THE DEVELOPMENT AND EVALUATION OF A SELF-INSTRUCTIONAL WORKBOOK IN THE CRAFT OF CHORD CONNECTION

Thesis for the Degree of Ph. D.

MICHIGAN STATE UNIVERSITY

Robert Russell Fink

1965

This is to certify that the

thesis entitled

The Development and Evaluation
of a Self-Instructional Workbook
in the Craft of Chord Connection

presented by

Robert Russell Fink

has been accepted towards fulfillment
of the requirements for

Ph. D. degree in Music

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Date May 14, 1965

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ABSTRACT

THE DEVELOPMENT AND EVALUATION
OF A SELF-INSTRUCTIONAL WORKBOOK
IN THE CRAFT OF CHORD CONNECTION

by Robert Russell Fink

The purpose of this study was to investigate the feasibility of teaching the basic craft of chord connection by means of a self-instructional workbook. In order to accomplish this, an experiment was conducted with seventy music students enrolled in four sections of second semester Freshman Music Theory at Western Michigan University.

The following procedures were used in carrying out the purposes of the study:

1. A 378 frame self-instructional workbook was developed and printed in book form.
2. Subjects in the experiment were divided into two groups. One group was taught by the self-instructional workbook and the other group was taught by the traditional teacher-classroom approach.
3. A test was devised which was administered both before training and after training.
4. Records were kept of subject-time and teacher-time required to complete the course of study.
5. Data were analyzed statistically.

Results indicated that (1) the subjects who completed the self-instructional workbook achieved significantly better scores on the post-training test than the subjects who were trained by the teacher-classroom approach; (2) the subjects who were trained by the self-instructional workbook required more time to complete the course of study than the other subjects; and (3) less teacher-time was necessary for the subjects who were trained by the self-instructional workbook.

On the basis of these results the following conclusions were drawn:

1. Subjects learned the basic craft of chord connection effectively by means of self-instructional materials.

2. Subjects were much less likely to achieve extremely low scores on tests in basic chord connection if they were taught by a programed learning approach rather than a teacher-classroom approach.

3. Subjects were much more likely to achieve very high scores on tests in basic chord connection if they were taught by a programed learning approach rather than a teacher-classroom approach.

4. A programed learning approach to teaching basic chord connection will not result in a saving of student time in comparison to a teacher-classroom approach.

5. Much teacher-time can be conserved by teaching the craft of chord connection by means of programed learning rather than by a teacher-classroom approach.

THE DEVELOPMENT AND EVALUATION OF A SELF-INSTRUCTIONAL WORKBOOK IN THE CRAFT OF CHORD CONNECTION

By

Robert Russell Fink

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Music

1965

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to the many people who helped to make this study possible: To Dr. H. Owen Reed, chairman of my committee, for his advice and guidance; to Dr. Merrell Sherburn for his astute and understanding supervision of the project; to the other members of my committee for their kind assistance; to the Western Michigan University Music Department and Mrs. Ethel Adams for cooperating in making music theory classes available for this experiment; to the students who participated in the experiment; to Mr. Tom Fulton for teaching the control group, and for his many helpful comments; and especially to my wife, Ruth, for spending countless hours reading, typing, and contributing moral support, and to my daughter, Denise, for her patience and general good behavior.

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CHAPTER I

INTRODUCTION

Background of the Study

During the past decade certain experimental psychologists have generated great interest among educators through research in self-instructional techniques. These techniques are based on the principle that behavior can be conditioned through a process involving the interaction of a stimulus, a response and reinforcement.[1] The term programed learning, which stems from this research, refers to instructional methods in which teacher functions are provided by a wholly or partially automated sequence of instructional segments.[2] These segments, which are called frames, usually consist of four different parts: (1) an item of information, (2) A question or statement designed to elicit a response, (3) space for a response, and (4) the correct response. A student reads the item of information, responds to the question

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[1] B. F. Skinner, Science and Human Behavior (New York: The MacMillan Co., 1953), pp. 65-66.

[2] D. L. Cook, "Teaching Machine Terms: A Glossary," Programmed Learning, ed. W. I. Smith and J. W. Moore (Princeton, New Jersey: D. Van Nostrand Co., 1962), p. 232.

and then compares his response to the correct one. In this way he receives immediate knowledge of the accuracy of his response which has the advantage of reinforcing the activity or correcting a misunderstanding. Most programs are written in such a way that the student's response is right a high percentage of the time and the act of telling the student that he is correct becomes a reward or reinforcement.[3]

The earliest effort in the field of what later was to be called programed learning, was undoubtedly Pressey's automatic testing machine which was developed in the early 1920's.[4] However, the great surge of research activity that was to occur did not begin until an article written by Skinner[5] in 1954, (1) explained the psychological and educational principles that made programed learning feasible and desirable, (2) reported on the results of successful experiments in this area, and (3) recommended that this method of instruction immediately be incorporated into American education. Since that time many articles and books have been written about programed learning and texts which utilize this

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[3] E. B. Fry, Teaching Machines and Programmed Instruction (New York: McGraw-Hill Book Co. Inc., 1963), pp. 2-3.

[4] S. L. Pressey, "A Simple Apparatus Which Gives Tests and Scores--and Teaches," Teaching Machines and Programmed Learning, ed. A. A. Lumsdaine and R. Glaser (Washington, D. C.: National Education Association, 1960), pp. 35-41.

[5] B. F. Skinner, "The Science of Learning and the Art of Teaching," Harvard Educational Review, XXIV (1954), pp. 86-97.

instructional procedure have been developed in almost all subject matter areas. Also, many experiments have been completed that have shown programed learning to hold great promise for training and education.[6]

Walter Ihrke[7] stated in 1963 that he believed the need for individualized instruction in music subjects could not be met by traditional methods alone, but that the pattern of experiences which would most efficiently lead to the development of a necessary musical skill must be determined and then the acquisition of the discriminations and generalizations that both underlie and constitute this skill must be automated. He observed that "...the problem then is to determine what elements of music are relevant, which can and should be taught, and which are suited to automated techniques without in any way impairing the ultimate fusion of some or all of the elements into the complete musical experience."[8] Successful programs have been developed in two areas of music study--aural perception and the fundamentals of music.[9] The investigation which led to the writing of this paper was undertaken

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[6] W. A. Deterline, An Introduction to Programed Instruction (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1962), pp. 63-64.

[7] W. R. Ihrke, "Automated Music Training," Journal of Research in Music Education, XI (1963), p. 6.

[8] Ibid., p. 10

[9] These programs are discussed in detail under Related Studies.

to explore the feasibility of extending programed learning into another area.

The Problem

One of the most time consuming phases of the study of music theory, for students and teachers alike, is that part of written harmony called part-writing. At the present time students usually learn the concepts and procedures of part-writing through lectures, assigned readings and by working problems in figured bass. Figured bass problems must be corrected by an instructor and because considerable time is necessary to do this, often it is not possible for old assignments to be returned before new ones are given. As a result, students do not have the opportunity to study previously-corrected problems before beginning new ones and mistakes are made over and over again with correction coming days or weeks later. This creates an unsound learning situation that tends to reinforce incorrect procedures. Information is needed to determine if it is possible, through programed learning, to teach this material more efficiently.

Part-writing has two main aspects: (1) chord choice, which is primarily a matter of aesthetic judgement, and (2) chord connection, which is more concerned with the technical manipulation of materials. It was decided to isolate chord connection from chord choice and to examine the feasibility of teaching chord connection by means of programed learning. This decision was made for the following reasons:

1. Because technical material seems to lend itself particularly well to programed learning.

2. So that this, the most time consuming part of the study of part-writing, could be given emphasis.

3. To limit the scope of the investigation.

The Purpose of the Study

The purpose of the study was to determine whether a self-instructional approach to teaching basic chord connection is as effective and expeditious as the traditional teacher-classroom method.

Delimitations

This investigation was limited to programed learning in the craft of connecting triads in four voices, which was taken to include the following areas of information:

1. The ranges of the voices.

2. The voicing of root position, first inversion and second inversion triads.

3. The connecting of voiced root position, first inversion and second inversion triads.

A knowledge of the fundamentals of music (intervals, scales, keys and triads) was considered prerequisite to basic chord connection.

Related Research

To the knowledge of this writer, no experiments involving a self-instructional method of teaching part-writing have yet been concluded. However, a number of studies have been made

which explore the application of programed learning techniques to subject matter in the field of music theory. Some of these studies are discussed below.

Clough investigated the effectiveness of a program in written pitch intervals and found that students learned the content "...in a very creditable fashion without the instructor's support in the form of lectures, quizzes and so forth."[10] This was a linear program which required the student to progress through a series of lessons by following small sequential steps each of which required a response. There were 284 items in the program and they were divided into 13 sets.[11] Clough also explored the attitude of the students toward programed learning and concluded that they were highly satisfied and would generally not object to its future use.[12]

Experimentation with programs in meters, cadences, small sectional forms, and musical dictation has been done by Cramer who reported the results as highly satisfactory.[13] The programs in meters, cadences and small sectional forms were presented by the use of a tape recorder with the students writing their responses on an answer sheet. The mechanical procedure

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[10] John Clough and others, "Oberlin Teaching Machine Project 1959-60," A report submitted to the Ford Foundation, February, 1961, p. 32.

[11] Ibid.

[12] Ibid., p. 33

[13] Ibid., p. 37

consisted of: (1) a voice on the tape asking a question about a musical excerpt, (2) the playing of the excerpt, (3) allowing time for the student to respond, and (4) the voice on the tape giving the correct response.[14] The program in musical dictation was also presented on tape. The voice established the meter and then the excerpt was sounded. Students responded in a booklet and by turning a page could locate the correct answer and compare it to their response.[15]

In 1962, Carlsen investigated certain variables pertaining to the development of melodic dictation ability by means of programed learning.[16] In his experiment, a control group was taught melodic dictation by a teacher in a teacher-classroom situation and an experimental group learned melodic dictation by means of a programed book and recorded tapes. Half of the experimental section used a linear program and half used a branching program. Results of the study revealed that one programing technique was as effective as the other in aural perception training and that there was considerable value in teaching melodic dictation

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[14] Ibid., p. 36

[15] Ibid.

[16] J. C. Carlsen, "An Investigation of Programmed Learning in Melodic Dictation by Means of a Teaching Machine Using a Branching Technique of Programming," (unpublished Ph. D. Dissertation, Northwestern University, 1962). Reported in part in "Programed Learning in Melodic Dictation," Journal of Research in Music Education, XII, (Summer, 1964), pp. 139-148.

with programed tape recorded material.

Barnes reported that a programed book in music fundamentals was developed and tested with students in an elementary education music fundamentals class.[17] The students were divided into a control group and an experimental group. Both groups were taught in the same manner and by the same instructor. The programed book was given only to the experimental group and they completed it outside of class. Results indicated that the programed instruction, when used as an auxiliary learning experience, increased the effectiveness of the learnings.

Harder[18] is presently writing a programed text in written harmony and he reports that he is encouraged with the results of preliminary testing of the first five chapters.

All of the studies cited above indicate that programed learning can be an effective method of teaching certain phases of music theory, but none has conclusively supported the practicability of teaching chord connection by this means.

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[17] R. A. Barnes, "Programed Instruction: An Approach in Teaching Music Fundamentals to Students in Elementary Education," Paper read at a Symposium for College Teachers of Music Education, The Ohio State University, February 15-16, 1963.

[18] Interview with Paul Harder, Department of Music, Michigan State University, February 3, 1965.

Questions Being Tested

This study was undertaken to investigate experimentally the feasibility of teaching chord connection by means of programed learning. Answers to the following questions were sought:

1. How effective will programed learning be as a teaching method for basic chord connection?

2. How expeditious will programed learning be as a teaching method for basic chord connection?

To allow for statistical analysis of the data, the above questions were stated as the following null hypotheses:

1. There is no significant difference between test scores of subjects as a result of method of teaching.

2. There is no significant difference in the amount of time subjects require to complete the course of study as a result of method of teaching.

In order to prove or disprove these hypotheses, a 378 page self-instructional workbook[19] in the craft of chord connection was developed and tested.

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[19] This workbook is available at the Music Library, Michigan State University, East Lansing, Michigan.

CHAPTER II

ORGANIZATION OF THE STUDY

Developing the Self-Instructional Workbook

A study of the techniques of programing was undertaken as a first step in the process of developing a self-instructional workbook to be used in the experiment.[20] As a result of this study it was decided that the workbook should not be strictly linear in design but that it should allow for branching so that students who were fast learners would be relieved from unnecessary repetitive drill and thus be able to finish the program more quickly. It was also decided that there would be two different response modes, one being discriminatory and the other being constructive. The discriminatory response mode that was adopted was of the so-called baboon variety.[21] The constructive response mode was one that required written answers of a technical nature involving various symbols of musical notation and analysis. The decision to use these

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[20] See Bibliography under Programed Learning.

[21] In this type of response mode two answers (a and b) are given and the learner must determine whether (a), (b), both or neither is correct.

two particular response modes was made after experimentation with numerous students indicated that they held interest to a high degree.[22]

The material to be programed was derived from over twenty authoritative harmony texts.[23] A syllabus was made by arranging the material in a logical sequence for learning,[24] and this syllabus then served as the source of item content for the individual frames of the program. Matrices were developed to regulate variables such as keys, types of chords, and kinds of connection, so that there would be an equality of emphasis in these areas. A flow chart was kept to control the presentation and follow-up of new material. The frames were written on index cards so that the steps between frames could be adjusted by adding or deleting cards. The material was programed in sections, and each section was tested for clarity with student volunteers.

A permanent format for the workbook was developed that took into consideration the following points:

1. There must be sufficient space for the presentation, in clearly readable form, of items of information.

2. Ample room must be allowed for responses.

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[22]During the fall of 1963 a certain amount of material on chord connection was programed with various modes of response and selected students were asked to comment on the degree of interest the various modes afforded.

[23]See Bibliography under Chord Connection.

[24]See Appendix A.

3. Answers should be masked to encourage independent responses.[25]

4. There must be an easy-to-follow line of succession between parts of frames and between whole frames.

The first eight sections of the thirteen-section workbook were given an informal preliminary testing at the Michigan State University Youth Music Program during the summer of 1964. Twenty-one high school students who were attending music theory classes served as the subjects for the experiment. Nine of these students were in one class and twelve were in another with enrollment in the classes considered to be random as it was the result of a general registration. The class of nine was designated as the control group and the class of twelve was the experimental group.

A pre-test, which also served as a post-test, was devised that was considered to reflect the desired learning goal for the course of study. This test was given to both groups, after which the control group was trained using the traditional teacher-classroom method and the experimental group was trained solely with the self-instructional workbook. The same material was covered by both groups. At the end of a three week time period both groups were given the test again. An analysis of the data showed that while the experimental group scored lower on the pre-test (a mean score of

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[25]It is generally believed that masking is not necessary in a linear program but because this program contained branching and because the desired responses were highly technical, it was felt that masking should be taken into consideration.

24.5 compared to a mean score of 40.3 for the control group) it scored higher on the post-test (a mean score of 94.05 compared to a mean score of 89.0 for the control group). These results seemed to indicate that the self-instructional workbook could teach the basic craft of chord connection effectively.

The experimental group was asked to fill out a questionnaire which was designed to elicit student impressions of the workbook. Answers to the questionnaire indicated that a high percentage of the respondents believed that the program:

1. Had a format that was very easy to follow.
2. Presented new material at the right rate of speed.
3. Was interesting to work on.
4. Had the advantage of allowing each student to work at his own pace without interference from a teacher.
5. Contained too great an incidence of repetition in the way of drill problems.

The negative response in point five above was taken into consideration and revisions were made in the program to allow for more branching in the drill sections.

Experimental Design

During the 1965 spring semester, an experiment was conducted with seventy music students enrolled in four sections of second semester Freshmen Music Theory at Western Michigan University. The purpose of the experiment was to investigate the

feasibility of teaching the basic craft of chord connection by means of a self-instructional workbook. Students in two of the four music theory sections served as a control group and students in the other two sections were the experimental group. The control group numbered thirty-two and the experimental group numbered thirty-eight. Both groups were given a pre-test and, after a period of training, a post-test. The control group was trained by the traditional teacher-classroom method and the experimental group was trained solely by means of the self-instructional workbook. Both groups covered the same material.

Sampling Procedure

The group of students used in the experiment was considered to be homogeneous because enrollment in the four sections of music theory that were included in the experiment was handled in a random manner through a general registration. Carlsen attempted to control enrollment in the classes involved in his experiment, and found that due to the problems inherent in all registration systems, his groups were contaminated. This created some difficulties in the statistical analysis of his data.[26] In the present experiment there was an assumed random population of seventy and the

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[26] J. C. Carlsen, "An Investigation of Programmed Learning in Melodic Dictation by Means of a Teaching Machine Using a Branching Technique of Programming," (unpublished Ph. D. Dissertation, Northwestern University, 1962), p. 20.

statistical formula for comparison of means that was used was considered to be valid with a population of sixty or more.[27]

Testing Procedure

The same test was used in the experiment as both the pre-test and the post-test.[28] It was designed to represent terminal behavior for a course of study in basic chord connection.[29] The validity of the test was verified by a number of experts in the field of music theory.[30] All subjects were given the test prior to training and then again after training. Pre-test scores served as control scores and post-test scores served as criterion scores.

The subjects were allowed twenty minutes to work on the test each of the two times that they took it. This particular time period was set so as to make it impossible for anyone to complete the test without error. This was necessary in order to measure accurately the level of accomplishment of all subjects. The test was scored on the basis of one point for each of 100 possible answers. The answers were either in the form of written musical notes or

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[27] J. E. Freund, Mathematical Statistics, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1962), pp. 266-267.

[28] This test is included in Appendix B.

[29] The test was given to a number of college students who had completed music theory study and they all considered it to be a very comprehensive but well defined measuring tool for skill and knowledge in basic chord connection.

[30] Merrell Sherburn, Michigan State University, East Lansing, Michigan; Tom Fulton and Burt Szabo, Western Michigan University, Kalamazoo, Michigan.

Roman numerals (for analysis). These symbols were to be filled in by the subjects. There was only one possible answer where Roman numerals were involved, but where notes were involved there were sometimes a number of answers that could be considered correct. Notes were considered to be incorrect if any of the following errors were made:

1. The note was not a member of the indicated chord.
2. The note was not in the proper voice range.
3. The chord was in the wrong structure.
4. The vertical spacing was incorrect.
5. The voice leading to the note was incorrect.

Nothing was deducted for the absence or incorrect direction of stems or for including the upper three voices in the treble clef.

Training Procedure

The control group was trained by the traditional teacher-classroom method which included lectures, class drill and assignments to be completed outside of class and returned for correction by the teacher. The experimental group was trained solely by the self-instructional workbook. The subjects in this group were allowed to work at their own pace both in class and outside of class. Some questions about the program were asked by students and answered by the teacher but no additional information or explanation concerning the subject matter of the program was given. The course objectives, concepts and terminology were the same for

both groups. The training period for both groups was set at a maximum of eight weeks.

Timing Procedure

Subjects in both the control group and the experimental group were required to keep an accurate record of the amount of time spent outside of class in completing the course of study. Time spent in class was recorded by the teacher. Every assignment given to the control group had a space at the top of the page to be used for recording the amount of time that it took to complete the assignment. Subjects in the experimental group were instructed to record on the first page of each section of the workbook, the amount of time that it took to complete that section. A time log was kept for each of the subjects in the experiment.

Statistical Design

The experiment was designed so that the significance of the test-score data could be analyzed by means of a t-test. Since the number of students was greater than thirty in both the experimental and the control groups, the t distribution was approximated by the standard normal distribution. The following statistic was used:[31]

$$z = \frac{\bar{x}_1 - \bar{x}_2 - D}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

[31] Freund, p. 267.

Where:

$\bar{x}_1$ = mean of the first sample

$\bar{x}_2$ = mean of the second sample

n_1 = number in the first sample

n_2 = number in the second sample

s_1^2 = first sample variance

s_2^2 = second sample variance

D = hypothesized difference between means.

The sample variances were calculated by means of the following formula:[32]

$$s^2 = \sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n - 1}$$

The statistical test stated above takes into consideration the fact that individuals differ in their ability to learn a given task at a given time. When this test is employed the chance or random factors which determine the selection of the particular individuals who comprise the particular samples will not give an advantage to either group. The test negates, among others, the following specific variables:[33]

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[32] Ibid., p. 189.

[33] P. Blommers and E. F. Lindquist, Elementary Statistical Methods in Psychology and Education (Boston: Houghton Mifflin Co., 1960), pp. 308-309.

1. The particular set of individuals in one sample may have been more intelligent, and hence more rapid learners, than those in the other sample.

2. The particular set of individuals in one sample may have had more previous experience with a learning task of the type involved than those in the other sample.

3. The particular set of individuals in one sample may have been in better physical condition at the time of the experiment than those in the other sample.

The 5 percent level of confidence was set for statistical significance.[34]

The significance of the time data[35] was analyzed by means of a simple comparison of the mean time requirements of the two groups. It was realized that the human-error element that was introduced by having each subject record his own time would make it impossible to have anything but a rather unscientific approximation of actual time spent. Consequently, it was felt that subjecting this data to formal statistical analysis would only

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[34]The selection of a confidence level for statistical significance is an arbitrary one. It is presently common practice for experimenters in the behavioral sciences to select the 5 percent level. See A. L. Edwards, Statistical Methods for the Behavioral Sciences (New York: Rinehart and Co., 1954), pp. 241-244.

[35]Time data refers to the time required for each subject to complete the course of study.

serve to make the rather unscientifically arrived-at data appear otherwise. An accurate record of teacher-time, was kept for both the experimental and the control groups.

CHAPTER III

ANALYSIS OF THE DATA AND RESULTS

Null Hypothesis 1

> There is no significant difference between test scores of subjects as a result of method of teaching.

This hypothesis was tested by means of an approximation of the t-test. Data for the analysis were derived from the post-test scores of all subjects. Pre-test scores were used for comparison. Table 1 presents these scores.

TABLE 1

PRE-TEST ($^{1}X^{1}Y$) AND POST-TEST ($^{2}X^{2}Y$) SCORES*

Experimental Group		Control Group	
$^{1}X_{i}$	$^{2}X_{i}$	$^{1}Y_{i}$	$^{2}Y_{i}$
1	84	24	67
25	81	4	87
6	88	15	41
37	90	60	88
33	85	54	91
0	57	59	90
18	87	17	83
25	86	23	76
11	96	22	46
12	89	5	58
10	79	0	56

TABLE 1--Continued

Experimental Group		Control Group	
$^{1}X_i$	$^{2}X_i$	$^{1}Y_i$	$^{2}Y_i$
2	86	16	89
33	86	63	79
1	79	5	89
45	90	22	74
0	88	10	58
11	51	10	55
22	82	49	92
22	80	12	58
35	81	23	71
25	94	31	68
0	88	16	73
21	76	58	61
46	72	15	67
8	90	37	55
36	85	11	73
30	87	34	84
19	94	8	87
12	94	12	85
11	79	0	60
25	91	23	52
22	96	12	57
81	94		
22	86		
29	91		
53	90		
27	78		
9	86		

*In this study pre-test and post-test scores were always stated as the number correct out of a perfect score of one-hundred.

The mean scores for the pre-test are presented in Table 2.

TABLE 2

MEAN SCORES FOR THE PRE-TEST

Group	Mean Score
Experimental	21.705
Control	23.438
Difference	1.733

The mean scores for the post-test are presented in Table 3.

TABLE 3

MEAN SCORES FOR THE POST-TEST

Group	Mean Score
Experimental	84.632
Control	70.938
Difference	13.694

The results indicated a significant difference at the 5 per cent level of confidence between the post-test scores of the experimental group and the post-test scores of the control group. Therefore, Null Hypothesis 1 must be rejected.

Null Hypothesis 2

> There is no significant difference in the amount of time subjects require to complete the course of study as a result of method of teaching.

This hypothesis was tested by a simple comparison of the mean time requirements of the experimental and the control groups. Data for the analysis were derived from the time log that was kept for each subject. Table 4 presents these times.

TABLE 4

SUBJECT TIME REQUIREMENTS FOR COMPLETING THE COURSE OF STUDY*

Experimental Group	Control Group
1249	392
841	467
1275	562
1720	652
802	377
1193	297
1139	442
1501	802
834	595
1570	487
1202	482
827	457
1165	622
1364	397
1815	491
1052	507
1220	592
667	522
1078	457
895	432
1501	562
1231	502
1449	432
1321	722
1586	427
1163	577
1088	452
1072	620
851	447
1573	822
977	482
1231	767
669	
1265	
1069	
1099	
1659	
1280	

*In this study time requirement data were always recorded in minutes.

The mean time requirements for completing the course of study are presented in Table 5.

TABLE 5

MEAN TIME REQUIREMENTS FOR COMPLETING THE COURSE OF STUDY

Group	Time Requirement
Experimental	1197.3
Control	526.6
Difference	670.7

The results indicated a significant difference between the time requirements of the experimental group and the control group, and Null Hypothesis 2 was rejected.

Teacher Time Requirement

Data on the teacher-time necessary for completing the course of study were also collected. It was found that the teacher of the control group spent 167 minutes lecturing and answering questions, 423 minutes constructing drill problems, and 566 minutes correcting completed drill problems, for a total of 1156 minutes. The teacher of the experimental group spent 6 minutes answering questions. These data indicate that a great deal more teacher-time was necessary for the control group to complete the course of study than for the experimental group. However, the time involved in the development of the programed workbook was not considered. Teacher time requirements for completing the course of study are presented in Table 6.

TABLE 6

TEACHER TIME REQUIREMENTS FOR COMPLETING THE COURSE OF STUDY

Teacher	Time Requirement
Experimental Group	6
Control Group	1156
Difference	1150

Summary of the Results

There was a significant difference between test scores of subjects as a result of method of teaching, therefore, Null Hypothesis 1 was rejected.

There was a significant difference in the amount of time subjects required to complete the course of study as a result of method of teaching, therefore, Null Hypothesis 2 was rejected.

A great deal more teacher-time was necessary for the control group to complete the course of study than for the experimental group.

CHAPTER IV

CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

Programed Learning Effectiveness

The results of the experiment indicated that programed learning can be an effective teaching method for basic chord connection and that such an approach can result in significantly better test scores than the traditional teacher-classroom approach. Therefore, it can be concluded that learning, in the craft of chord connection, is not necessarily dependent on an interpersonal teacher-student relationship, but that it can be accomplished as well or better with the student working on a program by himself at his own rate of speed without benefit of teacher guidance.

The data indicated that extremely low scores were much more frequent in the group trained by the teacher-classroom approach. Fifteen subjects in this group scored below 70 on the post-test while only two of the subjects who were trained by the programed workbook scored below 70. Stated in percentages--46.8 percent of the control group and 5.3 percent of the experimental group scored below 70 on the post-test. (It might be noted that neither of the two subjects in the experimental group who scored below 70 completed the self-instructional workbook. Reasons given

for not completing the program were poor study habits and organization of time, not lack of time.) From this information it can be concluded that subjects are much less likely to achieve extremely low scores on tests in basic chord connection if they are taught by a programed learning approach rather than a teacher-classroom approach providing they complete the program.

The data also indicated that only three subjects (9.4 per cent) in the control group scored 90 or above on the post-test, while twelve subjects (31.6 per cent) in the experimental group scored 90 or above. From this information it can be concluded that subjects are much more likely to achieve very high scores on tests in basic chord connection if they are taught by a programed learning approach rather than a teacher-classroom approach.

It can be observed that not only was the mean score on the post-test higher for the group that was taught by the self-instructional workbook, but also there were far fewer extremely low scores and many more very high scores in this group than in the group taught by the teacher-classroom approach.

This may possibly be explained by the inherent nature of programed materials. The classroom teacher relies to a great extent upon intuition and student response for a guide to sequence of materials and speed of presentation. With such an approach it is quite possible that certain aspects of the course of

study may receive less attention than they should, and that certain less-vocal students may, because of their failure to understand certain concepts and their hesitancy to make their problems known, fall hopelessly behind. Programed instructional materials, in theory at least, are designed so that concepts will be presented in logical sequence. No aspects of the course of study can be slighted nor details left to chance because there is no teacher who can be depended upon to straighten things out if there is a point of misunderstanding. The programed material must itself be completely understandable if it is to be effective. Consequently, a higher degree of organization must be applied to any material being programed than is usually found in conventional presentations, and this fact alone serves to make programed material easier to comprehend. The speed-of-presentation of new concepts is another factor which must be carefully controlled in programing. A program must be designed so that students of many different intellectual levels can comprehend it without assistance. On the other hand, classroom teachers can not at all times gear their pace of material presentation to the slowest student in the class because faster learners might suffer by this.

Another important advantage of programed learning is the element of immediate reinforcement. It has been proven that student learning is enhanced greatly, when reinforcement takes place immediately. In teacher-classroom situations reinforcement

does not take place until corrected assignments are returned, and this may be a period of a week or more, after the assignment was completed by the student.

Programed Learning Efficiency

The results of the experiment indicated that programed learning can be--for the subjects--a more time consuming method of learning basic chord connection than the teacher-classroom approach. Therefore, it can be concluded that a programed learning approach to teaching basic chord connection will not result in a saving of student time in comparison to the teacher-classroom approach. In fact, in this particular experiment, the mean time necessary for the completing of the course of study was more than twice as much (227.4 per cent) for the subjects taught by programed learning as it was for the subjects taught by the teacher-classroom approach.

However, this in itself does not appear to be a particularly negative conclusion. The fact that the group that spent the most time scored the highest, is a significant one. It implies what most teachers believe to be true: that a great deal of structured drill work is necessary to develop the craft of chord connection. In this experiment the group taught by the self-instructional workbook was required to do far more drill work than the group taught in the teacher-classroom situation.

The data also indicated that much less teacher-time

was necessary for the group taught by programed learning than for the group taught by the teacher-classroom approach. In fact, the teacher of the group using programed learning spent only 1/2 of 1 per cent as much time as the other teacher. From this it can be concluded that much teacher-time can be conserved by employing programed learning as a teaching device for the craft of chord connection.

Recommendations

The results of this experiment clearly indicated the value of a programed learning approach to the teaching of basic chord connection. It is recommended that the programing of this phase of theory instruction be investigated further and implemented in schools where music theory is taught.

It is also recommended that other subject matter areas in the field of music theory be investigated as to the feasibility of teaching at least some of their aspects through programed learning. The following areas of study are suggested:

1. Chord choice.
2. Non-harmonic tones.
3. Cadences.
4. Modulation.
5. Seventh chords.
6. Chromatic harmony.

Implications for Further Research

This study suggested the need for investigation of:

1. The significance of repetitive drill in learning basic chord connection.

2. The significance of immediate reinforcement in learning basic chord connection.

3. The significance of a highly controlled sequence of material presentation in learning basic chord connection.

CHAPTER V

SUMMARY

During the 1965 spring semester, an experiment was conducted with seventy music students enrolled in four sections of second semester Freshman Music Theory, Music 161, at Western Michigan University. The purpose of this experiment was to investigate the feasibility of teaching the basic craft of chord connection by means of a self-instructional workbook. Specifically, the investigation sought to answer these questions:

1. How effective will programed learning be as a teaching method for basic chord connection?

2. How expeditious will programed learning be as a teaching method for basic chord connection?

A self-instructional workbook in the craft of chord connection was developed, sections of this workbook were tested in a pilot study, and revisions were made on the basis of this study. The revised self-instructional workbook, consisting of 378 frames, was printed in book form.

Students in two of four selected music theory sections served as a control group for the experiment, and students in the other two sections were the experimental group. The control

group numbered thirty-two and the experimental group numbered thirty-eight. The population of seventy subjects used in the experiment was considered to be homogeneous.

A test was devised that was designed to represent terminal behavior for a course of study in basic chord connection. This test served as a pre-test (before training) and a post-test (after training). The validity of the test was verified by a number of experts in the field of music theory. The subjects were allowed twenty minutes to work on the test each of the two times that they took it. The test was scored on the basis of one point for each of 100 possible answers.

The control group was trained by the traditional teacher-classroom method. The experimental group was trained solely by means of the self-instructional workbook. Each subject in the experimental group had his own workbook and progressed at his own pace. Subjects in the control group were required to complete weekly assignments. The training period for both groups was set at a maximum of eight weeks. The course objectives, concepts and terminology were the same for both groups.

Subjects in both the control group and the experimental group were required to keep a record of the amount of time spent outside of class in completing the course of study. Time spent in class was recorded by the teacher. A time log was kept for each of the students in the experiment.

To allow for statistical analysis of the data, the questions being examined were stated as the following null hypotheses:

1. There is no significant difference between test scores of subjects as a result of method of teaching.

2. There is no significant difference in the amount of time subjects require to complete the course of study as a result of method of teaching.

Null Hypothesis 1 was tested by means of an approximation of the t-test. The 5 per cent level of confidence was set for statistical significance. Null Hypothesis 2 was tested by a simple comparison of the mean time requirements of the two groups.

Analysis of the post-test score data indicated a significant difference at the 5 per cent level of confidence between the mean scores of the experimental group and the control group. Therefore, Null Hypothesis 1 was rejected.

Analysis of the time data for the subjects in the two groups indicated a significant difference. Therefore, Null Hypothesis 2 was rejected.

Data on teacher-time necessary for completing the course of study were also collected. These data indicated that a great deal more teacher-time was necessary for the control group to complete the course of study than for the experimental group.

On the basis of these results, the following conclusions were drawn:

1. Subjects learned the basic craft of chord connection effectively by means of self-instructional materials.

2. Subjects were much less likely to achieve extremely low scores on tests in basic chord connection if they were taught by a programed learning approach rather than a teacher-classroom approach.

3. Subjects were much more likely to achieve very high scores on tests in basic chord connection, if they were taught by a programed learning approach rather than a teacher-classroom approach.

4. The programed learning approach to teaching basic chord connection will not result in a saving of student time in comparison to a teacher-classroom approach.

5. Much teacher-time can be conserved by teaching the craft of chord connection by means of programed learning rather than by the teacher-classroom approach.

On the basis of the findings of this study the following recommendations were made:

1. Programed learning should be further investigated and then implemented as a method of teaching the basic craft of chord connection in schools offering music theory.

2. The feasibility of the use of programed learning to teach at least some aspects of chord choice, non-harmonic tones, cadences, modulation, seventh chords, and chromatic harmony should be investigated.

APPENDIX A

(The material below is the syllabus from which the item content of the program was derived.)

The Craft of Chord Connection

Pitch Organization

In order to write and understand traditional music[36] something must be learned of the ways in which pitches can be organized to create a musical effect. Two very basic methods of organization are possible. The first method is to organize pitches so that they sound one after another. A logical arrangement of pitches organized in this way is called a line. Lines will be notated horizontally (from left to right) in musical scores and parts. Therefore, this method of organizing pitches will be called horizontal organization.

The second very basic method of organizing pitches is to arrange them so that they sound at the same time. A logical arrangement of pitches organized in this way is called a chord. Chords will be notated vertically (up and down) in musical scores and parts. Therefore, this method of organizing pitches will be called vertical organization.

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[36] In this study, traditional music refers to music written in the style of 18th and 19th century tonality.

The horizontal organization of pitches creates lines which can be played by an instrument or sung by a vocalist. The vertical organization of pitches creates chords which can be played by a group of instruments or sung by a group of voices. Chords can also be played by a single instrument which is capable of sounding many pitches at the same time.

There are many ways to write music. In some of these ways horizontal organization seems to be emphasized. In other ways of writing music vertical organization seems to be emphasized. Still other ways of writing music do not seem to emphasize one method of organization over the other. Both methods appear to be of equal importance.

Every piece of music has its own proportion of horizontal organization to vertical organization. The amount of emphasis on one or the other is dependent on the style in which the music is written. However, they will rarely be completely separated. Almost all music will show evidence of both methods of organization.

Seldom in traditional music will one line appear by itself for any great length of time. The reason for this is that it is difficult for one line by itself to create an extensive musical effect. A good musical effect can be achieved for almost any length of time by combining lines. When two or more lines are combined, pitches will periodically be sounded at the same time. Consequently, both horizontal organization and vertical organization will be present even though horizontal organization may be emphasized.

Seldom in traditional music will one chord be found by itself for any length of time. The reason for this is that it is difficult for one chord by itself to create an extensive musical effect. A good musical effect can be achieved over a long time period by sounding different chords one after another. When two or more chords are sounded one after another, lines will be created by the individual pitches of the consecutive chords. Consequently, both vertical organization and horizontal organization are present even though vertical organization is emphasized.

Line Movement

The nature of lines formed when chords are sounded one after another will vary depending upon the style of the music. By far the most common kind of line formed in this way will be called here a smooth line. This kind of a line will move predominantly scalewise with skips limited mostly to thirds. Skips of a fourth or more are less common. When chords are sounded one after another in such a way that the individual pitches of the chords form smooth lines, the chords are said to be connected. This study is concerned with the craft of connecting consecutive chords. The verb connect is used here to indicate the way in which chords are tied together by the smooth movement of lines.

Of course it is possible not to connect consecutive chords with smooth lines, but instead to treat the chords as isolated groups of pitches. This will rarely be done in traditional music except for special effect. Consequently it will not be studied here.

If one chord is to be connected to another chord the individual pitches of the first chord should move horizontally to the individual pitches of the second chord so that smooth lines are formed. The smooth lines formed when consecutive chords are connected will usually move by step or by the skip of a third. Movement by the skip of a fourth is less common except in the lowest line. The lines can move either up or down by step or by small skip. It is also possible for a pitch in a line to be repeated. When a pitch is repeated the line will at that point remain static (no motion will result).

Thus it is possible for a line to behave in five different ways:

1. It can move up by step.
2. It can move down by step.
3. It can move up by skip.
4. It can move down by skip.
5. It may not move at all but instead remain static through repetition.

Motion Between Lines

When chords are connected a combination of lines is present. These lines move in certain relationships to each other. Four different relationships of motion are possible between lines:

1. When lines move in the same direction (either up or down) at the same interval they are said to be in parallel motion.

2. When lines move in the same direction (either up or down) but not at the same interval, they are said to be in similar motion.

3. When lines move in opposite directions they are said to be in contrary motion.

4. When one line moves while another remains stationary (through repetition of a pitch or by virtue of a long note value) the lines are said to be in oblique motion.

When two lines both have repeated pitches at the same time they remain static. No motion is present.

Triads

While the horizontal movement of voice lines is extremely important in music, of equal importance is the vertical arrangement of pitches that results in chords. The most frequently used chord in traditional music is the triad. A triad is a chord consisting of three different tones. In this study we will be concerned only with the triads of the tertian system of harmony. In this system the relationship between the three different tones of a triad is always reckoned from the foundation tone which is called the root. The root of a triad like the root of a tree serves as a ground-work on which to build. Any pitch can serve as the root of a triad. The second tone of a triad will create the interval of a third above the root. This tone will be called the third of the triad. The remaining tone of a triad will create the interval of a fifth above the root and will be called the fifth of the triad.

Four types of triads are frequently found in traditional

music. The kind of third and the kind of fifth above the root determine the type of the triad:

1. A triad that has a major third and a perfect fifth is called a major triad.

2. A triad that has a minor third and a perfect fifth is called a minor triad.

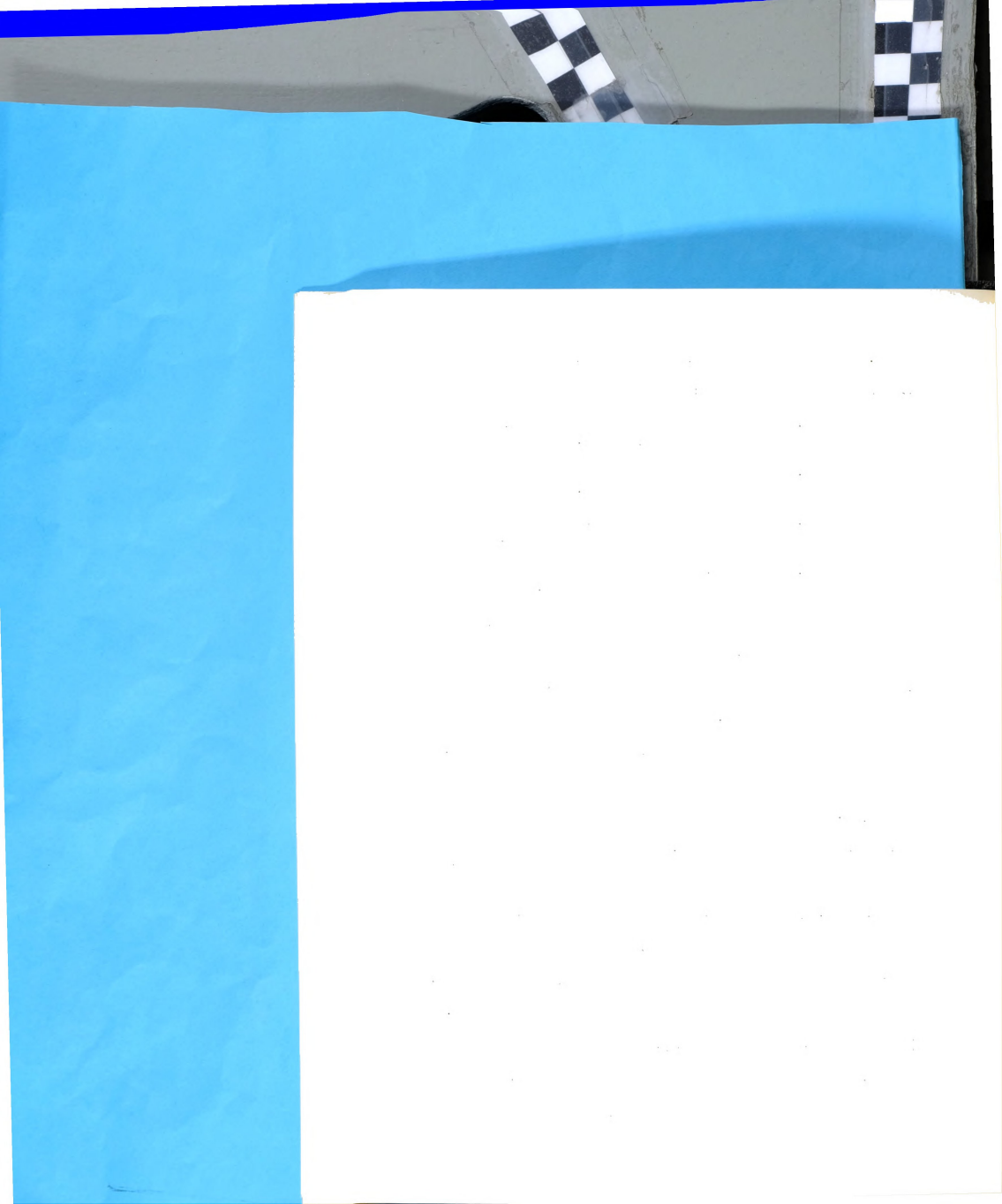
3. A triad that has a minor third and a diminished fifth is called a diminished triad.

4. A triad that has a major third and an augmented fifth is called an augmented triad.

Triads can be constructed in major and minor keys using any scale degree as root. When triads are constructed in keys the type will depend upon the exact intervals between the root and the other members of the triad. These intervals will be determined by the scale degrees utilized for the root, third and fifth of the triad.

A triad can be identified by its place in a key as well as by its type. Triads are named in a key according to the position of their roots in the scale of the key. Roman numerals representing the scale degree locations of the roots of triads are used for identification. (For example, if the root of a triad is on the second scale degree it will be called a II (two) chord, if the root of a triad is on the third scale degree it will be called a III (three) chord, etc.) Triads will be named in this manner in all major and minor keys. (In order to identify a triad in a key, the key must first be determined and then the root of the triad must be located in this key.)

The root of a triad will not always be the lowest sounding



pitch of the triad. It is also possible to have either the third or the fifth of a triad as the lowest sounding pitch. When the root of a triad is the lowest sounding pitch, the triad is said to be in root position. If either the third or the fifth of a triad is the lowest sounding pitch, the triad is said to be in inversion. A high percentage of the triads found in traditional music will be in root position. Consequently, this study will concentrate on root position triads at the present time. Inversion will be discussed in detail later.

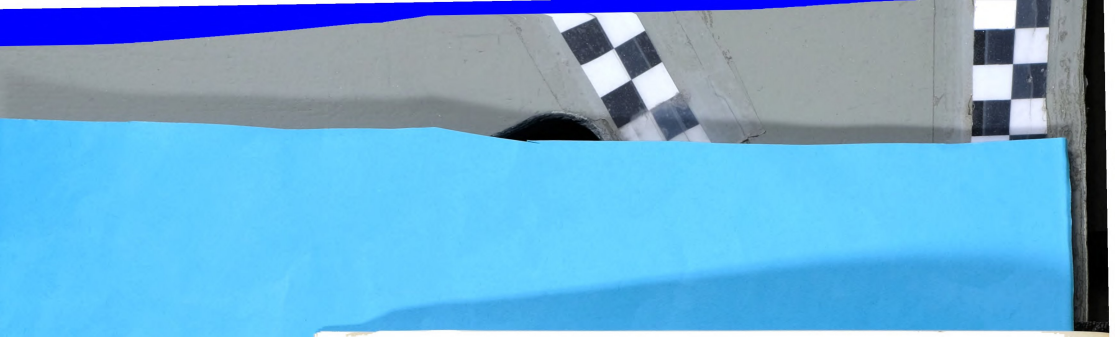
Doubling

Any triad can be expanded into a structure of more than three tones if one or more of the tones appear twice. When this is done the tone or tones that appear more than once are said to be doubled. The process is called doubling. A triad tone can be doubled at either the unison or the octave. This study will be limited to the connecting of triads with one doubled tone. In root position triads this doubled tone will most often be the root.

The Four Voices

When triads with one doubled tone are being connected, four lines will be created as the tones move horizontally from one chord to the next. Each of these lines will be called a voice. The term voice will also apply to the individual tones of a single chord. While the term voice will be used in this study, another term, part, can be used interchangeably with it.

For our purposes, the four voices (which represent a



triad with a doubled tone) will be written on the grand staff. A grand staff can be constructed by connecting a treble and a bass clef staff with a line and a brace. The four voices will be written on the grand staff to allow for the playing of examples at the piano. When examples are intended for a group of musical instruments they can be transcribed from the grand staff into the proper clef or transposition of the instruments involved.

Each of the four voices will have a name. The names are derived from vocal music but they will be used here in a general way. They will refer to the relative position of the four voices. These names could represent four brass instruments, four woodwind instruments, four stringed instruments, or various combinations of four instruments as well as four singers.

The voice in the highest relative position will be called the soprano (abbreviation S). The soprano voice will be written in the treble clef. Stems attached to the note heads in the soprano voice will always go up.

The voice located immediately below the soprano will be called the alto (abbreviation A). The alto voice will also be written in the treble clef. Stems attached to the note heads in the alto voice will always go down.

The voice located immediately below the alto will be called the tenor (abbreviation T). The tenor voice will be written in the bass clef. Stems attached to the note heads in the tenor voice will always go up.

The voice in the lowest relative position will be called the bass (abbreviation B). The bass voice will be written in the bass clef. Stems attached to the note heads in the bass voice will always go down.

Each of the four voices will be written in a different specific pitch area. The term voice range will be used to identify the pitch area to which a voice is limited. Each of the voice ranges will encompass an octave plus a fifth. This limitation of range is necessary so that the voice lines can be sung or played on various instruments without exceeding vocal or instrumental capabilities.

The soprano voice will be limited to pitches within a range extending from middle C to the G located an octave and a fifth above. The alto voice range will be from small G to the D located an octave and a fifth above. The tenor voice range will be from small C to the G located an octave and a fifth above. The bass voice range will be from large F up to middle C. These voice ranges should rarely be exceeded when writing four part music for vocalists. However, when writing for musical instruments the ranges can be extended or relocated (transposed) depending upon the ranges of the instruments involved and the capabilities of the performers.

Four-voice Triad Structure

A triad can be arranged on the grand staff for four voices by choosing triad tones which fit the individual voice ranges. Care

must be taken to include all three of the different tones of the triad plus the correctly doubled one.

The tones of triads are present throughout the voice ranges. The act of choosing one particular tone for each voice is called spacing. Spacing must be carefully controlled so as to assure the best possible vertical sound in each chord. Many different correct spacings are possible for any triad. There is one basic principle that must be adhered to when spacing triads for four voices. That is the following: While the bass and tenor are often quite far apart, the alto must never be more than an octave from either the tenor or the soprano.

When triads are spaced correctly for the four voices, two basic kinds of structure can be noted. One kind is called closed structure. In this structure the distance between the tenor and soprano will always be an octave or less. The other kind of structure is called open structure. In this structure the distance between the tenor and soprano will always be more than an octave.

Voice Leading and Harmonic Relationships

When two root position triads in four voices are being connected, the bass voice is predetermined by the choice of the chords. For example, if a I chord in C major is connected to a V chord in C major the bass line will have to be C to G (scale steps 1 to 5). While the bass voice is predetermined in this way, each of the upper 3 voices must be led from its place in the first chord to its proper place in the second chord. This process is called voice

leading. Voice leading will vary depending upon the harmonic relationship of the two triads being connected. Four different harmonic relationships are possible between triads. These four different relationships are determined by the interval between the roots of the triads.

The first type of harmonic relationship between triads will be called the relationship of a unison. The roots of two triads which are in this relationship will be the same pitch (or an octave apart) as in a repeated chord. (The intervals of a unison and an octave are essentially the same as far as harmonic relationship is concerned.)

The second type of harmonic relationship will be called the relationship of a fifth. The roots of two triads which are in this relationship will be a fifth (or a fourth) apart. (The root of a triad can move either up or down to the root of the next triad and even though the resulting intervals will differ--a fifth or fourth in this case--the harmonic relationship remains the same because the same two triads are involved.)

The third type of harmonic relationship will be called the relationship of a second. The roots of two triads which are in this relationship will be a second (or rarely, a seventh) apart.

The fourth type of harmonic relationship will be called the relationship of a third. The roots of two triads which are in this relationship will be a third (or sometimes a sixth) apart.

The Connection of Root Position Triads

In some styles of music it is possible to find two triads in the relationship of a unison with the second triad an exact repetition of the first. In this case the triads do not have to be connected by voice leading because there is no motion of the voices. In the style of four part writing being studied here, it will usually be preferable to change the soprano in the second triad when a triad is repeated. This will be done to create more interesting voice lines. It will necessitate voice leading. There are two main methods for connecting root position triads in the relationship of a unison. The first method is as follows: Move the three upper voices in similar motion, up or down, to the nearest chord tones. (The second method will be discussed later.)

Two triads in the relationship of a fifth have one tone in common. This tone is called a common tone. In chord connection this common tone will very often be kept in the same voice. There are three main methods for connecting root position triads in the relationship of a fifth. The first method is as follows: Keep the common tone in the same voice in the second chord and lead the other two chord tones scalewise to the nearest chord tones of the second chord that will assure proper doubling--for the present, proper doubling means doubled root. (The other methods will be discussed later.)

Two triads in the relationship of a second have no common

tones. There are two main methods for connecting root position triads in the relationship of a second. The first method is as follows: Move the upper three voices of the first triad in contrary motion to the bass, to the nearest tones of the second triad. (The second method will be discussed later.)

Two triads in the relationship of a third have two common tones. There are two main methods for connecting root position triads in the relationship of a third. The first method is as follows: Keep each of the two common tones in the same voice in the second chord and lead the remaining voice to the nearest chord tone of the second chord that will assure proper doubling. (The second method will be discussed later.)

Any root position major or minor triads can be connected by using the methods for triad connection given previously. However, other methods will be used at times in order to make the soprano line more interesting melodically or in order to create more variety in chord structure. Skips of the intervals of a fifth or a sixth are used in soprano lines occasionally to add melodic interest. These large skips most often occur between triads in the relationship of a unison. They will occur less often between triads in other harmonic relationships. Changes in chord structure, from closed to open or from open to closed, add variety to a progression. These changes also often occur between triads in the relationship of a unison.

When two triads in the relationship of a unison are connected with a large skip in the soprano line, a change in structure between the triads is desirable as it will create smoother alto and tenor lines. The second method for connecting root position triads in the relationship of a unison is as follows: Keep one of the three upper tones in the same voice in the second chord and let the other two voices exchange tones. (A change in structure will take place with this method of connection.)

When two triads in the relationship of a fifth are connected, more melodic variety will be possible in the soprano line if the common tone is not always kept in the same voice. The second method for connecting root position triads in the relationship of a fifth is as follows: Move the upper three voices of the first triad in similar motion to the nearest tones of the second triad. (Note that the common tone will not be kept in the same voice.)

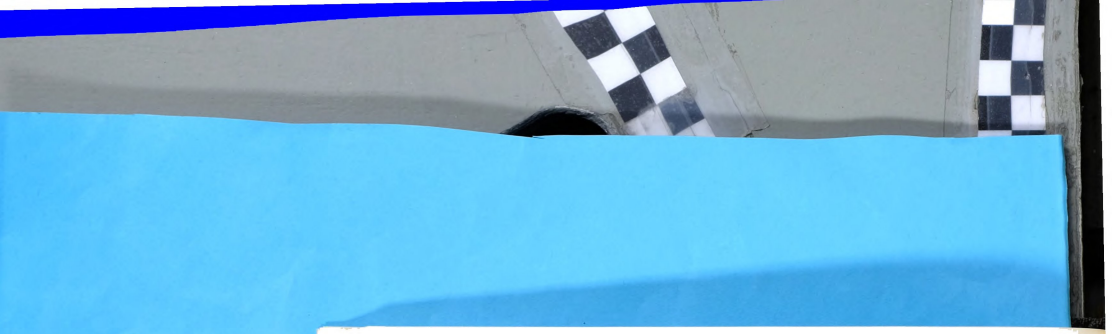
Occasionally, for reasons of melodic interest, skips of the intervals of a fourth or a fifth are used in the soprano line when two triads in the relationship of a fifth are connected. When this is the case, a structural change will be desirable so that the inner voices will be able to move smoothly. The third method for connecting root position triads in the relationship of a fifth is as follows: Keep the common tone in the same voice in the second chord; move the third of the first chord to the third of the second chord; move the remaining voice by step to the nearest chord tone that will assure proper doubling.

In the first method for connecting root position triads in the relationship of a second, the upper three voices always move in contrary motion to the bass. Thus, the soprano and bass voices never move in the same direction. For reasons of melodic interest it is occasionally desirable to move the soprano and bass voices in the same direction when triads in the relationship of a second are connected. This can be accomplished by employing a different method of connection. The second method for connecting root position triads in the relationship of a second is as follows: Move the third of the first chord to the third of the second chord; move the other two voices contrary to the bass to the nearest chord tones. (Note that the second triad will have a doubled third, not a doubled root.)

Because of the fact that the second triad will have a doubled third when the above method is used, it is important to know how to move from a triad with a doubled third. The following procedure should be followed for the present: Move the upper three voices in such a manner that no voice skips more than a third and the root is doubled in the second triad.

Triads in First Inversion

Variety in chord sounds and smoother bass lines can be created by sometimes arranging the tones of a triad so that the bass tone is not the root. When either the third or the fifth of a triad is the lowest tone (the bass tone) the triad is said to be inverted.



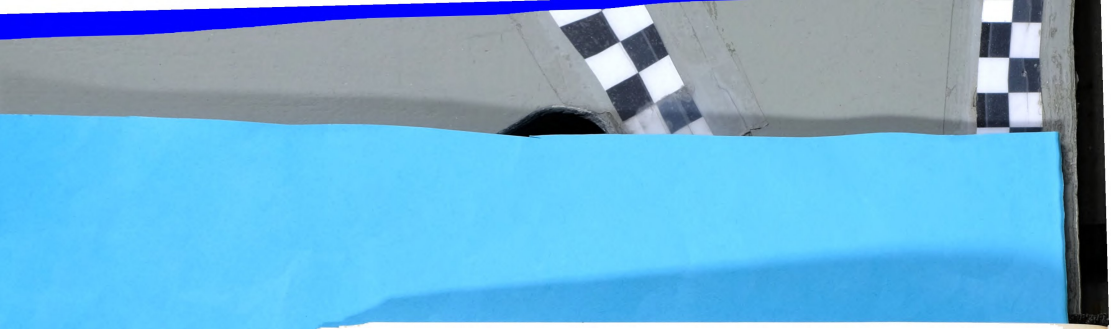
When the lowest tone of a triad is the third, the triad is said to be in first inversion. First inversion triads are also called chords of the sixth. They are given this name because the interval between the bass note and the root is a sixth. First inversion triads are identified by an Arabic numeral six written beneath the chord.

First inversion triads, like root position triads, are identified in a key by Roman numerals representing the scale degree location of their roots. However, it must be remembered that the root and the bass tone are not the same pitch in first inversion triads. Therefore, the root must be located before the triad can be identified in a key.

There is more freedom of doubling in first inversion triads than in root position triads. In root position triads the root is by far the most commonly doubled tone. In first inversion triads various doublings are possible depending upon the quality of the triad and its place in the key. First inversion I, IV and V triads in major and minor keys will usually be doubled in the following way: Double the root or fifth; the choice of the chord member to be doubled will depend on the voice leading situation but a good general rule is to double the one that is in the soprano.

The Connection of Root Position and First Inversion Triads

A simple procedure for connecting root position and first inversion (with root or fifth in the soprano) triads when the triads are in the relationship of a fifth, is as follows: Keep common tones



in the same voice whenever possible and move the other voices to the nearest chord tones that will assure proper doubling.

The first inversion II triad is doubled differently in major keys than it is in minor. In major keys it will be doubled in the following way: Double the root, fifth or bass; a good general rule is to double the one that is in the soprano. First inversion II triads with root or fifth in the soprano may be connected to root position triads in the relationship of a unison or a fifth by following the simple procedure given above. First inversion II triads with the third in the soprano will be handled somewhat differently. Chord connection involving the first inversion II triad with the third in the soprano will be taken up later.

Up to this point, a positive approach has been taken to the procedures of chord connection. All of the methods stated so far have been designed to avoid incorrect voice leading. They can be used a high percentage of the time and, if adhered to, will make for very musical results. However, it is impossible to cover every voice leading situation with a positive procedure. There are too many possibilities. Instead, it would seem more feasible at this time to learn a few negative rules which, if applied correctly and coordinated with previous procedures, should lead to good voice leading in other situations. The first negative rule is this: Avoid movement in parallel perfect unisons, octaves or fifths by any two voices.

A general procedure for chord connection that can be used in situations not covered by previous procedures is stated below:

1. Keep common tones in the same voice and move the other voices to the nearest tones that will assure proper doubling.

2. Check each of the different pairs of voices for parallel perfect fifths, octaves or unisons (if there are none, the connection is complete).

3. If parallel perfect fifths, octaves or unisons are present, remove them by utilizing one or more of the following procedures:

   a) give up a common tone rather than keeping it in the same voice;

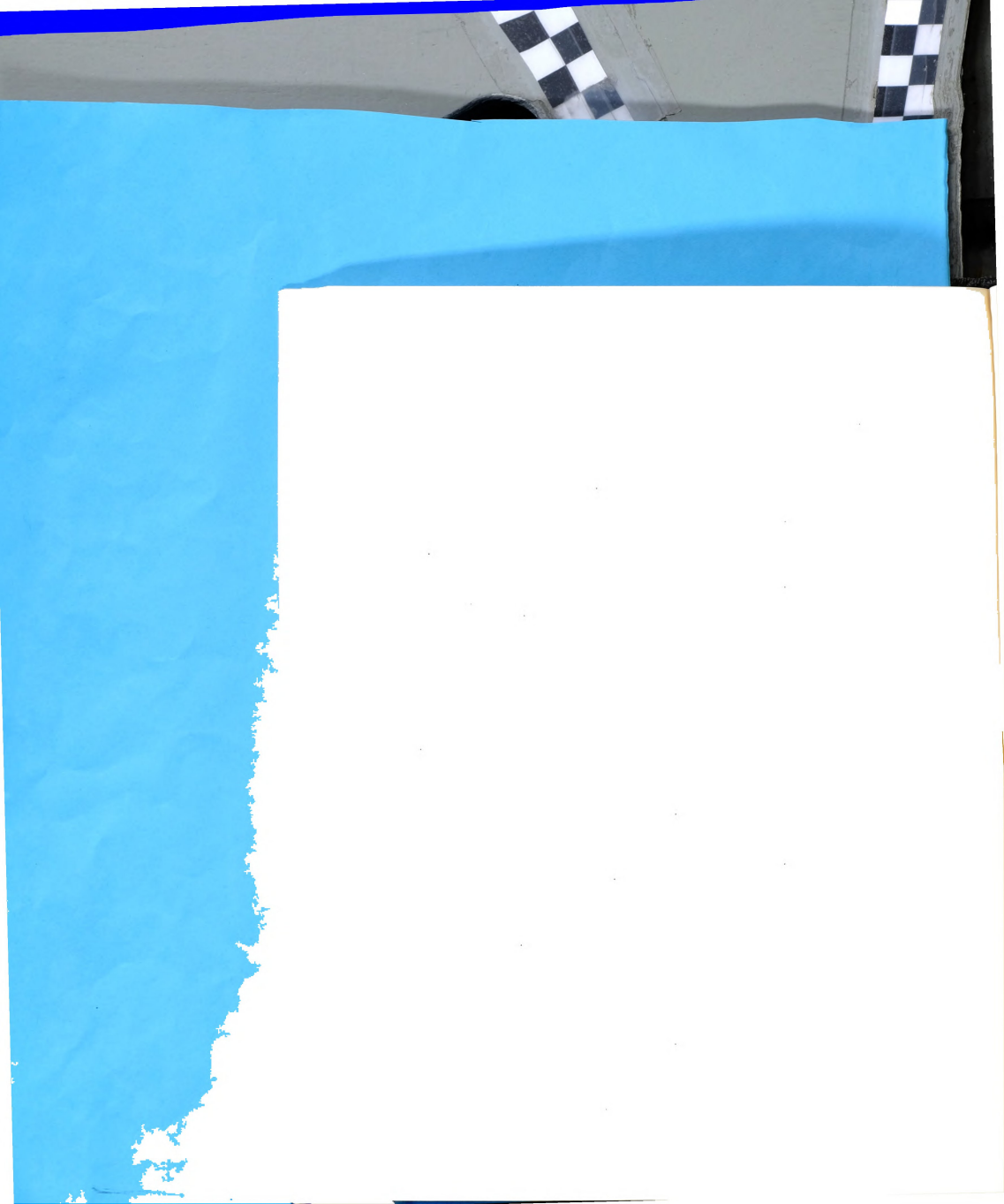
   b) change the doubling in the second chord to another acceptable doubling;

   c) move the voices to different chord tones.

   Any adjustments should be made by moving to the nearest possible chord tone that will solve the problem. It should rarely be necessary to skip over a fourth in an inner voice.

4. Check to be sure that new incorrect motion has not been created.

A second negative rule of voice leading is the following: Do not double the leading tone (seventh scale degree). When IV is connected to V using the second method for connecting two triads in the relationship of a second, an adjustment must be made so that the leading tone will not be doubled. This can be done by moving an inner voice by skip down to the root of the V instead of having it double the third which is the leading tone.



The VII chord in major and minor keys and the II chord in minor keys are diminished triads. Diminished triads will seldom appear in root position. They will appear frequently in first inversion. First inversion VII chords in major and minor keys and first inversion II chords in minor keys will be doubled in the following way: Double either the bass or the fifth; the first choice should be to double the bass. First inversion diminished triads can be connected to other triads in root position or first inversion by following the general procedure outlined previously.

Triads in Second Inversion

It has been stated previously that when the root of a triad is the bass tone, the triad is in root position, and that when the third of a triad is the bass tone, the triad is in first inversion. Triads also appear with the fifth as bass tone. When the pitches of a triad are arranged in this way, the triad is said to be in second inversion. In the same way that first inversion triads are marked with a 6, second inversion triads will be marked with a $\frac{6}{4}$. This marking is used to indicate that the root of the chord is a fourth above the bass and the third of the chord is a sixth above the bass. The I chord is found more often in second inversion than any other triad. It should be doubled in the following way: Double the bass--the fifth of the triad.

The Connection of Root Position, First Inversion and Second Inversion Triads

The second inversion I chord can be connected to other triads by following the previously stated general procedure.

As has already been stated, motion by any two voices in parallel perfect unisons, octaves or fifths is incorrect. It is also incorrect for any two voices to move in contrary octaves or fifths. While this is a less common error in voice leading, it does occur occasionally and must be avoided. Essentially this is the same error as parallel perfect motion only the two voices involved skip in opposite directions to the second perfect interval instead of moving to it by step in the same direction.

The third negative rule of voice leading is as follows: Avoid the movement of the intervals of an augmented second or an augmented fourth in all voice lines.

Freer Rules of Doubling

This syllabus was intended to be a logical arrangement of the materials necessary for a solid background in the basic craft of chord connection. The concepts, rules and procedures that have been stated can be used to solve most of the problems that will arise in the process of connecting triads. However, situations may occur that cannot be solved by applying this body of information. When this is the case, a solution can many times be found in a freer approach to doubling. Also, situations may occur where it will be

desirable to double more freely so that smoother voice lines will be possible. Therefore, a list of alternate doublings for exceptional cases has been presented below:

1. Never double the leading tone (this rule should still be observed).

2. In root position triads:

   a) first choice--double the root
   b) second choice--double the third (except in the V chord)
   c) third choice--double the fifth.

3. In first inversion major triads:

   a) first choice--double the soprano
   b) second choice--double the alto with the tenor
   c) third choice--double the bass (except in the V chord).

4. In first inversion minor triads:

   a) first choice--double the soprano
   b) second choice--double the bass
   c) third choice--double the alto with the tenor.

5. In first inversion diminished triads:

   a) first choice--double the bass
   b) second choice--double the fifth.

6. In second inversion major and minor triads double the bass.

APPENDIX B

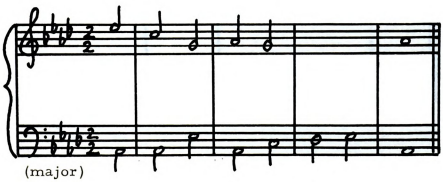
PRE-TEST--POST-TEST

Only triads should be used in this test; inversions should be used only where they are specifically marked. When chords are connected the upper three voices should move in the following ways only: (1) by step or the skip of a third (whenever possible), (2) by the skip of a fourth (only when necessary).

In examples (a) and (b):

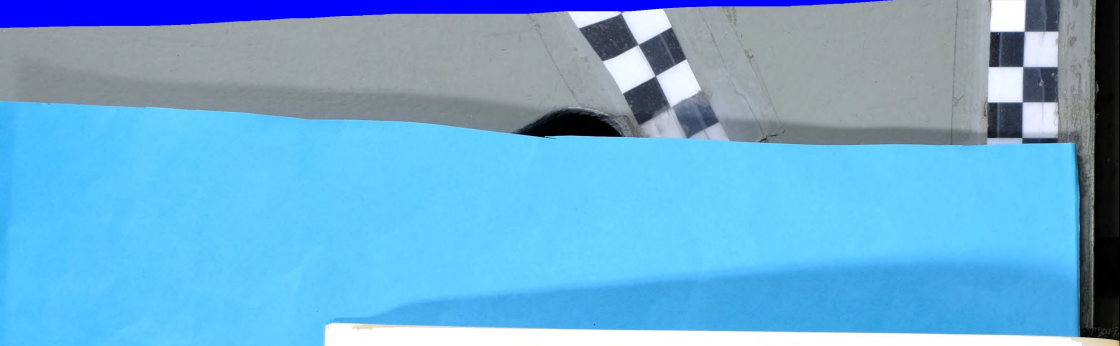
1. Identify each triad by Roman numeral.
2. Fill in the missing voices beginning in the structure indicated.

(a) Begin in open structure.

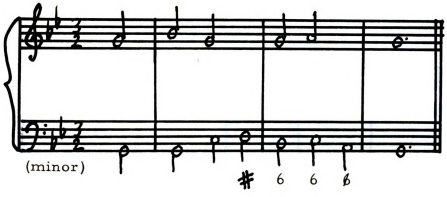


(major)

Roman numerals _ _ _ _ _ _ _ _



(b) Begin in closed structure.



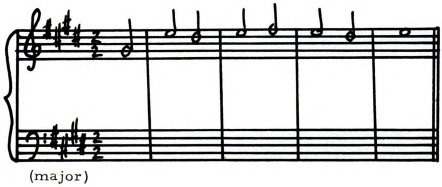
Roman numerals — — — — — — —

In examples (c) and (d):

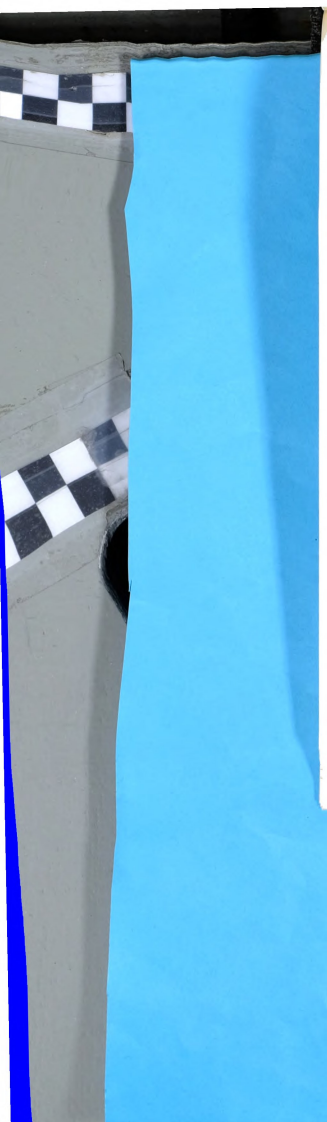
1. Fill in the bass line according to the Roman numerals and inversion markings.

2. Fill in the other missing voices beginning in the structure indicated.

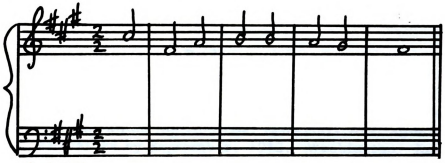
(c) Begin in closed structure.



I I VII^6 I^6 II^6 I^6_4 V VI



(d) Begin in open structure.



I I VI IV II^6 I^6_4 V VI

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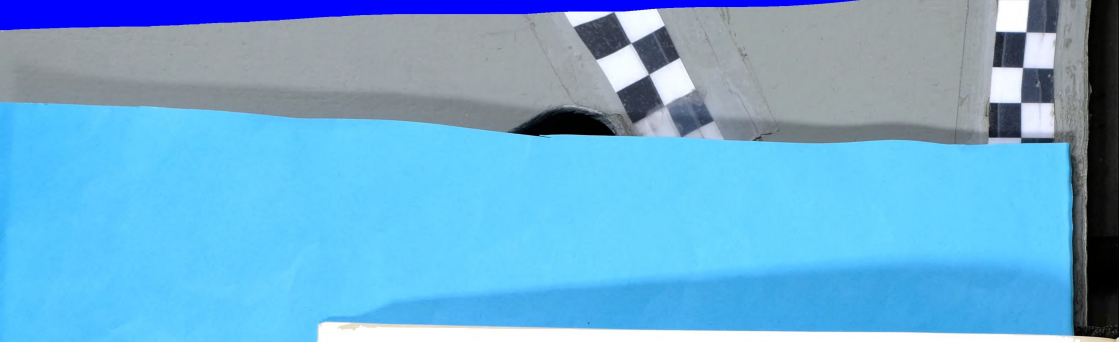

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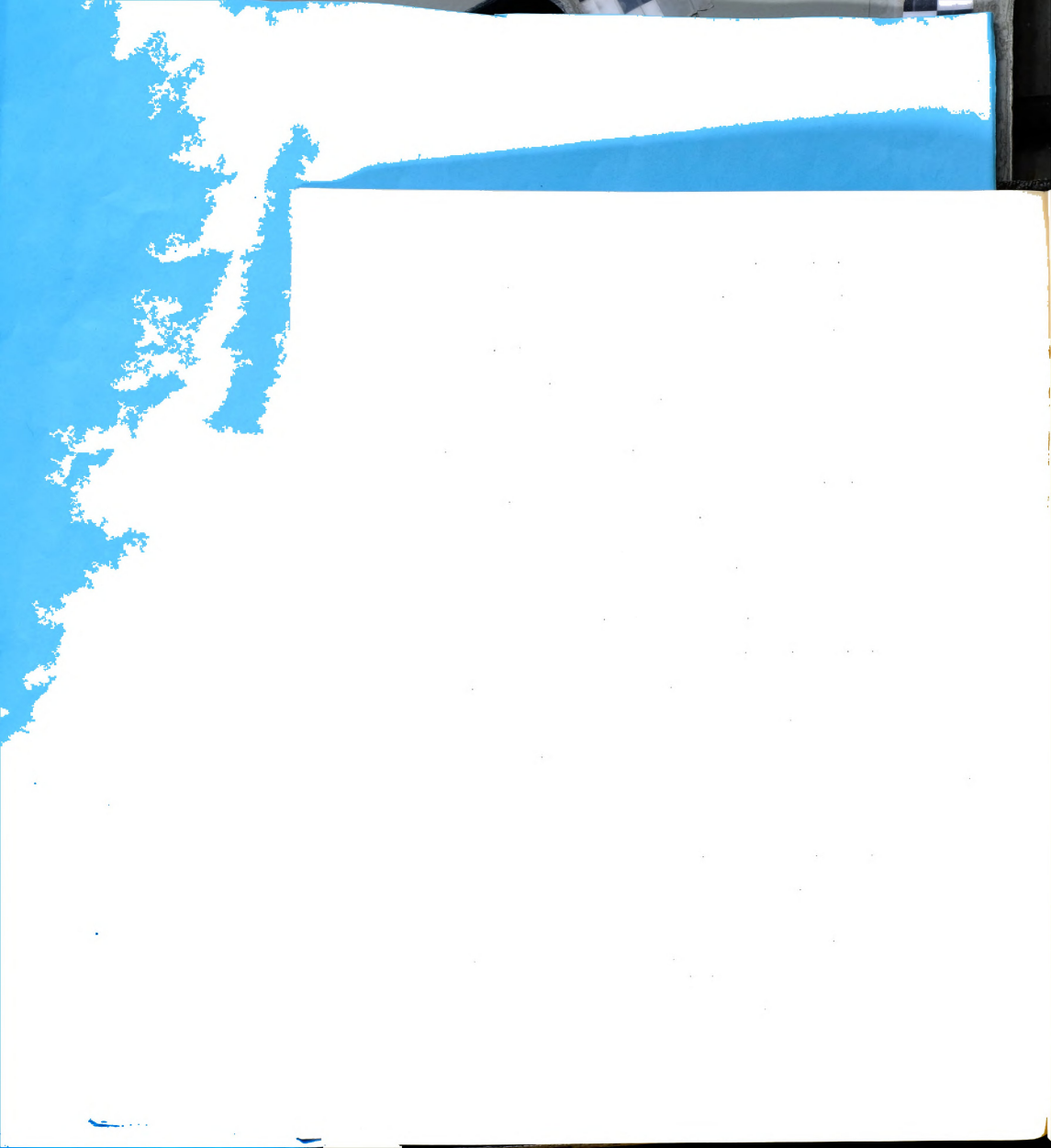

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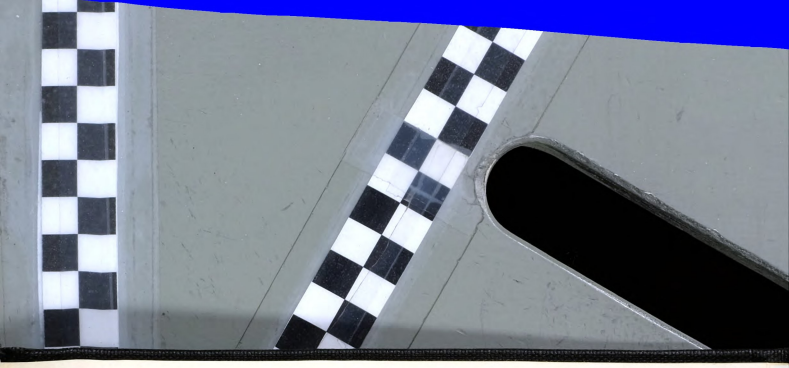

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