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An Objective evaluation of music in the school.

Harold C. Hemond
University of Massachusetts Amherst

AN OBJECTIVE EVALUATION of MUSIC IN THE SCHOOL

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AN OBJECTIVE EVALUATION OF MUSIC IN THE SCHOOL

by

HAROLD C. HEMOND

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requirements for the Master of Science degree
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1939

TO MY PARENTS

WHOSE INTEREST AND ENCOURAGEMENT

HAS MADE POSSIBLE

THIS STUDY

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AN OBJECTIVE EVALUATION OF MUSIC IN THE SCHOOL

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THE INTRODUCTION

CHAPTER 1

THE INTRODUCTION

The musically minded theorist has long been interested in the problems of the value of music in a liberal education, and the value of music as an educational tool, and the value of music as a mind-trainer. As will be indicated in the next chapter, even the old Greek educators believed music to be of great importance in education, and they included music as one of the Seven Liberal Arts. This interest has continued through the years, and today the reader can find a number of articles in recent periodicals extolling the educational qualities of good music.

(1) Intrinsic Values of Music: The observing reader, in his review of past and current musical literature, will note, however, one striking characteristic: the articles are generally of a theoretical or philosophical nature. Most often, the writers discuss some phase of the intrinsic values of music. An enlarged discussion of these articles, and of the various claims made by them for music, is presented in chapter two.

(2) Motivation of Other Studies: One of the more insistent claims for music is concerned with its power to motivate the pupil in all of his various studies. Mathews[1] says: "Through its influence upon the unconscious state

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1. Mathews, W. Smythe Babcock Music, Its Ideals and Methods p 155

of mind, music is one of the most potent instrumentalities in education." Birchard[2] makes this statement: "Music opens wide the sources of power and vision in man." And Gunther[3] adds this idea: "Instruction in the art of music should be the first stepping stone in life. Through it everything else will become more readily comprehended." Plainly these writers feel that music has some intrinsic power which serves unconsciously to stir the individual, and causes him to make great intellectual achievement.

(3) Objective Studies Lacking: The claim that music has a motivating power is a subjective one. There is a definite lack of objectivity concerning this point; as indeed, there is a lack of objectivity in all phases of the field of music. The writer does not wish to precipitate a discussion as to the relative merits of subjective and objective information; nevertheless, he maintains the belief that objective data could certainly do music no injury. Thus an objective study concerned with the proposition that music has a motivating power would be valuable.

(4) Measurement of Music Values: The value of music in school must be judged, of course, solely by its effect on the results or outcomes of education. And there are many outcomes of education; some are ethereal, others are more

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2. Birchard, C. C. "What is Education Without Music" Musician XXXVIII (July 1933) p 5
3. Gunther, Katherine "Music an Educational Essential" Musician XLII (September 1937) p 155

practical. For purposes of an objective study, the more esthetic results have to be eliminated from consideration, for there is as yet no way to measure these. This leaves practical outcomes. To measure the practical benefits, the method available that offers the greatest degree of objectivity is a consideration of the school marks. Hence, the value of music is guaged here by reference to school marks.

(5) Definition of Music: The necessity for defining the term "music" has risen. The definition is a broad and inclusive one. For purposes of this study, all vocal, as well as all instrumental, participation will be referred to under the general term of "music".

(6) This Study: This study is concerned with an attempt to present objective information about the value of music in the school. More especially, this study attempts to discover the extent to which music may be considered to have general motivating influence on all school work. The method of this study involves a consideration and comparison of the school grades of pupils participating in music with the grades of pupils not participating in music to any great extent.

CHAPTER 2

REVIEW OF THE LITERATURE

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REVIEW OF THE LITERATURE

(1) Claims of Emotional Value for Music: That music has great educational value is a belief that apparently has been held for many years. As early as the time of the Greeks, we can find evidences of prevailing thought as to the value of music. Plato[1] is quoted as having said: "The education of heroes should be gymnastics for the body, and music for the soul. Begin the education with music." The general feeling of the Greeks with regard to music is expressed by Campbell[2]:

> Intellect and emotion are each dependent upon the other as the head and the body. Nothing to excess implies the use of a balance of educational resources, both intellectual and emotional.

Thus we have presented the idea that music has a great emotional value which liberal educators should utilize. Nor has the idea of emotional value of music gone without recognition from modern writers. Recently, Witherspoon[3] has said:

> Education must pay adequate attention to the training and development of the emotions. It must give emotions as wide an opportunity as it gives the cold-blooded reason and thought.

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1. Campbell, L. B. "Music Education and Youth" Musician XLII (March 1937) p 48
2. Ibid. p 48
3. Witherspoon, Herbert "Need for Music in General Education" Musician XL (March 1935) p 7-9

In the same general vein, Ritter[4] has said:

> Music is eminently humanizing and social: it softens and neutralizes the materialistic aims of our time; it keeps up a thread of ideality between man's mind and soul.

(2) Broader Claims for Music: Modern writers are not content to make a claim purely of emotional value for music. Many writers will extend their claims a great deal further. Birchard[5] says: "Music opens wide the sources of power and vision in man." Gunther[6] pushes this claim a bit further with:

> Instruction in the art of music should be the first stepping stone in life. Through it everything else will become more readily comprehended. From music as a center, educational paths spread in all directions.

Mursell and Glenn[7] add this thought: "Musical ability is not a lonely ability. It has natural affinities for other excellences." Mathews[8] makes more specific claims for music:

> To appreciate fine musical effects, to discriminate closely between them, and to have so perfect a concept of them as to be able to reproduce them at call, is to have acquired a refined and trained

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4. Ritter, Frederic Louis Two Lectures p 26
5. Birchard, C. C. "What is Education Without Music" Musician XXXVIII (July 1933) p 5
6. Gunther, Katherine "Music an Educational Essential" Musician XLII (September 1937) p 155
7. Mursell, James L. and Glenn, Mabelle The Psychology of School Music Teaching p 16
8. Mathews, W. Smythe Babcock Music, Its Ideals and Methods p 108

> sense of hearing, which will have many relations to other departments of activity, besides tending to the development of greater brain power, in just the same way as the brain is developed by every added activity of sense perception.

Again, Mathews[9] makes this statement: "Through its influence upon the unconscious state of mind, music is one of the most potent instrumentalities in education, if we rightly employ it." But Witherspoon[10] seems to have reached the peak of the claims in this quotation:

> I would claim for music that it contains practically the elements of physics, in conjunction with a power of inspiration, which more than any other art, or science, or education, can develop, purify, and improve our use and understanding of those institutions and instincts upon which our real existences are founded.

So, we now have a picture indicating that musical theorists have great faith in the ability of music to produce many effects on both the spiritual and physical natures of man.

(3) Music in the School Curriculum: Let us turn now more closely to the school situation. Let us see what the writers have to say concerning the introduction, and the use of music in the schools. Howard[11] discusses the first attempts (in 1832) to bring music into the schools. He says:

> In a few years the school board began to be impressed, and some of its members

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9. op. cit. p 155
10. Witherspoon, Herbert "Music as a Vital Factor in Education" Proceedings Music Teachers National Association 1926 vol. 26 p 54
11. Howard, John Tasker Our American Music, Three Hundred Years of It p 324

> saw that they were wrong in fearing that music study would divert the pupils from their regular tasks. Those who studied music had an added zeal for other subjects.

The early resistance to music has been dispelled so that now, according to Dann[12]:

> Educators of vision recognize the humanizing, refining power of music in life; its great social, vocational, and educational value; and welcome its inclusion in the school curricula.

Morgan[13] strengthens this feeling by: "Music and other arts are not fads and frills, but important parts of our educational curriculum." In connection with the place of music in the curriculum, we find Earhart[14] advocating the vocational use of music: "Music, as a vocational subject, far outranks any of the regular or academic subjects." But Jason[15] advocates music as a moral discipline, for:

> It teaches lessons of co-operation and teamwork, gives a sense of pride and self-respect - yet curbs the ego, cultivates a taste for beauty and all worthwhile things.

Gehrkens[16] argues in favor of a correlation of music with other subjects: "It is music and the other arts that make

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12. Dann, Hollis "Music as a Major Subject in Education" Musician XXXV (October 1930) p 12
13. Morgan, R. V. "Music as Education" Education LIV (October 1933) p 91-3
14. Earhart, Will "The Value of Applied Music as a School Subject" Proceedings Music Teachers National Association 1919 vol. 14 p 168
15. Jason, J. "Music and Youth" Musician XLI (October 1936) p 152
16. Gehrkens, Karl W. "Correlation, Its Philosophy and Practice" Music Supervisors Journal XX (Feb. 1934) p 16-7

life interesting and bearable. So, in dealing with music, we must teach it not in isolation, but as a part of the common experience which is the life of humanity." And Mursell[17] sums up music as an ideal school activity, for:

> It calls for and supplies group activities; it calls for expressive activities; it calls for creative activities; music activities tend to set their own standards (in contrast to many activities where the teacher must set the standard); music activities can be organized for a sequential advance; there are possibilities for diversified activities.

(4) Objective Studies: We see, however, that in the discussion so far presented, there has been no objectivity apparent. The writers have all been entirely subjective. Let us now see what has been done in the way of objective measurement in the field of the value of music. Here we find a woefull dearth of material.

(a) General: Kwalwasser[18], and Moore[19], independently have arrived at the conclusion that general intelligence is a consideration quite independent of musical intelligence. Crichfield[20] has found that there is no relation between musical talent and mathematical ability, while Moore[21] has

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17. Mursell, James L. Human Values in Music Education p 112
18. Kwalwasser, Jacob "Report of the Committee on Tests and Measurements" Proceedings Music Teachers National Association 1930 p 264-8
19. Moore, Margaret "Factors Involved in the Measurement of Certain Abilities and Capacities Related to Music" Thesis George Washington University
20. Crichfield, F. W. "A Study of the Correlation Between Music Talent Test Scores and Arithmetic Marks for Pupils in Grades 5, 6, 7, 8" Thesis Indiana State Teachers College
21. op. cit.

shown that no relationship exists between musical ability and reading. Parker[22] finds that the correlation coefficients between grades received in music and general school gredes range from 0.33 to 0.43. These studies all contribute isolated facts which have little bearing on this study.

(b) Scott's Study: Two studies are noted, however, which do give some bearing on this study. Scott[23] found that the scholastic average of pupils who were engaged in private home music study was 82.16 as compared with a scholastic average of the whole school of 79.10. This indicated to him that the serious minded music student was above average in industry and accomplishment. The actual amount of the 3.06 difference which can be attributed to music rather than to other factors is not discussed.

(c) Webster's Study: The other study is that of Webster[24]. He calls attention to a grade study of music pupils in the Minneapolis schools. The average grade achievement of 700 music pupils is compared with the average grade achievement of an equal number of pupils not taking music and selected at random. The purpose of the study was to show the comparative "mental strength" of the two groups, and the results quoted by Webster seem to show a certain

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22. Parker, A. B. "The Relationship of Grades in Music Classes to Grades in Other School Subjects in High School" Thesis University of Southern California
23. Scott, Frank A. "A Survey of Home Music Study" Proceedings Music Teachers National Association 1919 vol. 14 p 171-9
24. Webster, W. F. "Music and the Sacred Seven" Music Supervisors Journal XIII (May 1927) p 33, 45

relationship between success in music and success in other subjects as compared with the control group. In this work, it was found that the music students had 18% "A" grades, and 3% "F" grades, while the average figures for the pupils not taking music were 10% "A", and 7% "F" grades[25]. The study can be criticized, however, on the grounds that the control was poor, no mention was made of what grades were considered, nor was there any attempt made to justify, explain, or investigate further the discovered tendency.

(5) Summary: We find writers discussing value of music from theoretical and subjective viewpoints; we find some writers discussing the place of music in the school; and we find some few persons attempting to measure certain values of music in the school. But this review does little more than to suggest the direction of the answer to the question that the writer of this study has raised. As yet we have not discovered exactly how much difference a real participation in music will make on the scholastic grades of the average high school pupil. Since we wish to know what this effect of music is, and there is no available information, we must make a study which will supply the desired information. This, the writer has attempted to do.

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25. See Appendix A for verification of these figures by certain data obtained in this study.

CHAPTER 3

STATEMENT OF PROBLEM AND SUMMARY OF PROCEDURE

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(1) Problem: In order to crystallize attention on the method used in this study, let us state here the problem of this study:

> With the average senior high school pupil, does there seem to be any benefit in the direction of increased achievement in general school work by virtue of participation in the musical activities of the school?

(2) Subjects: The pupils used in this study were seniors, class of 1939, in eight high schools in Western Massachusetts. Of these eight schools, three are typical large schools of the Valley League, three are medium sized schools from the Valley Wheel group, and the remaining two are small schools representing the Hampshire League. Thus, the data gathered can be considered to be representative of the Western Massachusetts area. The names of the schools used, along with the name of the league which each one represents, are shown in List 1. A Map showing the locations of these schools in Western Massachusetts can be found on page 19.

In number, the pupils used were 484, of which 227 took an active part in music, and 227 made no special effort to participate in the school musical activities. List 2 shows

LIST 1

The Schools Used in This Study, and the League Which Each Represents.

Greenfield High School	Valley League
Holyoke High School	Valley League
Westfield High School	Valley League
Ludlow High School	Valley Wheel
Ware High School	Valley Wheel
West Springfield High School	Valley Wheel
Amherst High School	Hampshire League
South Hadley High School	Hampshire League

the distribution of these pupils in the various schools used. The number of pupils indicated for each school is, in each case, the total of an equal number of music and non-music pupils. Thus, the list indicates that 54 pupils from Greenfield high school were used; and this will be interpreted to mean that 27 were musical participants, and the other 27 did not take part in musical affairs.

(3) Material: The material used in this study is that which is generally found on the cumulative record cards of the pupils in each school. The material found on these record cards was roughly considered under two main sections: (a) information for use in the pairing of pupils, and in the control of this study (see Chapter Four); and (b) the information for use in the comparison of the music pupils

LIST 2

Distribution of the Pupils in the Schools Used.

Total number of pupils	School
60	Amherst
54	Greenfield
92	Holyoke
40	Ludlow
68	South Hadley
42	Ware
56	Westfield
42	West Springfield
454	Total

with the non-music pupils, which was the scholastic grades of each pupil (see Chapter Five).

(4) Procedure: We wish to know the effect of a participation in music on the average pupil; hence, our method must be one which actually touches a group of average pupils. The method must also be one which will measure the effect of music alone. And therefore, the most suitable device would seem to be the method of matched pairs. If we can find a large enough number of pairs of students who are alike in every respect except participation in music (one of each pair participates to a great extent, and the other participates rarely), and if we note the difference between

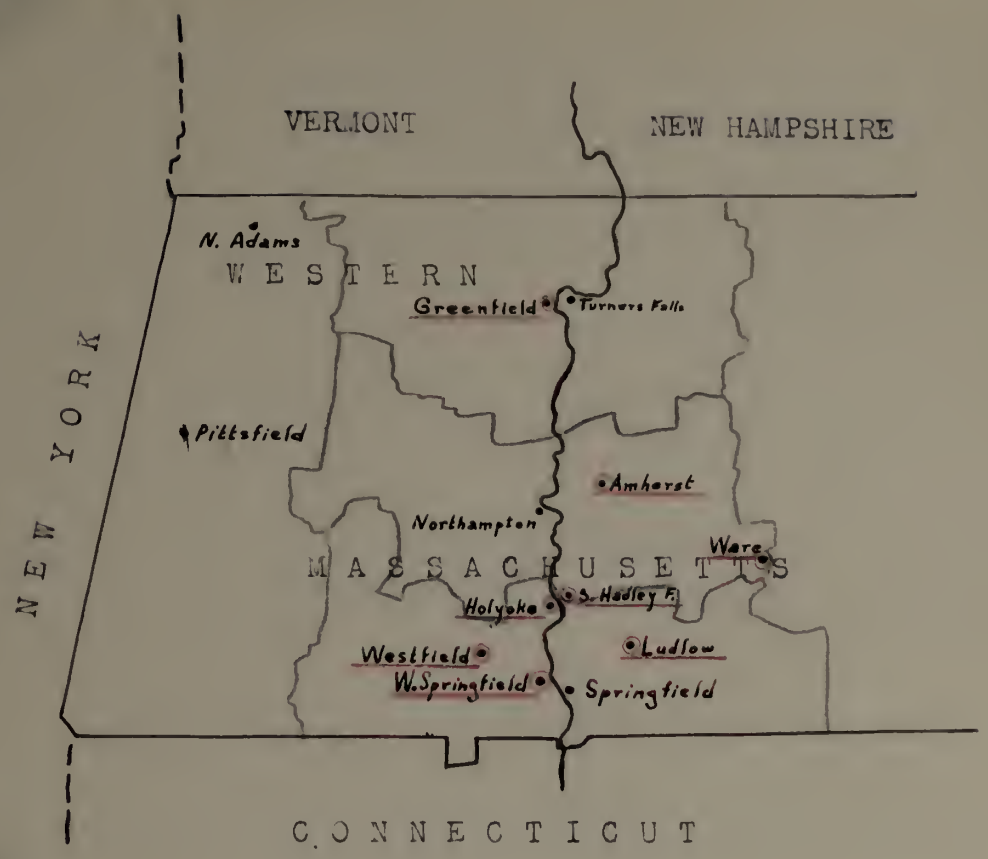
the scholastic grades of each pair, and if we average this difference, then, under ideal conditions, we have some justification for presuming that this difference is due to participation in music. The method used in this study attempts to approach as nearly as possible to this ideal condition for the matched pair method.

(a) Pairing of Pupils: The method, then, involves pairing of music pupils with non-music pupils. The items considered in pairing were those items which had an effect on an individual's scholastic marks. Of course, the items that could have an effect on scholarship of the individual are probably as numerous as the individuals themselves. To have considered all these items in pairing would have been an obvious impossibility. Hence, it was necessary to select some of the more potent factors, and to restrict pairing to these. The effects of other less important factors were left to the "Law of Averages" to iron out. Thus, the items by which pairings were made are:

(i) Sex,
(ii) Intelligence quotient,
(iii) General school average the year before the start of this study,
(iv) Total amount of time spent in extra-curricular activity,
(v) The general course of study,
(vi) The general school environment.

(b) Interpretation of Pairing Items: The items used in pairing need some interpretation. For we did not expect, nor did we find, that the pairs would be exactly similar in all these items. However the factors were held to as closely as possible.

ILLUSTRATION 1



Map of Western Massachusetts

showing

Locations of the Schools

Used in This Study

(Underlined with red)

(i) The sex item was strictly observed; boys were paired with boys, and girls were paired with girls.

(ii) The intelligence quotient was not allowed to vary in any one case by more than five points.

(iii) The school average with each pair was restricted to the difference between a "C-" and an average "C".

(iv) The time spent in extra-curricular activity was not allowed excessive variation.

(v) Course of study was held as invariable as possible, although some variation was unavoidable; but one rule was maintained: college preparatory pupils were never paired with commercial students.

(vi) The general school environment was never violated, pupils always being paired with another pupil from the same school.

The items of intelligence, scholastic average the year previous to the study, and extra-curricular time, were able to vary slightly with individual pairs. However, it was required that the averages of these items for each group must be similar. This procedure was deemed valid and logical because of the fact that the conclusions of this study are all to be formulated in terms of averages. For a summary of the control figures see page 33.

(c) Collection of Data: The items of data relating to the selecting of the musical and non-musical pupils, to the obtaining of information for use in pairing, and to the recording of the marks of the pupils used in this study, are

all separate items. However, in practice, in the actual collecting of the data, it was found inadvisable to collect them separately, because of the amount of time that would be involved. It was found to be most efficient merely to copy, in each school, the cumulative records of all the seniors on to a separate card for each pupil. For a sample of this card see page 22. The grouping and pairing was then carried out at a later date.

(d) Tabulation of Data: The tabulation of the data presented some considerable work, as well as a few problems. For it was found, while collecting the data, that every school visited had a different system of marking and record keeping. It was necessary, then, to translate the marks to a common scale. In view of the fact that number grades were needed for comparing the groups statistically, the common scale used was the scale of 100%. The marks in all the schools were translated to this scale[1]. For purposes of the actual tabulation of the marks, this distribution involving five point groups was used:

95 - 100
90 - 94.99
85 - 89.99
80 - 84.99
75 - 79.99
70 - 74.99
65 - 69.99
60 - 64.99

With this distribution, all failing scores were placed in the 60 - 64.99 group. The distribution had the advantage

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1. This conversion scale may be found in Appendix C, and a sample of an actual tabulation sheet is in Appendix D.

ILLUSTRATION 2

Sample of Data Cards

Music Card

132 Boy Col. Orchestra "
78

1	2	3	
E 88	E87	E86	2: 3: 4: 5:
La$_2$ 75	Phys. 85	Chem 86	8: 11: 12: 17:
F$_1$ 83	F$_2$ 80	Rev. Math 75	18:
Geom. 78	Ad. Alg 75	F$_3$ 70	
		Hist. 87	45: 47

Non-Music Card

134 Boy Col. Leader Club. 41
77 A.A.A.

1	2	3	
E 80	E84	E83	2: 3: 4: 5
F$_1$ 70	F$_2$ 75	F$_3$ 65	11: 12: 17
Geom. 70	Alg$_2$ 60	Chem. 76	
M. Dr. 78	M. Dr. 85	Fu. Spk. 90	41
Printd. 73	Printd. 85	Hist. 80	45: 47
	Anc. Hist. 72		

I.Q., Sex, Curriculum, Activity, Pair series number
Scholastic Average

Marks are recorded in this space. Symbols are used to indicate the various subjects.

These are key numbers to marks used from this card.

Each subject had its key number.

Key to the data shown on above cards.

of easy statistical computation, and more important, it served to iron out any minor inequalities between the marking systems of the various schools.

(e) Technique of the Comparison of the Two Groups: The music pupils are compared with the non-music pupils on the basis of the averages of the scholastic grades made by the members of each group. Since the control figures are such that the average music pupil is similar to the average non-music pupil in every respect that would effect school marks except participation in music, then any difference that we shall find in the averages of the school grades can be largely attributed to this participation. The critical ratio technique is used to indicate the reality of the differences in the averages of the marks of the two groups. For a discussion of the critical ratio technique see Garrett[2].

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2. Garrett, Henry C. Statistics in Psychology and Education p 118-148

CHAPTER 4

SUMMARY OF CONTROL DATA

CHAPTER 4

SUMMARY OF CONTROL DATA

This chapter is devoted to a presentation of the evidence that the two groups were under a good control; and that the groups, at the beginning of the sophomore year (the starting point of this study), were similar in all respects that influence scholastic marks except participation in music. There follows successively the control information concerning:

(1) Scholastic average
(2) Intelligence quotient
(3) Extra-curricular time
(4) Course of study
(5) Distribution of sex
(6) School environment

(1) Scholastic Average: The results of the two groups concerning scholastic average is presented in Table I. It will be noted that the mean for each group is 81.8. Since there is no difference in the means[1], the critical ratio is also zero. The critical ratio is the statistical concept used by this study to determine whether or not differences between two sets of data are real. A critical ratio of zero indicates that each group has a 50-50 chance of being better

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1. The fact that the scholastic average was the first numerical item considered in pairing will account for this condition, which would otherwise be a most remarkable coincidence.

TABLE I

Analysis of the Scholastic Average of Each Group the Year Before the Start of This Study

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
93	13	13	5.7	5.7
90	3	4	1.3	1.8
87	25	24	11.0	10.5
84	53	49	23.4	21.6
81	29	28	12.8	12.3
78	36	42	15.9	18.5
75	40	45	17.6	19.8
72	18	12	8.0	5.3
69	3	5	1.3	2.3
66	6	4	2.6	1.8
63	1	1	0.4	0.4
	227	227	100.0	100.0

	Music	Non-Music
Mean score[x]	81.8	81.8
Standard deviation	6.2	6.1
Standard dev. of mean	0.4	0.4
Difference between means	0.0	
St. dev. of difference	0.56	
Critical ratio	0.0	

x. See Appendix B for a sample of a complete statistical computation.

than the other group. For a complete discussion of the critical ratio technique, see Garrett[2]. Since the ratio here is zero, the indication is that there is no real

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2. Op. cit. p 118-148

difference between the groups on the basis of scholastic average the year before the start of this study. This item accounts for any differences in the marks of the two groups that would have been made by virtue of the fact that some pupils seem naturally to study harder than other pupils.

(2) Intelligence Quotient: A comparison of the averages of the intelligence quotients of the pupils in each group is shown in Table II. The fact that the difference between the means is only 0.2, and the critical ratio of this difference only 0.1, serves to indicate that there is no real difference between the two groups on the basis of the item of intelligence; and hence, intelligence will not be a factor in causing differences in school marks. The fact that the means are roughly 111 is an indication that the pupils used in this study constitute a group well above the average in intelligence; and thus, we can expect that the school marks of both groups will probably be above average.

(3) Extra-Curricular Time: The amount of time spent in extra-curricular activity by each group was investigated. This time is expressed in a number of hours per week per year spent in the activity. List 3 shows the number of time periods of hour/week/years assigned to each activity. It is important that the amount of time spent by each group in outside affairs be relatively equal. Otherwise, the claim could be made that one group has higher average grades because the members of that group have more time to study. Using the figures from List 3, the average extra-curricular time was

LIST 3

Hour/ week/ years Assigned to Each Extra-Curricular Activity.

Activity	Time
Sports	
Football	3
Basketball	3
Baseball	3
Hockey	2
Soccer	2
Track	2
Tennis	1
Golf	1
School paper	3.5
Cheer leader	2
Student council	1
Clubs (each)	1
Dance committee	0.5
Class officer	0.5
Band	1
Glee club	1
Orchestra	1

TABLE II

An Analysis of the Intelligence Quotients of the Pupils in Each Group

Score	Number receiving score		Percent receiving score	
	Music	Non-Music	Music	Non-Music
155	1	1	0.8	0.8
.....				
140		1		0.8
135	4	5	3.1	3.7
130	9	6	6.9	4.6
125	14	8	10.8	6.1
120	8	10	6.1	7.7
115	13	20	10.0	15.4
110	14	15	10.8	11.6
105	17	13	13.1	10.0
100	17	20	13.1	15.4
95	14	9	10.8	6.9
90	10	13	7.7	10.0
85	5	7	3.7	5.4
80	4	2	3.1	1.6
	130	130	100.0	100.0

	Music	Non-Music
Mean score	110.7	110.5
Standard deviation	14.7	14.4
Standard dev. of mean	1.3	1.3
Difference between means	0.2	
St. dev. of difference	1.8	
Critical ratio	0.1	

computed for each group. Table III indicates that the music group spent an average time of 1.6 hr/wk/yr in outside activities, while the Non-Music group spent an average time of only 1.3 hr/wk/yr. No academic credit is (generally) given

TABLE III

An Analysis of the Time Spent in Extra-Curricular Activity by Each Group.

Music Group	
Total hours	354.5
Pupils considered	227
Average time	1.6 hr/wk/yr
Non-Music Group	
Total hours	155.5
Pupils considered[x]	122
Average time	1.3 hr/wk/yr

x. Data on this point was available only in these schools: Holyoke, Ludlow, South Hadley, and West Springfield.

for the activities other than music; and hence, the tendency is for these other activities to be recorded only in spasmodic intervals. It is reasonable, then, to suppose that our non-music group has spent some extra time which the records do not show, and thus, that groups average time really should be higher than the 1.3 hr/wk/yr that is found in Table III. With this consideration, it is apparently true that both groups spend about an equal amount of time in their extra-curricular activities.

(4) Course of Study: Table IV indicates the distribution of the general course of study among the pupils used in this work. Notice that the music group has 23 more College Preparatory than the non-music group; but that the

TABLE IV

An Analysis of the Distribution of the Course of Study of the Pupils.

Course	Number in course		Percent in course	
	Music	Non-Music	Music	Non-Music
College Prep.	107	84	47.2	37.0
General	55	62	24.2	27.3
Business	65	81	28.6	35.7
	227	227	100.0	100.0

non-music group has 16 Business pupils, and 7 General pupils more than the music group. A feeling exists among some people to the effect that there is a tendency in some schools to favor the College Preparatory group with higher marks for the same achievement than the other pupils receive; and thus, since the larger number of college pupils is in the music group, that group will be favored by the situation. However, when questioned on this point, Dr. Howard Conant, Principal of Holyoke High School 1907 - 1939, said, "There is no tendency for College Preparatory pupils to receive a higher grade for the same achievement than a Commercial or General pupil. If any difference does exist, it is quite probably in the opposite direction. The fact that the College Preparatory pupils may be certified for college entrance causes teachers to try to grade those pupils very closely." If we accept the words of this authority, we can assume that

the probability that this situation will effect the school grades is very small. There is also another consideration involved here concerning the fact that College Preparatory pupils seem to work harder and thus obtain higher grades. When questioned as to the validity of this feeling, Dr. Conant said, "The fact that those pupils are working for a chance to go to college seems to be an added incentive." Figures are not readily available which will permit a good judgment of the extent of this influence on the grades of the pupils used in this study. Much of the influence, if it does exist, would have been minimized by the pairing factor of general scholastic average the year before the start of this study. However, since definite information is not available, we shall consider this item to be a possible weakness of this study. The significance of the differences in distribution of course of study probably is felt most in the inequality of the number of marks found for each separate subject included in Chapter five.

(5) Distribution of Sex: Table V indicates the distribution of the sex of the pupils of this study. Notice that the groups match each other boy for boy, and girl for girl. Thus, there will be no differences in the averages of the school marks of each group caused by an unequal distribution of sex. Notice also that the number of girls exceeds the number of boys by 51. Since all the music pupils found were used in this study regardless of sex, these figures serve to indicate that more girls tend to take part

TABLE V

An Analysis of the Distribution of the Sex of the Pupils

Sex	Number of pupils		Percent of pupils	
	Music	Non-Music	Music	Non-Music
Boys	88	88	38.8	38.8
Girls	139	139	61.2	61.2
	227	227	100.0	100.0

in musical activities than boys.

(6) School Environment: School environment may easily have a large effect on a pupil's scholastic grades. For it is a well known fact that schools may vary greatly in their standards of achievement; and for this reason, a certain mark received in one school may not be at all comparable to the same mark received in another school. In order to take care of the possibility that this factor might cause some differences in the averages of the grades of the two groups, pupils were never paired with other pupils outside of their own school.

(7) Summary of the Control Data: Table VI summarizes the salient points concerning the control data. From a consideration of these facts, as well as the explanations of these facts found on this and preceding pages, it was considered that the two groups were similar in all these items which could have a large effect on scholarship except the item of participation in music. Hence, any difference

found in the averages of the school grades of the two groups could be said to be due to participation in music.

TABLE VI

A Summary of the Control Figures.

Pairing item	Music	Non-Music
Scholastic average	81.8	81.8
Intelligence quot.	110.7	110.5
Extra-curr. time	1.6 hr	1.3 hr
Curriculum		
College	107	84
General	55	62
Business	65	81
Sex		
Boys	88	88
Girls	139	139
School environment	Pupils paired with pupils from the same school.	

(8) A Test of the Control: Near the end of this study, after the pupils had been paired, and after the data had been summarized, and before the conclusions were made, a test for the extent of the control obtained was made. The purpose of the test was to determine if the control of the groups was really good. The pupils had been paired as well as was possible; but, still the question of whether or not there was any other significant item relative to control had not been settled. The test was an attempt to settle this question.

(a) Home Environment Investigated: The factor of the home environment had not been considered in the pairing, other than to eliminate pupils from the study who were known to come from an undesirable atmosphere. The reasons for not considering this factor were several: (1) the information would necessarily be partly subjective; (2) the addition of another pairing factor would have greatly reduced the number of pairs found; (3) it was hoped that home conditions (as well as any other factor that we had not considered) would average out between the two groups. Thus, it was assumed that home environment would not materially effect this study; but, some test of this assumption was desired.

(i) Occupation of Parents: The only means of readily measuring home environment, and it is not a reliable means, is to consider the occupation of the parents. Accordingly, the occupations of the male parent of thirty-four average music pupils were compared with the occupations of the male parent of the corresponding non-music pupils. The result of this comparison is shown in Table VII.

(ii) Homes Rated: In an attempt to gain some type of objectivity, the positions of the parents were all rated either as good, fair, or poor. These ratings are also shown in Table VII, where a cross indicates a good position, a zero sign shows an average occupation, and a minus sign indicates a poor position. It is assumed (probably somewhat presumptuously) that, on the average, a good home environment will accompany a good position of the parent, and a poor home

TABLE VII

An Analysis of the Occupations of the Male Parents of 34 Average Pairs of Pupils.

Music		Non-Music	
(x)Mill executive[x]	6	(x)Mill executive	1
(x)Mill supervisor	4	(x)Mill supervisor	5
(o)Mill-hand	11	(o)Mill-hand	7
(x)Mailman	1	(x)Machinist	1
(x)Druggist	1	(x)Tax collector	1
(x)Chemical engineer	1	(o)Blacksmith	1
(x)Laundry prop.	1	(o)Distributor	1
(o)Painter	1	(o)Painter	2
(o)Farmer	1	(o)Farmer	2
(o)Musician	1	(o)Carpenter	1
		(o)Truck driver	1
		(o)Milk man	1
		(-)W. P. A.	4
(-)Unemployed	1	(-)Unemployed	1
(-)Deceased	5	(-)Deceased	5
	34		34

x. The symbols in front of the positions refer to the rating of that position. Cross indicates good, zero means average, and minus indicates poor. For a summary of the ratings, see Table VIII.

atmosphere will go with a poor occupation of the parent. The ratings are summarized in Table VIII. The results when tabulated seemed to show a slight tendency for the parents of the music pupils to have better occupations. If this is a

TABLE VIII

A Summary of the Ratings of the Parental Occupations.

Type of position	Number of type		Percent of type	
	Music	Non-Music	Music	Non-Music
Good	14	8	41.2	23.5
Fair	14	16	41.2	47.1
Poor	6	10	17.6	29.4
	34	34	100.0	100.0

fact, it is logical, then, to assume that the music pupils come from a better home environment; or at least it may be safe to assume that the average home conditions for the music pupils and the non-music pupils are not the same. If the music pupils do come from better homes, then it can very fairly be claimed that the difference in achievement in favor of the music group is due to the influence of the home rather than to music. It is unfortunate that enough exact data on home environment, and an accurate means of measurement of this factor, were not available to settle the question of which group had the advantage of this influence. Since definite information is not available, however, we shall consider, in this study, that the influence of home environment is equal for both groups.

CHAPTER 5

SUMMARY OF THE DATA

CHAPTER 5

SUMMARY OF THE DATA

The school marks of the music and non-music groups were compared in a number of subject-fields in order to discover whether any one group was relatively more successful in their school work. The results are presented in the following pages under appropriate headings.

(1) English 2, Grade 10: The results of the two groups in English 2, Grade 10, are presented in Table IX. The mean score[1] of the music group is 81.8, with a standard deviation of 8.0, and a standard deviation of the mean of 0.53. The mean of the non-music group is 78.9, with a standard deviation of the distribution of 8.3, and a standard error of the mean of 0.53. The difference between the means is 2.9 points in favor of the music group, with the standard deviation of this difference being 0.76. The critical ratio, then, is 3.8. Since convention holds that a critical ratio of 3.0 is all that is necessary to indicate that the difference between the two groups is real[2], then the ratio here of 3.8 supports the assertion that the superior achievement of the music pupils is real, and not due to chance factors. Note, in Table IX, that 35 music pupils received a grade of 90 or better, while only 17 (one-half as many) non-music pupils received that grade; and also, only 6 music pupils had a failing mark,

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1. See Appendix B for a sample of a complete statistical computation.
2. Garrett, Henry C. Statistics in Psychology and Education p 118-148

TABLE IX

An Analysis of the Marks of the Two Groups in English 2, Grade 10.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	22	8	9.7	3.5
90	13	9	5.7	4.0
85	35	32	15.4	14.1
80	78	64	34.4	28.2
75	25	36	11.0	15.9
70	36	47	15.9	20.6
65	12	17	5.3	7.5
60	6	14	2.6	6.2
	227	227	100.0	100.0

	Music	Non-Music
Mean score	81.8	78.9
Standard deviation	8.0	8.3
Standard dev. of mean	0.53	0.55
Difference between means	2.9	
Standard dev. of diff.	0.76	
Critical ratio	3.8	

while 14 non-music pupils made less than 64 points. This is a truly remarkable situation.

(2) English 3, Grade 11: The results of the two groups in English 3, Grade 11, are presented in Table X. The mean score of the music group is 81.6, while the average score of the non-music group is 79.2. There exists a difference between the means of 2.4 points, and the critical ratio of this difference is 3.2. Notice that while the music group

TABLE X

An Analysis of the Marks of the Two Groups in English 3, Grade 11.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	13	7	5.7	3.0
90	14	11	6.2	4.9
85	46	35	20.2	15.4
80	74	63	32.6	27.8
75	23	27	10.1	11.9
70	42	60	18.5	26.4
65	11	16	4.9	7.1
60	4	8	1.8	3.5
	227	227	100.0	100.0

	Music	Non-Music	
Mean score	81.6	79.2	
Standard deviation	7.9	8.0	
Standard dev. of mean	0.52	0.53	
Difference between means		2.4	
Standard dev. of diff.		0.75	
Critical ratio		3.2	

is still greatly superior to the non-music group, the difference that existed between the two groups in English 2 has here been lessened; due, not so much to a loss by the music people as to a gain by the non-music group.

(3) English 4, Grade 12: The results of the two groups in English 4, Grade 12, appear in Table XI. The mean mark for the music group is 80.5, and for the non-music group is 77.9. The difference between the means is equal to 2.6 points. Computation shows the critical ratio to be 3.0. In this

TABLE XI

An Analysis of the Marks of the Two Groups in English 4, Grade 12.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	11	4	6.4	2.3
90	7	5	4.0	2.8
85	27	18	15.6	10.2
80	55	44	31.8	25.0
75	19	20	11.0	11.4
70	42	53	24.3	30.1
65	8	24	4.6	13.6
60	4	8	2.3	4.6
	173	176	100.0	100.0

	Music	Non-Music
Mean score	80.5	77.9
Standard deviation	8.0	8.0
Standard dev. of mean	0.61	0.61
Difference between means	2.6	
Standard dev. of diff.	0.86	
Critical ratio	3.0	

subject, both groups have averages which are more than one point lower than their means in English 2, or 3. Notice that in this subject, as was true in English 2, that the music group has twice as many high marks, and only one-half as many low marks, as the non-music group.

(4) Summary of English Subjects: The differences noted in the means of the English subjects have all been in favor of the music group. The critical ratios of these differences in English 2, 3, 4, are respectively 3.8, 3.2, 3.0. Thus in

English, it is quite apparent that the music pupils have achieved more than the non-music pupils.

(5) United States History: The results of the two groups in United States History are shown in Table XII. The mean score of the music group is 81.8, and the mean score of the non-music pupils is 78.8. The difference between the means is 3.0 points. The critical ratio of this difference is found to be 3.6. It will be noticed that a large number of marks were available for this subject, as well as for the English subjects. This is because of the fact that these are required subjects in every high school, and hence, almost every pupil considered had these marks on his card. None of the elective subjects, which are considered in the remainder of this chapter, have as many marks as these required courses.

(6) Modern History: The results of the two groups in Modern History are presented in Table XIII. The mean score of the music group is 80.2, while that of the non-music group is 78.1. Therefore, 2.1 points separate the two averages. The critical ratio is computed at 1.6. Since the accepted value of critical ratio to show a real difference is 3.0, this ratio of 1.6 is only 53% of what it should be to indicate true superiority of the music group. Notice that in this, an elective subject, there are fewer marks than in the required subjects. However, the marks here are sufficient to give reliable information concerning the differences between the two groups.

(7) World History: The results of the two groups in

TABLE XII

An Analysis of the Marks of the Two Groups in United States History.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	23	11	10.9	5.1
90	15	9	7.1	4.1
85	32	27	15.2	12.4
80	58	59	27.5	27.2
75	28	25	13.3	11.5
70	37	55	17.5	25.4
65	13	21	6.1	9.7
60	5	10	2.4	4.6
	211	217	100.0	100.0

	Music	Non-Music	
Mean score	81.8	78.8	
Standard deviation	8.9	3.6	
Standard dev. of mean	0.61	0.58	
Difference between means			3.0
Standard dev. of diff.			0.84
Critical ratio			3.6

World History are presented in Table XIV. With the music group, the average score is 84.0; with the non-music group, the average score is 80.9. Then, the difference between the means is 3.1 points, and the critical ratio of this difference is computed to be 1.7. Notice that there are no failing marks recorded for either group in this subject. The ratio here of 1.7 is not high enough to assure reliable superiority for the music group. The chances that the

TABLE XIII

An Analysis of the Marks of the Two Groups in Modern History.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	5	3	9.8	5.1
90	1	1	2.0	1.7
85	6	7	11.8	11.9
80	12	12	23.5	20.3
75	7	12	13.7	20.3
70	17	18	33.3	30.5
65	1	2	2.0	3.4
60	2	4	3.9	6.8
	51	59	100.0	100.0

	Music	Non-Music
Mean score	80.2	78.1
Standard deviation	8.9	8.2
Standard dev. of mean	1.3	1.1
Difference between means	2.1	
Standard dev. of diff.	1.3	
Critical ratio	1.6	

difference between the means is real[3] are in the proportion of 22 to 1.

(8) Social Problems: Table XV presents the results of the two groups in the Social Problems[4] course. The average score of the music group is 83.0; the average of the non-music people is 80.2; and, the difference between these scores is

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3. Tiegs and Crawford Statistics for Teachers p 137
4. Other names for this course include Problems of Democracy, and Modern Problems.

TABLE XIV

An Analysis of the Marks of the Two Groups in World History.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	9	2	21.4	4.2
90	1	3	2.4	6.3
85	7	11	16.7	22.9
80	11	11	26.1	22.9
75	7	7	16.7	14.5
70	5	11	11.9	22.9
65	2	3	4.8	6.3
60	0	0	0.0	0.0
	42	48	100.0	100.0

	Music	Non-Music
Mean score	84.0	80.9
Standard deviation	8.9	7.7
Standard dev. of mean	1.4	1.1
Difference between means	3.1	
Standard dev. of diff.	1.8	
Critical ratio	1.7	

2.8 points. The critical ratio figures out to be 2.0. This ratio is only 67% of what it should be to indicate a true difference between the averages of the two groups. Notice the unusual distribution of the non-music group. Thirty marks, or nearly one-half of the total number, fall in the 80-84.99 class. This fact, of course, accounts for the low standard deviation of 7.6.

(9) Summary of History Subjects: The differences in

TABLE XV

An Analysis of the Marks of the Two Groups in Social Problems.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	9	2	14.1	2.9
90	2	3	3.1	4.4
85	11	9	17.2	13.0
80	21	30	32.8	43.5
75	8	8	12.5	11.6
70	11	9	17.2	13.0
65	2	5	3.1	7.2
60	0	3	0.0	4.4
	64	69	100.0	100.0

	Music	Non-Music
Mean score	83.0	80.2
Standard deviation	8.1	7.6
Standard dev. of mean	1.0	0.91
Difference between means	2.8	
Standard dev. of diff.	1.4	
Critical ratio	2.0	

in the mean scores of the history subjects (including the United States, Modern, and World histories, and Social Problems) are all in favor of the music group. But the critical ratios of these differences, with the one exception of that of United States History, are in the vicinity of 2.0. This fact serves to indicate that the seemingly greater achievement of the music group in the histories has only a fair chance of being true.

TABLE XVI

An Analysis of the Marks of the Two Groups in Business Training.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	6	5	10.0	6.2
90	4	1	6.7	1.2
85	12	14	20.0	17.3
80	12	16	20.0	19.8
75	7	9	11.7	11.1
70	15	21	25.0	25.9
65	2	10	3.3	12.3
60	2	5	3.3	6.2
	60	81	100.0	100.0

	Music	Non-Music	
Mean score	81.4	78.2	
Standard deviation	9.0	9.0	
Standard dev. of mean	1.2	1.0	
Difference between means			3.2
Standard dev. of diff.			1.6
Critical ratio			2.0

(10) Business Training: Consult Table XVI for the results of the two groups in the Business Training course. The mean score of the music group is 81.4, while the mean score of the non-music group is 78.2. The difference between the means is 3.2 points, and the critical ratio of this difference is 2.0. With this ratio, the chances that the difference between the two groups is real are in the simple proportion of 43 to 1. Notice that in this, a business

subject, the non-music group has 21 more marks than the music group. This condition is caused mainly by the fact that the non-music group has a higher percentage of business pupils than the music group (see Table IV).

(11) Typewriting 1: For the results of the comparison of the two groups in Typewriting 1, see Table XVII. In this subject, the average score of the music group is 80.7, and the average of the non-music group is 76.7. A difference of 4.0 points exists between the averages. The critical ratio of this difference computes to be 4.1. This ratio is a very high one, being in fact the highest ratio obtained on any one subject in this study. The biggest single cause of this high ratio would seem to be the fact that the non-music group has five times as many failing marks as the music group. It has been suggested, that if the music group is largely composed of piano players, then the rhythm and the finger movement acquired by the players would transfer to typewriting, and it would be only natural to expect that this musical group would show the greatest achievement in this particular subject.

(12) Bookkeeping 1: The results of the comparison of the two groups in Bookkeeping 1 are shown in Table XVIII. The musical group mean score is 80.3, while the non-musical group mean score is 77.3. The difference between the two means is 3.0 points, and the critical ratio is equal to 2.3. Here, the ratio is a fair one, but it is not high enough to indicate a reliable difference between the two groups. It

TABLE XVII

An Analysis of the Marks of the Two Groups in Typewriting 1.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	9	4	6.4	2.6
90	11	4	7.8	2.6
85	14	16	9.9	10.2
80	47	39	33.4	25.0
75	19	20	13.5	12.8
70	32	43	22.7	27.6
65	5	10	3.5	6.4
60	4	20	2.8	12.8
	141	156	100.0	100.0

	Music	Non-Music
Mean score	80.7	76.7
Standard deviation	8.2	8.5
Standard dev. of mean	0.69	0.68
Difference between means	4.0	
Standard dev. of diff.	0.97	
Critical ratio	4.1	

will be noted that the difference that does exist in this subject is largely due to the presence in the non-music group of a greater number of low grades than in the music group.

(13) Bookkeeping 2: The comparison of the two groups in Bookkeeping 2 can be seen in Table XIX. The musical mean is 81.1, and the non-musical average is equal to 77.3. A difference of 3.8 points separates the two averages. The

TABLE XVIII

An Analysis of the Marks of the Two Groups in Bookkeeping 1.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	6	7	7.1	5.9
90	4	3	4.7	2.5
85	16	9	18.8	7.6
80	22	28	25.9	23.7
75	13	18	15.3	15.2
70	13	30	15.3	25.4
65	4	12	4.7	10.2
60	7	11	8.2	9.3
	85	118	100.0	100.0

	Music	Non-Music	
Mean score	80.3	77.3	
Standard deviation	9.1	9.0	
Standard dev. of mean	0.99	0.83	
Difference between means			3.0
Standard dev. of diff.			1.3
Critical ratio			2.3

critical ratio is computed to be 2.1. Again, this ratio is not large enough to be conclusively indicative of a real superiority of the music people. Notice, by comparison of the total number of marks here with those in Table XVIII, that probably more than 50% of the pupils starting the course in Bookkeeping are eliminated at the end of the first year's work.

(14) Stenography 1: The results of the last of the

TABLE XIX

An Analysis of the Marks of the Two Groups in Bookkeeping 2.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	4	4	10.0	7.6
90	1	0	2.5	0.0
85	7	6	17.5	11.3
80	10	12	25.0	22.6
75	7	8	17.5	15.1
70	9	10	22.5	18.9
65	1	7	2.5	13.2
60	1	6	2.5	11.3
	40	53	100.0	100.0

	Music	Non-Music
Mean score	81.1	77.3
Standard deviation	8.4	9.5
Standard dev. of mean	1.3	1.3
Difference between means	3.8	
Standard dev. of diff.	1.8	
Critical ratio	2.1	

business subjects, Stenography 1, are presented in Table XX. The music group has a mean score of 80.0, and the non-music pupils have an average of 76.9. The point difference between the two averages is 3.1, and the critical ratio of this difference is 1.9. As with the other business subjects, this ratio is only a fair one; and again the non-music group has the greatest number of low marks, while each group has about an equal number of the higher grades.

TABLE XX

An Analysis of the Marks of the Two Groups in Stenography 1.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	6	4	9.0	4.6
90	4	4	6.0	4.6
85	9	8	13.4	9.2
80	17	20	25.4	23.0
75	12	10	17.9	11.5
70	8	22	11.9	25.3
65	3	5	4.5	5.7
60	8	14	11.9	16.1
	67	87	100.0	100.0

	Music	Non-Music
Mean score	80.0	76.9
Standard deviation	9.9	9.6
Standard dev. of mean	1.2	1.0
Difference between means	3.1	
Standard dev. of diff.	1.6	
Critical ratio	1.9	

(15) Summary of the Business Subjects: The summary for the business subjects is much the same as that for the history subjects. The differences in the mean scores of the two groups are all in favor of the music group. Yet, the critical ratios, with the one exception of Typewriting, are approximately in the order of 2.0. And thus, it can be claimed that there is only a fair chance that the superior achievement of the music group in the business

subjects is real.

(16) Latin 2: Table XXI shows the results of the comparison of the two groups in Latin 2. The musical mean is 82.7, and the non-musical mean is 80.2. A 2.5 point difference exists between the two means, and the critical ratio of this difference is equal to 1.5. This ratio is only 50% of what it should be if it is to indicate a real difference between the two groups. In terms of chances, there are only 14 to 1 that the music group is actually superior.

(17) French 1: Refer to Table XXII for the results of the two groups in French 1. The average score of the music group is 81.8, while the average score of the non-music group is 80.4. The difference between the two mean scores is 1.4 points, and the critical ratio of this difference is only 0.9. This ratio is so low that there are only four chances to one that the music group is superior in this subject. Notice that the numbers of low marks are about equal for both groups.

(18) French 2: For a comparison of the results of the two groups for French 2, see Table XXIII. A mean score of 83.2 is made by the music pupils, and a mean score of 82.8 is made by the non-music group. The difference between the two means is only 0.4 points. The critical ratio is 0.3. This ratio is so small that it is actually almost negligible. The chances are equal at one to one that either group is superior to the other in achievement. Notice the unusually small number of low grades made by both groups; and also,

TABLE XXI

An Analysis of the Marks of the Two Groups in Latin 2.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	10	4	12.6	6.9
90	5	8	6.3	13.8
85	12	10	15.2	17.2
80	29	11	36.7	19.0
75	7	5	8.9	8.6
70	9	9	11.4	15.5
65	4	2	5.1	3.5
60	3	9	3.8	15.5
	79	58	100.0	100.0

	Music	Non-Music
Mean score	82.7	80.2
Standard deviation	8.9	10.7
Standard dev. of mean	1.0	1.4
Difference between means	2.5	
Standard dev. of diff.	1.7	
Critical ratio	1.5	

notice that there are no failing grades recorded for the non-music group.

(19) Summary of Foreign Languages: The differences in the means here are all at least slightly in favor of the music group. The critical ratios, however, are very low, the largest of them being only 1.5. Because of this fact, there is very little justification for claiming a superiority of achievement for either group in these foreign

TABLE XXII

An Analysis of the Marks of the Two Groups in French 1.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	13	3	12.4	3.8
90	9	12	8.55	15.0
85	12	15	11.4	18.8
80	38	17	36.2	21.2
75	7	5	6.7	6.3
70	11	13	10.5	16.2
65	6	9	5.7	11.2
60	9	6	8.55	7.5
	105	80	100.00	100.0

	Music	Non-Music
Mean score	81.8	80.4
Standard deviation	9.9	9.8
Standard dev. of mean	0.96	1.1
Difference between means	1.4	
Standard dev. of diff.	1.5	
Critical ratio	0.9	

language subject-fields.

(20) Algebra 1: The results for the two groups in Algebra 1 can be found in Table XXIV. The mean score made by the music group is 78.8, and the mean score made by the non-music group is 79.1. The difference between the means is 0.3 points in favor of the non-music group. The critical ratio of this difference is 0.2. This is the only subject in this study which shows any superior achievement on the

TABLE XXIII

An Analysis of the Marks of the Two Groups in French 2.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	13	5	12.1	6.8
90	10	8	9.3	11.0
85	19	16	17.8	21.9
80	33	21	30.8	28.8
75	8	8	7.5	11.0
70	19	10	17.8	13.7
65	3	5	2.8	6.8
60	2	0	1.9	0.0
	107	73	100.0	100.0

	Music	Non-Music
Mean score	83.2	82.8
Standard deviation	8.6	8.0
Standard dev. of mean	0.83	0.94
Difference between means	0.4	
Standard dev. of diff.	1.3	
Critical ratio	0.3	

part of the non-music group. But the fact that the critical ratio is only 0.2, indicates that this difference is not significant. Note that the average scores here are much lower than the average scores of most of the other subjects in this study. Note also, that in this subject, it is the music group which has the great majority of failing grades.

(21) Algebra 2: For the results of the two groups in Algebra 2, see Table XXV. The music group shows a mean

TABLE XXIV

An Analysis of the Marks of the Two Groups in Algebra 1.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	8	8	9.6	11.0
90	1	0	1.2	0.0
85	14	13	16.9	17.8
80	22	14	26.5	19.2
75	6	5	7.2	6.8
70	16	24	19.3	32.9
65	1	2	1.2	2.7
60	15	7	18.1	9.6
	83	73	100.0	100.0

	Music	Non-Music
Mean score	78.8	79.1
Standard deviation	10.5	9.8
Standard dev. of mean	1.2	1.2
Difference between means	-0.3[x]	
Standard dev. of diff.	1.7	
Critical ratio	-0.2	

x. Notice that the difference here is in favor of the non-music group.

score of 80.2, while the non-music group shows a mean score of 78.4. The difference between the means is 1.8 points. The critical ratio is 1.1. This ratio, also, is too small to be significant. The chances are only six to one that the superior showing of the music group is real. Notice the unusual heterogeneity of the non-music group that is indicated by the rather high standard deviation of 11.1.

TABLE XXV

An Analysis of the Marks of the Two Groups in Algebra 2.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	7	7	8.4	10.1
90	6	5	7.2	7.3
85	9	10	10.9	14.5
80	24	8	28.9	11.6
75	8	10	9.7	14.5
70	19	9	22.9	13.0
65	6	10	7.2	14.5
60	4	10	4.8	14.5
	83	69	100.0	100.0

	Music	Non-Music
Mean score	80.2	78.4
Standard deviation	9.2	11.1
Standard dev. of mean	1.0	1.3
Difference between means	1.8	
Standard dev. of diff.	1.6	
Critical ratio	1.1	

(22) Plane Geometry: The results of the two groups in Plane Geometry may be found in Table XXVI. The mean of the music group is 78.3, while the mean of the non-music people is 78.1. The difference between the two means is 0.2 points, and the critical ratio is 0.2. Again, the ratio is so small that it may practically be called negligible. The generally low averages of the two groups in the mathematical subjects continues here.

TABLE XXVI

An Analysis of the Marks of the Two Groups in Plane Geometry.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	10	5	9.4	6.0
90	6	3	5.7	3.6
85	12	9	11.3	10.7
80	18	20	17.0	23.8
75	14	10	13.2	11.9
70	23	24	21.7	28.6
65	10	6	9.4	7.1
60	13	7	12.3	8.3
	106	84	100.0	100.0

	Music	Non-Music
Mean score	78.3	78.1
Standard deviation	10.4	9.0
Standard dev. of mean	1.0	0.98
Difference between means	0.2	
Standard dev. of diff.	1.4	
Critical ratio	0.2	

(23) Summary of the Mathematical Subjects: On an average, the mathematical subjects (including Algebra, and Plane Geometry) show a slight tendency to have higher mean scores in the musical group. However, in each case, the critical ratio of the difference either is at, or is approaching, the order of negligibility. Thus, there is no reason for claiming a superiority of achievement for either group in any mathematical subject.

(24) Biology: The comparison of the two groups in Biology is presented in Table XXVII. A mean score of 82.1 is shown for the musical group, and a mean of 78.2 is shown for the non-musical group. Between the two means is a difference of 3.9 points, and the critical ratio of this difference is 3.5. This ratio is well above the 3.0 ratio that is needed to indicate a real difference. The fact that the low marks are three times as numerous in the non-music group as they are in the music group, had a large influence in putting the ratio up to its high point.

(25) General Chemistry: In Table XXVIII can be found the results of the two groups in General Chemistry. The musical mean score is 81.2, and the non-musical mean is 80.1. The difference between the two means is 1.1 points, and the critical ratio is equal to 0.9. This ratio is another one of those that are too small to reliably indicate a real difference between the two sets of scores.

(26) General Physics: The results of the two groups in General Physics can be found in Table XXIX. The mean score of the music group is 81.6, and the average of the non-music group is 81.3. The difference between the means is only 0.3 points, and the critical ratio of this difference is 0.2. As has been previously pointed out, a ratio of 0.2 is of practically negligible size, and hence, there is no real difference between the two groups in General Physics.

(27) Summary of the Sciences: The physical, chemical, and biological sciences show results that favor the music

TABLE XXVII

An Analysis of the Marks of the Two Groups in Biology.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	15	8	12.9	6.0
90	2	2	1.7	1.5
85	22	18	19.0	13.5
80	36	36	31.0	27.1
75	15	17	12.9	12.8
70	16	24	13.8	18.1
65	7	16	6.1	12.0
60	3	12	2.6	9.0
	116	133	100.0	100.0

	Music	Non-Music
Mean score	82.1	78.2
Standard deviation	8.7	9.1
Standard dev. of mean	0.81	0.79
Difference between means	3.9	
Standard dev. of diff.	1.1	
Critical ratio	3.5	

group in varying amounts, from small to large. The critical ratios for the physical and chemical sciences are negligible, while the ratio in the biological science is quite significant. The difference in the results of the sciences is hard to rationalize except on the ground of mathematical content. There is little mathematics in the biology course, rather a large amount in chemistry, and very much in physics. We have seen (see page 59) that the music pupils show no tendency to

TABLE XXVIII

An Analysis of the Marks of the Two Groups in General Chemistry.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	9	4	10.4	4.7
90	3	2	3.5	2.4
85	17	13	19.8	15.3
80	23	36	26.8	42.3
75	6	4	7.0	4.7
70	20	16	23.2	18.8
65	6	6	7.0	7.1
60	2	4	2.3	4.7
	86	85	100.0	100.0

	Music	Non-Music	
Mean score	81.2	80.1	
Standard deviation	9.0	8.1	
Standard dev. of mean	0.97	0.87	
Difference between means			1.1
Standard dev. of diff.			1.3
Critical ratio			0.9

excell in mathematics. Perhaps, then, this fact is being reflected by the sciences; for the greatest superiority of achievement of the music pupils there is in the subject with the least mathematics (Biology); and conversely, the music pupils show no superiority in physics, which is a subject very largely developed by mathematics.

(28) Composite of All Scores: The results of the comparison of the composites of all the scores is presented

TABLE XXIX

An Analysis of the Marks of the Two Groups in General Physics.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	4	4	7.5	6.2
90	2	2	3.8	3.1
85	9	14	17.0	21.9
80	17	21	32.0	32.8
75	10	6	18.9	9.4
70	10	11	18.9	17.2
65	0	6	0.0	9.4
60	1	0	1.9	0.0
	53	64	100.0	100.0

	Music	Non-Music
Mean score	81.6	81.3
Standard deviation	7.4	7.9
Standard dev. of mean	1.0	0.99
Difference between means	0.3	
Standard dev. of diff.	1.4	
Critical ratio	0.2	

in Table XXX. For the music group, the mean score is 81.2. For the non-music group, the mean score is 78.7. There is a difference between the means of 2.5 points, and the critical ratio of this difference is 9.3. This ratio is extremely high. It is more than three times as large as is necessary to show a real difference. In terms of chances, there are almost an infinite number to one that the superior showing by the music group is real. Since the difference between

TABLE XXX

An Analysis of the Composite of All the Marks for Both Groups.

Mark	Number receiving mark		Percent receiving mark	
	Music	Non-Music	Music	Non-Music
95	212	109	9.6	4.9
90	121	95	5.5	4.2
85	348	310	15.8	13.9
80	657	582	29.8	25.9
75	256	270	11.6	12.1
70	410	519	18.6	23.2
65	107	194	4.8	8.7
60	95	158	4.3	7.1
	2206	2237	100.0	100.0

	Music	Non-Music
Mean score	81.2	78.7
Standard deviation	8.9	8.9
Standard dev. of mean	0.19	0.19
Difference between means	2.5	
Standard dev. of diff.	0.27	
Critical ratio	9.3	

the means is figured in terms of averages, 2.5 points here can be considered to be very large. In fact, this number of points is sufficient to raise an individual's grade in all of his subjects by an amount that is represented by the interval between a "C-" and an average "C".

By reference to the totals of the distributions, it can be seen that a grand total of 4443 different marks were used in this study. These marks were obtained from the records of

454 pupils, which means that there was an average of 9.8 marks per pupil. In three years of high school, the ordinary pupil will study from 12 to 15 regular subjects. Since 9.8 of these subjects were considered in this study, we may assume that this study reflects a good cross-section of the regular curriculum.

(29) General Summary of Data: A general summary of the important items of data concerning all the subject-fields studied in this work is found in Table XXXI. This table is presented in such a way as to indicate, for each of the subject-fields, the degree to which the achievement of the music group in that subject is superior to the achievement of the non-music group. The critical ratio column, then, contains the most important information in the table. Some statements concerning the amount of reality associated with the superior achievement of the music group in each of the general study divisions follow:

(i) The difference in the English subjects is positively real.

(ii) The difference in the history subjects is only fair.

(iii) There is also only a fair reliability to the musical superiority in the business subjects.

(iv) There is very little reliability to the difference between the groups in the foreign languages.

(v) In mathematical subjects, the difference is almost, if not actually, negligible.

TABLE XXXI

Summary of the Salient Points of Data.

	Music score	Non-Music score	Difference in favor of music	Critical ratio	Chances[x] to one that diff. is real
English 2	81.8	78.9	2.9	3.8	14000
English 3	81.6	79.2	2.4	3.2	1450
English 4	80.5	77.9	2.6	3.0	770
U. S. History	81.8	78.8	3.0	3.6	6200
Mod. History	80.2	78.1	2.1	1.6	17
World History	84.0	80.9	3.1	1.7	22
Social Prob.	83.0	80.2	2.8	2.0	43
Bus. Training	81.4	78.2	3.2	2.0	43
Typewriting 1	80.7	76.7	4.0	4.1	48000
Bookkeeping 1	80.3	77.3	3.0	2.3	92
Bookkeeping 2	81.1	77.3	3.8	2.1	55
Stenography 1	80.0	76.9	3.1	1.9	34
Latin 2	82.7	80.2	2.5	1.5	14
French 1	81.8	80.4	1.4	0.9	4
French 2	83.2	82.8	0.4	0.3	2
Algebra 1	78.8	79.1	-0.3	-0.2	1
Algebra 2	80.2	78.4	1.8	1.1	6
Pl. Geometry	78.3	78.1	0.2	0.2	1
Biology	82.1	78.2	3.9	3.5	4300
Gen. Chem.	81.2	80.1	1.1	0.9	4
Gen. Physics	81.6	81.3	0.3	0.2	1
Composite	81.2	78.7	2.5	9.3	infinite

x. These figures are quoted from Tiegs and Crawford Statistics for Teachers p 137.

(vi) With the exception of Biology, there is little, if any, difference between the groups in the sciences.

(vii) The composite indicates that, when all scores are considered, the music group will always show superior achievement.

(30) A Test of the Data Involving An Examination of Achievement Test Scores: After the data had been summarized, a further check on this study, involving an examination of achievement test ratings, was attempted. If the music group actually did achieve more than the non-music group, then this difference probably would be reflected by achievement test scores. In order to have a check on this study, this point was investigated. Unfortunately, data was not available in sufficient quantity to make an exact study. Achievement test scores were found for only twenty pairs of pupils. The results of the comparison of the two groups are presented in Table XXXII. The average percentile rank of the music group

TABLE XXXII

An Analysis of the Data Concerning Achievement Test Scores.

	Music	Non-Music
Number of pupils used	20	20
Mean percentile rank[x]	46.8	39.8
Standard deviation	20.0	17.3
Standard dev. of mean	4.3	3.8
Difference between means	7.0	
Standard dev. of diff.	5.6	
Critical ratio	1.3	

x. Refers to the rank on the Progressive Achievement Test.

is 46.8, and the average rank of the non-music group is 39.8.

The difference between the means is 7.0 points, and the critical ratio is only 1.3. This ratio indicates that the difference is not statistically significant. However, the accuracy of the statistical elements used here is greatly lowered by the fact that a very small number of cases were considered. This difficulty could not be corrected because there were no more achievement test scores available. Nevertheless, the information presented here can be taken as an indication that the music group tends to achieve more than the non-music group. And this conclusion would be in the same general direction as the conclusions to this study.

CHAPTER 6

SUMMARY OF RESULTS AND LIMITATIONS OF THIS STUDY

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(1) Restatement of Problem: At this point, before attempting to make any conclusions, it is probably best that we again consult the working problem of this study:

> With the average senior high school pupil, does there seem to be any benefit in the direction of increased achievement in general school work by virtue of participation in the musical activities of the school?

And this problem is interpreted to mean that the primary duty of this study is to attempt to discover exactly what sort of situation exists with regards to the relative achievement of musical and non-musical pupils.

(2) Notable Facts of Data: Let us now note some of the more salient facts presented in the summary of the data on page 66. We can make these observations:

(i) The composite of all the marks shows that the music group has an average of 2.5 points higher than the non-music group. The critical ratio of this difference is extremely high at 9.3.

(ii) The English subjects show consistently higher averages of the music group over the non-music group. The critical ratios for English 2, 3, and 4 are respectively 3.8, 3.2, and 3.0.

(iii) The history subjects (United States, Modern, World, and Social Problems), and the business subjects (Business Training, Typewriting, Bookkeeping, and Stenography) all show higher averages for the music group than for the non-music group. With only two exceptions, the critical ratios of the differences in these subjects are in the vicinity of 2.0.

(iv) The remainder of the subject-fields, which includes the foreign languages (Latin, and French), mathematics (Algebra, and Geometry), and the sciences (Biology, Chemistry, and Physics), in general show slight differences in favor of the music group. However, the critical ratios of these differences, with the one exception of Biology, are practically negligible.

(3) Statement of Conclusions: In the light of the observations concerning the data which are presented in the previous section, these following conclusions now seem to be justified:

(i) On the average, the music pupils do actually tend to achieve more in school than the non-music pupils.

(ii) The greater achievement of the music pupils is statistically significant in the English subjects.

(iii) The superior achievement of the music pupils is only fairly significant in the histories, and in the business subjects.

(iv) In foreign languages, sciences, and mathematics, there is no stable basis for claiming any difference in the achievement of either group.

(4) General Summary of Conclusions: In answer to the major question raised in this study concerning the exact situation existing with regards to the relative achievement of music and non-music pupils, we now feel justified in saying that music pupils do achieve more in school than do non-music pupils. When control of this study was being established, six of the more important items effecting the school marks were considered; and hence, the superior achievement of the music group was not due to these items. However, there are many items that could effect school marks, such as nationality and home environment, which were not directly controlled. Thus, some of the difference between the two groups may be due to the influence of these factors. But, because of the fact that control was established over six of the more important items which have an effect on school marks, there is extreme possibility that the largest part of the superior achievement is really due to participation in music. The reasons as to why music causes an increased achievement in school will involve another study in itself, and an answer was not attempted in this study. Many writers (see Chapter Two) have made subjective answers to this question. In general, these writers seem to suggest that music motivates intellectual

activity through its effect on the emotions. It is also possible that special skills that are developed through music participation are easily transfered to other school subjects.

(5) Weaknesses of the Study: Several weaknesses seem to be apparent in this study, and they are here presented and discussed.

(i) There are not enough pairs of pupils used in the study. Of course, 227 pairs were used, and this number would have been sufficient if all pupils studied all of the various subjects offered in the high school. As it happened, however, when each subject-field in this study was considered separately, there often were not enough marks available for a particular subject-field to make the results very significant. In order to be able to have sufficient marks for every subject offered in the high school, there would probably be required about 500 pairs of pupils.

(ii) The pairing of the pupils in this study has been defended as being good; yet, an improvement might have been made had more time and data been available. An improvement is especially desired with regard to the item of distribution of the course of study. The object of pairing was to make the groups similar in all respects except the factor of participation in music. Thus, pairing might also have been improved had several more factors such as home environment, and nationality of the

pupil been considered. (As has been pointed out, however, this action would have tremendously increased the difficulty of finding the data and pairing the pupils.)

(iii) Only the objective outcomes of education were considered in this study, to the total neglect of the esthetic outcomes. This omission is a handicap when conclusions are made from this study. For, in terms of actual value for living, it is possible that the non-music pupils who engage in other activities are getting more out of school than the music pupils. No information is available on this point, yet it is an important consideration, and it should not be overlooked when one is evaluating actual school practices.

(iv) It is possible that the differences such as were discovered in this study run in trends. That is, the difference may exist today where it might not have existed perhaps ten years ago. To get information on this point would have required the repetition of the entire study using ten year old records; and the time required to do this was prohibitive.

CHAPTER 7

IMPLICATIONS IN EDUCATION AND SUGGESTIONS FOR FUTURE STUDY

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(1) The Hasty Educational Inference: One type of hasty inference from the conclusions of this study might be something like this:

> Since the pupils who participate to a great extent in music obtain better grades in school than those pupils who do not participate, we should attempt to stimulate a definite and active participation in music in all pupils, that they may all do better school work.

(2) Hasty Inference Not Warranted: It is the opinion of the author, however, that the conclusions of this study do not warrant the making of an inference as far-reaching as the above seems to be; and the reasons for this opinion are two:

(i) This study has admitted the possibility that the difference between the music and non-music groups may not be due entirely to the motivational influence of participation in music.

(ii) This study has considered only the objectively visible outcomes of school work, to the total neglect of all other intangible, subjective, yet worthy values. Hence, there is no basic information here as to the effect of music on these other vague, but highly

important, outcomes.

(3) Statement of Inferences: In the light of the two main objections which are presented in the previous section, the first hasty inference must be revised. It seems, however, that the following inferences are justified:

(i) If school marks should happen to be the only consideration, then apparently there would be no harm in purposely fostering participation in music in all pupils.

(ii) If one follows the generally prevailing belief that music has a great emotional value, then it would seem worthwhile to develop interest and participation in music regardless of its effect on school marks.

(iii) If a pupil has only passing interest in school marks, and no desire to gain the emotional and spiritual values of music, then apparently it would be a waste of time for him to study music at all.

(iv) If a pupil has already developed his interest in music, nothing should be done that in any way will tend to destroy that interest or hinder his continued participation in music.

(v) Since most people probably come somewhere under (i) or (ii) (above), then it would seem wise for every school to provide at least the opportunity for the development of the interest in music that is every pupil. There should, in general, be no compeling of pupils to take part. To conform to this inference, a school would most

probably have to provide a band, an orchestra, a glee club, technical instruction in music, opportunity for general choral singing, and give credit for outside music study under approved teachers.

(4) Suggestions for Future Study: The suggestions here for future study generate in the main from the thought that the weaknesses (see Chapter Six) of this study should be eradicated. The suggestions, then, can be stated briefly as follows:

(i) Repeat the study using twice as many pupils.

(ii) Repeat the study with the idea of improving the control, especially with regards to the distribution of the course of study.

(iii) Repeat the study using more pairing factors. The items of home environment, and nationality of the pupil, could be added to the six items used in this study.

(iv) Determine in some manner whether or not there is any difference in the amount of actual value for living that the music and non-music pupils get from school.

(v) Investigate trends by repeating the study twice using sets of data ten years apart.

(vi) Attempt to discover the reasons why participation in music causes a superior achievement in school.

APPENDICIES

APPENDIX A

Verification of Webster's Study: In Chapter Two, on page 12, there is reference made to a grade study of music pupils in the Minneapolis schools by W. F. Webster. He compared the average grade achievement of 700 music pupils with the average grade achievement of an equal number of pupils not taking music and selected at random. The comparison was made by finding the percentage of "A" and "F" scores made by each group.

It so happens, in this study, that the data necessary to verify Webster's study is readily available. Hence, it was considered proper to insert the verification at this point.

By consulting Table XXX of composite scores on page 64, the necessary information can be found. Of 2206 marks credited to the music group, 333 have a value of 90 or better, while 95 have a value of 64 or less. And, of the 2237 marks credited to the non-music group, 204 have a value of 90 or better, while 158 have a value of 64 or less.

Webster's study speaks in terms of "A" and "F" marks. For purposes of this verification, then, the marks in this study with a value of 90 or better will be considered "A", and marks with a value of 64 or less will be called "F". The comparison between the two studies is found in the Table XXXIII on the next page.

TABLE XXXIII

A Comparison of the Results of This Study with Webster's Study.

Group	Score	Percentages	
		This study	Webster's study
Music	"A"	15.1%[x]	18%
	"F"	4.3%	3%
Non-Music	"A"	9.1%	10%
	"F"	7.1%	7%

x. Read: 15.1% of all the marks credited to the music group have an "A" value.

Both studies agree that the music group makes more high, and less low, marks than the non-music group. With the music group, the high marks greatly exceed the low marks; while with the non-music group, the high and low marks tend to equalize, with the high marks being favored slightly. Thus, it can be seen that these two studies agree closely, not only with regard to the direction of the difference between the two groups, but also with regard to the extent of that difference.

APPENDIX B

Sample of a Complete Statistical Computation: There is much use made in this study of various statistical concepts. Many tables refer to such items as the mean of the distribution, or the standard deviation of the distribution. Presented here is a sample of the complete statistical procedure that is necessary to find these various items. The data for English 2, Grade 10 is used for this sample.

For the Music Group:

Raw scores	Frequency of score	Deviation of score from assumed average	Freq. times dev.	Freq. times square of dev.
X	f	d	fd	fd^2
95	22	3	66	132
90	13	2	26	52
85	35	1	35	35
80	78			
75	25	-1	-25	25
70	36	-2	-72	144
65	12	-3	-36	108
60	6	-4	-24	96
Totals	227		-30	592

The mean score is first found.

Mean equals, assumed mean, plus, the sum of the fd's times the interval divided by the number of scores[1]. Thus

$$M = 82.5 + \frac{(-30)(5)}{227}$$

$$= 82.5 - 0.7 = 81.8$$

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1. Tiegs and Crawford Statistics for Teachers p 54

The standard deviation of the distribution is found. Standard deviation[2] equals, the interval times, the square root of, the sum of the fd squares divided by the number of scores minus the correction factor[3]. Thus

$$s = 5\sqrt{\frac{592}{227} - \left(\frac{30}{227}\right)^2}$$

$$= 5\sqrt{2.59} = \underline{8.0}$$

The standard deviation of the mean is then found. Standard deviation of the mean equals, the deviation of the distribution, divided by the square root of the number of scores[4]. Thus

$$s_m = \frac{8.0}{\sqrt{227}} = \frac{8.0}{15.0} = \underline{0.53}$$

For the Non-Music Group:

X	f	d	fd	fd^2
95	8	3	24	72
90	9	2	18	36
85	32	1	32	32
80	64			
75	36	-1	-36	36
70	47	-2	-94	188
65	17	-3	-51	153
60	14	-4	-56	224
Totals	227		-163	741

The mean score, the standard deviation of the distribution, and the standard deviation of the

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2. Ibid. p 99
3. The correction is equal to, the square of, the sum of the fd's divided by the number of scores.
4. Ibid. p 133

mean are all found for this group in the same manner as has been indicated for the music group. Thus

$$M = 82.5 + \frac{(-163)(5)}{227}$$
$$= 82.5 - 3.6 = \underline{78.9}$$

$$s = 5\sqrt{\frac{741}{227} - \left(\frac{163}{227}\right)^2}$$
$$= 5\sqrt{2.74} = \underline{8.3}$$

$$s_m = \frac{8.3}{\sqrt{227}} = \frac{8.3}{15.0} = \underline{0.55}$$

For a comparison of the two groups:

The difference between the mean scores of the two groups is found. Thus

$$D = 81.8 - 78.9 = \underline{2.9}$$

The standard deviation of this difference is found.

Standard deviation of the difference equals, the square root of, the sum of the squares of the standard deviations of the mean of the two distributions[5]. Thus

$$s_d = \sqrt{(0.53)^2 + (0.55)^2}$$
$$= \sqrt{0.58} = \underline{0.76}$$

The critical ratio of the difference is found.

The critical ratio is the relation of the

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5. Ibid. p 139

point difference between the means to the standard deviation of this difference[6]. Thus

$$C.\ R. = \frac{2.9}{0.76} = \underline{3.8}$$

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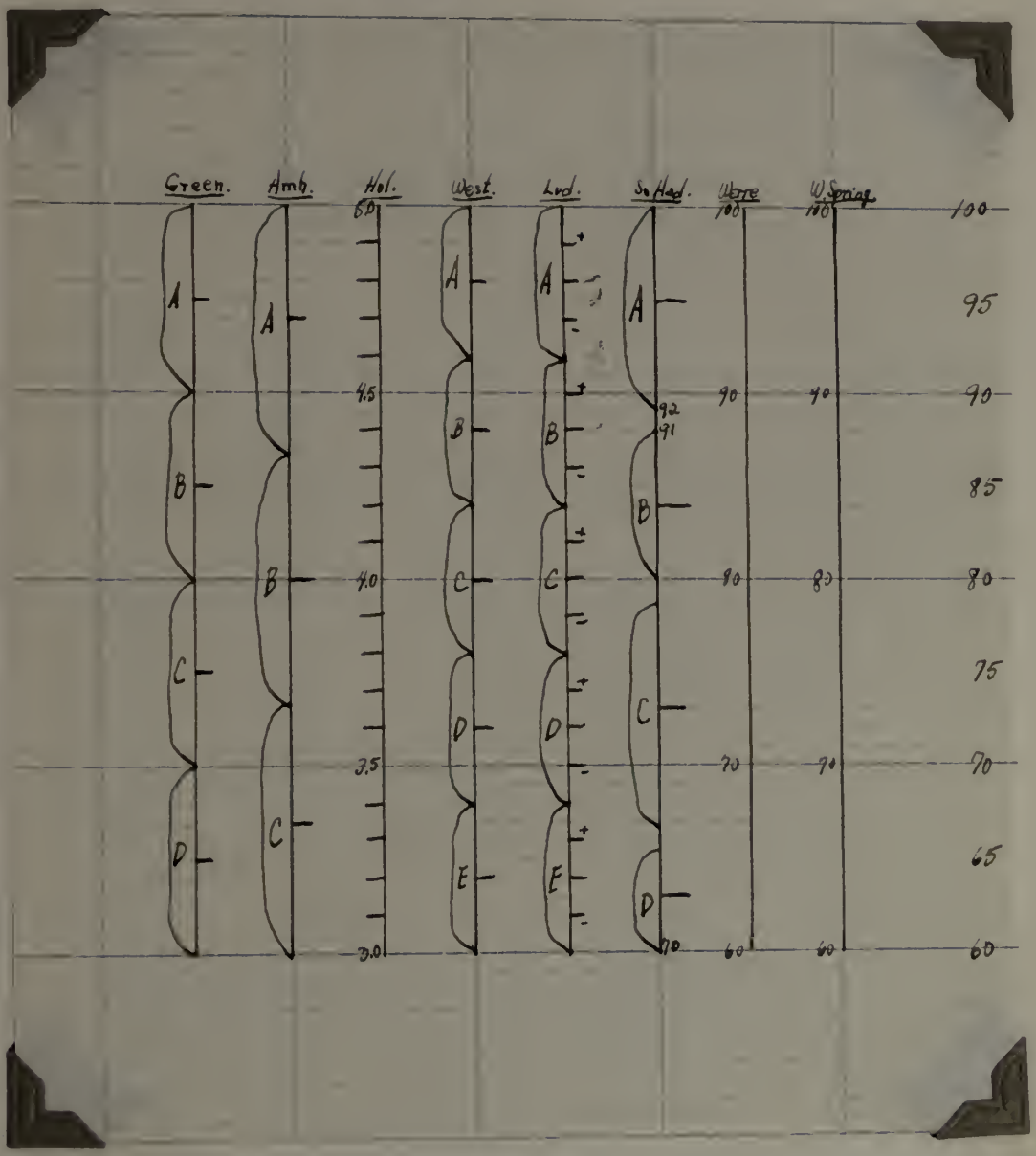
6. Ibid. p 140

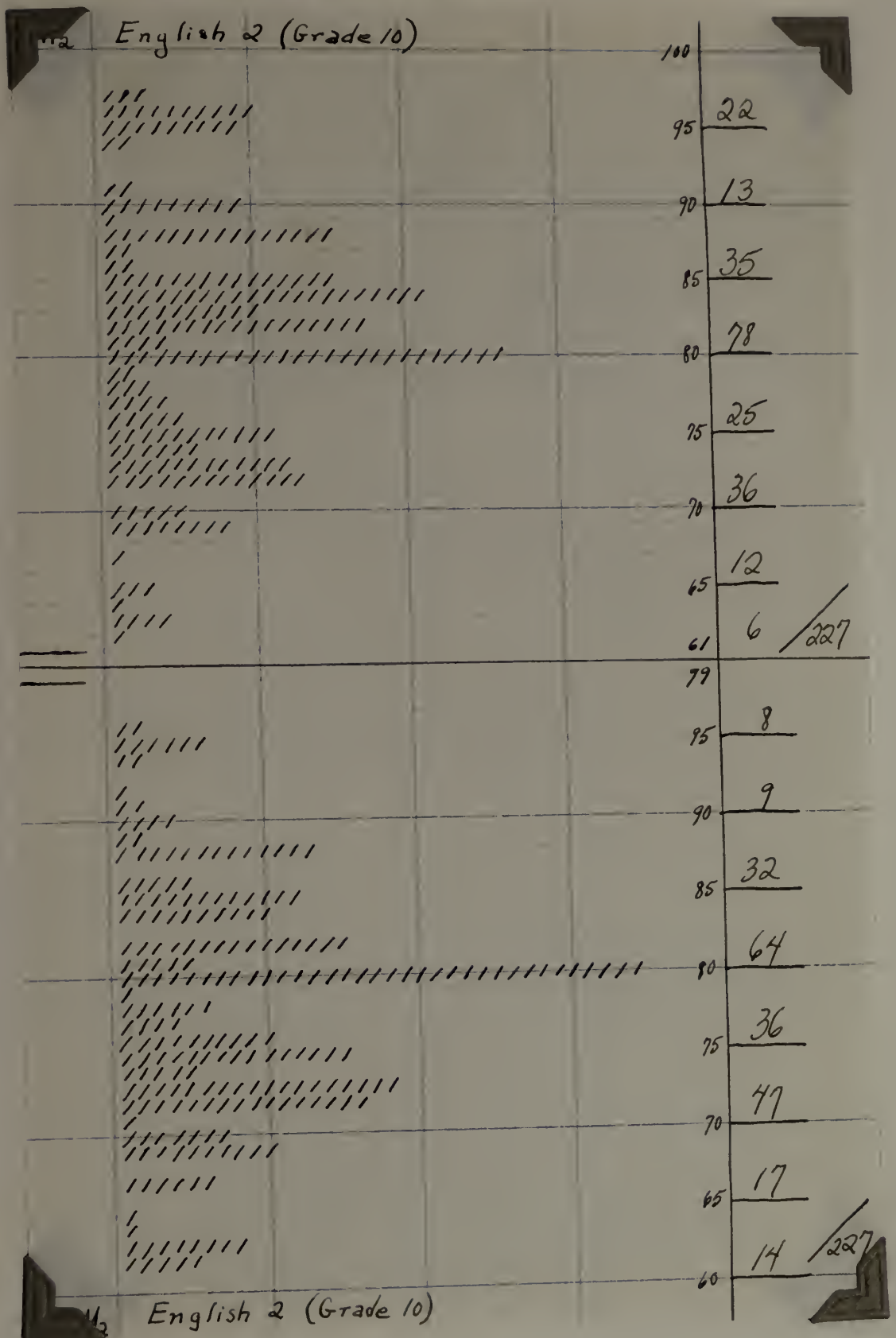
APPENDIX C

Conversion Scale for Marks: Each school used in this study had a slightly different marking system. Thus, before it was possible to tabulate the marks from these schools, a common scale had to be selected. Because of ease of computation, the common scale of 100% was selected. In the scale shown here, the marks of the various schools all are converted to the 100% scale.



APPENDIX D

Sample of Actual Tabulation Sheet:



BIBLIOGRAPHY

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A complete bibliography of the many references to the value of music in current educational writings would comprise a large monograph in itself. It was considered of more value in this study to give an annotated bibliography of a few selected references. The selection was made with the view of meeting the needs of anyone who might contemplate continuing the investigation from where this study ended; and who, therefore, would desire to build up a background of information with regard to what has been done in the subject.

The bibliography is divided in two parts:

Part I includes books, monographs, bulletins, and theses.

Part II is a list of articles from magazines and periodicals.

PART I

Books

Boyd, W. W. "Music in a Liberal Arts Course" Proceedings Music Teachers National Association 1925 vol. 20, p 33-9

Defends music study as a means of broadening the individual.

"Music requires the closest application and some of the most rigid processes of reasoning in order to come into full conception of music relationships. Some of the finest intellects and certainly most cultured people would be found in our special class of musicians." p 34

Clement, Stanley Francis "The Correlation of Music with Other Subjects in Ninety Junior High Schools of Massachusetts" Unpublished thesis. A. M. Boston University 1936, 97p

Sets forth information obtained from a questionnaire, answered by 90 junior high schools, relative to the degree and manner in which those schools attempt to correlate music with various other subjects. Concludes that correlation of music with other subjects is a practice only among the minority of teachers.

Crichfield, F. W. "A Study of the Correlation Between Music Talent Test Scores and Arithmetic Marks for Pupils in Grades 5, 6, 7, 8" Unpublished thesis. M. A. Indiana State Teachers College August, 1934 190p

Concerned with the problem of determining the coefficient of correlation between musical talent and mathematical ability for pupils in grades 5, 6, 7, 8 of Center Township School, La Porte, Indiana. Concludes that the relationship existing between musical talent and mathematical ability is so small as to be of no predictive value.

Earhart, Will "The Value of Applied Music as a School Subject" Proceedings Music Teachers National Association 1919 vol. 14, p 163-170

Discusses briefly: the aim of education; the value of music in education; the value of applied music in education.

"Music, as a vocational subject, far outranks any of the regular or academic subjects.... yet, as a social accomplishment, and in its power to act favorably upon all social conditions, it is almost, if not quite incomparable."

Garrett, Henry C. Statistics in Psychology and Education

New York: Longmans, Green and Co. 1935 p xiii & 317
Presents a good discussion of educational statistics. The chapter "The Reliability of Measures", p 118-148, explains the critical ratio technique.

Howard, John Tasker Our American Music, Three Hundred Years of It New York: Thomas Y. Crowell Co. p xxiii & 713
A few pages concern the first attempts (in 1832) at introducing music into the schools. p 324-6
"In a few years the school board began to be impressed, and some of its members saw that they were wrong in fearing that music study would divert the pupils from their regular tasks. Those who studied music had an added zeal for other subjects."

Kwalwasser, Jacob "Report of the Committee on Tests and Measurements" Proceedings Music Teachers National Association 1930 p 264-8
"Although many musicians believe a high correlation between general intelligence and musical intelligence, legitimate proof of such relationship is nowhere to be found. In spite of the fact that musicians for a long time have considered themselves "God's chosen people" mentally, statistical data is not so flattering. It is quite evident that what we call general intelligence is a consideration independent of musical intelligence." p 267

Mathews, W. Smythe Babcock Music, Its Ideals and Methods Philadelphia: Theodore Presser p iii & 225; Chapter 15, "Public School Music - Success or Non-Success"
"To appreciate fine musical effects, to discriminate closely between them, and to have so perfect a concept of them as to be able to reproduce them at call, is to have acquired a refined and trained sense of hearing, which will have many relations to other departments of activity, besides tending to the development of greater brain power, in just the same way as the brain is developed by every added activity of sense perception." p 108

Ibid. Chapter 24, "Music in Its Relation to Other School Studies"
"Through its influence upon the unconscious state of mind, music is one of the most potent instrumentalities in education, if we rightly employ it." p 155

Moore, Margaret "Factors Involved in the Measurement of Certain Abilities and Capacities Related to Music" Unpub. thesis. M. A. 1934 George Washington University 31p
Attempts to measure the relationship between the general intelligence of a group of fifth and sixth grade pupils and their musical ability as measured by the

Kwalwasser-Dykema music tests, and also, the relationship between their musical ability and their achievement in reading and arithmetic. Finds the relationship between general intelligence and musical ability to be negligible, and that no relationship exists between musical ability and reading or arithmetic.

Mursell, James L. Human Values in Music Education Boston: Silver, Burdett and Co. 1934 382p
Discusses in detail the problem of the ultimate educational values of music.

Ibid. Chapter 8, "Music and the School"
"Music is an ideal school activity, because: it calls for, and supplies, group activities; it calls for expressive activities; it calls for creative activities; music activities tend to set their own standards (in contrast to many subjects where the teacher must set the standard); music activities can be organized for a sequential advance; there are possibilities for diversified activities." p 112

Mursell, James L. Principles of Musical Education New York: The MacMillan Co. 1927 p xvi & 295
A presentation of the scientifically established facts regarding musical education.
"Outstanding musical gift is accompanied by intelligence well above average (shown by German studies). If children are classified as musical, half-musical, and non-musical, it is the first group the largest proportion of whose members make satisfactory progress in school. No mistake could be greater than to suppose that musicianship and stupidity go together."

Mursell, James L. and Glenn, Mabelle The Psychology of School Music Teaching Boston: Silver, Burdett and Co. 1931 p iv & 371
Presents the established results of psychological investigations in the field of music, adapted for the music teacher.

Ibid. Chapter 2, "Music and the Child"
"Musical ability is not a lonely ability. It has natural affinities for other excellences."

Parker, Alan Berthold "The Relationship of Grades in Music Classes to Grades in Other School Subjects in High School" Unpublished thesis. A. M. University of Southern California 1932 230p
Studies correlation of music grades with grades in

other subjects, and with subjective teacher character ratings of the pupils. Finds the correlation coefficients between music grades and general school grades ranged from 0.33 to 0.43, which, in the opinion of Parker, indicates that success in music and success in school work is determined by different factors.

Ritter, Frederic Louis Two Lectures New York: Edward Schuberth and Co. 97p; Lecture I, "Music in Its Relation to Intellectual Life"

A scholarly discussion of the ethical value of music.

"Music is eminently humanizing and social; it softens and neutralizes the materialistic aims of our time; it keeps up a thread of ideality between man's mind and soul." p 26

Schoen, Max The Effects of Music New York: Harcourt, Brace and Co. p ix & 273

Essays in the main chosen from among the papers submitted in a competition conducted by the American Psychological Association in 1921 for the most meritorious research on the effects of music.

Scott, Frank A. "A Survey of Home Music Study" Proceedings Music Teachers National Association 1919 vol. 14, p 171-9

A report of an inquiry in senior and junior high schools in Belmont, Mass.(10,000 pop.) in June 1918. Among other things, the inquiry wanted to know the scholarship grades secured by students who also did home music study. Finds that the scholastic average of all music students was 82.16 as compared with an average for the whole school of 79.10.

"It is very apparent that the serious minded music student was above the average in industry and accomplishment." p 175

Stoddard, A. J. "The Relation of the Arts to the Purposes of Democracy" Yearbook 1935 Music Educators National Conference p 23-28

The character values of music are shown. Music is viewed as an essential part of civic training.

Tiegs, Ernest W. and Crawford, Claude C. Statistics for Teachers Boston: Houghton Mifflin Co. 1930 p xviii & 212

Presents the elements of statistical science as applied to the one field of education.

Tremaine, C. M. History of National Music Week New York: National Bureau for Advancement of Music 232p

The foreword contains quotations of well known persons appraising the value of music.

Wise, Mary Ethel "A Music Survey of a Junior High School" Unpub. thesis. M. A. Syracuse Univ. 1936 55p

Attempts to determine the musical talent, sex, age, intelligence, training, and musical achievement of pupils in the seventh, eighth, and first half of the ninth year of Theodore Roosevelt junior high school, Syracuse, N. Y.

Witherspoon, Herbert "Music as a Vital Factor in Education" Proceedings Music Teachers National Association 1926 vol. 21, p 54-9

Discusses music as a means of emotional uplift to our whole people.

"I would claim for music that it contains practically the elements of physics, in conjunction with a power of inspiration which more than any other art, or science, or education, can develop, purify, and improve our use and understandings of those institutions and instincts upon which our real existences are founded." p 54

Zanzig, Augustus Delafield Music in American Life, Present and Future New York: Oxford University Press 1932 560p Prepared for the National Recreation Association

A survey of the amateur musical resources in America, covering all kinds of activities. Chapter IX discusses school music and its relation to the community.

PART II

Articles

Allen, W. D. "Place of Music in a Liberal Education" Musician XL (December 1935) p 18-19
"Music is a fundamental human need. Music, properly taught, and the subjects connected with music, contain all the elements necessary for a liberal education."

Baldwin, Lillian "Correlations" Music Supervisors Journal XVII (March 1931) p 63
Discusses the principles of the correlation of music with other school subjects.

Birchard, C. C. "What is Education Without Music" Musician XXXVIII (July 1933) p 5
A defense of music in the public schools.
"Music opens wide the sources of power and vision in man."

Campbell, L. B. "Music Education and Youth" Musician XLII (March 1937) p 48
Cites the neglected wisdom of the Greeks with regard to the importance of music study.
"The education of heroes should be gumnastics for the body, and music for the soul. Begin the education with music." -Plato-
"Intellect and emotion are each dependent upon the other as the head and the body. Nothing to excess implies the use of a balance of educational resources, both intellectual and emotional."

Dann, Hollis "Music as a Major Subject in Education" Musician XXXV (October 1930) p 12
An article on the intellectual parity of music as an educational subject.
"Educators of vision recognize the humanizing, refining power of music in life, its great social, vocational, and educational value, and welcome its inclusion in the school curricula."

Dykema, Peter W. "Music in the School Survey" Music Supervisors Journal XVII (October 1931) p 20-21

An outline of the report of the music survey group at Teachers College, Columbia.

Education LIV, 2 (October 1933)
This issue of the magazine is devoted to music training and education.

English, Horace "The Procedure of Matched Cases - A Caution" The Journal of Educational Psychology XXIX, 8 (November 1938) p 620-2

A discussion of the procedure used in this study. "In the procedure of matched cases, there is grave danger that by 'holding constant' a certain number of variables, we shall illicitly introduce the effect of other variables."

Gehrkens, Karl W. "Correlation, Its Philosophy and Practice" Music Supervisors Journal XX (February 1934) p 16-17

Discusses the possibilities of correlation of music with various other subjects and fields of knowledge. "It is music and the other arts that make life interesting and bearable. So in dealing with music we must teach it not in isolation, but as a part of the common experience, which is the life of humanity."

Gunther, Katherine "Music an Educational Essential" Musician XLII (September 1937) p 155

"Instruction in the art of music should be the first stepping stone in life. Through it everything else will become more readily comprehended. From music as a center, educational paths spread in all directions."

Jason, J. "Music and Youth" Musician XLI (October 1936) p 152

Music training teaches moral discipline; teaches lessons of co-operation and teamwork; gives a sense of pride and self-respect, yet curbs the ego; cultivates a taste for beauty and worthwhile things; helps to maintain the child in better health by virtue of the happiness obtained. Thus, music instruction should be compulsory in schools today.

Miller, Richard "Uber musikalische Begabung und ihre Beziehungen zu sonstigen Anlagen" Zeitschrift für Psychologie XCVII 1925 p 191-214

The school records of students in a teacher training institution where music was required were studied, men only being investigated. These characteristics of the musical personality were revealed: high grade mentality, and much versatility; close correlation between musical and mathematical ability; usually notable linguistic ability; qualities of effective social leadership; emotional and unstable, often not punctual or scientific; physically strong, healthy, and active; sometimes shows hysterical tendencies.

Morgan, R. V. "Music as Education" Education LIV

(October 1933) p 91-3
Discusses the place of music study in the school curriculum.
"Music and other arts are not fads and frills, but important parts of our educational curriculum."

Pannenborg, H. J. and W. A. "Die Psychologie des Musikers" Zeitschrift für Psychologie LXXIII 1915 p 91-136
Investigated the abilities of 423 musical adults, 21 composers with whom the biographical method was used, and 2757 school children between the ages of twelve and eighteen. Found a high measure of agreement between the three groups, so that we may conclude that musicality has about the same psychic and cultural characteristics wherever found.

Samuelson, A. "Place of Music" School and Society XLIII (June 20, 1936) p 825-32; Address to Music Educators National Conference, New York, April 3, 1936
Advises: continuous program of appreciation, participation, and interpretation of music for all children; strengthen the music program of the community; discover and train new talent, who will develop the Creative Period in the history of American music.

Webster, W. F. "Music and the Sacred Seven" Music Supervisors Journal XIII (May 1927) p 33, 45
The relation of music to the Seven Cardinal Principles of Education is discussed. Attention is called to the grade study of music pupils in the Minneapolis schools.

Witherspoon, Herbert "Need for Music in General Education" Musician XL (March 1935) p 7-9
A good philosophic treatment of the value of music. "Education must pay adequate attention to the training and development of the emotions. It must give emotions as wide an opportunity as it gives the cold-blooded reason and thought."

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Approved by:

Stowell C. Goding

Wm. C. Sanctuary

Albert W. Purvis

Thesis Committee

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