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The Ohio State University,
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THE DEVELOPMENT AND EVALUATION OF
PROGRAMMED INSTRUCTION IN THE
TECHNIQUES OF JAZZ ENSEMBLE ARRANGING

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
The Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

* * * * *

The Ohio State University
1978

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Affectionately dedicated to my wife

DEBORAH

without whose encouragement and assistance this study would not have been possible
ACKNOWLEDGMENTS

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lovely and "active" children, typed the many revisions of the dissertation and the program text itself, I offer my appreciation.
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CHAPTER I

INTRODUCTION

Introductory Statement

Today, both the music educator and music student are highly dependent upon contemporary pedagogical research in order to successfully combat the growing problem of organizing, presenting, and assimilating massive portions of important new information which has begun to overshadow the hours available for the teaching-learning process. Schuller cites the continuing difficulty of absorbing and accommodating into the college-university music curricula "the ever-changing, ever-advancing, ever-expanding compositional techniques, idioms, concepts and procedures." Compounding this problem is the need:

... to deal with these new compositional concepts at several levels and in terms of various sub-disciplines: a) teaching these new techniques and ideas to budding, upcoming composers; b) teaching them to performers (perhaps our most crucial obligation); c) teaching the theories and theoretical abstracts which underlie these new concepts or which are derived from them.¹

Schuller further observes that in recent years the whole field of new music has exploded into dozens of splinter groups and an absolute plethora of new techniques, encompassing not only all the schools within the so-called area of classical contemporary music, but, as well, the influence of Afro-American music in all of its forms . . . .

In looking at the prospective changes in the college-university music curriculum in the 1980's, Miller stated that the curriculum will concentrate on "a central core of common musical experiences which will emphasize analytical processes, performing experiences, and compositional-improvisational experiences." 

For its continued progress, music theory, composition and cognate studies are increasingly becoming dependent upon the resultant effectiveness of programed instruction in its various forms and the use of media in

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2Ibid., p. 97.


4"Programed" in current usage is also spelled "programmed." The investigator has used the spelling "programed" throughout this dissertation. However, when the spelling "programmed" appears, it is in context of a quotation.
teaching theoretical information. Luce notes the current general employment of programmed instruction devices in college level theory courses to facilitate "the instruction of so-called traditional harmony by compressing what was formerly done in 2 years into one year. . . ." On the subject of media instruction, Luce, further points out "the greater use of actual scores, and recordings to demonstrate theoretical concepts and styles."\(^5\)

In a review of published music materials, Swanzy found a paucity of software, except for programmed texts, available for programmed instruction in music. He points out the need for developing "programmed tapes and materials compatible with the latest advances in hardware for individual and group instruction."\(^6\)

Computer-assisted instruction (CAI), while based on the principles of programmed instruction, is still experimental. The impact of CAI is felt strongly in recent music education research, and in those areas of music study objective in nature specifically. Ihrke writes:


Within the last few years we have seen a rapidly growing interest in computer applications in music, principally in analysis, theory, and composition. The results clearly indicate that computer-assisted instruction is possible since music symbols and sounds can be translated into computer language and then retranslated into music. It appears that highly sophisticated communication can take place between student and computer. It is also apparent that an entirely revised programmed material is necessary if we are to fulfill this promise.

Ihrke concludes by stating that the complex courses usually labeled "theory" appear to be a teaching area "in desperate need of help" and suggests that educators examine "the possibilities of training by electronic devices, and structure a new curriculum and courses which maintain a practical and efficient balance between human teacher presentation and technological aids".7

Another writer looking at the college-university music department in the year 1980 projected that "Basic theory instruction will become automated or departments will be out of business."8

This trend toward the use of technological aids in music teaching brings forth a need for specially designed instructional products without which the new

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pedagogical methodologies cannot achieve the new educational needs and goals.

**Need for the Study**

The phenomenal growth of the educational jazz movement in the schools and college-universities of America during the last two decades is a significant development in music education. This area of music education had its main impetus from increased interest in the "stage band" in the 1950's. Jazz ensemble performance, although developed extensively, did not penetrate the college-university curriculum until early in the 1960's. Today, the jazz ensemble, euphemistically known as the "stage band" or "lab band," is ubiquitous in high school and college-university concerts, clinics, and festivals, and with increasing frequency, jazz ensembles and jazz studies have been included in college-university curricula. In 1971, a survey undertaken by Berry revealed the existence of approximately 15,000 high school jazz bands and more than 600 organized college-university jazz ensembles.\(^9\) More recently, Ferguson and Feldstein estimated the number of junior high and high

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school stage bands at approximately twenty thousand.\textsuperscript{10}

This receptivity to jazz ensembles can be attributed to several factors. To an appreciable degree, it has resulted from a changed attitude toward jazz in education. A recent statement by Pleasants pointed out that:

The past decade has seen a significant change . . . in the attitude of American music educators to the status of jazz in the curriculums of secondary schools and universities, as reflected in the acceptance, in 1968, of the National Association of Jazz Educators into the Music Educators National Conference as an associate body, and in the proliferation of jazz bands in the schools with official approval and sponsorship. But this acceptance is still far from universal . . . .\textsuperscript{11}

The inclusion of jazz performance ensembles in curricula can be viewed as the growing realization that jazz, closely associated with American culture, is a "proper" source of expressive music.\textsuperscript{12} The traditional jazz ensemble repertory, gradually enriched by a considerable number of recent significant original compositions,


has given the jazz ensemble a formidable position in the whole spectrum of the music world. Describing the historical significance of the jazz "orchestra" and its repertory, Russo emphasizes that:

The jazz orchestra is immensely important if only because it is the permanent repository of jazz; . . . But the jazz orchestra not only embraces and codifies what the jazz improviser has done, it has created a new way of looking at and combining instruments, especially brass and saxophones. It uses a chordal and melodic language which is fresh and alive.

. . . the music played by Duke Ellington, Count Basie, Woody Herman, and Stan Kenton cannot be dismissed; nor can one say without perverting the reality of jazz history that the orchestra in these cases merely acts as propellent for the virtuoso soloist. . . .

Perhaps the most important reaction to these developments has been the educational reevaluation of the jazz ensemble as a vehicle for displaying improvisational skills and a medium for composition and arranging. Concerning the latter, Pleasants stated in 1969 that:

The most significant aspect of stage-band activity in the past decade has been the development of student composer-arrangers. . . . A high percentage of the compositions and arrangements played by college and university bands today, if not by the high school bands, is the work of students themselves. . . .


A justifiable concern of Wiskirchen and others is the need for a balanced jazz program. According to Wiskirchen, "The necessity of emphasizing improvisation in the jazz curriculum does not mean that the ensemble, compositional aspects of jazz should be neglected." The Higher Education Committee of the Ohio Music Education Association recommended in its report "Qualities and Competencies of Music Educators" that future music educators possess composing and arranging skills in order to "meet the needs and ability levels of school performing groups and classroom situations."

Ostransky has remarked that the student of jazz should possess not only the necessary instrumental virtuosity but also a "considerably larger body of theoretical knowledge than his earlier counterparts."


16George C. Wiskirchen, "If We're Going to Teach Jazz, We Must Teach Improvisation," Music Educators Journal 62 (November 1975):68 74.

Essential to both jazz composition and improvisation, according to the same writer, is the recognition and understanding of compositional principles followed by the acquisition of requisite compositional techniques.

To illustrate Ostransky writes:

The study of style characteristics . . . must be bound up in the principles of composition, that is, what constitutes form, direction, texture, tension, release, and the many other tangible and intangible qualities that produce coherent and significant music. Once the principles are understood and accepted, the young composer's purpose will be to acquire the techniques necessary to express himself, and for the jazz improviser this will mean acquiring compositional devices and techniques as well as an instrumental facility. . . 18

Despite all the interest in jazz composition and arranging at this time, there is limited opportunity for the student to get information about its techniques. Commenting on this problem and other curricular inadequacies Coker writes:

. . . in educational circles, jazz and other non classical styles such as rock, pop, folk, country and Western have much in common. They are somewhat universally unwelcome - actively or passively - in the university. Each of the styles requires a similar kind of training, arranging, improvisation, personal and creative singing styles, keyboard work, modern harmony, electronic instruments, drum set, and even

recording techniques, and preparation for teaching the music to another generation. Yet little of the foregoing exists in the present average university curriculum.19

Reflecting the previous view, M. E. Hall, one of America's most eminent jazz and popular music educators, phrases his estimate of the current college-university jazz education scene in the following manner:

American Colleges and Universities too often concentrate upon the European tradition at the expense of our American style. Few colleges and universities have an adequate training program in today's music. A rather thorough investigation is given to 17th - 18th - 19th century European music and a graduate usually has reasonable competency in and knowledge of this style. Apparently it is assumed that technical proficiency and knowledge of the European style is sufficient and that a study of the various American styles is unnecessary (in many universities it is considered undesirable).

As a result of this philosophy, the "countless educators" [at both the public school and college-university level] . . . have learned the techniques of American music outside the university.20

Pleasants likewise remarked, "The young American musician . . . desiring to be educated in his own music, must, as a rule, look for it outside the educational system."21


21Henry Pleasants, Serious Music - and All that Jazz!, p. 127.
Wright has stated that "The urgency of need in jazz studies is so obvious at this point that one can frankly wonder at its late coming on the university and conservatory scene." He goes on to say that "enterprising students" when left to their own devices learned contemporary jazz music "but not to the full extent of their capabilities." He concludes by pointing out that "in the field of composition, conservatory-trained writers were getting short-changed in training and experiences in jazz, modern arranging and film writing."22

As part of his doctoral dissertation, Hepworth surveyed the preparation that teachers of stage band programs have had and arrived at three broad conclusions:

1. The primary avenue of preparation has been outside the college curriculum.
2. Seventy-five percent of the teachers opined that their college preparation was inadequate to prepare them to function effectively with a stage band.
3. Jazz theory was included among the areas deemed necessary in the preparation of high school teachers.23

The point made by these authorities cited is well


taken and corroborates the investigator's personal experience. Students on the college-university level are not customarily formally trained in the techniques of jazz composition and arranging, and any neophyte arranging student engaged in unstructured learning must be prepared to surmount many barriers before he can attain the competencies of the experienced jazz composer-arranger. Personal experience has revealed that an understanding of what musical instruments of the jazz ensemble can and cannot do coupled with knowledge of the pertinent concepts and principles of jazz arranging is essential to prevent some of the arranging errors that have led to serious performance problems, or in some cases complete failure, in a number of potentially well-conceived jazz ensemble arrangements. That work based on a much closer acquaintance with jazz composition, as well as with various arranging techniques, is needed is the only conclusion that can be drawn at this time.

Hall has cogently suggested that, "Until such time as the colleges and universities initiate programs of instruction dealing with youth [sic] music, other sources of knowledge must be found."24 Programed instruction employing sound supplementation-coordination, which seems

24M. E. Hall, Jazz Education in the 70's, p. 5.
to be particularly feasible to jazz arranging techniques, points to an answer to the disparity between the need for jazz studies and the "sources of knowledge" available to do the teaching.

In summary, during the past two decades, beginning with particular intensity in the years immediately following the emergence of jazz on the college-university level, the popularity of the jazz ensemble and the consequent need for arranging skills would seem to have created expectancies far beyond the average music department's capacity to fulfill them. Close scrutiny of music teacher competencies have increased the expectancy recently, but the chasm between these and achievement of the stated competencies seems to have widened. The question remains, How can jazz ensemble arranging techniques be transmitted in the most effective and expeditious way?

It seems clear that with the continued interest in programmed instruction and recent advances in sound reproduction instruments, research should be carried out to attempt to determine the feasibility of the combination of programmed instruction and tape-recorded materials in the teaching of jazz ensemble arranging techniques.

The availability of a programmed text with coordinated tape recorded sound materials in the techniques of jazz ensemble arranging could be of educational benefit
in the following specific ways:

1. Such multimedia instruction could serve to extend the student's vocabulary or deepen his musicianship through the process of learning to handle materials previously unfamiliar, or regarded, in some cases, as outside the territory proper to music education. The completion of a course in jazz ensemble arranging is not a requirement in the curriculum of the undergraduate music degree at all colleges and universities. The availability of such programmed instruction in this subject could afford students at such schools a methodology for developing concepts and techniques of this area of knowledge without the pursuit of a formal course of study.

2. A survey of programmed instruction in music teaching reveals that no programmed materials was found in this specific area, thus further justification for this study seems indicated by Scriven, who in a discussion comparing programmed texts with conventional textbooks, lists the potential advantages of the former as follows:
(1) Guaranteed comprehensibility
(2) Tested efficiency
(3) "Skip-proof" feature
(4) "Self-correcting" feature
(5) Automatic encouragement
(6) Diagnostic feature

3. As programed materials in music fundamentals and music theory are commercially available, this examination of jazz ensemble arranging techniques would materially enlarge educational resources in this dimension of the jazz education field for the non-college-university music student.

4. Lastly, the development of a programed text would be of considerable professional value to the writer in a manner described by Espich and Williams:

One of the programmer's advantages is that by the time he has developed a program on a subject he has become

---

something of a subject matter expert himself. 26

Statement of the Problem

Research attention has focused on the problem of the acquisition of theoretical knowledges of music by students at the college-university level. Numerous studies have been concerned with the application of programed instruction procedures to teaching music theory and cognate areas, but no research has explored the feasibility of programing the study of jazz ensemble arranging techniques. Presently, there are no available published programed texts or materials in jazz ensemble arranging or jazz composition.

Purpose of the Study

The purpose of this study was to investigate the feasibility of teaching the techniques of jazz ensemble arranging by means of a programed text and accompanying tape-recorded materials. The study sought:

1. To identify the pertinent concepts, principles and techniques employed by the jazz arranger.

2. To determine the relative importance of these concepts, principles and techniques.

26 James E. Espich and Bill Williams, Developing Programmed Instructional Materials: A Handbook for Program Writers (Belmont, California: Fearon Publishers,
3. To select the aural and visual materials to be programmed.
4. To develop a programmed format.
5. To organize the program.
6. To construct and sequence the frames.
7. To evaluate the effectiveness of the program for college-university music students, as determined by a criterion test.

Questions
The study sought to answer these questions:
1. Can a program of instruction be developed which will effectively teach jazz ensemble arranging techniques?
2. Will knowledge of jazz ensemble arranging techniques as measured by the *Jazz Ensemble Arranging Test* be significantly increased by the *Programed Instruction in the Techniques of Jazz Ensemble Arranging*?

Delimitations
The study was delimited by the nature of the assumed learner and the scope of the program.

The self-instructional program developed in this study is designed to be undertaken by the student who has successfully completed one academic year of high school music theory or who possesses the equivalent understanding
of the subject. In order that this programmed instruction function as it should, it is assumed that the student begin his study with certain theory fundamentals, i.e., a general knowledge of music notation, intervals, all major and minor scales, key signatures, the spelling of major, minor, diminished and augmented triads on any pitch, the inversions of each of these, and finally the formation of tertial structures beyond the triad (sevenths, ninths, elevenths and thirteenth). A basic aural concept of the tone quality of individual instruments of the contemporary jazz ensemble is also assumed.

The program included only standard instruments of the contemporary jazz ensemble.

Additional clarification of the delimitations of this study is made in chapter III.

Limitations

1. The study was limited to music and music education majors of The Ohio State University, Columbus, Ohio, and Baldwin-Wallace College, Berea, Ohio during the Autumn and Winter quarters of the 1977-1978 academic school year.

2. The design of the study assumed that each student has basically similar entry behavior. The improbability of this being true could affect the conclusions drawn by the investigation.
3. The program, which represented a formidable amount of material, was undertaken by the students while they were involved in other course work or academic projects, and full-time involvement and interest could not be totally controlled or maintained. There was little incentive for the subjects to diligently pursue the program as there was no threatened punishment for poor performance on the post test, nor were there any promises of reward. The study thus was dependent upon the subject's intrinsic desire to learn the material.

4. A limitation connected with the program, itself, concerns an inability to control the amount of effort subjects put forward because of the provision of immediate feedback information throughout the text. While the subjects were instructed that it was a requirement for them to listen to the recorded music examples in order to answer the questions presented in the frames, there was no way to insure that they would do so, and one of the purposes of the program was to expose the subject to the aural materials.

5. The conclusions refer only to the content in the program.
Definitions

The restricted and preferred usage of the following terms throughout this study is as follows:

**Program Instruction** is a method of instruction which has measurable objectives, pre-arranged experiential sequences and methods of presenting materials, and which is self-paced and self-correcting.

**Program** refers to an educational device that will cause a student to progress through a sequence of experiences ultimately leading to mastery of a subject with minimal error.

**Contemporary Jazz Ensemble** designates an instrumental performance and compositional medium consisting of the following sections and instruments therein: Saxophone (alto, tenor and baritone saxophones, C flute, $B^b$ clarinet), Brass ($B^b$ trumpets, flugelhorn, tenor trombone, bass trombone) and Rhythm (acoustic and electric piano, acoustic and electric bass, drum set).

**Arranging** refers to changing and adapting music for purposes not necessarily in the composer's design and involving creative writing and scoring in which alterations of musical factors occur according to prescribed principles and techniques.

**Voicing** refers to the process of vertically assigning and distributing instrumental voices by working from a sketch or completed composition.
CHAPTER II

REVIEW OF THE LITERATURE

In reviewing the literature, no programed instruction or programed instruction research was located dealing specifically in the area of jazz ensemble arranging or jazz composition. However, several studies were identified in which one or more of the components of the proposed study were investigated. The purpose of this chapter is to review those areas of research relative to the major areas of this study.

The first section of the chapter consists of a commentary on program instruction and a review of the major programing methodologies and paradigms and the underlying theory related to each. The second section focuses on programed instruction and computer-assisted instruction with reference to its application in music teaching. The third section deals primarily with a review of the literature specifically pertinent to the present study.
Programed Instruction

The rationale underlying programed instruction dates to the time of Socrates at least; and its lineage includes the European tutorial system, the learning theories of Rousseau, and so forth. The history of programed instruction itself begins with E. L. Thorndike's prophetical description of a teaching machine. Actual machines were produced by Sidney Pressey and B. F. Skinner, whose application of psychological principles from behavioral science to educating humans forms the philosophical basis of programed instruction. Its pedagogical importance derives from the upsurge of interest in programed instruction theory and methods over the past two decades.

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1 The Socratic or dialectic method of teacher-student interaction leading to the student's own discovery of a truth occupies much of the descriptive content of Plato's Dialogues.


decades, to which the music and music education literature has responded to a great extent.\(^5\)

**Principles of Programed Instruction**

There is some disagreement among programers as to what are, and what are not, the essential programed instruction principles. O'Day et al. lists the following:

1. Objective specification
2. Empirical testing
3. Self-pacing
4. Overt responding
5. Immediate feedback
6. Small-step size\(^6\)


Duncan has stated that "those features which distinguish one style of programmed instruction from another may not be so critical as was supposed." He goes on to say that whatever impact program instruction has had on learning can be attributed, not to features such as response mode and sequencing, but to task analysis, or the defining and ordering what the learner must master, a common feature of programming.\footnote{Keith Duncan, "Strategies for Analysis of the Task" in Strategies for Programmed Instruction: \textit{An Educational Technology} J. Hartley, ed., (London: Butterworths, 1972), p. 19.}

Lysaught and Williams have proposed techniques of programing which illustrate how a program is constructed to incorporate some of the above principles: (1) an analysis is made of the subject matter to be covered, (2) assumptions are made about the learners, since the abilities, backgrounds, and purposes of the students who will use the program must be considered in every step of the programing process, (3) long-term and short-term goals are stated in behavioral terms, (4) the skills and knowledges to reach these goals are arranged in a logical order, (5) a program paradigm or model is chosen to arrange for format and presentation of material, (6) ways are devised to build up knowledges and
skills gradually to shape the learner's behavior toward the final objectives, and (7) the program is field tested, evaluated, and revised.®

**Programing Paradigms**

The most widely used paradigms or basic structural program designs are linear, the branching, and mathematical programs.

**Linear Programs**

The basic linear program consists of an unbroken sequence of instructional segments called "frames". Each subject, regardless of his response or rate of progress, proceeds through every step. Typically, stimuli are brief and responses may be verified immediately by reference to the correct answer located either on a masked-off portion of the same page or on some other page. Linear programs generally require the student to construct the response.®

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9Ibid., pp. 71-72.
By breaking down behavior to fine enough segments, and presenting them to the learner at an appropriate rate, the program may lead the student along the path of knowledge with a minimal number of "error" responses. Some authorities stress that the subject's mistake is really the programmer's error.\textsuperscript{10} Garner, however, mentions that an error-rate of 5-10\% is acceptable.\textsuperscript{11}

An important concern with the basic linear program, the apparent discontinuity of the information flow, prompted the construction of the linear model, conversational chaining.\textsuperscript{12} In this paradigm the response to one frame is used as a reinforcer and a stimulus in the next frame. By overlapping frames, some of the benefits of free-flowing prose can be retained. When students can read the material, as in conversational chaining, continual testing is avoided. Typically, the response to one frame is capitalized in the next frame.\textsuperscript{13}


\textsuperscript{12}Lysaught and Williams, pp. 76-81.

\textsuperscript{13}Ibid., pp. 79-81.
Barlow, the originator of the paradigm, theorized that the conversational nature of the program would retain the student's interest and would promote better integration of learning materials to a greater extent than would be possible within the basic linear format.\textsuperscript{14}

**Branching Programs**

The developer of branching programs, Norman Crowder, describes his basic philosophy as follows:

I have approached the design of automatic tutoring materials from quite a different point of view (from Skinner's). To me the essential problem is that of controlling a communication process by the use of feedback. The student's response serves primarily as a means of determining whether the communication process has been effective and at the same time allows appropriate correction action to be taken when the communication has been ineffective.\textsuperscript{15}

Branching programs generally consist of a stimulus in the form of a statement followed by a multiple choice. The student's progression is determined by his comprehension ability. Most of the branching programs

\textsuperscript{14}Ibid., pp. 73-76.

use this simple branching technique referred to as "herring-bone branches". The program provides the student with a number of alternatives, one of which will lead the student to the next stage of the program, while the others will return him, after correction, to the original frame. Full branching programs, on the other hand, analyze student response and adapt future learning contingencies on the basis of each progressive response. Because of the variables required of this type of learning process, computers have been used in the experimental full branching programs developed to date.

Davies claims that the branching technique is "particularly suitable for dealing with material that involves complex problem solving strategies." He then qualifies this point by stating that "the subject matter should have a logical basis or structure which can be systematically developed frame by frame."

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17 See pp. 44-57 of this study.

Current research in programed instruction is engaged in assessing the validity of Skinner's and Crowder's positions. O'Day et al. included a number of favorable implications for the linear technique vis-a-vis the branching method. Results of their study supported the linear technique with regard to its: (1) use of small step size, (2) use of low-error rate, (3) avoidance of remediation, and (4) confirmation of degrading effects of program noise and miselicitation and nonelicitation of relevant responses. Support was not found for branching remediation or constructed response.\(^{19}\)

Research by Silberman et al. has not shown the linear or the branching program to be significantly superior to the other.\(^{20}\) Woodson, however, has suggested that the degree of homogeneity of the learners with regard to the material involved is related to the effectiveness of linear vs. branching techniques.\(^{21}\)

\(^{19}\)O'Day, pp. 146-47, 198-99.


Leith and Davies have observed that many recent programs contain a mixture or blending of the differing styles and formats, so that the two schools of programming (following Skinner's or Crowder's models) are tending to become less exclusive as far as actual teaching is concerned. According to Leith, "Programmers have become much more task-orientated and vary their methods to suit the job to be done."  

Mathetical Programs

Proponents of the mathetics approach to program construction describe their philosophy as follows:

Mathetics uses a transactional approach in which the trainee actually performs all of the operations that will be required of him--he learns by doing. The behavior to be instilled into the trainee can be derived from existing training materials or from a subject matter expert where good materials are not available. In any case, the behavior to be instilled into the trainee is prescribed in detail in advance and then systematically established in the repertoire in a manner that depends on the type of behavior involved. Sequences

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22Leith, p. 195; Davies, p. 83.
23Leith, p. 195.
24Mathetics refers to a programming paradigm as well as a sequencing technique.
("chains") in which each response sets up a unique stimulus "state of affairs" are taught backwards. Thus, a salesman would be taught the "close" of a sale first, a machinist the finishing procedure first, and a bank-teller trainee the close and balance of his cage first. In this manner, the lesson establishes the goal firmly in the repertoire of the student or trainee. This procedure corresponds to the food pan in animal work. Once the human knows "where he is going," each step in the chain becomes a reinforcing stimulus by connection with the final state of affairs.25

Chaining and the identification of chains, i.e. of sequences of responses, is a central idea in the mathetics system. Gilbert, the developer of this system, has emphasized that the responses in a chain i.e. task or subtask should be brought to mastery retrogressively. That is to say, that prompts should be withdrawn from the last response, then from the next to the last response, and so on. Research cited by Duncan, however, has not supported Gilbert's principle of retrogressive chaining.26


26Duncan, pp. 35-36
Methods for Ordering Items

Several major approaches are commonly employed in constructing the programed sequence: (1) The Pragmatic Approach, (2) The RULEG System, (3) The Mathetics System, (4) Learner Controlled Programs, and (5) Behavior Analysis.

The Pragmatic Approach

The pragmatic approach utilizes the experience of teachers who are familiar with programed instruction to align behavioral aims into a logically-sequenced framework of assumptions and objectives. This approach presumes that certain information is transmitted most effectively by means of a specific, empirically-determined sequence.27

The RULEG System

The RULEG System assumes that all programed material consists of either rules (RB) or examples (EG). The objective is to list all the rules associated with a particular unit of study and then to find one or more examples of each rule. The sequencing of rules follows, either in logical order or in accordance with a RU-Matrix,

27Lysaught and Williams, pp. 92-117.
a graphic representation of the relationship between, and among, all the rules included in the goal. Information progression initiates with the presentation of a rule, followed first by a completed example of the rule, then followed by an incomplete example of the rule which the student must complete. As with the pragmatic approach, the RULEG system approach requires a determination of terminal behavior as well as the structuring of a logical learning sequence by which the desired objectives may be achieved.\textsuperscript{28}

The RULEG system is in contrast to the EGRUL system which begins with low-level EG's that students can solve and then leads them to generate the RU's.\textsuperscript{29}

As a guideline for determining the appropriate system, Davies suggests that the RULEG system is to be preferred when the concept is an easy one for the target population, whereas the EGRUL system should be used when the concept is likely to be a difficult one.\textsuperscript{30}


\textsuperscript{29}Markle, p. 101.

\textsuperscript{30}Davies, p. 106.
The notion that the learning sequence may be prescribed by the structure of the subject matter is common to the RULEG system and techniques developed by Gagne. As outlined by Gagne, a task is first described in general terms, then broken down into subordinate operations (sub-tasks), to effect training requirements. The structure of expert performance is assumed to be hierarchical. In regard to sequencing, hierarchical analysis procedures entails that practice of an operation be preceded by mastery of any sub-operations not already in the trainee's repertory.31

Based on an extensive study of the relation between subject-matter structure and learning sequence, Hickey and Newton concluded that sequences which stated principles first were superior, and the evidence suggested that learning several sub-concepts first was detrimental, especially if they were learned at a point in the sequence remote from the introduction of the major concept.32

Studies dealing specifically with the sequential organization of subject material in program instruction have generally yielded equivocal findings. Ausubel has

31Duncan, pp. 38, 71.
32Ibid., pp. 40-41.
summarized considerable research evidence concluding that:

The principle of sequentiality has not really been tested yet on a long-term basis; since most programs (at least insofar as sub-units within a given learning task are concerned) do not presuppose a logical sequence of items such that each sub-unit is sequentially dependent on the preceding intra-task sub-unit, it apparently makes little difference whether the frames are carefully sequenced or presented in random order.  

The Mathetics System

The mathetics system utilizes reverse-order sequencing, i.e., the student is presented initially with the terminal step of the sequence; the student is then required to complete the process or previous steps necessary to achieve that terminal behavior. The procedure for writing a mathetics program begins with a task analysis to determine what behaviors are necessary to mastery, and what behaviors are already in the student's repertory. Following this, a learning prescription is formulated. This consists of a provisional course of remedial action likely to effect the desired behavioral change. Next, a domain theory is constructed which relates essential learning criteria of

the subject matter, expressed in behavioral terms. An **analytical repertory** of information available to a **subject-matter master** is then constructed. This is followed by a **characterization**—a description of the generalizations to be taught, their relevance to the student's competition, and of the behavior available to overcome that competition. Finally, an **exercise design** is devised which sequences information in format and priority as required by characterization analysis.$^{34}$

Gilbert's approach to "shaping" behavior, is essentially different from B. F. Skinner's in that the latter's is characterized as a process of building new responses on the basis of preceding ones leading to the notion of small steps and thus to small frames. Gilbert along with R. F. Mager have suggested that the programmer ought to allow the student to write the program, or—as an alternative measure—to define an optimum route for the student to take on the basis of his present repertory of skills. According to Davies:

> ... such an optimum route involves forcing the student to take as great a step as he can manage, leading to the notion of large steps and so to large frames.$^{35}$

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$^{35}$Davies, p. 95.
Learner Controlled Programs

Mager has advanced the thesis that the learner rather than the instructor should control the sequencing of subject material. Mager has shown that student-generated sequences have considerable commonality in their ordering of subject material, and may depart dramatically from those considered by the instructor to be inherent in the logic of the subject matter. Mager reported a sixty-five per cent reduction in training time by providing students behaviorally-stated objectives for an industrial training course and permitting them to structure their own course of training. Student-generated sequences tend to differ from traditional instructional sequences in the following ways:

1. Initial student interest tends to be in the concrete rather than in the abstract, in things rather than in theory, in how rather than in why.

2. Students tend to show interest in function before structure.

3. Students tend to proceed from a simple whole to a more complex whole.36

36Ibid., pp. 87-89; These findings align with Ausubel's principle of subsumption wherein ideas can only be meaningfully learned and retained if more inclusive and appropriately relevant concepts are already available to serve a subsuming role or to provide ideational anchorage. See David P. Ausubel, Educational Psychology, pp. 333-34, 339-40.
According to Mager, in order to effectively develop and evaluate instructional sequences, the specific terminal behavior expected of the student must be identified. Mager has recommended the following criteria to describe the desired behavior of the learner:

1. Identify the terminal behavior by name; specify the kind of behavior which will be accepted as evidence that the learner has achieved the objective.

2. Further define the desired behavior by describing the important conditions under which the behavior is expected to occur (given or restrictions, or both).

3. Specify the criterion of acceptable performance.37

Von Gruenigen points out that:

Stating instructional objectives in behavioral terms is central in determining what material should be learned, how it should be learned, and to what extent the student has learned it.38

Behavior Analysis

Behavior analysis entails a theory of concept-forming which is based on the learning processes of


generalization and discrimination. Central to this method of organizing subject matter is the notion of judiciously blending the introduction of new knowledge and the recalling of previously learned information through juxtaposition and contrast of old and new material, without confounding the two. The techniques developed by Le Xuan, based on the principles laid down by the American psychologist Francis Mechner, involve the following stages. First, the initial definition of aims in behavioral terms, is followed by a concise definition, expressed in a small number of key words. Each of these key words is then defined in the same way in a short formula, the key words of which will form the subject of a new definition, until the definitions given are recognized to correspond to patterns of behavior acquired by the students.\(^{39}\)

**Conclusions**

Concerning program instructional techniques which can most usefully contribute to program development, this section has not attempted to cover the whole spectrum or to provide a complete review but rather to

\(^{39}\)Pocztar, pp. 115-21.
discuss some of the different strategies which could be adopted.

One main conclusion that can be drawn from the first section of this chapter is that there is at present insufficient experience with programed materials to conclude that one paradigm per se is superior to the others. A more correct statement is that each method or combination of methods might be more appropriately suited to a particular subject matter or degree of difficulty. Because branching and mathetics programs have considerable larger frames, these programs tend to be more compact and place a greater demand on student learning skills. It is hypothesized that in the music arranging process the linear programs may be more effective at the elementary or fundamental techniques level, while branching and mathetics programs may be more effective at the advanced level. However, the validity of this assumption must await further empirical results.

A second and related conclusion is that a learning sequence based on a hierarchy of concepts may not be the most efficient teaching strategy, at least for some kinds of complex verbal learning. Research evidence cited indicated convincingly the superiority of learning sequences which commenced with the introduction of principles followed by sub-concepts.
Programed instruction is based on a wide variety of theoretical studies and gives rise in practice—as evidenced by the diversity of the techniques used—to numerous variants. O'Day et al., using a multivariant research design, studied the interactional effects of various conventional and experimental programed instructional formats and programed instruction principles on one another. The results of this study led to the following conclusions and recommendations intended as general guidelines for program design; here directly quoted for the most part to avoid distortion in meaning:

1. The principle of objective specification (or behavior analysis) and the principle of empirical testing should be considered as mandatory in programed instruction.

2. Principles of overt responding, immediate feedback, and small steps should be considered as optional. Of these three optional programed instruction principles, small steps is the riskiest to delete from a format. Those formats containing small steps are those that most reliably give acceptable large learning yields and acceptably small program times. The next riskiest principle to delete is the immediate feedback principle, particularly, if either overt or covert responding is present and if small steps are absent. In effect, this is tantamount to saying that pure confirmation should be replaced by some form of prompting.

3. There are a minority of training and educational situations where the criterion of near-perfect performance must be attained. The majority of such situations require only that instruction bring about substantial improvement.
4. Generally prompting is to be preferred over confirmation, particularly in the early stages of learning where most programmed instruction materials are employed. But where prompting is used heavily, programs should also contain some redundant frames with prompting gradually faded to the point of absence. Thus, some pure confirmation is utilized in the terminal stages of instruction in order to consolidate learning and insure retention when the additional stimulus support supplied by the program is no longer present.

5. While both thematic and formal prompting generally yield more learning, formal prompting requires significantly less time. The use of formal prompting can benefit where it cannot adversely affect attentiveness in reading the text. An example of appropriate use would be to establish a particular set of responses. But for purposes of associative learning, formal prompts should be used with caution, particularly on small-step programs, since they may hinder the establishment of desired stimulus control.

6. Program time tends to increase with the addition of:
   (a) overt responding
   (b) immediate feedback (knowledge of correct response remediation)

   Program time tends to decrease with the addition of:
   (a) small steps
   (b) option to review text prior to responding
   (c) prompting (thematic or formal)

7. In practice, the use of small steps automatically supplies thematic prompting and the opportunity to review text after viewing a test item.

8. The simplest form of immediate feedback is to indicate to the learner whether or not
a particular response is correct. When feedback is postresponse, as in a program using the confirmation mode, knowledge of correct response (KCR) is about as efficient as more elaborate forms of feedback, such as the remediation used in branching programs.

9. Wherever overt responding is used, it should be accompanied either by immediate feedback or, preferably, by small steps, or both. That is to say, responses should always be either prompted, or confirmed, or both. For most instructional objectives, confirmation could be deleted more readily than prompting.

10. If for some reason large-step size must be used, immediate feedback should be present so that the mistakes can be promptly corrected.

11. Where poor motivation among learners is present, the novelty value of programed instruction techniques that utilize immediate feedback and small steps are helpful per se.

12. Program noise (irrelevant information in the text) is to be avoided, but its harmful effects can be somewhat reduced by overt responding and appreciably reduced by overt responding plus immediate feedback.

13. Programers should elicit relevant response, especially when the program is small step.

14. In program development, improvements first should be made by revising the inadequate text, and then remediation should be introduced only after repeated efforts at communication have failed.

15. Where multiple-choice test items are employed the number of distractors should be kept to a minimum except in certain special circumstances, as in the terminal stages of discrimination training.\(^{40}\)

\(^{40}\)O'Day et al., pp. 209-13.
Computer-Assisted Instruction

This second section of the review describes a number of existing computer-assisted instruction (CAI) systems and ascertains the level of development or potential for music instruction. Because of the purposes of the present study, the emphasis is on the basic structure of these systems with reference to its utilization of programed instructional techniques, and on the manner in which computer systems are employed. Only systems designed expressly for the purpose of instruction are considered and the computational aspects of CAI are ignored.

Before describing specific applications of CAI in music teaching, a general overview based on a composite of existing systems is presented below focusing on the basic features of such systems.

Overview of CAI

The computer-assisted instruction movement evolved from earlier experience with programed instruction. It was chiefly the inadequacy of conventional program instruction that led some researchers to exploration of the computer as an aid in programed learning.\textsuperscript{41}

In this developmental stage, CAI defies precise definition. That there is considerable controversy over the role that the computer plays is evidenced by the variety of names being used: computer-assisted instruction, computer-managed instruction, Computer-based instruction, computer-aided instruction and so forth. 42

While experimentation in all music areas has not been done as yet, a great deal of speculation has taken place toward the potential uses of computers in music teaching. 43

A number of arguments have been made for the effectiveness of computers as instruction tools.


Individualized instruction has received much attention in educational literature, and, although there is little evidence to indicate it is superior to group instruction, this has been used as a primary justification for computer-assisted instruction. In a recent review of research on the effectiveness of CAI, Jamison et al., concluded that:

At the secondary school and college levels, . . . CAI is about as effective as TI [traditional classroom instruction] when it is used as a replacement. It may also result in substantial savings of student time in some classes.

The advantage of immediate feedback, is also thought to be conducive to efficient learning.

Typically the learner interacts with the computer program by means of a display i.e. typewriters, cathode

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45 Woodson, p. 48.


47 Woodson, 48.
ray tube (CRT) displays, sound from a linearly accessed tape recorder, or projected photography. The display usually includes a question or cue to which the learner is asked to respond. Common methods by which learners responses may be detected include keyboard and light pen on videoscreen. The computer evaluates the response in each case, and branches to the next item or gives correct feedback, as the instructional programmer has planned.48

The computer-based programed instruction has several specific advantages over conventional programed instructional media including its unlimited storage capacities, its ability to retrieve and process information, its ability to analyze student responses, its problem solving capacities, its ability to select the next information presentation or perform a combination of the above functions, and its versatility in terms of possible modes of presentation.49 According to Allvin, one of the most salient features of CAI for music teaching is:

48Ibid.

the system's ability to change the criteria for acceptable behavior as the student becomes more proficient in a given skill. Such criteria can be adjusted either automatically or by the student himself.\textsuperscript{50}

Stelzer has proposed a classification scheme that differentiates explicitly between the concept of instructional logic of the computerized instructional process.

According to Stelzer:

The instructional strategy refers to the role that the computerized portion of the instructional environment plays in the introduction of new material. It also refers to the structure that is imposed on the student-computer interaction by the instructional material and instructions that are stored in the computer. The instruction logic refers to the method that is employed to branch the student through the instructional material.\textsuperscript{51}

So viewed, several types of instructional strategies have been distinguished including: drill and practice, tutorial, dialogue and, simulation and gaming.

**Drill and Practice Strategy**

Stolurow defines drill and practice as:

... use of a computer to present learning materials which utilize the same sequence and format to give a student repeated opportunities for

\textsuperscript{50}Allvin, p. 133.

\textsuperscript{51}Stelzer, p. 44.
response. The student uses his own natural language and the objective is to build skills.52

In this strategy, student responses are assumed to be answers to questions or exercises presented to the learner. Thus, the student-computer interface is highly structured, in that deviation from the predefined sequence of instructional contingencies is usually not permitted.53 As pointed out by Suppes, this strategy is really intended to "supplement the regular curriculum taught by the teacher."54

Such basic music skills as ear-training, melodic and harmonic dictation, basic theory including the recognition and classification of triads, intervals and scales, terminology, and the detection of aural-visual discrepancies in score reading have been suggested as appropriate for this mode.55


53Stelzer, p. 44.


Within this strategy, individualization is achieved by variations in levels of difficulty in the material presented, review and repetition of types of problems.  

**Tutorial Instructional Strategy**

The tutorial strategy is more complex than the drill and practice mode in that more instructional material is presented and more sophisticated student responses are often called for. This strategy is generally used to assist in the presentation of new material rather than supplemental instruction. Like the drill and practice mode, the student-computer interaction in the tutorial strategy is highly structured. The sequence in which information is presented to the student and the expected student responses are totally prescribed by the programmer. More than any other, the tutorial strategy exemplifies the automation by computer of the programmed text.

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56 Woodson, p. 50.


58 Stelzer, p. 44.

59 Salisbury, p. 48.
While the drill and practice mode is concerned with the teaching of a skill in the performance of a specific task, the tutorial mode is employed to present a concept and develop skill in its use. The mutually facilitative and complementary nature of the drill and practice and tutorial strategies has been elsewhere suggested, and, to a degree, demonstrated in music instruction.

**Dialogue Instructional Strategy**

The dialogue strategy is characterized by the fact that both new material is introduced to the student under computer control and the student-computer interaction is predefined. Typically, by means of the typewriter keyboard, the student can enter comments,

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60 Suppes, p. 43.

61 Allvin, pp. 21-22; Deihl and Radocy, pp. 23-24.

request information, ask questions, enter responses in fairly free format. Ostensibly, the student engages in a "true conversation" with the computer. This capability clearly differentiates it from the tutorial strategy.

But this strategy is not without its problems, created, paradoxically, as Zinn points out, by its advantages:

As increasing control is assumed by the dialogue program, one improves the chances that sufficient information for successful conversation with the student will be acquired from the author. Of course this does not assure that the content will be worthwhile or that the student will meet the objectives of the instruction.

Simulation and Gaming

Simulation is a strategy in which the computer assists in the simulation of some real world event, situation or sequence of such contingencies. By interacting with the computer the student is able to control or affect the simulated events or processes.

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63Salisbury, p. 49.


65Stelzer, p. 44.
Bushnell et al. refer to gaming as a "particular kind of simulation." Such games, according to Woodson, place the student in a "situation which involves competition or conflict." He goes on to state that:

In order to improve his chances of winning, the learner must learn or improve some skill. The games are designed so that this skill is one important to an educational objective.67

**Instructional Logics**

In the references to instructional strategies vis-à-vis instructional logics, Stelzer insists that both concepts should be considered mutually exclusive by definition. That is, the question of what instructional logic is being employed is completely independent of the functions being performed by the computer with respect to the list of functions presented in the previous discussion.68

At least five types of instructional logics are available to the programmer; linear, intrinsic, learner-controlled, adaptive, and Socratic branching.

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67 Woodson, p. 49.

68 Stelzer, p. 44.
Woodson notes that "Although logically distinct, these branching logics are, often combined in practical programs". Each logic is described briefly as follows:

1. Linear logic refers to a sequence of instruction in which all learners negotiate the same sequence of steps. No branching occurs within the program, but extra-program branching may be used in the sense of selection of alternate programs.

2. Intrinsic logic refers to a sequence of instruction in which the branching is selected by the programmer. Usually this has taken the form of branches selected to be taken following two categories of responses, e.g., correct and incorrect responses, although several categories of responses can be employed.

3. Learner-controlled logic describes a sequence in which the learner chooses the branches he takes. Typically, alternatives are displayed, with recommendations, and the learner chooses his path.

4. Adaptive instructional logic is characterized by branching decisions based on student performance.

5. Socratic branching logic is characterized by partial answers and questions.69

While the preceding discussion was directed to CAI systems, similar strategies and instructional logics may have considerable possibilities for conventional programmed instruction.

69Woodson, pp. 48-49.
To complete this discussion of CAI, research in music teaching employing CAI will be considered briefly.

**Related Research**

**Music Theory**

Recently, experimental programs have been undertaken exploring the usage of the computer for the teaching of theoretical concepts. One such CAI program was developed at the State University College, Potsdam, New York. The program was designed for "collateral and supplementary use with Music Theory or Comprehensive Musicianship courses." Hultberg et. al. explain the primary function of the computer program is:

> . . . to provide maximum opportunity for self-directed study of parametrically delineated concepts and materials. Intended for use by students at any level of proficiency, program segments considered most appropriate may readily be selected for study or review.

The paradigmatic organization includes branching and strand organization which "allows the student to take all or any portion of the programs available; segments may be taken in any order; or repeated as often as desired."\(^70\)

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Further research by Hullfish into CAI in music theory compared the effectiveness of two instructional logics i.e. "decision rules" in presenting learning materials to college music students. Hullfish called these rules which control the learning sequence on the basis of the student's past performance "response-sensitive," in contrast to "response-insensitive" rules, which dictate branching behavior based on the student's last response. The variables involved in the former branching method were a pretest music knowledge score, incorrect answer, module posttest score, and request for branch. Results of the study based on posttest gain, indicated that response-sensitive programing results in greater achievement than the response-insensitive type. As hypothesized, the response-sensitive program produced greater heterogeneity in learning paths.71

Cooper compared the achievement of college students who learned fundamentals of music theory from CAI with the achievement of students who had traditional

independent study and lecture methods. Findings showed that the three groups did not differ significantly in learning.\textsuperscript{72}

Summary

In summary, this section has described and compared some of the different instructional strategies and logics which have been employed in current CAI. It has briefly clarified what seems to be an important source of confusion about the method and function of these instructional environments. The literature related to CAI in music theory has been reviewed and a number of general statements of the possibilities relative to music theory instruction were mentioned.

After a brief commentary on the conceptual approach to subject matter organization, section three will focus on some of the key concepts and principles inherent in current jazz ensemble arranging literature. Rather than review the specific arranging techniques, it was decided to allow the program itself to be the source of technical information.

Substantial research of programmed instruction in the area of jazz composition and orchestration, specifically, jazz ensemble arranging, is virtually nonexistent. Though much of the theoretical information prerequisite to the acquisition of skill in jazz ensemble arranging is found in existing music theory programs, only two programmed instruction studies were identified that dealt with subject areas appropriately relevant to the present study.

Concepts

Current emphasis in educational literature is providing evidence that concepts and principles can be keys to the structuring of subject materials, and that conceptualization facilitates learning.

Points of view about "concepts" and "principles" reflect variation among individuals, depending to a large extent upon the frame of reference from their specialized disciplines. To illustrate, Smith stated: "It is impossible to sharply differentiate facts and principles from concepts."73 On the other hand, Gagne made a distinction between concepts and principles,

referring to the latter as "a chain of two or more concepts." He noted the importance of viewing concept learning as preliminary to principles, and simpler in nature.

Bruner stated four general claims that he believes can be made if principles are taken into account in the structuring of a body of knowledge:

1. A subject becomes more comprehensible if fundamental principles are stressed.

2. Facts are easily forgotten, but principles remain and provide the vehicle needed to reconstruct details.

3. Adequate transfer of training appears to have understanding of fundamental principles as a prerequisite.

4. The knowledge lag or gap in a field is reduced when principles in the field are examined and re-examined, since principles stand the test of time better than do facts.

Phenix has stressed the use of key concepts as "basic central ideas, an understanding of which opens the door to an effective grasp of an entire field of knowledge." He has also referred to "their power to

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epitomize important common features of a large number of more particular ideas."\textsuperscript{76}

The concepts and principles fundamental to jazz composition should then provide content and structure for the subject area of jazz ensemble arranging.

\textbf{Jazz Ensemble Arranging Concepts and Principles}

An understanding of the jazz arranging approaches of Grove,\textsuperscript{77} and Sebesky\textsuperscript{78} necessitates an understanding of their underlying arranging concepts and principles. Each has contributed a number of basic concepts to the arranging literature extantly influential. Grove's voluminous compendium, largely based on concepts advanced by Delamont,\textsuperscript{79} is a comprehensive analysis of his own

\textsuperscript{76}Philip H. Phenix, "Key Concepts and the Crisis in Learning," Teachers College Record (December 1956): 140.


arranging practice. In this, Grove applies the concept of "density" to arranging for the jazz ensemble. As defined by Grove, "density" includes the following three factors:

1. The restriction of the number of different pitches being played simultaneously or vertically, excluding doubled pitches (the density of any specific place in an arrangement can be from one to eight different pitches i.e. one to eight part density).

2. The amount of doubling of notes producing the weight of the voicing.

3. The span of distance from the top to the bottom of any orchestral voicing.\(^\text{80}\)

Grove cites the following advantages of using the density approach:

1. The whole thrust of a phrase has a horizontal or linear effect. The reason for this is that the choice of harmonic notes under the melody tone are always selected in relation to the melody note. This selection is determined by the melody note down or from the melody note up. This is in contrast to a section-writing approach where a melody tone is selected, a bass tone is identified, and then a voice is chosen that automatically "saturates" the distance between the melody and bass pitch.

2. The degree of weight or saturation is controlled by the number of different pitches used.

\(^{80}\text{Grove, p. 175.}\)
3. Consequently, by using either extreme (thin or thick density) the effect of tension and climax can have its greatest contrast to release and simplicity.  

Although Grove's concept of density is relevant to a current discussion of arranging for the jazz ensemble, even more fundamentally important to conventional writing is the principle of "internal resonance" emphasized by Don Sebesky in his text The Contemporary Arranger. To this, Sebesky adds the principle of "harmonically complete ensemble sections." According to this same writer, "internal resonance" can be established by:

1. Maintaining the interval of a Major or minor sixth between the top and bottom voices in a section, or between the top voices of different sections of the ensemble.

2. The formation of harmonically complete chords (basic tones and extensions) within the various ensemble sections.  

This has established a dichotomy in current arranging literature which had existed previously in

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81Ibid., p. 179.
82Sebesky, p. 37.
various earlier literature on the subject, but which has received firm reinforcement and clear definition in the arranging approaches by Grove and Sebesky.

Programed Instruction in Orchestration

A study by Laurin Crowder developed a programed text and tested the effectiveness of it in teaching fundamentals of orchestration to university music students registered in orchestration classes. The program text was applied, tested, revised "numerous" times and finalized after "three complete printings." Specifically, the program was constructed to teach orchestration score order, foreign instrumental


terminology, instrument ranges, orchestral transposition, woodwind, brass, string and percussion playing techniques and idiomatic terminology, instrumental notation, and tonal characteristics of the basic woodwind and brass instruments.

There are 1,110 frames in the text and construction follows the linear approach "modified to incorporate considerable conversational chaining."85 No aural examples are provided though the text contains numerous visual examples.

The general procedure of this study was largely patterned after the recommendations of Lysaught and Williams previously cited in chapter II of this study. The pragmatic approach was used in the construction and sequencing of the frames. Regarding this, Crowder writes:

Sequences of frames were written on 4 by 6 cards and after careful editing and revision these sequences were tried out with a small number of students whose educational levels approximated those required by the program. A delineoscope was used to project each frame on a screen and the students wrote their responses on a sheet of paper. This process was usually carried out several times with each frame sequence. When the accuracy level of the students’ responses reached or neared one hundred percent the sequence was deemed ready for inclusion in the program.86

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85 Ibid.
The complete program was field tested with a "group of volunteers" from the target population. Following further revision and alteration, the finalized program was formally tested by a population of 26 students.

Results based on pretest/posttest achievement gain, indicated that there was a mean gain of 35.46 considered significant beyond the .01 level. The effectiveness of the program was reported by Crowder:

The test subjects scored a 100% degree of accuracy on 96% of the program's frames. On the total program the subjects, considered collectively, had a 98% degree of accuracy.87

Regarding the results of the study, Crowder states:

As the median score on the post-test was 83.65 and as this test measured a rather broad range of competencies essential to the orchestrator, it seems reasonable to conclude that the self-tutoring program could be a valuable aid in the teaching of orchestration, especially in view of the fact that the mean completion time on the program was only eleven hours and fifteen minutes. The implication of these statistics is that through use of the programmed text competencies usually requiring a full semester's work to develop might be attained in three weeks.

While the median score of 82.65 obtained with the test group on the post-test is not exceedingly high, it should be

87Ibid., p. viii.
pointed out that this performance was attained without any reinforcement from normal classroom lecture procedures.88

Programed Instruction in Part Writing

Fink explored the feasibility of using programed instruction for the teaching of part writing to university music theory students. Specifically, the study was concerned with the "craft of connecting triads in four voices." Results of this comparative study revealed that "subjects learned the basic craft of chord connection effectively by means of self-instructional materials." In addition, "for the subjects, programed learning can be a more time-consuming method than the teacher-classroom approach." The author notes, however, that "the group that spent the most time scored the highest" implying that:

"... a great deal of structural drill work is necessary to develop the craft of chord connection. The teacher of the [experimental] group using programed learning spent one-half of one percent as much time as the [control group] 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."89

88Ibid., p. 576-77.
Summary

Research relating to programed instruction in orchestration and cognate areas is in its preliminary stages. Except for some implications from a few studies, no evidence was found dealing with programed instruction and jazz composition in general or jazz ensemble arranging specifically.

A study dealing with orchestration fundamentals and another concerned with part writing found programed instruction feasible.
CHAPTER III

PROCEDURES

This chapter presents a description of the procedures which were employed in the development and evaluation of the Programed Instruction in the Techniques of Jazz Ensemble Arranging.

Program Development Procedures

Research Design

An examination of recent program instruction studies reveals that the emphasis has changed from external or direct comparative studies of effectiveness to detailed studies of how to improve the effectiveness of programs, and how to adapt programed instruction to various educational settings.¹

Consistent with this trend in feasibility studies concerned with developing effective programed materials, the present study was designed in two phases. In Phase I, the programed materials were assembled, pilot tested, revised, and judged ready for field testing; in Phase II, the finalized program was subjected to an evaluation of its effectiveness in teaching jazz ensemble arranging techniques.

Program Instruction Procedural Model

In order to structure the development and evaluation of this study, a programed instruction procedural model outlined by Hartley was followed with appropriate modification.2 The model, which indicates the general sequential "processes" which one would follow in order to develop programed instructional materials, is based primarily on the earlier work by Lysaught and Williams, Green, and others.3 The various


components in the model, for purposes of this study, are based upon the concepts developed by various researchers cited in Chapter II.4

Outlined below and followed by a detailed description are the sequential steps of the program adapted from the program instruction model:

1. The objectives were determined with respect to the student population.
2. The student population was specified.
3. A criterion test was prepared and validated.
4. The content was outlined.
5. Taking into account the objectives of the program, the entry behavior of the student population, and the nature of the material to be programmed, the sequences, teaching strategies and presentation methods were determined.
6. The first chapter was constructed.
7. Each of the subsequent chapters were constructed.
8. The program was pilot tested and revised.
9. The subjects for field testing were selected and pretested.

^See Chapter II, pp. 23-43.
10. The subjects were given the program and posttest.

11. The program data and test results were collected and analyzed.

Program and Instructional Objectives

The major aim of this program is to provide the student with a working knowledge of the cognitive aspects of various arranging and scoring approaches in arranging music for the jazz ensemble. The cognitive aspects can be thought of in terms of specific content that is to be mastered.

Consistent with Mager's guidelines, all the instructional objectives defined what the student has to be able to do, under what conditions, and to what level of proficiency. Also the objectives, are stated in terms of the cognitive domain including the behaviors pertaining to "knowledge," "intellectual abilities" or "intellectual skills." They represent the priority desired competencies. Throughout the

5Mager, p. 12.

program other competencies will be acquired, but the mastering of these is essential to the overall conceptual scheme. It was determined that 90 percent of the subjects have to demonstrate the attainment of the instructional objectives by achieving at least a level of 90 percent correct responses on a criterion-referenced multiple-choice objective test which is administered after completion of the program. The instructional objectives are presented in Appendix A.

**Student Population**

Freshmen college-university music and music education majors made up the student population. Since all the students undertaking the program were at least college-university freshmen with no formal orchestration or jazz ensemble arranging experience, certain basic entry skills, knowledges and abilities relative to music theory were implied by their status. It was assumed only that they possess an adequate aural concept of the tone qualities of the various instruments in the jazz ensemble.

**Criterion Test**

After the behavioral objectives were established, criterion-referenced multiple choice test questions were constructed for each of the 20 objectives. The face
validity of the *Jazz Ensemble Arranging Test* was based upon the fact that, essentially, the ability to answer correctly its one hundred questions represents the program's objectives. While not all the behaviors which the program was designed to develop were measured by the test, the investigator endeavored to construct a test which was a representative measure.

To verify the estimate of content validity, both the *Instructional Objectives* and the *Jazz Ensemble Arranging Test* were submitted to two experts in the field of jazz ensemble arranging.7 They were asked to respond to the following questions:

1. Do the *Instructional Objectives* represent the performance which could reasonably be expected of a beginning jazz ensemble arranger?

2. Does the *Jazz Ensemble Arranging Test* measure the achievement of the intended objectives?

The content validity of the *Instructional Objectives* and the *Jazz Ensemble Arranging Test* was established by the agreement of the two experts.

A preliminary analysis using the Kuder-Richardson 21 formula revealed that the test had a

7Dr. Joseph Levey, Director of Jazz Studies, The Ohio State University, Thad Jones, Composer-Arranger, Co-Leader of the Thad Jones-Mel Lewis Orchestra.
reliability coefficient of .71. This was deemed satisfactory for group measurement.

Mastery Testing

Mastery testing has been employed extensively to assess achievement gained through programed instruction. In a review of studies using mastery testing, Vander Ark reported that "sixty to eighty percent of the students responded correctly to ninety percent of the posttest items." Thus if the aim of a program is, as Markle has suggested, to achieve 90-90 (i.e. 90 percent of the students should obtain 90 percent on the test of the program's objectives) then it is clear that these programs have not been totally successful—at least by this criterion of program mastery. Baker, speaking from a different vantage point, has recently pointed out that "The criterion for mastery of an objective has been set universally at a percentile rank of 85%." None of

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the authorities cited, however, justified the use of this or any other definition of mastery and its rational basis is not obvious to this investigator.

In the absence of such data, the following guideline offered by Millman was considered in setting a required level of proficiency for the program. Millman states:

If, on the basis of a logical analysis of the subject matter and the extant instructional system, the knowledges and skills are seen as fundamental or prerequisite to future learning, then a high proficiency level should be required. A lower passing score can be tolerated when the material is not seen as completing a necessary link in the development of some more complex concept or skill, especially if the ideas will be covered again in the curriculum.\textsuperscript{11}

Application of this guideline in conjunction with the recommendations of Markle suggested a mastery level of at least 90 percent for the present program.

\textbf{Program Content}

A number of sources, some of which are mentioned in Chapter II,\textsuperscript{12} were used to isolate the instructional objectives. The identification of these objectives in effect defined the broad scope of program content, but


\textsuperscript{12}See Chapter II, pp. 59-63.
there were remaining questions to be answered. These included: What approach can be used to further delimit best the scope and to serve as a guide for selecting the most significant material for instruction? How can these materials be appropriately organized so as to become relevant and meaningful to the assumed learner? What factors determine the sequence of instruction?

The programer approached the analysis of subject matter and sequencing of the content with three caveats in mind:

1. The rules, or strategies encountered when the operations of a skilled man are described may vary in complexity, may not necessarily be explicit, consistently rational, or optimal.\(^\text{13}\)

2. A second warning, related to the first, is that "the artistic mind is neither accustomed nor wants to become accustomed" to "semantic exactitude and consistency."\(^\text{14}\)

\(^{13}\)Duncan, p. 71.

3. At this point in the program literature field, it is dubious whether one can determine with certainty a definitive sequence of rigidly ordered items in a fixed hierarchy.\textsuperscript{15}

After a period of exploration and study, it was decided that a conceptual approach offered the most realistic and promising pattern for the development of the program. Efforts were directed, therefore, toward the identification of principles and concepts inherent in jazz composition and ensemble arranging to serve as a theoretical framework for organizing program content.

By analyzing the field of jazz composition and arranging, certain key concepts and principles were identified that appeared to be most encompassing and generalized and from which increasingly less abstract levels of knowledge emerged. Three key concepts that exemplify the techniques of jazz ensemble arranging were identified. They include the conceptional applications of density, internal resonance, and the principle of harmonically complete ensemble sections. These central

concepts served as instruments for a framework, within which facts, ideas, generalizations, and techniques were structured, organized and sequenced.

It was decided to begin the program with three chapters devoted to the instruments of the jazz ensemble. The introduction of instrument ranges, transpositions, general characteristics and restrictions as a point of departure has the advantage of introducing the essential information which is made reference to in subsequent chapters that consider the theoretical aspects of voicing and orchestration. Chapters IV through IX deal with the various basic arranging techniques. The specific program content was sequenced as follows:

1. Instruments of the jazz ensemble
2. The density approach to orchestration and voicings
3. Interpreting primary thematic materials
4. Unison and octave writing
5. Dividing the band into two smaller ensembles
6. Melodic couplings
7. Repeated chord tones against the melody
8. Intervals
9. Counterpoint
10. Orchestration of two part density
11. Implying 4, 5, 6 and 7 part harmony with three pitches
12. Substitution notes
13. Triads as melodic couplings
14. Diatonic triads
15. Chord tones, passing and neighboring tones
16. Chromatic triads
17. Triads in open and closed positions
18. Closed and open fourth structures
19. Fourths applied to melodic couplings
20. Diatonic open fourths
21. Chromatic parallel closed and open fourths
22. Harmonic definition using open and closed fourths
23. Typical ranges of trumpet, trombone, and saxophone sections
24. Three part ensemble voicings
25. Four part open and closed voicings
26. Sax background and ensemble voicings
27. Specific problems relative to four or more parts of density
28. Implying 5, 6 and 7 part harmony with four pitches
29. Fourth structures in open position
30. Diatonic and chromatic closed 5th clusters
31. Orchestrating clusters
32. Open five part voicings
33. Mixing one to five levels of density
34. Mixed orchestral voicings
35. Section and combination of section voicings
Program types and Techniques

Several program types and techniques have been described in Chapter II. The approach used in the construction of the present program incorporates what the investigator takes to be the most useful features of the various programming strategies which have been proposed. These features include the following:

1. linear programming technique
2. herring-bone branches
3. RULEG-EGRUL techniques
4. constructed response
5. conversational chaining
6. various feedback techniques

Since this was a feasibility or developmental study, by definition there was freedom to explore a number of teaching strategies. The prevailing strategy, however, was to introduce certain arranging concepts and principles with exploratory materials and musical illustrations; frequently both positive and negative examples were employed. This introduction was followed by a number of frames concentrating in that area. Support for the use of negative as well as positive exemplars in concept development, comes from a research

16See Chapter II, pp. 25-40.
study by Haack.\textsuperscript{17}

The linear programing paradigm was selected as the basic paradigm for the following reasons:

1. The linear program is relatively simple to operate.

2. The program in jazz ensemble arranging techniques was designed for students who have reached an explicit academic level and who possess similar entry behavior.

3. Material that is known can be skipped over, or briefly reviewed by the student. Material not learned can be reviewed.

4. The linear program provides a greater amount of reinforcement than does the branching program.

5. The objectives are such that this is a situation where Skinner's views about errors may possibly be correct.\textsuperscript{18}

Guides to an appropriate response mode were those suggested by Glaser cited by Von Gruenigen. When


the criterion performance includes:

1. a precise response topography, use constructed response.
2. recognition, the form is unimportant.
3. fine stimulus discriminations, use alternative response choices.
4. elementary concept learning, choose presence or absence of concept.\textsuperscript{19}

The importance of relatively frequent, nonaversive feedback is well accepted in education. Moreover "Present evidence also suggests that the efficacy of feedback varies in proportion to its completeness."\textsuperscript{20}

Thus, the feedback provided in the present program is frequent, nonaversive, and relatively complete, frequently including additional information or clarification. An additional way in which the completeness of the feedback in the program was improved was to indicate why an answer was correct or incorrect. These review techniques were patterned somewhat after procedures employed by Von Gruenigen.\textsuperscript{21}

\textsuperscript{19}Von Gruenigen, p. 36.


\textsuperscript{21}Von Gruenigen, p. 38.
Presentation Strategy

Previous experimental presentation strategies in program instruction form the theoretical basis for hypothesizing that arranging techniques can be taught more effectively by a multisensory approach (textbook program and tape-recorded materials) than by a textbook program alone. This hypothesis is based on many factors, but the most important one is attention direction. An important function of any learning process is the attention directing function. The multisensory nature of the present program attempts to direct a student's attention to specific aspects of the arranging process and to the specific, sequenced set of arranging techniques to be learned. But even more importantly, the use of tape-recorded materials permits the student to hear the effects of each principle or technique on the sound quality produced by the entire jazz ensemble, sections, individual instruments or various instrumental combinations thereof.

Both the presentation of verbal information and the aural illustrations are attention directing devices that provide visual-aural concept reinforcement and thus should facilitate learning. In summary, the program has a number of attention directing features that cause the student to focus on the important aspects of the arranging process.
Format Design

A wide number of possibilities suggested themselves, largely as a consequence of the program type and the multi-sensory presentation strategy. It was decided that, in following the linear method of programing, a vertical format was more applicable than some others. This method allowed for frames of varying length, basic prose necessary for introductory remarks, and provided space for musical examples of varying lengths.

Further Considerations and Limitations

The following discussion will explore briefly the underlying pedagogical rationale of the programed text and focus on a certain key issue in order to give the flavor of the approach employed here to learning the craft of jazz ensemble arranging.

Recognizing the limitations of a purely "mechanical" approach, Thad Jones, one of the truly creative sources of "big band" jazz, has argued convincingly that the process of arranging requires cognitive as well as affective response. He believes the proportion of emphasis placed on these two approaches to jazz arranging is entirely personal, but both avenues are needed, for they reinforce and diversify each other. A basic knowledge of the process of arranging places affective
responses on a higher level, wherein more refined perceptions become possible. Conversely, the final insights in arriving at knowing the best decision or the most appropriate solution depend on value judgments that emerge more convincingly from plumbing the depths of intuition than from one's highest logic.  

This close interconnection of the cognitive and affective domains presents a number of implications for structuring the present study. Although this program is not explicitly constructed to display the interrelation described above, a certain resonance from this view undoubtedly appears in the text. For example, principles are not stated as rules, but are intended to serve as guides for the development of the student's own personal command of arranging techniques. Still another example is a clear analysis assessed against the judgments and conclusions of intuition intended to project and reinforce in a concrete way many values originating in the student's most fundamental underlying responses. Furthermore, it was decided that though subjective and emotional, the distinctions that result from questions such as: Which sequence of density

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22Interview with Thad Jones, Cleveland, Ohio March 1977.
levels stimulates dynamic intensity? or Which voiced passage "swings"? or similar questions can be logically arranged to indicate any aspects of objective order that underlie musical expression.

Construction of the Program

The following steps were followed in the construction of the program. First the information to be programed was identified. Second, the recorded materials which were to be supplied with the program were assembled and systematically scrutinized for the pertinent factors relevant to the techniques of jazz ensemble arranging. Next, a rough-draft of Chapter I was constructed to establish the form and approach that the program was to follow. Finally, the remaining eight chapters were programed with a similar flexible approach toward format, techniques, and style.

The programmer followed the principles and suggestions for frame construction developed by Davies. According to this author, the frame, as a behavioral unit, must realize the following specific behavioral requirements:

1. It must so interest and stimulate the student that he will engage in the required behavior.

2. It must present material (or stimuli) so that the student is forced (overtly or covertly) to make the desired response.
3. It may present stimuli in such a way that the student is forced to respond in a novel way.

4. It should either confirm that the response given is the desired one, and/or reinforce the novel response so that the same behavior will occur more easily in the future.

5. It may contain auxiliary material not essential to the desired behavior. 23

The first draft of the Programed Instruction in the Techniques of Jazz Ensemble Arranging was completed in July, 1977.

Developmental Testing Procedures

The purpose of the developmental or pilot testing phase was to identify possible ambiguous, badly worded or poorly sequenced frames. The program, after its original drafting, was pilot-tested with three subjects whose educational levels approximated those required by the program. An additional essential requirement for the subjects was time to devote to the program and availability during the developmental testing period. Internal evaluative data obtained from student performance as well as comments and reactions from the subjects were collected and analyzed as a basis for program revision. Procedures which followed the pilot

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23 Davies, p. 104.
testing phase involved revision based on the date sources and a general review by a nationally recognized authority in jazz ensemble arranging,\textsuperscript{24} as well as by a subject matter expert\textsuperscript{25} as a means of further evaluating the programmed materials and validating the program content and sequence. The various revisions resulted in an average error rate of less than 10 percent for the entire program.

Following this testing phase, the program was subjected to further revision and minor alteration and was thus deemed ready for field testing. The final revised program, consisting of 948 frames, was then duplicated and bound in book form.

**Equipment and Tape Duplicating Procedures**

The accompanying tape-recorded materials were processed by a professional recording engineer\textsuperscript{26} to eliminate all extraneous sounds and to insure proper spacing of verbal example numbers and musical materials.

The master tapes were dubbed from mono and stereo records by means of a Thorens TD-125IIB turntable, and a Sony TC-203SD cassette recorder with

\textsuperscript{24}Thad Jones, Arranger-Composer, Co-leader of the Thad Jones-Mel Lewis Orchestra.

\textsuperscript{25}Dr. Joseph Levey, Director of Jazz Studies, The Ohio State University.

\textsuperscript{26}Bruce Beauchamp, Crown Recording, Lakewood, Ohio.
Dolby B noise reduction unit. Verbal example numbers were recorded using a Beyer M-500 ribbon microphone. The verbal and recorded examples were then dubbed playback to a Revox A-700 halftrack stereo tape recorder for editing and timing. The stereo master was dubbed at 7 1/2 speed for monophonic playback by means of the Revox A-700 in the mono mode to a Crown SX-744 tape recorder. The two track mono recording was then dubbed back to the Revox A-700 for full or half track mono playback. All dubbed tapes were judged to be of good quality by the recording engineer.

Field Testing Procedures

The Jazz Ensemble Arranging Test was administered to the subjects as a pre-test to ascertain known knowledge and intuitive application of existing theoretical concepts. Upon completion of the Pre-test, each subject began work on the Programmed Instruction in the Techniques of Jazz Ensemble Arranging. All students were given detailed written and aural instructions concerning operation of the program. The written instructions and selected frame sequences of the program are presented in Appendix B. In addition to the written directions, the writer had several conferences and communications with Dr. Joseph Levey, who served as test and program administrator for the subjects at
The Ohio State University, to clarify the program, the procedures, and the testing.

The program used was similar in operation to those which had been used by the subjects in regular music theory classes so there were only minor adjustment problems in using the programmed text and the accompanying tape-recorded materials.

The subjects proceeded through the program in an individualized, self-paced manner; they were instructed only to consult no source of information on jazz ensemble arranging, other than the programmed text, until the field test was completed, and to report to the designated test administrator when they were ready to be post-tested on the program which they had completed.

Dr. Levey was responsible for insuring that all the program and test materials were readily available to The Ohio State University subjects as they were needed. Materials distribution for the Baldwin-Wallace College subjects was the responsibility of the writer.

Each subject kept a record of errors made on the frames and the amount of time consumed in completing each of the program's nine chapters. This information was recorded on a Frame Error Response Tally Sheet. The tally sheet is given in Appendix C.
The pre-test questions were randomized and Form B was administered as a post-test to the subjects after each returned the completed program. The same test was used for the purpose of facilitating a comparison between the two performances—before and after exposure to the programmed instruction. The complete post-test is given in Appendix D.

As the tests and programs were completed, they were marked in such a way that Dr. Levey could quickly determine each subject's progress by examining the check list. Each subject was expected to plan his work in a manner that would allow him to complete the program and tests within a reasonable amount of time. The individual pacing had caused the subjects to be somewhat spread out during the program and test administration. Some of the subjects had progressed through Chapter IX, while others had completed only the first two or three chapters. The subjects were then given a revised time schedule for completion of the program and tests. Due to time limitations for the field testing phase, all subjects were told to complete the program and post-test by January 3, 1978. Many of the subjects were, therefore, forced to take the post-test before they had adequately studied the program materials. The subjects were not told in advance of this schedule to avoid the
probable influence it would have had upon their pacing.

A third administration of the criterion test, a re-test, was given approximately one week after the post-test in order to obtain a final estimate of the reliability of the measure. For the re-test, half of the subjects received Form A and half received Form B of the *Jazz Ensemble Arranging Test*. Although there were no time limits placed on the test administrations, most students required approximately two hours to complete each test. The subjects were not given knowledge concerning any test results during the field testing phase.

It was considered desirable to obtain feedback from the subjects concerning various aspects of their experience with the program of instruction. It was felt that such information would be of value in revision or future utilization of the program. To ascertain subject reaction, a ten-question opinionnaire was distributed to the subjects after they had completed the program and test series. A copy of the opinionnaire and the subjects' responses to each question can be found in Appendix F.
Data Analysis Techniques

The data were analyzed for means, standard deviations, and $t$ value. A computer program for those data was used which was developed by Paul Sackett, Educational Development Center, The Ohio State University. The internal reliability of the criterion test was initially checked using the Kuder-Richardson 21 formula. Program SPSS, a program for the Pearson Product Moment Correlation, was used to obtain the final estimate of the reliability of the criterion test.

The investigator calculated raw scores, ranges, modes, and medians for the three administrations of the criterion test, mean gains, mean times to complete the program, and mean program error rates. Percentage of errors on individual chapters and for the entire program was also computed for each subject.
CHAPTER IV

ANALYSIS OF DATA

This chapter presents the major findings of the study. An analysis of data is presented as it related to program effectiveness and reliability of the criterion test.

Results

Ranges, modes, medians, means, and standard deviations for the pre-test, post-test, and re-test administrations are presented in Table 1.

Table 1

COMPARISON OF RANGES, MODES, MEDIAN, MEANS, AND STANDARD DEVIATIONS FOR THE THREE ADMINISTRATIONS

<table>
<thead>
<tr>
<th>Measure</th>
<th>No. Items</th>
<th>N</th>
<th>Range</th>
<th>Mode</th>
<th>Median</th>
<th>Mean</th>
<th>Mean Gain</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>100</td>
<td>15</td>
<td>22-54 (32)</td>
<td>35</td>
<td>38</td>
<td>37.4</td>
<td>7.41</td>
<td></td>
</tr>
<tr>
<td>Post-test</td>
<td>100</td>
<td>15</td>
<td>42-83 (41)</td>
<td>57</td>
<td>57</td>
<td>59.4</td>
<td>10.64</td>
<td></td>
</tr>
<tr>
<td>Re-test</td>
<td>100</td>
<td>15</td>
<td>27-80 (53)</td>
<td>45,55</td>
<td>57</td>
<td>54.9</td>
<td>14.25</td>
<td></td>
</tr>
</tbody>
</table>
Statistical evidence as to the effectiveness of the Programed Instruction in the Techniques of Jazz Ensemble Arranging rested on an analysis of pre- and Post-test scores on the Jazz Ensemble Arranging Test. Analysis of the data collected in the study was accomplished by means of the \( t \) test to determine the significance of difference between the pre- and post-test means scores for the purpose of examining gain in learning. The results of applying the \( t \) test for correlated samples are presented in Table 2.

### Table 2

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Mean Difference</th>
<th>( t )</th>
<th>( P )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>37.4</td>
<td>7.4</td>
<td>27</td>
<td>10.99</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Post-test</td>
<td>59.4</td>
<td>10.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A \( t \) value with 14 degrees of freedom must be 3.787 to be significant at the .001 level. The obtained \( t \) value of 10.99, was significant beyond the .001 level, and indicated that a significant gain in
learning the techniques of jazz arranging as a result of completing the Programed Instruction in the Techniques of Jazz Ensemble Arranging and measured by the pre- and post-measure of the Jazz Arranging Test was effected in the study population.

All fifteen subjects who participated in the field testing registered a gain on the post-test. The smallest gain was 9 and the largest gain was 35. The test population showed a mean gain of 27.

A computation of percentage scores on the post-test indicated that 90% of the subjects answered 44% of the items correctly and 56% of the items were answered correctly by 73% of the subjects. It should be noted that the post-test performance by all subjects was much lower than the desired 90-90 percent criterion level initially established for mastery performance.

The reliability of the Jazz Ensemble Arranging Test was determined by the test-retest procedure. Approximately one week after the post-test administration, seven subjects were assigned Form A and eight received Form B of the measure. A Pearson r coefficient of .92 was sufficient to establish reliability for group measurement. This estimate of test reliability was considered impressive in light of the small sample size and heterogeneous nature of the study population.
Following an exhaustive check of the accuracy of the 15,000+ responses of the fifteen test subjects in the program, a compilation of this information was developed. This analysis of the responses disclosed that 534 of the 948 frames in the program were completed with 100% accuracy by all fifteen subjects.

An analysis of the responses of the fifteen subjects in the program disclosed a range in the error rate from .9 to 16.2 percent. The Analysis of the responses by the fifteen subjects appears in Table 3.

**TABLE 3**

**ANALYSIS OF RESPONSES BY SUBJECTS**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Frames</th>
<th>Incorrect Responses</th>
<th>Percent Error Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>948</td>
<td>90</td>
<td>9.5</td>
</tr>
<tr>
<td>2</td>
<td>948</td>
<td>22</td>
<td>2.3</td>
</tr>
<tr>
<td>3</td>
<td>948</td>
<td>92</td>
<td>9.7</td>
</tr>
<tr>
<td>4</td>
<td>948</td>
<td>50</td>
<td>5.3</td>
</tr>
<tr>
<td>5</td>
<td>948</td>
<td>154</td>
<td>16.2</td>
</tr>
<tr>
<td>6</td>
<td>948</td>
<td>47</td>
<td>5.0</td>
</tr>
<tr>
<td>7</td>
<td>948</td>
<td>26</td>
<td>2.7</td>
</tr>
<tr>
<td>8</td>
<td>948</td>
<td>90</td>
<td>9.5</td>
</tr>
<tr>
<td>9</td>
<td>948</td>
<td>34</td>
<td>3.6</td>
</tr>
<tr>
<td>10</td>
<td>948</td>
<td>13</td>
<td>1.4</td>
</tr>
<tr>
<td>11</td>
<td>948</td>
<td>44</td>
<td>4.6</td>
</tr>
<tr>
<td>12</td>
<td>948</td>
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<td>2.7</td>
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<td>13</td>
<td>948</td>
<td>46</td>
<td>4.9</td>
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<tr>
<td>14</td>
<td>948</td>
<td>94</td>
<td>9.9</td>
</tr>
<tr>
<td>15</td>
<td>948</td>
<td>9</td>
<td>.9</td>
</tr>
<tr>
<td>Total</td>
<td>14220</td>
<td>837</td>
<td>5.9</td>
</tr>
</tbody>
</table>
Garner states that an error rate of 5-10 percent is acceptable in programmed instruction.\(^1\) It will be noted in Table 3 that the mean error rate of 5.9 is within the acceptable error range limits.

The analysis of the responses in each chapter of the program appears in Table 4. An examination of Table 4 reveals that the number of errors per chapter was not directly proportional to the number of frames in a chapter.

**TABLE 4**

**ANALYSIS OF RESPONSES BY PROGRAM CHAPTER**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Frames*</th>
<th>Incorrect Responses</th>
<th>Percent Error Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2912</td>
<td>168</td>
<td>5.8</td>
</tr>
<tr>
<td>II</td>
<td>2800</td>
<td>129</td>
<td>4.6</td>
</tr>
<tr>
<td>III</td>
<td>1936</td>
<td>82</td>
<td>4.2</td>
</tr>
<tr>
<td>IV</td>
<td>1312</td>
<td>98</td>
<td>7.5</td>
</tr>
<tr>
<td>V</td>
<td>1040</td>
<td>72</td>
<td>6.9</td>
</tr>
<tr>
<td>VI</td>
<td>2512</td>
<td>103</td>
<td>4.1</td>
</tr>
<tr>
<td>VII</td>
<td>1648</td>
<td>102</td>
<td>6.2</td>
</tr>
<tr>
<td>VIII</td>
<td>528</td>
<td>38</td>
<td>7.2</td>
</tr>
<tr>
<td>IX</td>
<td>480</td>
<td>45</td>
<td>9.4</td>
</tr>
<tr>
<td>Total</td>
<td>15168</td>
<td>837</td>
<td></td>
</tr>
</tbody>
</table>

*Number of frames in each chapter taken by fifteen subjects.

Further analysis of the responses indicated that twenty-four of the frames in the program are to be examined for revision of resequencing.

Each subject kept a record of the amount of time consumed in completing each of the program's nine chapters. These figures are reported in Appendix G. The maximum time consumed by a subject was 22 hours and 39 minutes and the minimum was 10 hours. The mean time consumption on the entire program was 15 hours and 5 minutes. This figure was somewhat surprising to the investigator as a completion time of 20 hours had been estimated based on the results of pilot testing. Maximum, minimum, and mean completion times for each chapter are shown in Table 5.

**TABLE 5**

**MINIMUM, MAXIMUM, AND MEAN COMPLETION TIME ON EACH OF THE NINE PROGRAM CHAPTERS**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Minimum Time (in min.)</th>
<th>Maximum Time (in min.)</th>
<th>Mean Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter I</td>
<td>90</td>
<td>204</td>
<td>137</td>
</tr>
<tr>
<td>Chapter II</td>
<td>89</td>
<td>220</td>
<td>141</td>
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<tr>
<td>Chapter III</td>
<td>75</td>
<td>180</td>
<td>113</td>
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<td>Chapter IV</td>
<td>60</td>
<td>205</td>
<td>98</td>
</tr>
<tr>
<td>Chapter V</td>
<td>20</td>
<td>120</td>
<td>67</td>
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<tr>
<td>Chapter VI</td>
<td>83</td>
<td>215</td>
<td>155</td>
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<tr>
<td>Chapter VII</td>
<td>55</td>
<td>190</td>
<td>117</td>
</tr>
<tr>
<td>Chapter VIII</td>
<td>15</td>
<td>90</td>
<td>41</td>
</tr>
<tr>
<td>Chapter IX</td>
<td>10</td>
<td>70</td>
<td>36</td>
</tr>
<tr>
<td>Entire Program</td>
<td>600</td>
<td>1359</td>
<td>905</td>
</tr>
</tbody>
</table>
Opinionnaire Results

Supporting information can also be added to the validation data from the reaction of subjects to the program instruction. The results of the opinionnaires filled in by the test subjects at the end of the program indicate that the programmed instruction impressed them favorably, fostered their interest in jazz arranging, and motivated them to pursue a self-study through participatory learning processes.

Responses to the open-ended request for additional comments, criticism and suggestions relevant to program improvement were varied. Generally, the responses were quite positive toward the program and its construction. The most common complaints centered around the sheer size of the program and trying to fit it into their already overcrowded schedule. Several noted that the volume of material presented the biggest problem and the suggestion was made that the program be administered one volume at a time with a separate pre- and post-test for each volume. Several indicated that they would like to have been able to interact with an instructor as they progressed through the program. The fact that the field testing phase caused some conflict with mid terms and final examinations was expressed by several subjects. The general
feelings were that the programmed instruction was interesting and the subject area was one of importance, however circumstances were less than ideal to allow the subjects to pursue the program as intensely as they wished.
CHAPTER V

SUMMARY AND CONCLUSIONS

Contained in this chapter are: (1) a summary of the procedures of the study and the results of the data analysis relating to the effectiveness of the program, (2) the investigator's conclusions based upon the findings, (3) discussion of the conclusions, and (4) recommendations for further research.

Summary

Purpose of the Study

The purpose of this study was to investigate the feasibility of teaching the techniques of jazz ensemble arranging by means of programmed instruction. The study sought to identify the pertinent concepts, principles and techniques employed by the jazz ensemble arranger, to develop a textbook with accompanying tape-recorded examples, and to evaluate the program as an instructional method with college-university music students.
**Limitations**

The study was limited to determining the feasibility of developing a program of instruction through which the techniques of jazz ensemble arranging could be learned by first year college-university students. An assessment of the effectiveness of the programed instruction was determined by an analysis of the difference between pre-test and post-test scores. The effectiveness of the program was tested with a single group design, and no attempt was made to compare the effectiveness of the programed mode of instruction with any other type of instructional method. In an effort to assess only that learning which resulted from undergoing the program, subjects were instructed to consult no source of information on jazz ensemble arranging, other than the programed text, until the field test was completed.

**Subjects**

Fifteen freshmen college-university music students from The Ohio State University and Baldwin-Wallace College made up the test population. The subjects had no prior formal instruction in jazz ensemble arranging.
Procedure

A self-instructional program of 948 frames was constructed. The programing style was basically linear, utilizing visual music examples. The program content was based upon the objectives and content of current texts designed for the jazz ensemble arranger. The materials, which consisted of a programed text and tape-recorded music examples, encompassed one to six-part writing and included a detailed examination of the instruments of the jazz ensemble. The required responses for the program frames varied among constructed response, matching, multiple-choice, open-ended response, and no response. Prompting and confirmation modes of feedback were utilized.

The program was pilot tested with three subjects drawn from the same population as the field test subjects. After numerous revisions, the program was finalized, and the field testing experiment was conducted. Subjects for the field testing pursued the program in an individualized, self-paced manner. Four weeks were allowed for completion of the program. Additional time allowances necessary for program completion resulted in extension of the field testing to almost three months.
For the purpose of measuring the effectiveness of the program, a Jazz Ensemble Arranging Test was developed by the investigator. This criterion-referenced measure consisted of 100 multiple choice items of jazz arranging and compositional knowledge. Content validity was established by two subject experts and an obtained reliability estimate of .71 using the Kuder-Richardson formula 21 was deemed satisfactory for group testing. The Jazz Ensemble Arranging Test was administered to the subjects; first as a pre-test to ascertain known knowledge, and second, as a post-test on completion of the program. Approximately one week after the post-test administration a third administration of assigned alternate forms of the criterion test was given. No instruction on the program material took place during this period, and students were not given knowledge concerning any test results.

Results

Each subject registered a gain on the post-test. The pre-post-test mean gain for the subjects was 27. Application of the t-test for correlated samples showed the gain to be significant beyond the .001 level (t=10.99, df=14, p<.001). The program was thus validated as an instructional method, at
least with the subjects who participated in the study.

Incorrect responses on the program ranged from .9 to 16.2 percent, with a mean error rate of 5.9 percent. Of the 948 frames in the program, 534 were completed with 100% accuracy by all fifteen subjects. Time spent by subjects on the program ranged from 10 to 22 hours. The mean time spent in self-instruction was 15 hours and 5 minutes.

The results of the opinionnaires filled in by the subjects at the end of the program indicate that the program instruction helped them in their learning about jazz arranging, impressed them favorably, fostered their interest in jazz arranging, and motivated them to pursue a self-study through participatory learning processes.

Conclusions
The results of the study offer persuasive evidence for the feasibility of programmed instruction for teaching the techniques of jazz ensemble arranging. A programmed text with accompanying tape-recorded examples was developed which effectively taught a body of jazz composition and arranging knowledge to college-university music students. The knowledge of jazz ensemble arranging techniques, as measured by the
Jazz Ensemble Arranging Test, was significantly increased by employing the Programed Instruction in the Techniques of Jazz Ensemble Arranging. Further support for the effectiveness of the programed instruction comes from the subjects whose reactions to using the program were overwhelmingly favorable.

As this test measured a rather broad range of competencies essential to the jazz ensemble arranger, it seems reasonable to conclude that the program could be an important aid in the teaching of jazz ensemble arranging, especially in view of the fact that the mean completion time on the total program was only 15 hours and 5 minutes. The implication of these findings is that through use of the program competencies usually requiring a full quarter or semester's work to develop might be attained in two or three weeks.

Discussion

Whereas subjects performed significantly better after exposure to the program of instruction beyond the .001 level, they failed to achieve the desired mastery criterion level of 90-90 on the post-test. The failure of the subjects to attain or even near the mastery level
was surprising. In view of the subjects' performance on the program, it was expected that the effect of the program would result in higher achievement scores.

One possible interpretation of these findings is that the sheer volume of information coupled with the extended time period for field testing (almost three months) resulted in some form of proactive or retroactive inhibition in the assumed learner thereby mitigating the program's effectiveness. Another possible explanation is that the errors made on the post-test were either the result of a failing to retain what was taught, or of a misunderstanding of it.

Because of the conditions under which the study was conducted, it might be reasonable to expect an even greater improvement in knowledge mean scores among subjects volunteering to take the programmed instruction, or in groups who have higher intrinsic motivation or fewer study conflicts competing for their time and energy. It would be possible to accomplish this by offering the program and its tape-recorded materials as part of a regularly scheduled college music course in jazz ensemble arranging.
The investigator would like to strongly suggest, following his experience in this study, that if a program is of some magnitude and complexity, then the field testing phase should be supervised and controlled by the programer. It is arguable that the programer's presence might create an "experimenter bias" in the results, and that more natural results might be obtained if the regular instructor carried out the field test, however, to this programer, the advantages in terms of expediting the process of program administration and evaluation would seem to outweigh the purported disadvantages.

Recommendations for Further Research

1. The most obvious recommendation emerging from this study is that additional research involving programed instruction in jazz composition and arranging is needed. A more thorough testing of the program developed in this study, possibly combining programed and conventional classroom instruction, would be valuable in providing additional information concerning the effectiveness of the program.

2. The program developed in this study encompassed a broad spectrum of the competencies prerequisite
to the attainment of skill as an arranger, but in an intentionally limited way. The findings of the study thus seem to indicate that the development of programs which would be narrow in scope, but deep in content, would be beneficial in teaching jazz composition and arranging.

3. The program developed in the study was found to be well suited for the techniques and knowledges studied and the group of subjects employed. There is serious doubt, though, that a full-blown jazz arranging course could effectively lend itself to programmed instruction. The investigator's reservations are predicated on the observation that the craft of jazz ensemble arranging requires, by its very nature, an emphasis on creative composition opportunities to demonstrate command of the techniques of arranging and orchestration. Accordingly, the question posed in this regard is: Can materials be designed incorporating a compositional approach to jazz ensemble arranging while remaining within the scope of programable material for effective instruction? This is a particularly critical area in which there is need for much investigation.
4. Future research should be undertaken to prepare the program for suitable computer-assisted instruction equipment. The computer, with audio and visual flexibility, would seem to be ideally suited to programming for the teaching of basic arranging techniques.
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Wiskirchen, George C. "If We're Going to Teach Jazz, We Must Teach Improvisation." Music Educators Journal 62 (November 1975): 68-74.

APPENDIX A

INSTRUCTIONAL OBJECTIVES
Instructional Objectives

1. Given multiple choice questions, student will be able to select an acceptable, possible range for each standard instrument of the jazz ensemble.

2. Given multiple choice questions, student will be able to select an acceptable, practical range for each standard instrument of the jazz ensemble.

3. Given multiple choice questions, student will be able to select the most effective range for each standard instrument of the jazz ensemble.

4. Given multiple choice questions concerning transposing properly from concert to written pitch, student will be able to select correctly transposed parts for the instruments of the jazz ensemble.

5. Given multiple choice questions, student will be able to select appropriate descriptive terms for the tonal characteristics of the wind instruments of the jazz ensemble.

6. Given multiple choice questions, student will be able to identify idiosyncratic restrictions and considerations of the wind instruments of the jazz ensemble.

7. Given multiple choice questions, student will be able to describe various brass muting techniques.

8. Given multiple choice questions, student will be able to define various articulation symbols used in jazz ensemble arranging.

9. Given multiple choice questions, student will be able to select the appropriate general effect generated by the use of the various basic instrument ranges of the jazz ensemble.

10. Given multiple choice questions concerning one part density, student will be able to describe various techniques involving the use of unison and/or octaves.
11. Given multiple choice questions concerning the application of two part density, student will be able to describe melodic coupling or interval combination techniques.

12. Given multiple choice questions, student will be able to select correct applications of implied 4, 5, 6 and 7 part density.

13. Given multiple choice questions concerning the application of three part density, student will be able to describe various triadic techniques.

14. Given multiple choice questions concerning three, four, and five part density, student will be able to select correct use of various voicing techniques employing 4ths (open and closed).

15. Given multiple choice questions, student will be able to select appropriate conventional effective ranges, of trumpet, trombone, and saxophone sections using three part density.

16. Given multiple choice questions concerning four and five part density, the student will be able to describe various open voicing techniques.

17. Given multiple choice questions concerning four and five part density, student will be able to describe various block voicing techniques.

18. Given multiple choice questions concerning four part density, student will be able to describe closed 5th cluster techniques.

19. Given multiple choice questions concerning improper voicing relative to four or more parts of density, student will be able to select correct solutions to voicing problems.

20. Given multiple choice questions, student will be able to define these terms pertaining to jazz ensemble arranging: harmonic density, span of orchestration, orchestral weight, internal resonance.
APPENDIX B

INSTRUCTIONS AND
SELECTED
FRAME SEQUENCES
INSTRUCTIONS TO THE STUDENT

The material in this text is presented in programed form. In programed instruction, information is broken down into small, carefully sequenced steps. These are referred to as frames. Each frame usually occupies one page. Most frames in this program require a written response, which may be a word or two, or consist of the solution of a musical problem. In certain frames you will be asked to choose the correct response from several alternative answers. In the frames where there are two alternatives from which to choose, simply circle the correct choice. You may proceed at your own pace through the program, moving quickly through those areas that present no difficulty and more slowly where you feel it necessary. After each step in the program, you are immediately informed of the correctness of your response.

The principal part of each frame is located in the upper portion of the page. Immediately below the thick black line are the correct answers. Use the cardboard sheet provided to cover these responses. After the response is written, check your response with the response below the thick black line.

Important: There are many cases where your answer need not be exactly the same as that supplied in the text. You should consider your response correct if it conveys the same meaning as the one given.

If you responded with a reasonably correct answer, proceed to the next frame. However, if your answer is incorrect, you must do the following:

1. Write an (x) indicating frame error on the accompanying Frame Response Error Tally Sheet next to the appropriate frame number and chapter.

2. Do not erase your answer. Once an answer has been given, it should be allowed to stand. Do not correct an incorrect written response. An analysis of these errors will be made in order to evaluate the program's effectiveness and to point out weaknesses that need revision.
3. Review the frame and/or preceding frame(s) in order to find out why you were incorrect. Mentally correct your error before proceeding. (Remember: do not correct your incorrect written response.)

It is extremely important that you keep a record of the amount of time it takes to complete each of the nine programmed chapters. This information should be written on the spaces provided at the beginning of each chapter on the Frame Response Error Tally Sheet.

Let us review briefly the important points you must keep in mind as you proceed through the program:

1. Mark the Frame Response Error Tally Sheet if your answer is incorrect.

2. Do not correct your incorrect written response.

3. Record the amount of time spent on each chapter on the Frame Response Error Tally Sheet.

As you go through this program, it is essential that you study the examples and listen to the accompanying recorded examples. The tape recording is available in the listening lab, Hughes Hall, School of Music, O.S.U. Just ask for the Jazz Ensemble Arranging tape recording.

Whenever RE (plus a number) appears alongside an example in a frame, it means that that particular example may be heard on the accompanying tape recording.

The recorded examples are an aid to effective study of this program in that it enables you to hear as well as see the specific arranging effects described in the program.

Unless otherwise directed, it is recommended that you study carefully the notated example first and then listen to the recorded example, repeating this procedure as necessary. At certain points you will be directed to listen to one or more recorded examples in order to answer questions presented in the frames.

Practically all of the printed musical examples in this program are in concert*-sketch form. This method

*The terms "concert" means that all of the instruments are written in the same key as the piano.
clearly illustrates at a glance exactly what is being played and by whom. No transposition is necessary except in the cases of those instruments that normally sound an octave lower than written, or where transposition is part of the instructional procedure, or where published transposed scores are used for analysis.
The following are some sample frames illustrating the procedures discussed in the "Instructions To The Student."

SAMPLE FRAME A

A. This is a programed text that deals with the techniques of jazz ensemble arranging.

ensemble

In this case, the student has written a correct answer for the frame, and so would proceed to the next frame in the programed text.

SAMPLE FRAME B

B. This is a programed text that deals with the techniques of jazz flowers arranging.

ensemble

In this case, the student answered incorrectly, so the student would then indicate a frame error by writing an X in the appropriate place on the Frame Response Error Tally Sheet. After recording his error, the student would then proceed to the next frame in the programed text.

To summarize:

1. Write all answers in this programed text.
2. Do not erase incorrect answers.
3. Place an X on the Tally Sheet if your answer is incorrect.
The trombones can be used with 3, 4, or 5 trumpets as a total brass section. Learn this principle:

When trombones are used with the trumpet section the lowest trumpet and 1st trombone should not exceed a 6th interval, and preferably not a 5th interval.

In (1) and (2) below, the lowest trumpet and 1st trombone notes are at least within the interval of a sixth. In (3), however, the interval between the first trombone and lowest trumpet is an octave. If carried on for several chords this type of voicing would cause an "empty" effect, lacking overall resonance, so it should be avoided.

What is the largest interval permissible between the lowest trumpet and 1st trombone parts? The _sixth_.
125. In which case below is there an excessive interval between the lower trumpet and 1st trombone?

(1) (2) (3)

(2).
126. In which case below is there an excessive interval between the lower trumpet and 1st trombone?

<table>
<thead>
<tr>
<th>Trpts</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Trbs</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
</tbody>
</table>

(1).
Notice in (3) of the preceding frame that the upper trombones double the lower trumpets at the unison. Learn this principle:

Then low trumpets are written it is possible to double at the unison the lower trumpets with the upper trombones.

Applying this principle to the chords below, add the 1st and 2nd trombone notes to complete each voicing.
128. Which example below would not be appropriate for the application of the principle stated in the preceding frame?

(1) (2) (3)
49. As you have learned, four part density is the first level of density where a complete chord is defined. The use of four or more parts of density poses two special problems which will concern us for the next few frames. The first point is that because of the exposed position of the melody note, or top of a voicing, one should avoid any half step interval between the adjacent two upper voices of a voicing. The second problem results from the presence of a minor ninth interval between any two voices of a block or block derived voicing. We shall direct our attention to the first problem.

The root of a major 7th chord is never used as the melody note, or top of a voicing. This is due to the objectionable dissonance which occurs between the root and seventh.

Examine the example below:

\[
(1) \text{ Cmaj 7} \quad (2) \text{ C6}
\]

In (1) a half step interval appears between the melody and the first harmony note immediately below it. Using this voicing, the dissonant effort of the half step interval destroys the melodic clarity.

The root of a major 7th chord is never used as the \underline{melody}. 

\[
\text{Cmaj 7} \quad \text{C6}
\]

\[
\text{\underline{Cmaj 7} \quad \underline{C6}}
\]
50. According to the statements made in the preceding frame, which voicing below provides the most agreeable sonority?

(1) Abmaj7 Fmaj7 Ebmaj7 Fmaj7

(2),
51. For the sake of avoiding the half step, the major 7th of the major chord is changed to a major 6th of the chord as shown below:

\[(a) \text{ undesirable} \quad (b) \text{ desirable}\]

The major 7th chord and the major 6th chord are interchangeable as they function the same way within a tonality, and taking advantage of this interchangeability eliminates any possibility of the undesirable half step occurring between the melody note (the chord root) and the first harmony note immediately below it.

The effect in (a) is unpleasant due to the half step which occurs between the top two adjacent voices. This problem is avoided in (b) by using a major 6th chord.
52. Example (b) in the preceding frame demonstrates the usual method of voicing a major chord whose root is in the melody. Learn this principle:

When the root of a major chord functions as the melody note, or top of a voicing, a major 6th chord should be used to harmonize the melody instead of a major 7th chord.

In order to avoid any half step between the melody note and the harmony note immediately below, we must change from a major 7th chord to a major ______ chord.
To pursue further the point of avoiding any half step interval between the top two adjacent voices, compare the examples below:

Example (2) is the result of applying a 9 for 1 melodic substitution based on example (1). Although the 9 for 1 substitution is valid in the inner voices, the situation is not appropriate here because the melody is the third of the D minor 7th chord. The use of a 9 for 1 substitution would change the second note from the top from a D to an E, thus creating the undesirable half step interval between the E (9th of the chord) and the melody note F. The minor 7th chord is the most susceptible to this problem because of the lowered (third/fifth/seventh) third of the minor 7th chord.
54. Example (1) in the preceding frame demonstrates the usual handling of a minor chord whose third is in the melody. Learn this principle:

When the third of a minor 7th, minor-major 7th, minor 6/9, minor 9 or 11th chord is in the melody, the major 9th of the chord should not be used below the melody note.

In order to avoid the half step occurring between the top two voices in extended minor chord forms, refrain from using the major ________ below the melody.

ninth
55. In view of the statements made in the preceding frame, which of the examples below are voiced correctly?

(1)  (2)  (3)  (4)

\[\text{Cmi7} \quad \text{Cmi7} \quad \text{Bbmi7(b5)} \quad \text{Gbmi7}\]

(2) and (4).
Another problem arises with the occurrence of a minor ninth interval that is present between any two voices of a block, "A" or "B" voicing. The most prevalent situation involves a major 7th chord whose root is placed above the major 7th. The use of the major seventh of the chord as a lower voice automatically forms the minor ninth interval that must be avoided.

Use a bracket ([]) to identify the minor ninth interval in each voicing above.
The voicing problem in the preceding frame is solved by replacing the major 7th of the chord with the 6th of the chord as shown below:

(a) \[ C_6 \] (b) \[ C_6 \]

The reason for using the related 6th of the chord (C6 in this case) is to avoid the minor ninth interval which otherwise would occur when the root of the major 7th chord is placed above the major seventh of the chord.
58. The two chief voicing concerns stated thus far are the avoidance of: (1) any half step interval between the melody note and the harmony note immediately below it, and (2) a minor ninth interval between any two voices of a closed or open voicing of certain chord types.

Keep in mind the following principles regarding voicing major and minor chord forms in four or more parts of density:

1. When the root of a major chord functions as the melody note, a major 6th chord should be used to harmonize the melody instead of a major 7th chord.

2. When the third of a minor 7th, minor-major 7th, minor 6/9, minor 9th or 11th chord is in the melody, the major ninth of the chord should not be used below the melody note.

3. When the root of a major 7th chord is placed higher than the major seventh of the chord, you should replace the major seventh with the sixth of the chord.

The major seventh and major sixth are interchangeable. (True/False) [True]
APPENDIX C

FRAME RESPONSE ERROR TALLY SHEET
APPENDIX D

CRITERION TEST (FORM B)
INSTRUCTIONS TO STUDENT

Having completed the Programed Instruction in the Techniques of Jazz Ensemble Arranging, you are now ready to take the Jazz Ensemble Arranging Post-Test. Use the answer sheet that has been supplied with the Post-Test. Do not write in the Post-Test booklet.
JAZZ ENSEMBLE ARRANGING POST-TEST

1. The correct transposition, for the trumpet, of this concert key signature and pitch is:

   (a)                      (b)                      (c)                      (d)                      (e)

2. Which of the concert pitch examples below represents the extended upper register of the trumpet:

   (a)                      (b)                      (c)                      (d)                      (e)

3. On middle and low range parts, it is best if the trumpets are in:

   a. unison
   b. adjacent octaves
   c. double octaves
   d. triple octaves
   e. quadruple octaves
4. Which of the voicings below will produce the best instrumental blend:

(a) Gmi7  (b) Cmi7  (c) Bmaj7  (d) Ebmi7  (e) Amaj7

5. Which example demonstrates mixed voicing:

(a) 4 Trumpets  (b) 5 Saxophones  (c) 2 Flutes  (d) 4 Trumpets  (e) 4 Horns

6. Which of the following types of triadic structures are not used in diatonic triadic harmonization:

a. major triad
b. minor triad
c. diminished triad
d. augmented triad
e. "c" and "d"
7. The practical concert range of the Eb baritone saxophone is:

   (a)   (b)   (c)   (d)   (e)

   \boxed{\begin{array}{c}
   \text{\textbf{C}}
   \\
   \text{\textbf{B}}
   \\
   \text{\textbf{A}}
   \\
   \text{\textbf{G}}
   \\
   \text{\textbf{F}}
   \end{array}}

8. What muting procedure will not achieve a muffled brass sound:
   a. hat
   b. in stand
   c. bucket
   d. straight mute
   e. H.O.S.

9. Which of the following best represents the most effective concert range of the trumpet:

   (a)   (b)   (c)   (d)   (e)

   \boxed{\begin{array}{c}
   \text{\textbf{G}}
   \\
   \text{\textbf{F}}
   \\
   \text{\textbf{E}}
   \\
   \text{\textbf{D}}
   \\
   \text{\textbf{C}}
   \end{array}}

10. When writing for the acoustic bass, it is best to avoid the overuse of notes on the:

    a. "G" string
    b. "D" string
    c. "A" string
    d. "E" string
    e. "D" and "A" strings

11. Which of the following glissandoes is impossible on the trombone:

    (a)   (b)   (c)   (d)   (e)

    \boxed{\begin{array}{c}
    \text{\textbf{E}}
    \\
    \text{\textbf{D}}
    \\
    \text{\textbf{C}}
    \\
    \text{\textbf{B}}
    \\
    \text{\textbf{A}}
    \end{array}}
12. A closed position triad can be changed to open position by:
   a. dropping the top voice an octave
   b. dropping the middle voice an octave
   c. dropping the lower voice an octave
   d. doubling the top voice an octave lower
   e. none of these

13. Which of the following best represents the most effective concert range of the tenor saxophone:

   - (a)
   - (b)
   - (c)
   - (d)
   - (e)

14. Which of the examples below most accurately represents the practical concert chromatic range of the tenor trombone:

   - (a)
   - (b)
   - (c)
   - (d)
   - (e)

15. Which combination below will not produce a tenor saxophone sound:

   a. alto/tenor in unison
   b. tenor/baritone in unison
   c. alto/baritone in unison
   d. tenor/baritone in octaves
   e. "b" and "c"
16. In which case is the dominant flat thirteenth chord correctly written and resolved:

\[(a) \quad (b) \quad (c) \quad (d) \quad (e)\]

\(
\text{G7} b_{13} \quad \text{Cmaj7}^{(9)} \quad \text{G7} b_{13} \quad \text{Cmaj7}^{(9)} \quad \text{G7} b_{13} \quad \text{Cmaj7}^{(9)} \quad \text{G7} b_{13} \quad \text{Cmaj7}^{(9)}
\)

17. Which of the examples below demonstrates the correct block-derived "B" voicing, for five saxophones, of this melody note and chord symbol \( \text{Cmaj7} \):

\[(a) \quad (b) \quad (c) \quad (d) \quad (e)\]

18. Which of the open five part chords below is voiced incorrectly:

\[(a) \quad (b) \quad (c) \quad (d) \quad (e)\]

\(
\text{Ab}_7 \text{G6} \quad \text{G7(b13)} \quad \text{Ab}_4 \text{13(9)} \quad \text{Bmi9(11)} \quad \text{G9(+11)}
\)
19. The French horn is written:
   a. a perfect fifth above the concert pitch
   b. a perfect fifth below the concert pitch
   c. a perfect fourth above the concert pitch
   d. a perfect fourth below the concert pitch
   e. where it sounds

20. Which of the examples below most accurately represents the best playing range for the flute:

   (a)   (b)   (c)   (d)   (e)

21. The degree of orchestral weight is controlled by:
   a. the number of different pitches
   b. the number of doublings of different pitches
   c. the distance from the top to the bottom of the voicing
   d. "a" and "b" only
   e. "a", "b" and "c"

22. When writing flutes and clarinets in unison, it is important to score them above this concert pitch:

   (a)   (b)   (c)   (d)   (e)
23. The most effective concert range of the flugelhorn is best represented by this span:

(a)  (b)  (c)  (d)  (e)  

24. Which of the examples below demonstrates the correct block-derived "A" voicing, for five saxophones, of this melody note and chord symbol \( D(7(b9)) \):

(a)  (b)  (c)  (d)  (e)  

25. Which of the following is an important consideration(s) in writing for the alto or tenor saxophone:

a. the bottom four notes are not orchestrally practical, having a "honking", gutty, dense quality
b. the extreme top register requires experienced musicians to insure acceptable intonation
c. instruments generally lack agility and flexibility
d. "a" and "b" only
e. "a", "b" and "c"
26. The primary effect of five part density is:
   a. melody
   b. rhythm
   c. harmony
   d. melody and rhythm
   e. none of these

27. Which of the examples below more strongly defines the chord structure:

   (a) F7  (b) F7  (c) F7  (d) F7  (e) F7

28. The symbol for a forceful attack of a note receiving full value is:
   a. ♩
   b. ♩
   c. ♩
   d. ♩
   e. ♩

29. This notation on the drum part, † † † † †, indicates:
   a. play time for the ensemble
   b. a drum "fill"
   c. a drum solo
   d. a rhythmic figure for drum reinforcement
   e. a drum break

30. When writing the piano and bass parts, chord symbols:
   a. are never used
   b. should indicate only the basic chord progression
   c. should always be "spelled" out
   d. should be harmonically complete
   e. should not contain modified tones within the chord
31. The symbol used to indicate a short, hard, heavy accent of a note receiving less than full value is:
   a. \(^\wedge\)
   b. \(\cdot\)
   c. \(\checkmark\)
   d. \(\circ\)
   e. \(\triangleright\)

32. Which of the examples below represents the proper transposition, for baritone saxophone, of this concert key signature and pitch:

   (a) (b) (c) (d) (e)

33. Which voicing below produces the effect of a large altered chord form:

   (a) (b) (c) (d) (e)

34. In which case is the eleventh chord correctly voiced:

   (a) (b) (c) (d) (e)
35. In which case is the minor ninth chord correctly voiced:

(a)  (b)  (c)  (d)  (e)

36. Which of the following best represents the practical range of the flute:

(a)  (b)  (c)  (d)  (e)

37. When voicing high number chords (11ths, 13ths), the thirds and sevenths should be placed in this range:

(a)  (b)  (c)  (d)  (e)

38. Which example demonstrates the 13/5 substitution:

(a)  (b)  (c)  (d)  (e)
39. Which of the following best represents the most effective concert range of the baritone saxophone:

(a) \( \) \( \) \( \) \( \) \( \) (b) \( \) \( \) \( \) \( \) \( \) (c) \( \) \( \) \( \) \( \) \( \) (d) \( \) \( \) \( \) \( \) \( \) (e) \( \) \( \) \( \) \( \) \( \)

40. Diatonic open 4th structures lend themselves as harmonizations most naturally to a melody based on the:

a. major scale
b. minor scale
c. blues scale
d. modal scale
e. diminished scale

41. In which case is the G+7 chord voiced correctly:

(a) \( \) \( \) \( \) \( \) \( \) (b) \( \) \( \) \( \) \( \) \( \) (c) \( \) \( \) \( \) \( \) \( \) (d) \( \) \( \) \( \) \( \) \( \) (e) \( \) \( \) \( \) \( \) \( \)

42. The normal accepted limit of voicing span for the trumpet section is the:

a. fifth
b. sixth
c. seventh
d. octave
e. tenth

43. A true unison between trumpets and trombones is possible if the melodic line is scored within this span:

(a) \( \) \( \) \( \) \( \) \( \) (b) \( \) \( \) \( \) \( \) \( \) (c) \( \) \( \) \( \) \( \) \( \) (d) \( \) \( \) \( \) \( \) \( \) (e) \( \) \( \) \( \) \( \) \( \)
44. The practical concert range of the alto saxophone is best represented by this pitch span:

(a) (b) (c) (d) (e)

45. In which case is the dominant thirteenth chord correctly voiced:

(a) (b) (c) (d) (e)

46. Which of the examples below represents the correct block voicing, for five saxophones, of this melody note and chord symbol Dm7:

(a) (b) (c) (d) (e)
47. Which of the following best represents the most effective concert range of the tenor trombone:

(a)  (b)  (c)  (d)  (e)

48. Adjacent octave doubling should be used when:

a. passages are very high
b. passages are very low
c. more intensity is desired
d. a purity of sound is needed
e. "a", "b" and "c"

49. Which voicing is most resonant:

(a)  (b)  (c)  (d)  (e)

50. In which case is the dominant ninth chord correctly voiced:

(a)  (b)  (c)  (d)  (e)

F7(b9)  Eb9(q)  Bb9  A9  Db9
51. Which of the following is an important consideration(s) in writing for the baritone saxophone:
   a. the availability of the special "A" key
   b. intonation problems in lower register
   c. the bottom five notes will not blend properly with other instruments
   d. the extreme upper register should be avoided orchestrally
   e. "a", "c" and "d" of the above

52. Which is the best resolution of the dominant thirteenth chord:

   \[ \begin{align*}
   &F &F &F_9 &F_9 &F_9 \\
   \end{align*} \]

53. Which of the following basic instrument ranges will produce a strong, heavy sound effect:

   \[ \begin{align*}
   &\text{(a)} &\text{(b)} &\text{(c)} &\text{(d)} &\text{(e)} \\
   \end{align*} \]

54. Which of the examples below represents the proper transposition, for the French horn, of this concert pitch and key signature:

   \[ \begin{align*}
   &\text{(a)} &\text{(b)} &\text{(c)} &\text{(d)} &\text{(e)} \\
   \end{align*} \]
55. Which of the following examples best represents contrapuntal writing technique:

(a)  (b)  (c)  (d)  (e)

56. Which of the examples below demonstrates the correct 7-3 voicing, for four voices, of this melody note and chord symbol Gmi7:

(a)  (b)  (c)  (d)  (e)

57. The practical written range of the acoustic or non-acoustic bass is best represented by this pitch span:

(a)  (b)  (c)  (d)  (e)
58. Alto saxophones alone should be scored in:
   a. adjacent octaves
   b. double octaves
   c. unison
   d. "a" or "b"
   e. none of these

59. When written for the alto saxophone, this concert key signature and pitch would be scored in this manner:

   (a) (b) (c) (d) (e)

60. Which of the following is an important consideration(s) in writing for the flugelhorn:
   a. more stable tone quality in lower register
   b. intonation above "C" in the staff becomes a problem
   c. do not score too much above the staff
   d. use in lower, quieter section of the arrangement
   e. all of the above

61. Which of the examples below best represents the practical written range of the clarinet:

   (a) (b) (c) (d) (e)
62. Which voicing below produces the most sonorous effect:

(a) \( A_{mi7} \)  (b) \( G_{mi7} \)  (c) \( F \)  (d) \( G_{mi9} \)  (e) \( C_{mi} \)

63. Which of the following best represents the most effective concert range of the bass trombone:

(a) \( b \)  (b) \( b \)  (c) \( b \)  (d) \( b \)  (e) \( b \)

64. When the repeated chord tone approach is employed in two part density:

a. a chord tone is selected as a second voice that is not included in the melody
b. varying intervals are selected in relationship to each melody note
c. the repeated note uses a different rhythmic pattern
d. the responsibility of the repeated tone is to define the harmonization assigned to a segment of the melody
e. "b", "c" and "d"

65. Which of the range spans below projects the strongest, fullest sound from the bass:

(a) \( b \)  (b) \( b \)  (c) \( b \)  (d) \( b \)  (e) \( b \)
66. Which of the examples below represents the proper transposition, for tenor saxophone, of this concert key signature and pitch:

![Musical Note Diagram]

(a) (b) (c) (d) (e)

67. The standard voicing approach for the four-member trumpet section is the usage of a triad structure with the fourth trumpet doubling the:

a. 1st trombone at the unison
b. 1st trumpet at the unison
c. 1st trumpet an octave lower
d. 2nd trumpet an octave lower
e. 3rd trumpet an octave lower

68. In which case is the major seventh chord correctly voiced:

![Musical Note Diagram]

(a) (b) (c) (a) (b)

69. Which of the following best represents the most effective concert range of the soprano saxophone:

![Musical Note Diagram]
70. Which of the voicings below produces the strongest sonority:

(a) Bbmaj9  (b) Gmaj9  (c) Bbmaj9  (d) Cmaj9  (e) Abmaj9

71. Which of the following best represents the most effective concert range of the alto saxophone:

(a)  (b)  (c)  (d)  (e)

72. The restriction of the number of separate pitches being played simultaneously is referred to as:

a. harmonic definition
b. harmonic density
c. internal resonance
d. orchestral weight
e. voicing

73. The trumpet section can be written in a block or closed voicing with the trombones playing exactly the same voicing an octave lower when the lead trumpet is in this range:

(a)  (b)  (c)  (d)  (e)
74. The possible written range of the soprano saxophone is the same as that of the:

a. alto saxophone  
b. tenor saxophone  
c. baritone saxophone (standard model)  
d. "a" and "b" only  
e. "a", "b" and "c"

75. The presence of the interval of a sixth between the top and bottom voices in a section, or between the top voices of different sections will help establish:

a. internal resonance  
b. harmonic density  
c. orchestral weight  
d. span of orchestration  
e. harmonic definition

76. When the concert key is Bb, the flute is written in the key of:

a. C  
b. F  
c. Bb  
d. B  
e. Eb

77. Which of the following most accurately represents the possible concert range of the Bb trumpet:

\[ \begin{array}{cccccc}
\text{(a)} & \text{(b)} & \text{(c)} & \text{(d)} & \text{(e)} \\
\text{\[ \begin{array}{c}
\text{b} & \text{c} & \text{d} & \text{e} \\
\text{f} & \text{g} & \text{a} & \text{b} \\
\text{c} & \text{d} & \text{e} & \text{f} \\
\text{g} & \text{a} & \text{b} & \text{c} \\
\text{b} & \text{c} & \text{d} & \text{e} \\
\text{f} & \text{g} & \text{a} & \text{b} \\
\end{array} \]}
\end{array} \]

78. In which case is the four part chord correctly voiced:

\[ \begin{array}{cccccc}
\text{(a)} & \text{(b)} & \text{(c)} & \text{(d)} & \text{(e)} \\
\text{\[ \begin{array}{c}
\text{Bb} & \text{G} & \text{F(\#11)} & \text{G(\#11)} & \text{B(\#11)} \\
\text{E} & \text{D} & \text{C(\#11)} & \text{B(\#11)} & \text{A(\#11)} \\
\text{D} & \text{C} & \text{B(\#11)} & \text{A(\#11)} & \text{G(\#11)} \\
\text{C} & \text{B} & \text{A(\#11)} & \text{G(\#11)} & \text{F(\#11)} \\
\text{B} & \text{A} & \text{G(\#11)} & \text{F(\#11)} & \text{E(\#11)} \\
\text{A} & \text{G} & \text{F(\#11)} & \text{E(\#11)} & \text{D(\#11)} \\
\text{G} & \text{F} & \text{E(\#11)} & \text{D(\#11)} & \text{C(\#11)} \\
\text{F} & \text{E} & \text{D(\#11)} & \text{C(\#11)} & \text{B(\#11)} \\
\text{E} & \text{D} & \text{C(\#11)} & \text{B(\#11)} & \text{A(\#11)} \\
\text{D} & \text{C} & \text{B(\#11)} & \text{A(\#11)} & \text{G(\#11)} \\
\text{C} & \text{B} & \text{A(\#11)} & \text{G(\#11)} & \text{F(\#11)} \\
\text{B} & \text{A} & \text{G(\#11)} & \text{F(\#11)} & \text{E(\#11)} \\
\text{A} & \text{G} & \text{F(\#11)} & \text{E(\#11)} & \text{D(\#11)} \\
\end{array} \]}
\end{array} \]
79. In which case is the seventh chord correctly voiced:

\[
\begin{align*}
\text{(a)} & : F^7 \\
\text{(b)} & : E_{mi}7 \\
\text{(c)} & : D^7 \\
\text{(d)} & : C_{maj}7 \\
\text{(e)} & : A_{b}
\end{align*}
\]

80. The 1st trombone playing the lead in a trombone solo section should be written in this range:

\[
\begin{align*}
\text{(a)} & : \\
\text{(b)} & : \\
\text{(c)} & : \\
\text{(d)} & : \\
\text{(e)} & : \\
\end{align*}
\]

81. Which of the examples below demonstrates the correct semi-open voicing, for five voices, of this melody note end chord symbol \( D_{mi}7 \):

\[
\begin{align*}
\text{(a)} & : \\
\text{(b)} & : \\
\text{(c)} & : \\
\text{(d)} & : \\
\text{(e)} & : \\
\end{align*}
\]
82. In which case is the closed 4th voiced correctly:

(a)  (b)  (c)  (d)  (e)

83. The practical concert range of the Bb tenor saxophone is best represented by this span:

(a)  (b)  (c)  (d)  (e)

84. When trombones are voiced with the trumpet section, the lowest trumpet and 1st trombone should not exceed this interval:

a. sixth
b. seventh
c. octave
d. ninth
e. tenth

85. Which of the examples below is voiced correctly for trombones used as background soli:

(a)  (b)  (c)  (d)  (e)
86. Which of the examples below is correctly scored for trumpets and trombones:

87. Which of the following instruments sounds an octave lower than notated on the concert sketch:
   a. tenor saxophone
   b. tenor trombone
   c. bass trombone
   d. piano
   e. string bass

88. Which of the following most accurately represents the practical concert range of the French horn:

89. The bass trombone's most powerful sound is produced in this register:
90. Which of the examples below is voiced correctly:

(a) \( E^\text{b} \)  (b) \( D^\text{b} \)  (c) \( A^\text{b} \)  (d) \( E^\text{b}m^\text{b} \)  (e) \( B^\text{b} \)

91. Which of the following concert pitch examples represents the clarinet's weakest tonal register:

(a) \( A^\text{b} \)  (b) \( E^\text{b} \)  (c) \( A^\text{b} \)  (d) \( B^\text{b} \)

92. Which of the following instrument ranges will produce a light "alive" sound effect with no major balance problems:

(a) \( C^\text{b} \)  (b) \( D^\text{b} \)  (c) \( E^\text{b} \)  (d) \( F^\text{b} \)  (e) \( G^\text{b} \)

93. When writing for lower pitched instruments, the smallest interval by which the bottom two notes in an inverted open position triad should be separated is the:

a. third  
b. fourth  
c. fifth  
d. sixth  
e. tenth
94. The symbol for indicating that the note is initially played a bit flat and bent upwards to the true pitch is:
   a. /b. \\
   c. J
d. AJ

e. 

95. Which of the following types of triadic structures is the most effective in triadic harmonization using chromatic triads:
   a. major triad
   b. minor triad
   c. diminished triad
   d. augmented triad
   e. "c" and "d"

96. The distance from the top to the bottom of an orchestral voicing is referred to as:
   a. harmonic density
   b. internal resonance
   c. orchestral weight
   d. block voicing
   e. span of orchestration

97. Which of the closed 5th clusters below is not orchestrated correctly:

   (a) (b) (c) (d) (e)

98. In which case is the dominant thirteenth chord correctly voiced:

   (a) (b) (c) (d) (e)
99. The lowest concert pitch within the possible range of a standard baritone saxophone is:

   (a)     (b)     (c)     (d)     (e)

100. Which of the following most accurately represents the practical concert chromatic range of the bass trombone:

   (a)     (b)     (c)     (d)     (e)
APPENDIX E

ANSWER SHEET USED WITH CRITERION TEST
RE-TEST ANSVER SHEET

Use pencil only. Blot out the letter of the correct answer completely, for example: (a)(b)(c)(d)(e). If you wish to change an answer, make certain all traces of the previous answer have been erased. When you have completed answering all 100 multiple choice items, please return the answer sheet and re-test booklet to Dr. Levey.

OPINIONNAIRE

DIRECTIONS TO STUDENT:

Based upon your experience with the Program Instruction in the Techniques of Jazz Ensemble Arranging, please answer the following questions:
(Write the letter of the appropriate answer in the space provided.)

1. The following are three claimed advantages for programmed instruction. Which of the three seemed to help you the most?

   a. You can progress at your own pace through the program.
   b. You are immediately informed of the correctness of your understanding.
   c. A program requires you to actively participate in the instructional process.

2. As listed in the previous question, a claimed advantage of programmed instruction over conventional instruction is that it holds the student's attention by requiring the student to constantly respond to the frame questions. To what extent did this procedure hold your attention?

   a. It held my attention about 100 percent of the time.
   b. * * * * * 75 * * * * *
   c. * * * * * 50 * * * * *
   d. * * * * * 25 * * * * *
   e. It hardly held my attention at all.

3. To what extent do you think that the use of the program helped you to learn the techniques of jazz ensemble arranging?

   a. It was an enormous help.
   b. It helped a great deal.
   c. It modestly helped.
   d. It was of little help.
   e. It was of no help.
4. Based on your experience with programed instruction in this study, as contrasted with your experience with the classroom lecture method, do you think that you would have learned more from lectures than from the use of the program?____
   a. I would have learned more from lectures.
   b. I would learn equally well from either method.
   c. I would probably learn less from the lectures.
   d. I am undecided.

5. Based on your experience with this program, do you think that programs are superior to regular textbooks?____
   a. A good program would be vastly superior to a good textbook.
   b. A good program would be superior to a good textbook.
   c. A good program or a good textbook would be equally useful.
   d. A good textbook is superior to a good program.

6. As you proceeded through the early frames of the program, what was your attitude to the program?____
   a. Favorable to learning by means of the program.
   b. Unfavorable
   c. Indifferent to the use of the program.

7-A. My early attitude toward the program was favorable and as I proceeded towards completing it my attitude:____
   a. became more favorable.
   b. became less favorable.
   c. remained the same as my early attitude.

7-B. My early attitude toward the program was unfavorable and as I proceeded towards completion, my attitude:____
   a. became more favorable.
   b. became less favorable.
   c. remained the same as my early attitude.
7-C. My early attitude toward the program was one of indifference and as I proceeded towards completion my attitude was:
   a. changed to favorable.
   b. changed to unfavorable.
   c. remained one of indifference.

8. Did the recorded music examples effectively contribute to your understanding of the arranging techniques? (Yes/No)

9. The program of instruction has:
   a. fostered my interest in jazz ensemble arranging.
   b. motivated me to pursue further study in jazz ensemble arranging.
   c. "a" and "b" above.
   d. accomplished none of the above.

10. Do you feel the material covered in the program is relevant and meaningful to you a college-university music student? (Yes/No)

11. Please make any additional comments, criticism and suggestions relevant to this program in the space below:

    Thanks again for your cooperation!
APPENDIX G

RAW DATA FOR THE
STUDY POPULATION
TABLE 6

RAW DATA FOR THE STUDY POPULATION

<table>
<thead>
<tr>
<th>Subject</th>
<th>Pre-test Raw Score</th>
<th>Raw Score</th>
<th>Post-test Raw Score</th>
<th>Re-test Raw Score</th>
<th>Pre-test-Posttest Gain</th>
<th>Ch. I Time</th>
<th>Ch. II Time</th>
<th>Ch. III Time</th>
<th>Ch. IV Time</th>
<th>Ch. V Time</th>
<th>Ch. VI Time</th>
<th>Ch. VII Time</th>
<th>Ch. VIII Time</th>
<th>Ch. IX Time</th>
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^a^Times given in number of minutes.
APPENDIX H

PROGRAMED INSTRUCTION
IN THE TECHNIQUES OF
JAZZ ENSEMBLE ARRANGING
Programmed Instruction in the Techniques of Jazz Ensemble Arranging is available for consultation at The Ohio State University School of Music.