picas, 2 slugs and 6 leads 21 picas long, and an empty leader case.

Presentation

This test is based on alinement of words, Roman

numerals, Arabic numerals. Keeping in mind that Arabic numerals pointing to numerals in case are cast on an en-space, aline them and the end of chapter names. Roman numerals are capital I, V, L, M, and C. They aline just opposite to Arabic numerals. Make the final justification at the end or ends of leaders.

#### Utilization

This test checks multiple justification in the alinement of 3 columns and included leaders, centering a line, spacing out a line, the use of Arabic and Roman numerals.

It offers closely watched practice in composition and distribution of type; practice in centering a line, and spacing out another; practice in alining five lines in three columns; practice in alining Roman and Arabic numerals which aline opposite in the same job so a comparison can be made by the student; practice in the use of leaders.

#### Discussion

Test seven was started rather early in this study and has been the point of much work. It was used at first in three sizes of type and three additional lines but in this form it was apparent there was too great a gap between it and the straight composition of the preceding test. Many students did not seem to comprehend its execution. When brought to its present form of seven lines and all in 10 point type, a great deal of time was spent on its

reliability and correlation during February, March, and May, 1928.

The procedure at this time was to give the test as explained in presentation of the test. This was scored and numbered 1. About 10 days later, with no reference to it in the intervening time, the students were given the test as near as possible under the same conditions; this was scored and marked 2. The correlation was found to be .50.

An attempt was then made to devise a test which would duplicate the problems of this test and figure 21 is the result. This duplicate, number 3, was given in the middle of May near the end of the school year. It has an error in that the Roman numerals are omitted and two sets of Arabic numerals are alined.

Twenty sets of this test were procured in this way and the correlations worked out as follows: 1 to 2--.50, 2 to 3--.54, and 1 to 3--.39.

In checking Test 7 it was noted four students in the present group had taken the test in 1928. Their 2 scores, Test 7 in 1928, with their scores of Test 7 in 1929, were taken and a correlation found of .84. The correlation between 1, Test 7 of 1928 and Test 7 of 1929 is .67 for these four students.

MARKETED

		Shares
January 1	Butte & Superior	1
January 10	United Verde Extension	29
January 15	National Lead	139
January 25	Westinghouse Elec.	274
January 30	Continental Motors	310

Figure 21  
A Duplicate Test for Test 7 used for Correlation

MARKETED

		Shares
January 1	Butte & Superior	1
January 10	United Verde Extension	29
January 15	National Lead	139
January 25	Westinghouse Elec.	274
January 30	Continental Motors	310

Figure 22  
Duplicate test set in 10 point  
Century Roman

TABLE VII

DATA COLLECTED IN TEST 7

Student	Composition		Distribution		Score
	Time	Errors	Time	Errors	
Group I					
B	11:20	0	4:30	0	15:50
A	10:10	0	3:50	2	18:00
Group II					
C	14:10	0	4:40	0	18:50
E	21:00	0	6:30	0	27:30
D	25:25	0	6:15	3	37:40
G	29:30	1	6:20	0	38:50
J	27:30	3	6:22	0	42:52
I	17:10	4	6:55	4	44:05
F	29:20	3	6:20	4	52:40
H	29:15	1	7:40	11	61:55
Group III					
K	17:05	1	5:05	0	25:10
M	28:15	3	7:15	1	46:30
O	36:40	0	10:10	0	46:50
L	30:00	0	6:55	5	46:55
N	31:00	1	8:15	4	50:15
P	49:00	0	10:00	8	78:00
Q	34:50	6	14:00	33	132:50

December 30, 1929 to January 6, 1930

<sup>2</sup> fi	<sup>3</sup> fi	<sup>5</sup> Em	<sup>2</sup> Em	<sup>13</sup> 3/4	<sup>5</sup> k	<sup>40</sup>	<sup>1</sup> 1	<sup>2</sup> 2	<sup>3</sup> 3	<sup>4</sup> 4	<sup>4</sup> 4	<sup>5</sup> 5	<sup>6</sup> 6	<sup>7</sup> 7	<sup>8</sup> 8	\$		Æ	Œ	æ	œ
<sup>8</sup> J	<sup>12</sup> b	<sup>18</sup> c	<sup>18</sup> d	<sup>18</sup> e			<sup>30</sup> i	<sup>30</sup> s	<sup>12</sup> f	<sup>12</sup> g	<sup>3</sup> ff	<sup>9</sup> 9	<sup>16</sup> A	<sup>16</sup> B	<sup>10</sup> C	<sup>8</sup> D	<sup>18</sup> E	<sup>7</sup> F	<sup>7</sup> G		
<sup>9</sup> !	<sup>20</sup> l	<sup>16</sup> m	<sup>30</sup> n	<sup>20</sup> h	<sup>16</sup>		<sup>30</sup> o	<sup>12</sup> y	<sup>12</sup> p	<sup>12</sup> w	<sup>6</sup> ;	<sup>6</sup> :	<sup>8</sup> H	<sup>16</sup> I	<sup>5</sup> K	<sup>10</sup> L	<sup>8</sup> M	<sup>16</sup> N	<sup>16</sup> O		
<sup>6</sup> Z	<sup>1</sup>	<sup>5</sup>		<sup>12</sup>			<sup>4</sup>	<sup>10</sup>			<sup>En</sup> ×	<sup>Quad</sup> ×	<sup>8</sup> P	<sup>3</sup> Q	<sup>16</sup> R	<sup>16</sup> S	<sup>16</sup> T	<sup>5</sup> V	<sup>6</sup> W		
<sup>6</sup> X	<sup>8</sup> v	<sup>16</sup> u	<sup>30</sup> t	<sup>X</sup> 3 Em Spaces			<sup>30</sup> a	<sup>30</sup> r	<sup>6</sup> ;	<sup>6</sup> :	<sup>X</sup> Quads	<sup>8</sup> P	<sup>3</sup> Q	<sup>16</sup> R	<sup>16</sup> S	<sup>16</sup> T	<sup>5</sup> V	<sup>6</sup> W			
<sup>6</sup> q			<sup>10</sup>	<sup>x</sup>			<sup>16</sup>	<sup>10</sup>	<sup>81</sup> .	<sup>8</sup> -	<sup>x</sup>	<sup>8</sup> X	<sup>8</sup> Y	<sup>8</sup> Z	<sup>5</sup> J	<sup>2</sup> U	<sup>6</sup> &	<sup>6</sup> fi			

American Type Founders Company

CALIFORNIA JOB CASE

Figure 23  
Font proportion for Test 7

CONTENTS

	Page
Chapter I..... A Brief History of Printing	1
Chapter II..... The Great Industry of Printing	19
Chapter III..... Type	27
Chapter IV..... Type Cases	36
Chapter V..... Spacing Material	54
Chapter VI..... The Process of Setting Type	89
Chapter VII..... The Handling of Type Forms	106
Chapter VIII..... Proofing and Correcting Forms	125
Chapter IX..... The Distribution of Type	135
Chapter X..... The Printers' System of Measurement	147
Appendix..... Printing Equipment for High Schools	287
Glossary..... Technical and Trade Terms	289
Index.....	300

Figure 25  
Copy for Test 8

CONTENTS

	Page
Chapter I..... A Brief History of Printing	1
Chapter II..... The Great Industry of Printing	19
Chapter III..... Type	27
Chapter IV..... Type Cases	36
Chapter V..... Spacing Material	54
Chapter VI..... The Process of Setting Type	89
Chapter VII..... The Handling of Type Forms	106
Chapter VIII..... Proofing and Correcting Forms	125
Chapter IX..... The Distribution of Type	135
Chapter X..... The Printers' System of Measurement	147
Appendix..... Printing Equipment for High Schools	287
Glossary..... Technical and Trade Schools	289
Index.....	300

Figure 26  
Test 8 as set in 12 point Century Bold,  
6 and 8 point Century Roman

TEST EIGHT

Mixed Type and Multiple Justification

Purpose

Many jobs are set in several sizes of type, and the compositor must be ever alert to note changes of size or face of type. Up to this test all the work has been in 10 point type. This test changes to 8 point type for the greater portion, with a line each of 6 point and 12 point.

Test 7 was a skeletonized table of contents of seven lines while this is more nearly complete and consists of fifteen lines.

Materials Needed

The materials necessary for this test are a font of 12 point Bold type suitable for the heading, a case each of 6 point and 8 point light face Roman type, (these are each to be in a separate California Job Case), a case of 8 point leaders, three empty California Job Cases, a composing stick set at 25 picas long, and an empty leader case.

Presentation

This test is based on alinement of words, Roman numerals, and Arabic numerals. Pay particular attention to the markings on the copy and follow copy accurately. Arabic numerals are cast on en-spaces. Roman numerals are made with capital letters. Final justification is made at

the end or ends of leader portion of line.

### Utilization

This test checks the use of several cases of type in composing a piece of work, the use of a smaller sized type than has been used before, multiple justification in this smaller size, centering a line, spacing out a line, each in different sizes, the use of Roman numerals through X, and the use of Arabic numerals. This is the most complete application of Arabic numerals in this series, each numeral being used two or more times, figure 27.

It offers practice in composition from and distribution to several cases, the use of a smaller sized type than was used in other tests, multiple justification, centering and spacing out a line, the use of Roman numerals through X, and complete coverage of Arabic numerals.

### Discussion

This test and Test 7 were both derived from the same source, an advertising leaflet of eight pages announcing Mr. Ralph W. Polk's book, The Practice of Printing. The leaflet had a page devoted to the contents of the book, and this test represents the first 12 lines and the last 3 of 45 lines listing the chapters. There have been seven modifications tried of this page. Tests 7 and 8 represent approximately the two extremes. The page numbers have been changed to offer a complete collection of Arabic numerals.

TABLE VIII

DATA COLLECTED IN TEST 8

Student	Composition Time	Errors	Distribution Time	Errors	Score
Group I					
A	28:10	1	11:42	1	44:52
B	35:45	2	16:45	5	68:30
Group II					
C	35:40	6	16:40	4	78:20
D	51:20	5	15:30	3	87:50
G	58:35	3	19:50	3	93:25
E	52:55	3	22:14	8	100:09
I	54:30	5	21:15	5	100:45
F	74:32	3	19:45	0	103:17
J	58:43	6	20:30	9	115:13
H	67:45	5	23:10	10	125:55
Group III					
K	43:15	2	16:15	10	85:30
L	74:50	2	21:10	4	110:00
M	68:40	1	28:40	11	122:20
O	74:20	0	32:00	10	126:20
N	62:50	7	23:15	13	133:05
P	96:20	6	25:30	9	157:50
Q	91:00	23	32:15	66	324:15

January 6 to 16, 1930

<sup>1</sup> ñ	<sup>2</sup> ñ	<sup>3</sup> Em	<sup>4</sup> Em	<sup>5</sup> ¿	<sup>6</sup> ƒ	<sup>7</sup> k	<sup>8</sup> 40	<sup>9</sup> 1	<sup>10</sup> 2	<sup>11</sup> 3	<sup>12</sup> 4	<sup>13</sup> 5	<sup>14</sup> 6	<sup>15</sup> 7	<sup>16</sup> 8	\$			Æ	Œ	æ	œ
<sup>17</sup> J	<sup>18</sup> b	<sup>19</sup> c	<sup>20</sup> d	<sup>21</sup> e	<sup>22</sup> i	<sup>23</sup> s	<sup>24</sup> f	<sup>25</sup> g	<sup>26</sup> ff	<sup>27</sup> 9	A	B	C	D	E	F	G					
<sup>28</sup> ?	<sup>29</sup> /	<sup>30</sup> 7	<sup>31</sup> 7	<sup>32</sup> 37	<sup>33</sup> 21	<sup>34</sup> 16	<sup>35</sup> 8	<sup>36</sup> 9	<sup>37</sup> fi	<sup>38</sup> Q	<sup>39</sup> 2	<sup>40</sup> /	<sup>41</sup> 12	<sup>42</sup> /	<sup>43</sup> /	<sup>44</sup> 2	<sup>45</sup> 2					
<sup>46</sup> !	<sup>47</sup> l	<sup>48</sup> m	<sup>49</sup> n	<sup>50</sup> h	<sup>51</sup> o	<sup>52</sup> y	<sup>53</sup> p	<sup>54</sup> w	<sup>55</sup> >	<sup>56</sup> Em*Quad	H	I	K	L	M	N	O					
<sup>57</sup> Z	<sup>58</sup> 6	<sup>59</sup> 5	<sup>60</sup> 22	<sup>61</sup> 19	<sup>62</sup> 30	<sup>63</sup> 9	<sup>64</sup> 19	<sup>65</sup> Em*Quad	<sup>66</sup> Em*Quad	<sup>67</sup> 3	<sup>68</sup> 16			<sup>69</sup> 2								
<sup>68</sup> X	<sup>69</sup> v	<sup>70</sup> u	<sup>71</sup> t	<sup>72</sup> 3Em Spaces	<sup>73</sup> a	<sup>74</sup> r	<sup>75</sup> ;	<sup>76</sup> :	<sup>77</sup> ·	<sup>78</sup> X	P	Q	R	S	T	V	W					
<sup>79</sup> q	<sup>80</sup> 4	<sup>81</sup> 26	<sup>82</sup> x	<sup>83</sup> 22	<sup>84</sup> 31	<sup>85</sup> ·	<sup>86</sup> -	<sup>87</sup> Quads	<sup>88</sup> ·	<sup>89</sup> x	<sup>90</sup> 6	<sup>91</sup> 6	<sup>92</sup> 4	<sup>93</sup> 12	<sup>94</sup> 5							
											<sup>95</sup> X	<sup>96</sup> Y	<sup>97</sup> Z	<sup>98</sup> J	<sup>99</sup> U	<sup>100</sup> &	<sup>101</sup> m					

American Type Founders Company

CALIFORNIA JOB CASE

Figure 27

Font proportion of 8 point type for Test 8

SUMMARY

This study presents eight manipulative tests in hand composition and the steps used in their development, and a study of methods, whereby manipulative tests in any phase of hand composition may be devised. These eight tests include check and practice on the sixteen characters difficult to distinguish, and the California Job Case in its entirety. Composition, including justification, and distribution are given to check and furnish practice in a single line comprising the entire alphabet; a short paragraph stressing ligatures; a long paragraph providing for division of words, and straight composition just above the average degree in difficulty; punctuation marks; capital letters; Arabic and Roman numerals as used in multiple justification; centering a line; use of mixed type. The discussion covers correlations and relations found as the work progressed. The set of scores for a group of seventeen students is furnished with each test. The proportion of letters used in each test, compared to a standard job font, is also given.



CONCLUSION

"The only things a trainer can do is start, check, and test a learner in the practice of a habit", according to Dr. C. A. Prosser. (Mimeographed sheet "Laws of Habit", class work C. A. C. Summer Session 1929.)

As stated in the introduction these eight manipulative tests examine the student for the definite things named in each test under "Purpose". Each student is compared to the same standard in the same manner.

Manipulation tests are shown to be necessary to check students in most phases of hand composition, for it is a physical operation about which some students can write but are unable to accomplish the physical acts.

The tests as developed form a series which constitutes also a teaching device, for they bring before the student organized, graduated material and show, step by step, his ability in the particular field tested. Each test is felt to accentuate a needed point of factual information at a time when it can be tied up with his previous experience.

Accurate speed can only be developed by knowing the case perfectly, understanding spacing and justification well, and verifying each line carefully and accurately before it is justified. The results show that these tests do give instruction, drill, and practice in these points.

When students have comparisons made of their work with

others, and with their own from time to time, they are spurred to keep up to a standard and their interest is revived. In giving the tests there was a great deal of interest aroused and much favorable rivalry manifested among the seventeen boys whose scores appear in this study.

"Tests of progress, given at periodical intervals, are needed to keep pupils up to a reasonable standard of interest in their courses and for purposes of grading students at the end of the year or at the end of the course". Mr. H. A. Toops, in *Trade Tests in Education* (13) (p. 2).

Manipulative tests offer to the student a yard stick by which to measure his own accomplishments. Grades are simply comparisons of different students, consciously or unconsciously made. This procedure as given in this paper gives the teacher a time and error check on the same piece of material for each student, making the grade a more accurate comparison.

It is believed that the method developed will make it possible for the trainer to devise manipulative tests for other phases of hand composition which the writer has considered of lesser importance.

Tho this work has been done with small groups it is felt that it will have value for larger groups and for other situations.

BIBLIOGRAPHY

(1)

Underwood Expert Typing Awards, Underwood Award Plan  
1926 (Revised 1928). New York City, Underwood  
Typewriter Co. 1928, p. 24.

Remington Rand Awards, A System of Prizes Awarded.  
Buffalo, N. Y. Remington Rand Business Service  
Inc. 1928, p. 22.

Royal Awards. New York City. Royal Typewriter  
Company, Inc. Fifth edition, p. 23.

Woodstock Honors, Full List of Awards for Proficiency  
in Typewriting. Woodstock, Ill. Woodstock  
Typewriter Co. 1927, p. 12.

Typing Awards 1929, L. C. Smith and Corona Typing  
Awards. Syracuse, N. Y. L. C. Smith and Corona  
Typewriters, Inc. 1929, p. 24.

(2)

Wells, George K. and Laubach, M. L. Industrial Arts  
Tests, A Group of Knowledge Tests, Printing.  
Peoria, Ill. Manual Arts Press, 1929.  
Manual, p. 8 and Test p. 7.

- (3)  
Hunter, William L. Completion Tests for Printing,  
P-1. Shop Tests Series No. 2. Peoria, Ill.  
The Manual Arts Press, 1928, p. 1.
- (4)  
Lessons in Teaching, A Correspondence Course.  
International Typographical Union Teachers  
Training Unit XIV--Lesson 5. Indianapolis,  
Indiana. International Typographical Union,  
1926, p. 9.
- (5)  
Polk, Ralph W. Elementary Printing Job Sheets.  
Peoria, Ill. The Manual Arts Press, 1928,  
p. x + 51.
- (6)  
Karch, R. Randolph. Junior High School Printing.  
Peoria, Ill. The Manual Arts Press, 1928, p. 175.
- (7)  
Selvidge, R. W. and Witt, Harvey Arthur. Instruction  
Manual for Young Printers. Peoria, Ill.  
The Manual Arts Press, 1926, p. 177.
- (8)  
Type, Typographical Technical Series for Apprentices  
(64 volumes) Vol. I. Washington, D. C.  
United Typothetae of America, 1918, p. x + 35.

- (9)  
Polk, Ralph W. The Practice of Printing. Peoria, Ill.  
The Manual Arts Press, 1926, p. xiv + 296.
- (10)  
Elements of Composition, Standard Textbooks on  
Printing. Chicago. Department of Education,  
United Typothetae of America, 1926 (Revised),  
p. x + 188.
- (11)  
Visual Aids for Instruction in Printing, A series of  
charts illustrating correct methods in various  
technical processes. Jersey City, N. J.  
Educational Department, American Type Founders  
Company. 24 charts.
- (12)  
Polk, Ralph W. Vocational Printing. Indianapolis,  
Ind. Guy M. Jones Co., 1918, p. vi + 243.
- (13)  
Toops, Herbert Anderson. Trade Tests in Education.  
Contributions to Education No. 115. Teachers  
College, Columbia University, New York, 1921,  
p. vi + 117.
- (14)  
Good, Carter V. How to Do Research in Education.  
Baltimore. Warwick and York, Inc., 1928, p. 298.

A B S T R A C T  
O F T H E T H E S I S  
----  
A S E R I E S  
O F  
M A N I P U L A T I V E T E S T S  
I N  
H A N D C O M P O S I T I O N

----  
Submitted by  
Harry Linton Crockett  
In partial fulfillment of the requirements  
for the Degree of Master of Science  
Colorado Agricultural College  
Fort Collins, Colorado

June 16, 1930

A Series of Manipulative Tests  
In Hand Composition

The printing trade today involves many highly developed machines and a high degree of specialization in workmanship. Yet, hand composition remains the basis of instruction for the typographer.

This study is the result of several years observation involving an analysis of the elements which go to make up accurate speed in students of high school and trade classes in printing.

Experimentation and observation brought the conclusion that written tests could not be made to cover phases of manipulative work and the eight tests were worked out to cover part of the manipulation phase, forming the basis for the development of a method in the use of manipulative tests in hand composition. The eight tests are offered to check students, as a teaching device, a method of developing accurate speed, a device to increase the level of the student's interest and keep him up to a reasonable standard. A score is obtained which can be used to assist in grading the student.

As no tests of this nature were available the first work was patterned after the typewriting tests which have been worked out to a high degree of efficiency. With this as a beginning, students were given selected pieces

of copy to set up and distribute, their work timed and the results carefully read and cases inspected. In order to arrive at a score the errors in composition and distribution were penalized, the penalty figure was found by timing the work of correcting these errors and taking the average time.

The record sheets for these tests are of two forms. The form used for the first two tests, which are distribution tests, is a ruled sheet laid off in columns; student's name, the time consumed to accomplish the work, list of errors found, total number of errors found, and score. The second form is for composition-distribution tests and is printed on news stock, 6 by 9 inches. On the front, spaces are provided at the top for the date, and student's name, and at the bottom are spaces for composition time, composition errors with a penalty of 3, distribution time, distribution errors with a penalty of 2, and score. The central portion of this page is blank and furnishes an adequate space for the student to pull a proof of his work in composition which is read and marked on this page. The reverse side is used to record errors in distribution when the case is inspected, and provides spaces for number, letter, and box, total and initials of person inspecting.

The tests have been developed over a period of years but not in the order presented, to furnish a set of scores

which were comparable, the series of tests were given to all the students enrolled in composition in Phoenix Union High School during the fall term of the school year 1929-1930. This enrollment consisted of 21 students, four of whom were dropped through school routine, leaving a class of 17 students which was divided into 3 groups. Group I, seniors who had taken composition 2 years or more previously; Group II, students who had taken composition one year; Group III, beginners. The table at the end of each test gives the result of each student's work in that test. The name of the student was not used, but a letter was given to represent him in all tables.

In order to furnish a basis of comparison between the number of letters used in each test with a given standard, Tests 3, 4, 5, 6, 7, and 8 are provided with font charts. This shows the standard lay-out of the California Job Case and gives the number of each letter, figure or character found in a standard 15A--30a Job Font, which is the unit of purchase of small complete collections of type, and is proportional to its use. Also this gives the number of each letter, figure or character used in the test.

The first two tests involve distribution only. In each case the student is furnished a selected collection of type, a galley to place them on, a composing stick in

which to place them as he picks them up, and a clean blank California Job Case in which to distribute them. The collection of type is thoroughly mixed and placed on the galley, and he is told to place them in the stick, and distribute them into the correct boxes of the case in the shortest time. The time consumed in this operation is noted. A competent person inspects the case noting the errors on the record form. His score is found by adding his time to 2 for each error, the lowest score is the best.

Test 1, Differentiation of Similar Characters, which involves distinguishing similar characters, confused in the beginner's mind by the necessity of casting type in reverse so it will print positive. Five each of these sixteen characters make up the collection of type used for this test.

Test 2, California Job Case, verifies the basis for hand composition. This case is generally used to hold a font type, and must be known perfectly for the student to make progress in composition. Three each of every letter, sign, numeral, mark, and space provided for in this case, constitute the collection of type for this test.

Tests 3, 4, 5, 6, 7, and 8 are composition-distribution tests and involve the setting in type of specific material from uniform copy. Proofing this type on the

record sheet, distribution of this type into clean blank cases. The proof is read and all errors marked. The case is inspected and errors noted. The time used in composition and distribution are each noted on the record sheet and penalties added for each error. The composition penalty is 3, the distribution error is 2.

Test 3, A Single Sentence Quotation, offers a complete use of the lower case alphabet and quotation marks, a single line of justification including the mechanics of the tests which follow, and serves to acquaint the student with the routine of this method.

Test 4, Short Paragraph Including Ligatures and Factual Information, provides several lines of justification, use of 3 of the 6 ligatures in common use. A ligature is a combination of 2 or 3 letters cast on one piece of type. The factual information is deemed of value because the work is so forcefully brought to the student's attention.

Test 5, Longer Paragraph Stressing Division of Words and Punctuation, supplies at least 10 lines of straight composition above the average degree of difficulty. This material can rarely be set without the division of some words which is important in printing, and furnishes use of punctuation.

Test 6, Capital Letters, involves capital letters

only, this portion of the case has not been used to any extent in this series.

Test 7, Centering; Alinement of Words, Arabic Numerals, and Roman Numerals, checks on multiple justification in the alinement of 3 columns, involving the use of both Arabic and Roman numerals.

Test 8, Mixed Type and Multiple Justification, examines the student on the use of several more lines than the preceding one. Arabic numerals are more generously used.

Printed copy for each test as it is given to student, and as it appears correctly set, is submitted at the beginning of each test.

The tests are divided into; Purpose, Materials Needed, Presentation, Utilization, and Discussion. Discussion includes the source of the test, previous use made of it, comparison with similar tests devised and former uses.