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# GUIDELINES FOR THE INSTRUCTIONAL DESIGN OF TECHNOLOGICAL AND COOPERATIVE APPLICATIONS IN A MUSIC PROGRAM

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A Thesis in the

Special Individualized Programme

Presented in Partial Fulfilment of the Requirements
for the Degree of Master of Arts at
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# ABSTRACT

## Guidelines for The Instructional Design of Technological and Cooperative Applications in a Music Program

Michel-Charles Therrien

The basis of this thesis is to assist in the development of instructional strategies using cooperative[1] and technological learning tools. An experiment comparing supported[2] self-study in computer-based instruction versus cooperative learning groups was used as the basis of the instructional design system. The purpose of this study is to compare the effectiveness and/or the efficiency of two teaching strategies in the field of Theory and Aural Training. One approach uses a cooperative strategy where students work in small groups on their Theory and Ear-Training skills using a piano as sound source. The other approach uses a self-regulating tutorial strategy where students use a computer equipped with a Theory and Ear-Training software (Practica Musica) and receive randomly generated and/or pre-defined Theory and


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1 There is ample use in the literature of both terms : Cooperative and Collaborative Learning; though these terms are used interchangeably by some, the author will use cooperative learning unless quoting from the literature where collaborative learning is used. Unfortunately, there is no universally recognized definition. Nonetheless, for many, cooperative learning refers to those group techniques where teachers use structures and strategies to encourage learners to work together. Collaborative learning does not utilize nearly the same degree of teacher structuring; rather, the desire to work together arises naturally from a sense of a self-governing principle in the classroom.

2 Supported here (and throughout the text) implies that students were guided as to what was required of them to learn and that a resource person was available for their questions.

Ear-Training material (i.e. intervals, rhythm, pitch matching, identify scales, name chords, etc...) along with immediate response to their input.

Two treatment groups (CAL vs cooperative learning) of nine students each were randomly chosen; the cooperative learning group was randomly divided in three subgroups. Practical music experience and non-practical music experience[3], based on the students information sheet, was used as a second variable. The treatment accorded the participants was administered over a period of thirteen weeks at the rate of one hour period per week, followed by an Ear-Training and Theory test and a ten-item questionnaire relating to attitude towards the music course. Scores indicate that there was no significant difference in the acquisition of theory & ear-training skills of students using either of the two teaching methods. Experience level did yield significant results on all tests, participants with practical experience improved their scores significantly from pre-test to post-test.

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3 Practical music experience or non-practical music experience was based on a personal information sheet, where students listed their experience (or not) as musicians.

## ACKNOWLEDGEMENTS

{En mémoire de mes parents Simone et Paul-Emile Therrien}

I would like to express my sincere appreciation to my advisory committee; Professors Allan Crossman, Mark Corwin and Gina Walker who notwithstanding their very busy schedules were supportive of my exigencies and consistently helpful.

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# CHAPTER ONE

## Introduction

### Rationale

For many years researchers have been attempting to identify basic abilities and individual differences between learners in terms of their cognitive styles (Riding, 1991) that could be used when designing instructional materials. There has been increasing interest in the understanding of the variety of individual differences in approaches to learning and how these differences relate to performance. Research in this area is fragmented and it is difficult to organize it into a comprehensive theory; furthermore, the use of broad and varying research methods has often generated conflicting results. Lembke (1985) though has stated that: "Learning styles do exist, learning styles are not difficult to identify and diagnose and, when students are taught through their preferred learning styles, academic achievement increases." Learning style refers to the habitual, cross-situational use of a strategy (Schmeck & Geisler-Brenstein, 1989). Curry (1983) has developed a model using a graphic "onion" to represent various constructs of learning styles . At the core of the "onion" model is Cognitive Personality Style. This is the individual's cognitive information processing habits, which is an underlying and relatively permanent personality dimension. Moving outward on her "onion" lies the middle layer, the Information Processing Style. This layer represents the individual's

intellectual approach to assimilating information. Outermost, and most observable, is the Instructional Preferences "layer", which deals with the individual's choice of environment in which to learn. As this layer interacts directly with the environment, it is the most easily influenced level of measurement in the learning styles system. Now, it is not the purpose of this study to analyze the various theories of cognitive or information learning styles, and though there is little conclusive empirical support linking the individuals' learning style and their learning performance or learning outcome, research in this area has identified that learning styles are a concern of the instructional body, and that performance is presumed to be affected by personality and environmental factors via the study process complex (Biggs, 1978). The intent of this study, however, is to assess two instructional methods that are interdependent of the learning styles and the study process complex paradigm associated with strategy dimensions; these are: Supported Self-Study using Computer-Assisted Learning (CAL) and Cooperative Learning.

## Context of the Problem

The initial problem that exists in this domain is the determination of the extent to which supported self-study using computer-assisted learning and/or cooperative learning promotes academic achievement. The establishment of these relationships could enable educators to create more efficient instructional strategies while attending to the various differences in

learning styles of individuals. Using cooperative learning means that students are responsible for their own learning as well as for the achievement of peers (Abrami & Bures, 1996); therefore, the participation of every member in the group is crucial. Cooperative learning or any other classroom intervention affects not only social interdependence but the classroom as a whole (Salomon & Globerson, 1989). Related problems to cooperative learning centre around social interdependence of group learning, Abrami, et al. (1996) suggest that social interdependence can be positive, negative or neutral. Positive interdependence exists when students cooperate and perceive that their chances of success are increased by other students' success. Negative interdependence exists when they compete with each other and feel their chances of success are decreased by other students' success. Neutral interdependence occurs when they learn individualistically and their chances of success are independent of their classmates' success.

Problems related to computer-assisted learning on the other hand deal with the individual's ability to manage his/her goal achievement; the goal achievement of one student is unrelated to the goal achievement of other students (Deutsch, 1962).

## Research Question

The main purpose of this research is to compare the effectiveness and/or the efficiency of two instructional strategies in the fields of Music

Theory and Aural Training. One approach uses a cooperative strategy where students work in small groups and interact by working on Music Theory questions and Ear-Training drills, using a piano as sound source. The other approach uses a supported self-regulating tutorial strategy where students use a computer equipped with a Theory and Ear-Training software (Practica Musica) and receive randomly generated and pre-defined Theory and Ear-Training material (i.e. intervals, rhythm, pitch matching, identify scales, name chords, etc...) along with immediate response to their input; Quick Time Instruments[4] (QTI) are used as sound source. Musical literacy and aural ability will be assessed as will the motivational levels of the learners. One must agree that using such inductive research is limited, and that a comparison between two strategies cannot determine all the causal factors affecting the results. Therefore, when considering the possible threats to validity, precautions must be taken. However, because emphasis has been placed on external validity, a comparison of this kind can contribute relevant data regarding the usefulness of the various instructional systems in real educational environments.

Differences Among Strategies

Cooperative learning is a set of instructional strategies that encourage students to share their skills and abilities with other members of the group in

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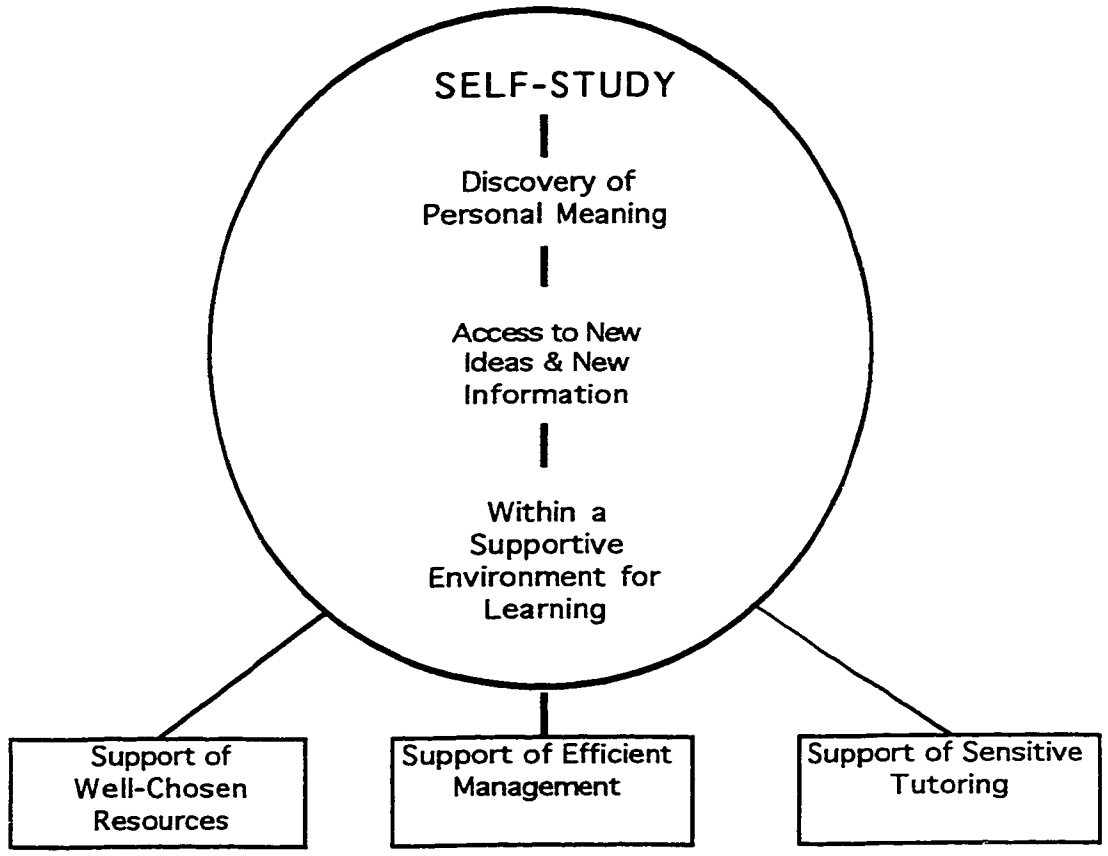
4 Quick Time Instruments are synthesized sounds generated by the DSP chip in the computer. In Practica Musica the available sampled sounds were: Piano, Guitar, Voice and Organ.

order to achieve a common goal (Johnson & Johnson, 1989). Supported self-study implies: well-chosen resources, efficient management and sensitive tutoring along with an appropriate environment for learning with access to new ideas and information (Waterhouse, 1988) (see fig 1). Literature on computer-assisted learning suggest the following advantages: Instruction can be tailored to the individual; instruction can take place at the individual's own pace; the individual can be protected from peer criticism. This implies that the instructional quality and quantity is enhanced.

**Figure 1**




Philip Waterhouse's Concept of Supported Self-Study

# CHAPTER TWO

## Literature Review

### Overview

This chapter will provide a review of the literature pertaining to learning structures related to supported self-study using CAL and cooperative learning, also how these learning systems affect learning outcomes. Since part of this thesis includes recommendations for an instructional design system, a review of the literature related to instructional design is also included.

Johnson, Johnson & Scott (1978) claim that: In a cooperative situation student achievement is positively correlated; when one student achieves his/her goal all students achieve their goals. In an individualistic situation student goal achievement is independent; the goal achievement of one student is unrelated to the goal achievement of other students (Deutsch, 1962). Empirical research done to examine the effect of computers or cooperative learning attending to music instruction specifically is scarce, but this is not a central issue with respect to the general learning outcome of the music student. While an in-depth look at a music student's learning processes would be desirable it is not in the scope of this study to do so. On the basis of previous research on cooperation and CAL, there is considerable evidence that the study of these two instructional techniques can be critical to understanding an individual's learning outcome regardless of study area. In order to demonstrate the diversity in orientations, a thorough analysis of the

relevant theoretical literature will be presented. Along with the variety of theoretical orientations, there are a number of different methodological approaches which researchers in these fields have employed.

In recent years there has been a drastic shift in considerations regarding learning, from the viewpoint of the learner as a passive recipient of information to that of the learner as an interactive participant in the process of information assimilation. As a result, recent theories have attempted to identify personality characteristics and cognitive abilities that mediate learning. Until the early 1980's there had been relatively little systematic experimental investigation of individual differences in student learning (Richardson, 1983). In order to fully understand the impact and importance of the outcome of instruction, Johnson, Johnson & Scott (1978) claim that we need to be concerned with the classroom goal structure and that there are three goal structures which can be implemented in the classroom: cooperation, competition and individualization. The field of educational technology and instructional design seem to be co-dependent on this trilogy . It is because of this ability to draw from a diversity of backgrounds that studies conducted by researchers from the field of educational technology offer great promise in contributing to the body of knowledge concerning how individuals learn and perform in academic settings.

## Introduction to the Field

For many years researchers have tried to assess the effectiveness and efficiency of computer-assisted music instruction as compared to the traditional teaching method. This particular study, however, examines particular research concerned with cooperative learning vs computer-assisted learning strategies developed for music theory and aural skills training. For the purpose of this paper the author will combine Music Theory and Ear-Training (T&ET), reason being that it is the author's belief that they are interrelated by their very nature and the students participating in this study were always asked to sing or play theoretical examples and to establish theoretical principles of Ear-Training exercises.

### *Terminology and Conceptual Issues*

The Greek philosopher Pythagoras was one of the first (that we know of) to think about sound in an orderly way. He based his theory of music on the fact that some of the musical intervals seemed to be related in a direct way (Stolba, 1990). In short, our intervallic music system was developed, a sort of vibration recipe. If the frequencies (of a sound) are related to one another by the ratios of integers, the sound is harmonious. The ear recognizes the relations between the components, and will prove able to appreciate the relations of one such complex sound to another. Thus in Aural Training the

learner develops the ability to discriminate between the different components of such a complex structure, taking the Physical Properties of: 1. Frequency, 2. Amplitude, 3. Vibration Structure and translating them into Mental Properties of: 1. Pitch, 2. Loudness, 3. Timbre.

The learner in a Theory/Ear-Training class should be able to recognize and differentiate among the different characteristics of musical sounds (including those of rhythm). After successful completion of a low-level Theory and Aural Training Instruction, the learner can identify the various degrees of melodic intervals (ascending and descending simple intervals), differentiate between major and minor harmonies, identify and reproduce the forms of simple and compound meters and can write a combination of these in a simple melodic dictation.

Teaching ear-training on an individual basis or in a classroom environment has been the norm for many years. The student listens to lectures by the instructor or hears musical examples and passively tries to assimilate the various concepts. The instructor will often divide classroom time to accommodate theory, ear-training exercises and dictation drills. The instructor will usually use the piano as the sound source for the exercises, then students will sing the various pitch exercises (individually or as a group) or the pitches may be in the form of notation on paper or blackboard, with the instructor verifying correctness on the piano. The accuracy of pitch discernment for individual students is difficult to verify unless dealt with on

an individual basis. Often the student is asked to work with a partner, where one plays the exercise on the piano and the other identifies the notes. In classroom situations the learners must follow the group learning curve.

*Supported Self-study and CAL*

The growing popularity of computer-assisted learning in the field of music has obliged researchers to recognize the need to further examine the effects of different types of computer hardware and software on student learning and curriculum objectives. James A. Hoffmann (1991) says: "The accessibility provided by computers has the power to restore music-making to its vital function in society, once again opening its profound resources to everyone." The advent of technology in the field of music instruction has produced much controversy among researchers, owing to the fact that art lends itself with difficulty to such a scientific and structured learning environment as provided by computers. This may explain the scarcity of research done to examine the effects of computers on music instruction. In terms of the existing literature, much of it is descriptive rather than experimental, with an emphasis on computers as a source of student motivation and satisfaction rather than on their effects in terms of learning outcome. The motivational function of the computer has been considered as an important factor in many computer-based instruction programs (Yang & Chin, 1996). It has been noted that intrinsic features of the computer such as

immediate feedback, animation, sound, active interaction and individualization are more likely to motivate students to learn than any other media.

Computers do have the ability to record and analyze great amounts of data and can be adapted to individual needs (Taylor, 1982). Most of the research to date has been done on music courseware for the Plato platform (software development has lagged behind breakneck advances in technology). GUIDO (Graded Units for Interactive Dictation Operations), MEDICI (MElodic DIctation Computerized Instruction), and HITP (Harmonic Intonation Training Program) are three examples of systems used for music instruction.

GUIDO drills students in five different areas: intervals, melodies, chord qualities, harmonies and rhythms (Hofstetter, 1981). In each case, a student identifies an interval played by the computer. MEDICI offers exercises in melodic dictation. Students must write the melody (using an interactive music editor on-screen) as played by the computer. In the HITP, a student judges whether or not a harmony is in tune.

Certain factors characterize all three instructional systems. Students' data is tracked and saved, which allows for both monitoring individual progress and cumulating data for research in music instruction (for example, examining learning patterns and problems, Hofstetter, 1981). Other factors include increased efficiency and a greater capacity for individualized instruction, as compared to traditional methods (Webster, 1990).

Studies have not clearly demonstrated that computer-based instruction of musical skills is any more effective than traditional methods. Taylor conducted a study in which he compared post-test gain scores of music majors trained on the MEDICI system and those trained by teachers playing melodies on piano. All tests and training drew randomly from the same bank of melodies, so content was the same for all students. The tests were presented half by synthesizer and half by piano, so neither training group would be favoured. The analysis resulted in the retention of the null hypothesis, ie. there was no difference in gain scores on a melodic dictation post-test between the MEDICI group and the piano group.

Dalby (1992) tested the effectiveness of the HITP he developed by comparing gain scores of 20 students who received computer training to 20 students in the control group, who received no training at all. He was able to reject the alternative hypothesis because the experimental group had higher gain scores, and concluded the HITP is an effective instructional tool (although the difference in mean scores was relatively small, as was the sample size).

In general it seems computer-assisted aural training is more efficient but not necessarily more effective than traditional methods of instruction (Peters 1993). However, these results are based on music software developed in the 1980's for use on mainframe computers. Given the advances in

software and hardware technologies, the effectiveness of computer-assisted learning should be reassessed.

Many issues with regard to the effectiveness of computer-assisted learning still remain open to investigation. Have computers been properly introduced and integrated into existing teaching patterns? Have instructors undergone adequate training in the use of new technology so as to provide learners with a sufficiently motivating learning environment?

In conclusion, it appears that no significant findings have been produced with regard to computer-assisted learning versus cooperative learning methods. However, the researcher feels that the subject still has not been exhausted and that it would be of interest to study the effect of cooperative learning methods combined with computer-assisted learning on students with practical musical experience as opposed to students without any musical experience whatsoever.

*Cooperative Learning Systems*

In our present education system, it is customary for students to be in competition with one another for grades and recognition, where one student's academic accomplishment decreases the chances for other students to attain success (Johnson & Johnson, 1989). But man is a social animal: learning is a social exercise as well as an individual private event (Abrami & Bures, 1996). Due to the very nature of music, collaboration is familiar ground

for the music student. One just has to look at the various ensembles a music student must participate in during his/her studies. Music teachers tend to use ensembles or groups in one form or another in the classroom and often students are confronted with group work at some point in their academic lives. We can even make a parallel between cooperative learning and ensemble or group work. In both cases, the students are usually arranged in close proximity to the other group members, they interact with one another while working together on an assignment, and they are usually evaluated as a group. Cooperative learning though has more structure and thus increases the chances that all students in the group will become active learners. Cooperative learning assures that all the students are responsible for achieving the group's purpose, which is usually not the case in regular group work. The nature of cooperative work is in working together, dividing tasks equally, total commitment and participation, and working interdependently towards a common goal and that each member becomes responsible not only for their learning but also for the learning of each member of the group (Johnson & Johnson, 1989). Sharan (1990) states that individual accountability " is a sense of personal responsibility to the other group members for contributing one's efforts to accomplish the group's goals."

Cooperative learning groups can either be student-initiated, teacher-initiated or randomly assigned. Teacher-initiated or random assignment groups is encouraged over student-initiated groups for the simple reason that

when students choose themselves they tend to pick their friends or people who have similar skills, and/or of same gender, and ethnicity. Also, the likelihood that one student will be left out because none of the students wants him/her in their group is nullified by having an objective or random group assignment. In cooperative learning, participation of every member in the group is crucial and the actions of each member alters the group's position. Each member is responsible for the other and they all must come to terms on a final group decision. Johnson & Johnson (1986) suggest that four collaborative skills need to be taught in order to promote effective collaborative learning, these are: Leadership, communication, trust building, and conflict management. Therefore, teacher guidance is recommended to teach and promote the application of these skills.

However, for cooperative learning groups to be successful (e.g., reaching the groups' objectives), thorough involvement of every participant in the group is critical. When individual accountability is fully embodied in the task, the guarantee that every person in the group is accountable for contributing to the process is reinforced. Salomon and Globerson (1989) claim that team members can show "reduced expenditure of mental effort, loafing behaviour, even effort avoidance, in ways that debilitate learning"; they also identify four possible negative effects: the "free rider", the "sucker", the "status differential", and the "ganging up" effects.

The "free rider" effect surfaces when one of the team members expects

the other members to do the bulk of the work which is needed to complete the assignment; thus the more accomplished members begin to feel resentment and the "sucker" effect appears. Unfortunately the impending outcome to this effect is that the harder working members of the team could possibly curtail their responsibilities within the group. In contrast, certain members of a team may feel frustrated if they sense that other members are not capable of accomplishing a task or are not putting in the required effort; then the "status differential" effect can develop. Team members that manifest notable competence will most likely receive higher standing in the group, and will consequently receive more help from the other team-mates and therefore increase their social influence on the group and students with lower status will have less influence (Salomon and Globerson, 1989) .

Therefore, the proper assignment of tasks within a group is crucial as it ensures that each member of the group is dynamically taking part in the group process. Task interdependence is an essential element that distinguishes cooperative group work from traditional group work, this can be fostered by dividing the task so that each student is responsible for completing a section of the assignment. Abrami et al. (1993) contend that individual accountability enhances group work in many ways; a) each group member is made aware of what his/her responsibilities are to the group; b) it confirms if a student needs assistance; c) duplication of work and effort is potentially eliminated.

Abrami et al. (1993) contends that educators should foster positive interdependence; positive interdependence refers to the manner in which students work together in order to reach their common goal and exists when the results of each member of the group are affected by the actions of others Abrami et al., have separated positive interdependence into three categories: outcome, means, and social interdependence. Outcome interdependence refers to the manner in which students are motivated to work as team-mates. Means interdependence is subdivided in three categories: resource interdependence, task interdependence, and role interdependence. Sharing resources to complete an assignment can profit cooperative learning . Group members' intrinsic interest in the task and the necessity of each student to complete some part of the project emphasizes task interdependence. (Abrami and Chambers, 1996). The role that each student is assigned is vital to the completion of the group task. Johnson and Johnson (1989) recommend that students be assigned designated roles designed to help them comprehend the necessary cognitive and social skills that are required. Social interdependence, varies from the other two (outcome and means) in that it capitalizes on non-academic functions to encourage confidence and communication among group members. It has been observed that group cohesiveness has improved greatly after participating in non-academic activities.

*Instructional Design Systems*

Smith and Ragan (1993) define instructional design as follows: " The term instructional design refers to the systematic process of translating principles of learning and instruction into plans for instructional materials and activities. An instructional designer is somewhat like an engineer. Both plan their works based upon principles that have been successful in the past—the engineer on the laws of physics, and the designer on basic principles of instruction and learning. Both try to design things that are not only functional but also attractive or appealing to the user of the product. Both the engineer and instructional designer have established problem-solving procedures that they use to guide them in making decisions about their designs. Through this systematic process both the engineer and the instructional designer plan out what the finished product will be like. Both write specifications (plans) for the products, but they do not necessarily translate their specifications into an actual product." They go on to say that "Careful, systematic planning is particularly important when the medium of instruction is something other than a teacher".

R. F. Mager (1984) states that the instructional designer should attempt to answer three major questions:

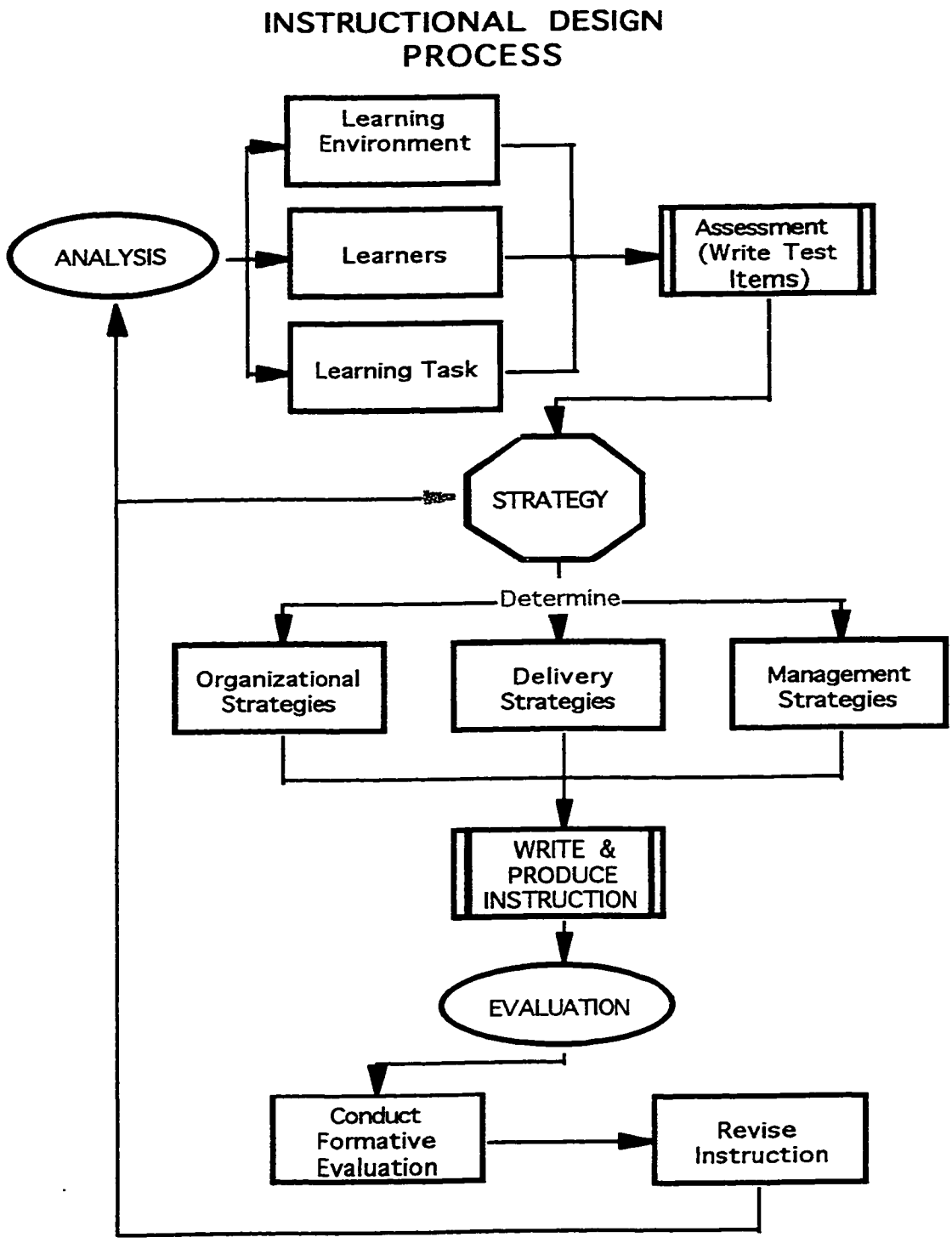
1. Where are we going? (What are the objectives of the instruction?)

2. How will we get there? (What is the instructional strategy and the instructional medium?)
3. How will we know when we have arrived? (What should our tests look like? How will we evaluate and revise the instructional materials?)

Smith and Ragan (1993) restated these as major phases of an instructional design and development process:
1. Perform an instructional analysis to determine "where we're going."
2. Develop an instructional strategy to determine "how we'll get there."
3. Develop and conduct evaluation to determine "how we'll know when we're there."

The following instructional design process model in Figure 2 is a flow chart which gives a graphic representation and overview of the instructional design process model, with the three main components being: analysis, strategy and evaluation. This process has traditionally involved instructors, learners and textbooks but a more current perspective involves teachers, students, materials, and learning environment (Dick & Carey, 1990).

**Figure 2**


INSTRUCTIONAL DESIGN PROCESS
Learning Environment
ANALYSIS
Learners
Assessment (Write Test Items)
Learning Task
STRATEGY
Determine
Organizational Strategies
Delivery Strategies
Management Strategies
WRITE & PRODUCE INSTRUCTION
EVALUATION
Conduct Formative Evaluation
Revise Instruction

*Motivation and ARC's Model*

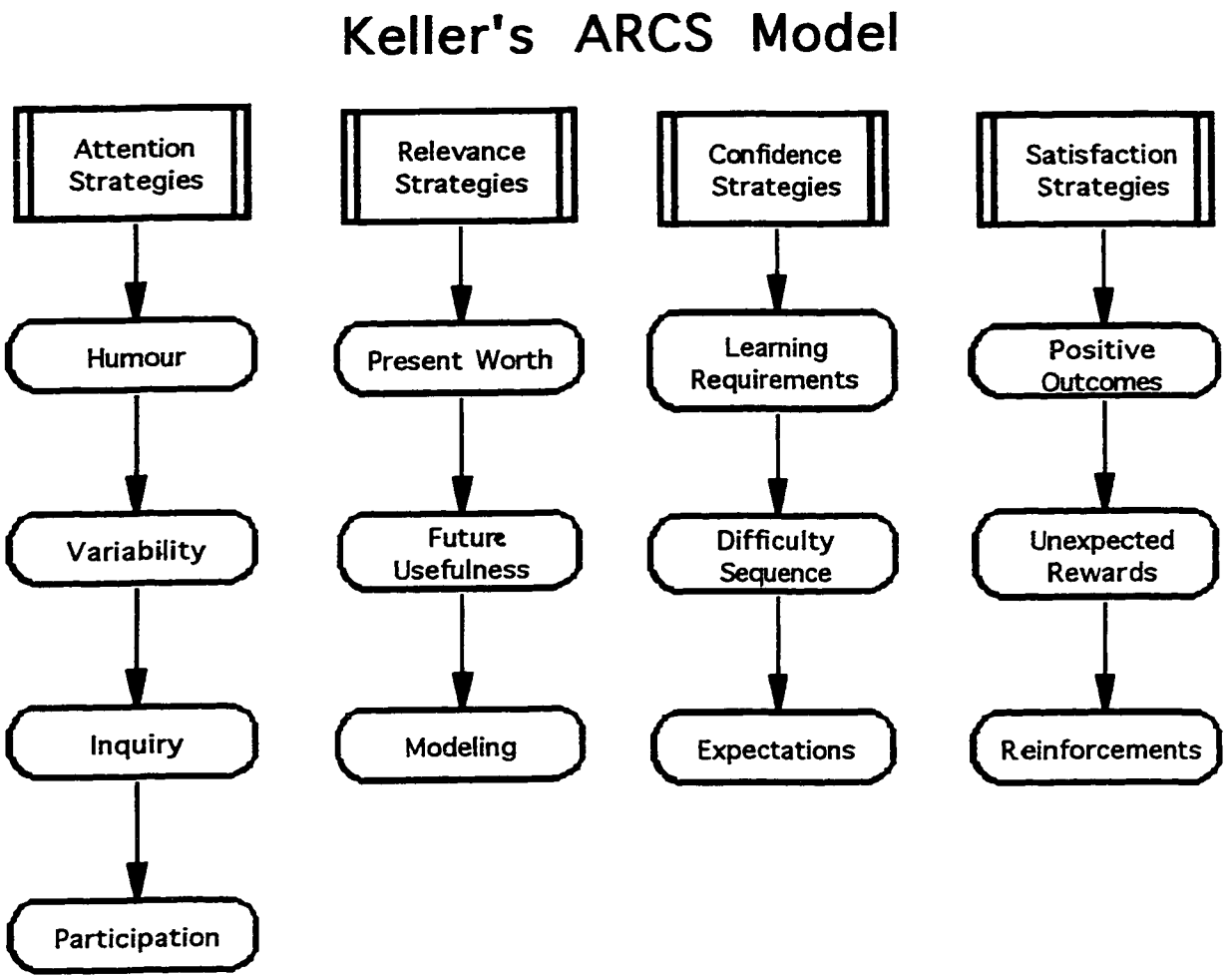
It is not the purpose of this study to explore the complex relationship between motivation and learning, but there is sufficient documented data collected by researchers to maintain that a relationship between the two does exist (Travers, 1977; Keller, 1979). Weiner (1972) claims that an individual's personality can be identified as either internally (e.g., ability, effort) or externally (e.g., luck, task difficulty) oriented.

Low motivation level is susceptible to create obstacles when learning is imposed (Bruner, 1966), for discrete information, skills to be learnt or tasks to be accomplished may seem inconsequential and inapplicable to the learners' need. Furthermore, the level demanded by the instructor may be impossible to accomplish for a particular learners' capability, Keller (1979) infers that motivation and behaviour are the result of interactions between a person and the environment. The environment is the element which should be manipulated by the instructor in order to support and modify the level of motivation of the learner (Curry, 1983). Gagné (1985), states that learner motivation in relation to academic studies can be greatly enhanced if the instructor establishes certain conditions that reflect the students' capabilities and interests.

John Keller (1987) has examined this problem in a systematic way and developed the ARCS model based upon his review of the psychological literature on motivation. The four parts of this model are: Attention,

Relevance, Confidence and Satisfaction. These four attributes must be an integral part throughout the instruction in order to produce instruction that motivates the learner (Dick & Carey, 1990). There is a direct relationship between the Instructional Design Process and the four elements in Keller's ARCS model.

**Figure 3**



*Summary*

This review of the literature acknowledges that research into the identification of learning styles has progressed using many distinct methodological approaches, and that learning style is an essential consideration of the instructional design process. Furthermore, performance is presumed to be affected by personality and environmental factors (Biggs, 1978). Nonetheless, though there has been pertinent theoretical correlations between learning styles and performance outcome, the empirical research dealing with that relationship has provided ambivalent results. This uncertainty has motivated researchers to be more discerning as to the nature of the measures used to determine the outcome variables. It has also led to the understanding that the outcome of efficient instructional strategies are determined by a number of other variables such as personality, motivation, curiosity and/or prior knowledge. Reflection on these considerations has led to the present analysis of the relationship between these variables using two instructional methods in an attempt to clarify the function of efficient instructional strategies for improving student performance.

*The Present Study*

The present study will allow for inquiry into the influence of the environment and teaching method, more specifically cooperative learning and computer-assisted learning, using a group of research participants from

the Montreal area (i.e. volunteer, undergraduate students from a large metropolitan university). A section of this study is designed as a guideline and/or suggestions for enhancing the instructional process in a music program. The individual characteristics of cognition, prior-knowledge, practical experience and approach to learning will be measured to determine whether or not the participants in either condition will assimilate new information analogously.

In addition, an objectively scored measure of learning outcome (Theory and Ear-training tests of cognitive performance), has been used in the present research. Furthermore, an attitude measure has been included to further examine the correlation between the participants' interests and learning style.

*Research Hypothesis*

As a result of the reviewed literature, the following research hypotheses were formulated for investigation in the present study. The (null) hypotheses for this study can be stated:

A.- There will be no significant difference in the acquisition of theory & ear-training skills of students using CAL and students using cooperative learning methods.

B.- There will be no significant difference in the acquisition of theory & ear-training skills of students with previous practical music experience.

The main objective of this study is to prove that (1) students who receive computer-assisted music instruction will not acquire greater theoretical and/or aural skill than those trained in the cooperative learning method, and (2) that previous music experience will not facilitate the acquisition of theoretical and/or aural skills.

The theoretical justification lies in the fact that students in either condition will have more individualized instructional tools and improve their skills through immediate feedback and modelling and that prior practical experience will not be a supportive component in assimilating new information.

# CHAPTER THREE

## Method

### Target Population and Characteristics

*Cognitive Characteristics*

a. General

In general, students in these classes are average to above-average in intelligence. They have a fair to good knowledge of musical styles but are mostly from a popular or jazz music background. Artistic talent is more developed in this group than in the average population.

b. Specific Prior Knowledge

The learners vary in their experience as musicians. Some have no or very limited experience; others are professional musicians. As for computer skills, they are generally poor. Their auditory capacities range from poor to above average. All lack in varying degrees basic music theory and aural discrimination.

*Physiological Characteristics*

The learners range in age from late teens to mid-twenties with approximately 35% female and 65% male. All seem generally in good physical condition. The only physiological characteristic that could have a direct

impact on this instruction would be deafness, and with the amount of input in terms of decibels that we are exposed to in everyday life, including close proximity listening media (ie: headphones, walkmans, etc...), can make partial deafness a concern.

*Affective Characteristics*

Most learners enter the course to learn the basic musical language that they need for entering university level music. They are for the most part highly motivated with a few that are taking this course only because it is required. For the most part, they intend to pursue a career as musicians and want to learn the necessary tools. Most are full-time students, others part-time. Around 50% have jobs that require more than 12 hrs a week of their time. In general they are quite ready and willing to learn.

*Social Characteristics*

Most are quite comfortable in social situations, as they often perform on stage or gatherings as musicians or want to do so eventually. Their role models vary from rock stars to intellectual jazz improvisers. The learners are from various social and ethnic backgrounds and in general do not know each other except through this or other related courses, but some approx. 5% are friends and play in groups together.

## Participants

Originally, twenty students had signed the consent form, but due to attrition (ie. illness, dropped course and absence at the test time), two subjects were lost. Participants were all from the Music Literacy course (N = 18) at Concordia University in Montreal . This is a low-level music theory and ear-training course given in the Music Department of Concordia University. Ten of the participants have little or no musical experience (no prior knowledge of the subject and/or no practical application save general interest), and are taking the course to learn the basics, while the eight others have prior musical experience (previous musical training or knowledge of the rudiments of music and/or practical music application) and are taking the class as a refresher course. Three of the participants are not in the Music Program (one in English Literature, one in Theatre and one in Sociology).

## Instruments and Materials

### *CAL Software*

The software package used for the CAL group in this study was Practica Musica and is commercially developed for home and educational use. It is widely used in universities and conservatories in Canada, the U.S., and Australia. It is an interactive and self-correcting theory and ear-training application , and can be customized to fit students' needs of all levels. The

screen shows a staff and a standard piano keyboard and input is done by mouse, qwerty keyboard or MIDI keyboard. For this study students were using mouse or qwerty keyboard as input devices.

*Informed Consent Form*

This one-page form provided participants with information concerning the design and reason for conducting the research in which they were about to participate. Participants were guaranteed that the data and results provided from the tests would be absolutely anonymous, that their participation was voluntary, and they could withdraw at any time without any reprisal. Students were then asked to sign the consent form indicating their willingness to volunteer as participants. This form was approved by the Chair of the Music Department of Concordia University in Montreal, Quebec. (See Appendix A for a copy of the form)

*Measures*

For the purpose of this study, measures of the dependent variable were designed in conjunction with the objectives as defined in the Music Literacy (INMS 499) course curriculum. The researcher felt it was appropriate that a teacher-made measure would have more content validity than a standardized test (see Appendix B for copies of the pre- and post-dictation and theory tests), since it would consistently reflect the specific

objectives that students would have to perform throughout their learning. To further ensure content validity and reduce any possible experimenter bias, the task of developing the test was assigned to a Department of Music professor who is not otherwise involved in the experiment and was the instructional designer of the course.

*Cognitive Measures*

Participants' cognitive knowledge of the content covered by the instructional unit was measured by way of a pre-test and post-test, administered to both treatment groups. The pre-test consisted of the entrance exam administered to all music students wishing to enter the Music Department at Concordia University in Montreal. Designed by the Theory Committee, the pre-test assessed the cognitive terminal performance objective, and several key subordinate objectives of the instructional unit. The cognitive post-test consisted of a mid-term exam designed by an instructor of the Concordia University Music Department, both the pre-test and post-test assessed student knowledge of subject matter addressed by the instructional unit.

*Theory Test*

The purpose of this measure was to test learners' basic musical theory knowledge. The main interest was in knowing how learners had

mastered these skills rather than how they would rate against one another.

Each subject was given a criterion test of eight items, dealing with simple interval identification, major/minor scales, all chords, progressions, transpositions, measure grouping and modes. Both pre-test and post-test were of equal difficulty level. The same criterion tests were given to both groups.

*Dictation Test*

The purpose of this measure was to test learners' basic aural discrimination and recognition skills. Once again, the main interest was in knowing how learners had mastered these skills rather than how they would rate against one another.

Each subject was given a criterion test of six items, dealing with simple interval recognition and major/minor chords. The same criterion test was given to both groups. The test was administered using sampled sounds on a DAT (Digital Audio Tape) to emulate live instrument sound source.

*Attitude Questionnaire*

Both groups also received a ten-item questionnaire relating to attitude towards the various aspects of the course in general ( CAL or Cooperative learning , to which participants responded using a Likert Scale). Students filled out this questionnaire after the post-test.

The questionnaire itself was based on and loosely adapted from the

format designed by Smith & Ragan (Smith & Ragan, 1993 p398-99) to assess the effect of grouping and CAL. Even though it has not been evaluated in terms of content validity or reliability, the researcher feels that its face validity is a sufficient criterion for justifying its use.

Procedure

A systematically designed instructional unit, incorporating cooperative learning and Computer Assisted Learning (CAL) constituted the instruction for the treatment conditions. The unit was developed by the researcher, according to principles of Instructional Systems Design, and addressed the content normally covered during the Fall semester (namely, Theory and Ear-Training ) by the Music Literacy course in question. The unit consisted of a total of thirteen one-hour sessions, and was delivered over a period of thirteen weeks (one hour a week) to the treatment groups. In both treatment conditions, instruction was carried out and supervised by the regular course instructor.

Students were first pre-selected as to having practical musical experience (previous musical training and/or had worked as a musician) or no practical musical experience (very little or no prior knowledge of the subject save general interest); then, within each condition, students were randomly assigned to either one of the two treatment conditions: a cooperative learning group (Coop) and a Computer-Assisted Learning group (CAL).

The CAL group had access to a Macintosh laboratory in the Loyola main building every Thursday between 9:30 and 10:30 AM, whereas the cooperative learning group was subdivided into 3 small groups and had access to a music classroom and 2 modules with an acoustic piano in each, for the same time frame and in the same building. The CAL group was working individually, each with a computer as tutor and sound source generator and using Practica Musica software Version 3 for theory and ear-training exercises. The cooperative learning group worked on similar exercises in theory and ear-training but in small groups of three using the piano as the sound source. Both groups were supervised by the regular course teacher who was available for any questions students had during the instruction unit. The teacher is a part-time teacher at Concordia University and also a graduate student in Music and Educational Technology with fifteen years experience as a music director and composer for film and television. The teacher identified the materials and gave a series of exercises to the ensemble of the students in the class before each unit. The teacher did not work individually with students during the unit but was available for questions. At the end of the thirteen week period, the teacher gave a post-test and a ten item Likert scale attitude questionnaire to all the students of both groups. The pre-tests (placement tests) were administered during the registration period for the 1996-97 academic year; due to the availability of background information, the researcher was aware of previous experience if any.

They were not intact groups.

Evaluation Design

The study was conducted according to a pre-test post-test design. The two testing sessions were implemented during two terms of an academic year (May to December). The pre-test was given in May and the post-test in December after the treatment. The data was analyzed immediately, and certain significant cognitive and attitudinal shifts between the two tests were identified (see Table 1 to 7 for means and standard deviations; also Appendix D for raw data, generated with MINITAB).

Design Constraints

As Campbell and Stanley have remarked, factorial designs are often based on true experimental designs, particularly the Pre-test / Post-test Control Group Design and the Post-test-Only Control Group Design (Campbell and Stanley, 1963, p.27). This study was conceived on the basis of the preceding model.

There are two independent variables, both of which are manipulated. This design would take this form:

| | | |
|---|---|---|
| R $O_1$ | $X_1$ | $O_2$ |
| R $O_3$ | $X_2$ | $O_4$ |

Two treatment groups were therefore established, with subjects being randomly assigned to each group. The manipulated variable is the method of instruction (cooperative learning versus CAL), and the classification variable is the practical experience level of students (experienced versus non-experienced). The dependent variable is the acquisition of basic musical skills (Theory and Ear-training).

To further ensure internal validity of the experiment, the following measures were taken:

1.- The experiment was carried out in the actual university setting, to be as representative as possible of the actual learning environment.

2.- Students were given specific guidelines as to the learning levels they would be mastering.

3.- The tester closely observed students as they participated in the experiment, in order to control for extraneous variables noting any information considered relevant to the experiment.

To best provide for the equalization of treatments, both groups were told how important their contribution was to the outcome of the experiment. As much as possible, groups were controlled for experimental treatment diffusion. Students received special permission to access the music lab and music modules for the time of the experiment.

*Testing*

Testing was carried out for both groups in a way that no one particular treatment was favoured. The questionnaire assessed both groups' attitudes towards each type of treatment, and served to indicate whether differences in test scores would be attributable to learning attitudes.

Prior experience with the test was a concern but the amount of time between tests (six months) minimized this effect. Attrition was minimized by the random assignment of non-experienced and experienced students. The researcher has furthermore identified the following extraneous variables:

The John Henry effect - students from one group are competing with students from the other group.

Some students from this study had expressed a keen interest in using computers to train for aural skills. The researcher originally thought that the novelty of using computer-assisted learning might produce a more positive result because it would initially serve to further motivate students.

Experimenter bias - the experimenter administering the treatment was also one of the investigators.

*History*

External events that occurred between the pre-test and the post-test could have affected the study's results due to the long period between the pre-test and the treatment. But a survey by the researcher prior to the treatment

indicated that no real effect had occurred (no participants took summer classes or had private tutoring, etc...). During the treatment, however, the groups were in different environments.

*Instrumentation*

Theoretically, instrumentation, the effect of changes in the measuring instrument, may have operated, but since both groups were responding to a fixed instrument (printed test), and both received the tests at the same time and within the same interval, this effect was easily controlled.

*Maturation*

Biological and /or psychological changes within the subjects may have occurred if the participants grew tired, irritated, frustrated or bored. Since participation was voluntary, these variables were less likely to have intervened.

Data Analysis

In order to determine the reliability of the item ratings, several tests were performed on the data. The statistical analyses conducted were twofold. One series of tests were conducted on the results obtained from the pre-tests and post-test on Theory and Dictation (Student Performance). The other series on student ratings (Attitude). The statistical analyses were conducted

using several statistical methods contained in an interactive statistical software package called MINITAB Version 10 for Windows. The Alpha level was set at .05.

*Student Performance*

Tests conducted on the data were descriptive statistics and a General Linear Model analysis of variance (ANOVA).

This study examined the following on student performance:

1. Overall, did scores rate differently between the pre-tests and post-tests?
2. Was there a significant difference between scores in CAL and cooperative learning groups?
3. Did experience or non-experience have an effect on scores between the pre-tests and post-tests?
4. Did the teaching condition have an effect on scores?
5. Did experience level have an effect?

*Attitude*

Tests conducted on the data were descriptive and frequency statistics and a chi-square test was used to determine trends and sub-trends in group opinion from the Likert scale attitude questionnaire.

## CHAPTER FOUR

## Results

Variables of interest for comparisons of student performance and opinion were the conditions to which they were assigned in the factorial design: teaching condition (computer-assisted learning vs. cooperative learning) and experience level (prior practical musical experience vs. no prior practical musical experience). For student performance, it also became interesting to compare results of the pre-tests and those of the post-tests, for the group as a whole, as well as for each of the four conditions. There were not enough students from an undergraduate program other than music to make worthwhile comparisons between music majors and non-music majors.

### Student Performance

Table 1 lists the mean results for the group as a whole, for both pre-tests and post-tests. This table clearly demonstrates that mean results were much better on the post-test.

**Table 1**

| | | THEORY | | | | DICTATION | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pretest | | Post-test | | Pretest | | Post-test | |
| | N | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| ALL | 18 | 38.42 | 27.88 | 81.44 | 21.64 | 20.81 | 17.50 | 76.78 | 18.79 |

Table 2 lists the results for all tests, for the group, divided per teaching condition (CAL vs. coop). The same trend emerges in this table.

**Table 2**

| | | THEORY | | | | DICTATION | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pretest | | Post-test | | Pretest | | Post-test | |
| | N | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| **CAL** | 9 | 38.40 | 32.0 | 83.28 | 21.25 | 16.00 | 15.02 | 79.72 | 17.13 |
| **Coop** | 9 | 38.44 | 25.07 | 79.61 | 23.15 | 25.61 | 19.32 | 73.83 | 20.92 |

Table 3 lists the results for the same tests for the group, divided per experience level (practical music experience vs. no practical music experience). Again, mean results were much better on the post-test than on the pre-test.

**Table 3**

| | | THEORY | | | | DICTATION | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pretest | | Post-test | | Pretest | | Post-test | |
| | N | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| **Exp** | 8 | 43.31 | 23.13 | 93.69 | 5.96 | 31.62 | 15.65 | 88.31 | 14.02 |
| **N-Exp** | 10 | 34.5 | 31.9 | 71.65 | 24.84 | 12.15 | 14.17 | 67.55 | 17.36 |

Tables 4, 5, 6 and 7 show the mean results for each cell of the 2 X 2 factorial design, for each of the tests. These tables demonstrate that mean results have a tendency to be better for students who have practical musical experience. No single trend seems to emerge when comparing means on teaching condition.

**Table 4**

**Pretest Theory**

| | Experienced | | Non-Experienced | | ALL | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| **CAL** | 39.63 | 15.047 | 37.50 | 13.459 | 38.56 | 10.094 |
| **Coop** | 47.00 | 15.047 | 31.60 | 13.459 | 39.30 | 10.094 |
| **All** | 43.31 | 10.640 | 34.55 | 9.517 | | |

**Table 5**

**Pretest Dictation**

| | Experienced | | Non-Experienced | | ALL | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| **CAL** | 24.50 | 7.3533 | 9.20 | 6.577 | 16.85 | 4.933 |
| **Coop** | 38.75 | 7.3533 | 15.10 | 6.577 | 26.925 | 4.933 |
| **All** | 31.625 | 5.199 | 12.15 | 4.650 | | |

**Table 6**

**Post-test Theory**

| | Experienced | | Non-Experienced | | ALL | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| **CAL** | 92.50 | 10.009 | 75.90 | 8.952 | 84.20 | 6.714 |
| **Coop** | 94.87 | 10.009 | 67.40 | 8.952 | 81.14 | 6.714 |
| **All** | 93.69 | 7.077 | 71.65 | 6.330 | | |

**Table 7**

**Post-test Dictation**

| | Experienced | | Non-Experienced | | ALL | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| **CAL** | 92.37 | 8.359 | 69.60 | 7.476 | 80.99 | 5.607 |
| **Coop** | 84.25 | 8.359 | 65.50 | 7.476 | 74.88 | 5.607 |
| **All** | 88.31 | 5.911 | 67.55 | 5.287 | | |

Inferential tests were therefore run to examine the significance of differences in scores:

- from pre-tests to post-tests
- according to teaching condition
- according to experience level

*Differences from pretest to post-test scores*

The differences from pre-test to post-test scores were confirmed by running one way ANOVA tests on the groups in each of the four conditions.

Students in the CAL condition (n = 9, two results per student) improved significantly from the pre-test (mean = 38.40) to the post-test (mean = 83.28) in theory: $F(1,17) = 12.26$, $p<0.05$. They also improved significantly from the pre-test (mean = 16.00) to the post-test (mean = 79.72) in dictation: $F(1,17) = 70.44$, $p<0.05$. Students in the COOP condition (n = 9, two results per student) improved significantly from the pre-test (mean = 38.44) to the post-test (mean = 79.61) in theory: $F(1,17) = 13.10$, $p<0.05$. They also improved significantly from the pre-test (mean = 25.61) to the post-test (mean = 73.83) in dictation: $F(1,17) = 25.81$ $p<0.05$.

Students in the experienced (EXP) condition (n = 8, two results per student) improved significantly from the pre-test (mean = 43.31) to the post-test (mean = 93.69) in theory: $F(1,15)=35.59$, $p<0.05$. They also improved significantly from the pre-test (mean = 31.62) to the post-test (mean = 88.31) in dictation: $F(1,15)=58.25$, $p<0.05$. Students in the non-experienced (N-EXP) condition (n = 10, two results per student) improved significantly from the pre-test (mean = 34.50) to the post-test (mean = 71.65) in theory: $F(1,19)=8.44$,

$p<0.05$. They also improved significantly from the pre-test (mean = 12.15) to the post-test (mean = 67.55) in dictation: $F(1,19)=61.14$, $p<0.05$.

*Differences attributed to teaching condition*

General linear model analysis of variance (ANOVA) tests were also conducted to determine whether significant differences in Student performance could be attributed to teaching condition.

No significant results were found: there were neither main effects nor interaction effects.

*Differences attributed to musical experience level*

General linear model analysis of variance (ANOVA) tests were once again conducted to determine whether significant differences in Student performance could be attributed to experience level.

Significant results revealed a main effect on all tests, except the theory pre-test:

There was a main effect on experience level on the dictation pre-test: $F(1,17) = 7.79$, $p<0.05$. Students with practical musical experience (mean = 31.62) performed better than students with no practical musical experience (mean = 12.15).

There was a main effect on experience level on the dictation posttest: $F(1,17) = 6.86$, $p<0.05$. Students with practical musical experience (mean = 88.31 ) performed better than students with no practical musical experience (mean = 67.55).

There was a main effect on experience level on the theory posttest: $F(1,17) = 5.39$, $p<0.05$. Students with practical musical experience (mean = 93.69) performed better than students with no practical musical experience (mean = 71.65).

No interactions were observed among the variables.

*Student opinion*

Table 8 lists the ratings to each of the nine questions on the attitude survey administered after the study was over, listing the statements which received most disagreement first and those which received most agreement last. Questionnaires were handed to both groups and all questions were identical for each group but pertaining to the condition ( see appendix C for questionnaire templates). These are results for the group as a whole.

The listing of percentage of agreement/disagreement indicates that there is little difference between the ratings to each statement: most statements received 'Agree' as the most popular rating. Question 2, 'I feel I would have learned more in a classroom with a teacher', received the lowest

mean rating (2.89), indicating most disagreement of all with the statement, and also got the highest percentage of disagreement of all the statements (33.33% of respondents choosing 'Disagree'). Question 3, 'I enjoyed getting immediate feedback', received the highest mean rating (4.30), indicating most agreement of all with the statement, while Question 1, 'I enjoyed working in collaboration with my peers', got the highest percentage of agreement of all the statements (61.11% of respondents choosing 'Agree').

**Table 8**

| Question | 1 (%) | 2 (%) | 3 (%) | 4 (%) | 5 (%) | Mean | SD |
|---|---|---|---|---|---|---|---|
| 2 | 5.56 | 33.33 | 33.33 | 22.22 | 5.56 | 2.89 | 1.02 |
| 4 | 5.56 | 27.78 | 22.22 | 44.44 | 0 | 3.05 | 0.99 |
| 5 | 0 | 29.41 | 35.29 | 17.65 | 17.65 | 3.23 | 1.09 |
| 9 | 0 | 22.22 | 27.78 | 44.44 | 5.56 | 3.33 | 0.91 |
| 8 | 5.56 | 16.67 | 11.11 | 55.56 | 11.11 | 3.50 | 1.09 |
| 1 | 5.56 | 5.56 | 5.56 | 61.11 | 22.22 | 3.89 | 1.02 |
| 6 | 0 | 5.56 | 11.11 | 55.56 | 27.78 | 4.05 | 0.80 |
| 7 | 5.56 | 0 | 11.11 | 50.00 | 33.33 | 4.05 | 0.99 |
| 3 | 0 | 0 | 11.76 | 47.06 | 41.18 | 4.30 | 0.69 |

Table 9 shows the mean and standard deviation opinion ratings per statement.

**Table 9**

| Statements (In order 1 - 9) | Mean | SD |
|---|---|---|
| I enjoyed CAL/working in collaboration with my peers. | 3.89 | 1.02 |
| I feel I would have learned more in a classroom with a teacher. | 2.89 | 1.02 |
| I enjoyed getting immediate feedback. | 4.30 | 0.69 |
| I thought working with CAL / in collaboration with my peers was more efficient (e.g. Better control of schedule). | 3.05 | 0.99 |
| I enjoyed CAL but I think working in collaboration with others would have been more enjoyable / I enjoyed working in collaboration with my peers but I think CAL would have been more enjoyable. | 3.23 | 1.09 |
| I thought using CAL / working in collaboration with my peers was effective (e.g. I learned something). | 4.05 | 0.80 |
| I feel CAL / working in collaboration with my peers is a good learning tool at College or University levels. | 4.05 | 0.99 |
| I could easily focus on my problems and work them out. | 3.50 | 1.09 |
| In relation to question #8, I feel I would have learned more with a teacher. | 3.33 | 0.91 |

Inferential tests were run to check whether there were significant differences of opinion for each statement:

- according to teaching condition;
- according to experience level.

*Teaching condition*

Chi-square tests indicated no significant differences by teaching condition.

*Experience level*

The same tests showed a significant difference in experience level only for Question 9. Students with prior musical experience expressed significantly more agreement with the statement (mean = 3.80) than students with no experience (mean = 2.75): $X_2$ (f) = 7.07, $p<0.05$.

There were no other significant results on experience level.

(See appendix D for complete results)

# CHAPTER FIVE

## Discussion

Interpretation of the results of the statistical analyses between test scores and the performance variables is limited due to the large proportion of coefficients that are non-significant. However, relevant observations can be made. The discussion is separated into four parts: Foreword, Discussion of the major findings of the study, Implications for learners and Suggestions for further research.

### Foreword

Facilitating and improving student learning is an essential part of most academic strategies. More and more instructional designers are working with teachers and administrators to develop and refine educational materials and techniques that help promote learning and expand the learners' understanding. Two methods that are currently being explored quite extensively by educational researchers are: Cooperative learning and Computer-Assisted Learning. Researchers have documented these two methods quite extensively and results show that both learning methods have similar positive effects: a) students learn more; b) students seem to appreciate the material more; c) students feel more involved in the educational process; d) students develop more as interactive learners.

Nevertheless, in the course of this study, the researcher found that many teachers and students alike are very cautious, even apprehensive, of these methods. Such cautions and fears are often informally expressed by both students and educators and are seldom addressed in the literature. Examples are: a) The teacher is becoming more of a resource person and students must take on a greater share of responsibility; b) Computer-assisted learning and/or cooperative learning is not suited for everyone; c) Technology is alienating students; d) Students need constant teacher support.

Nonetheless, as numerous studies have shown, there are advantages to both of these methods (CAL and Coop); instructional designers should attempt to develop pertinent techniques to implement these strategies in a gradual manner to attain a better understanding and enhance participation from the teaching body. To deny the possible usefulness of these two methods and not confront their limitations with appropriate analysis could inevitably prevent beneficial educational techniques from developing.

The results of this study support the statistical null hypothesis. More specifically, there was no significant difference in the acquisition of theory & ear-training skills of students using either of the two teaching methods. However, the experienced group did perform significantly better than the non-experienced group, which could be attributed to a motivational factor due to higher expectancy (Keller, 1979).

## Discussion of the Major Findings of the Study

### *Teaching Methods*

This empirical research has attempted to demonstrate that two atypical modes of instruction can be equally effective. In both cases the learners' comprehension and knowledge of the subject matter improved significantly from pre-test to the post-test. Both strategies were concerned with attempting to provide a method to maximize learning, since it was organised to reinforce interaction between the learners and the instructional materials. Since both groups (CAL and Coop) performed consistently better in the theory and ear-training post-tests, competence could not be attributed to teaching method.

Therefore, both instructional strategies could be said to be successful in accomplishing the objective of enhancing skills, and both are equally suited to satisfy the needs of the learner. Imperative to the numerous current trends viewing the learner as an active element in the learning process is the need to relate to a pragmatic learning experience . Therefore, effective learning is seen as starting with the practical, that with the most significant expectancy and value to the learner, and that which the learner can experience (Keller, 1979). Moreover, both methods have an intrinsic flexibility that allow the integration of supplemental material according to the needs of the learner, though this integration will differ according to the particular strategy: a) CAL due to its one-on-one tutoring and immediate feedback, b) cooperative

learning due to its small group interaction and common interests of the learners.

Furthermore, teachers may have a greater sense of rapport with students as they are able to inform and guide them through the various learning experiences and establish a more direct path of communication, instead of the more formal and uncompromising lecture model. The results obtained from both alternate teaching methods (CAL and Coop) help to confirm the appropriateness of their instructional strategies as a whole. Both the CAL and cooperative learning approach seem to assert that the interrelation of all parts of the learning process, have a positive effect. The results of the Likert Scale (Attitude) questionnaire relating to teaching method indicated that the lessons were efficiently integrated and progressed relatively well. Also, the fact that the topics were interesting and/or relevant seem to have a direct effect on the students' effort to understand and work out the problems of complex lessons.

The preceding statements, supported by the findings of this study, seem to suggest that an effective lesson requires a properly constructed instructional strategy combined with discerning attention to the learner's needs. Feedback to the instructor is also a key element of these instructional strategies because it improves the evaluation of the chosen lesson strategy and this in turn supports the learner.

*Experience Level*

It is assumed that given learners with similar entry levels (defined in this study by the pre-test), and given equal and precise objectives, these learners should perform equally well. The results indicate the contrary. The non-experienced group scored significantly lower than the experienced group in all measures.

The above observations raise some questions of efficiency and motivation, but they also point to certain limitations and validity concerns. External validity was definitely affected due to the small number of our sample and the fact that the focus was on a specific population (ie. undergraduate entry-level music students).

In part, the results of the study were as expected. The superiority of the experienced group can be explained in that the subjects were much more familiar and comfortable with this type (music) of environment (ie. used to analyzing musical examples, performing in front of an audience, etc...). Also, experienced learners were more comfortable in any given musical environment, thus showing that prior knowledge is a definite advantage to learning. These results were particularly encouraging for two reasons. First, although both teaching conditions proved to be most effective in spite of their atypical nature, the built-in flexibility of both conditions encouraged

participants to derive aptitude from prior experience and, secondly, prevented the instructor from establishing a routine which could lead to boredom.

Different levels of academic proficiency and motivational differences have been recognized as fact by numerous research. In the past, educators have found a precise relationship between intelligence and learning, as well as motivation and learning. Furthermore, it was assumed that if learning did not ensue, one of the two conditions were identified as the probable cause. However, research in this area has established that additional considerations could improve on these characteristics, one of these means is instructional design systems.

A second intent of the study was to examine the achievement differences between academic proficiency and experience level. The fact that there was no interaction between the variables for teaching condition suggests that the instructional strategies satisfied the knowledge acquisition criteria for all levels of academic proficiency and the different levels of experience. The experienced students, though, did significantly better than the non-experienced students, regardless of teaching condition. As for the differences noted between the experience level groups, the only explanation offered is the fact that the participants were more familiar with the basic skills due to having to use them on a regular basis, and therefore these participants were highly motivated. Because the lesson materials were easily related to pragmatic exercises, it was possible that the lessons reflected the students'

interest. The experienced participants were conceivably curious and were able to monitor what was most relevant to him/her. The fact that the participant was able to exercise his/her skills cognitively, in whatever manner he/she knew best, conceivably motivated an appropriate solution. Therefore, it would be safe to assume that the effort was increased (Dodge, 1978; Kopp, 1982). This can indicate that gaining attention of the learner is a crucial first step at all levels of instruction (Gagné, 1977), and it can also be said that gaining attention requires the ability of the learner to recognize and relate to the experience (Winn, 1982). In addition, this corroborates Kolb's (1984) model of experiential learning in which he describes a learning cycle containing four stages, where stage one is Concrete Experience ( the other three being Reflective Observation, Abstract Conceptualization and Active Experimentation).

Although the non-experienced students valued the classes, they still had to cope with the extra burden of acquiring altogether new knowledge and this could have affected their motivational level. However, both CAL and Cooperative learning instructional strategies has managed to enhance their perspective, and greatly increase their skills: CAL group (Theory: pre-test mean = 38.40 to post-test mean = 83.28, Dictation: pre-test mean = 38.44 to the posttest mean = 79.61); Coop group (Theory: pre-test mean = 38.44 to the posttest mean = 79.61, Dictation: pre-test mean = 25.61 to the posttest mean = 73.83). This could suggest that incorporating a pragmatic teaching strategy at a

very early stage could improve motivational levels substantially, or as Riding (1991) suggests, a *Cognitive Styles Analysis* could be used to determine the range of cognitive styles (experience levels) present in the target population.

*Implications for the Learners*

Both conditions (CAL & Cooperative learning), when well implemented, could be advantageous for music educators, and they can also have practical implications for the instructional designer. The data collected in this study can contribute new insights to help improve the effectiveness of the learners' approach to education. Understanding the areas in which learners have solid concepts and accounting for them in the design of courses can enhance the instructional methodology. By providing educators with these tools that integrate the learners in a pragmatic framework, they can conceivably determine what will work with their students and hopefully avoid many of the abstract academic hurdles faced by most learners.
An interesting finding in this study was that, to some students, working with their peers was very useful, but to others working in a supported self-study system was more beneficial. This was not surprising, because much of the literature on Instructional design suggests that as we acquire more and more tools with which to work, interesting mixtures of theories and practice emerge (Bednar et al., 1991). Furthermore, Richard E. Clark, (1983,1994) claims that media are "mere vehicles that deliver instruction but do not influence

student achievement any more than the truck that delivers our groceries causes changes in our nutrition" (1983, p.445), suggesting that there is evidence that many very different media attributes accomplish the same learning goal. However, instructional *method*[5] will influence learning by providing relevant examples to connect new information in a learning task with information in their prior experience (Clark, 1994).

Confirmed by the results of this study, statements considered very relevant to the participants concerned the benefits that could likely manifest themselves by the synthesis of both teaching conditions. Some of the statements were: "...a rotation system; one where CAL is used one period of the week and cooperative groups used in the other.", "While I found it useful to get feedback from my peers, their feedback is futile if I cannot focus on correcting my mistakes individually.", "... CAL can provide more drilling, then the whole group can participate".

Based on the findings, it becomes obvious that decisions regarding how the instructional unit is structured and how the work is divided among learners should not be taken without a great deal of thought. In cooperative learning, there is always the chance that some students will tend to do more work than others, and consequently generate some resentment among the other participants (status differential effect).

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5 An instructional method is: any way to shape information that activates, supplants or compensates for the cognitive processes necessary for achievement or motivation (Salomon, 1979; Clark, 1994)

Hence, in order to remove dissenting attitudes related to this condition, teachers should thoroughly monitor the groups' work and insist that each student contribute thoroughly to the group. Teachers should try to develop small group learning into a useful, productive and pleasing event; teachers should highlight the congenial as well as the academic aspects of taking part in group work. This can be readily accomplished if students are encouraged to initiate activities that promote correlation between peers. Activities that promote trust and communication between students are designated as team-building activities (Abrami, et al., 1993).

Additionally, in the CAL condition, there is also the consideration that students will not take the responsibility to manage their own work in the most efficient way. Teachers, once again, should supervise and advise students in such a manner that the learner is encouraged to develop to his/her full potential and be permitted, even encouraged, to draw from relevant personal experience. Most importantly, teachers should make sure that the assigned task is one that can be done in a given condition, since not all tasks can be accomplished as group work and/or utilizing cryptic computer applications .

# CHAPTER SIX

## Guidelines for a Relevant Systematic Instructional Design in a Music Education Environment

"The will is never free; it is always attached to an object, a purpose. It is simply the engine in the car, it can't steer."
Joyce Cary, 1888-1957

Introduction

Education is a word that comes from the Latin, *"educare"* to bring up, rear, or train - more specifically, to draw or lead out. One of the ramifications of this is that there are resources to draw upon; hence this implies that the skill to learn is within the student. R. Gagné (1995) has divided possible learning outcomes into five large categories or "domains": Verbal Information (or Declarative Knowledge), Intellectual Skills, Cognitive Strategies, Attitudes and Psychomotor Skills.

Musicianship has two components, it is: a) an Intellectual Skill, using concrete concepts requiring the selection, identification and use of a number of acquired concepts. b) a Psychomotor Skill, using coordinated muscular movements that are typified by smoothness and precise timing. (Although psychomotor skills have a visible muscular component, they are also dependent on a cognitive component, usually a procedural rule that organizes the kind and sequence of actions.)

Instruction is an Intellectual Skill that involves the ability to apply knowledge across a variety of instances or circumstances, but can touch on most if not all of the above domains: Declarative Knowledge, Intellectual Skills, Cognitive Strategies, Attitudes and Psychomotor Skills.

There are many approaches to the study of knowledge (cognitive science) and of late two of them seem to share equal favour in the instructional design process: the Objectivist (traditional) and Constructivist approaches. In a traditional systematic instructional design approach, the learners receive specific objectives; " In order to design instruction, the designer must have a clear idea of what the learner should learn as a result of the instruction." ( Smith & Ragan, 1993), in some of the newer perspective (constructivist model) one moves towards a process of 'negotiation' or 'construction' (Bednar et al, 1991). In Objectivist theories, meaning resides in objectives or the instructional goal; in Constructivist theories, meaning is a process of negotiation between teacher and learner. Along with negotiation, one must come to terms with the fact that the learner may either accept, modify, ignore or reject an idea according to their experience, attitudes and purposes.

Although it is not within the scope of this paper to deliberate on the various epistemological theories, the objectivist and constructivist approaches to instructional design are relevant to the instructional concepts and strategies represented in this chapter. The degree to which meaning

occurs in the relationship between learner and instruction can go from a completely pre-determined interpretation to a broad, more subjective one, and consequently: a) Objectivist: Interpretation or meaning exists exclusively in transmission; b) Constructivist: Interpretation or meaning exists in the interaction between learner and instruction; c) Subjectivist: Interpretation or meaning is established entirely by learner.

As mentioned earlier in this study, the importance of an instructor (guide or coach) in both conditions (CAL and cooperative learning) is essential, and since we are concerned with instruction, pre-supposing a form of communication, the Subjectivist model will be excluded for the purpose of these recommendations. Therefore, the author will concentrate on a system of communication that has components of 'transmission': that is, something which can be 'transmitted' from a 'sender' to a 'receiver', and in which the 'receiver' may have a passive or interactive role, but in both conditions (CAL or cooperative learning) there is interaction. The Subjectivist viewpoint however, has academic significance especially in music where the learner must incorporate the element of self-study if he/she is going to succeed (ex: learning to play an instrument, deciding on a personal interpretation of a work, etc...)

Instructional Transaction

"Learning transfer is limited while using systematic performance

objectives"(Bednar et al., 1991). One interpretation of this argument could be that when performance objectives are identified, the learning goal has been broken down into numerous isolated, decontextualized tasks. A constructivist`s approach argues that "learning should occur in realistic settings" (Merrill, 1991) and never broken down into separate tasks.

However, if context is never separated from the learning task, it is difficult to see how the transfer of learning or knowledge to previously unencountered contexts is facilitated; by never decontextualizing learning, the learner will probably attempt to associate new knowledge directly with the context in which it is presented, which can or cannot be beneficial for assimilating the information presented. Performance objectives, no matter how specific (ie. at the micro, or task level) or general (ie. closer to the instructional goal level), are particularly helpful for assisting instructional designers in designing appropriate instruction or curriculum for a learner-centred instructional environment. Performance objectives provide a framework for ensuring that the instruction is associated to what the learner is supposed to learn through the instructional intervention. The ability of the learner to transfer knowledge to new contexts is greatly enhanced through the learning of abstractions. Merrill et al. (1990) agree that initial instruction can and should be contextualized; however, at some point the learning must be abstracted in order for the learner to become familiar with the concepts themselves, without the "distraction" of contextual details. This will help the

learners apply the learned ideas or concepts to new contexts.

One must acknowledge the importance of an active learner; most importantly, this activity must be meaningful for the learner in order to enhance the learning process. One will certainly remember more from instruction in which he/she plays an active role than lessons in which one is expected just to soak in the rays of knowledge. In music, for example, it is easier to remember and assimilate various musical pieces if one sings/plays them in an appropriate context (ie. Groups, choir, ensembles, orchestras, etc...). However, in order for learners to take a meaningful, active and effective role in their knowledge acquisition, they must be aware of what they are expected to learn (this may be expressed in more general, and less microscopic task-oriented objectives as traditionally done). Additionally, they must have a way of knowing whether they have learned or not, this can be resolved with the "performance" nature of the objectives (ie. expressing objectives in performance terms ).

By informing the learners of objectives, they become empowered and can use this information to select the learning strategies they feel are most appropriate. They can also conduct periodic "self-assessments" to ascertain independently, whether they need more learning, or information, in order to achieve the objective(s). Without performance objectives, we would be creating academic environments in which learners would improvise "self-chosen positions" on a wide spectrum of knowledge. Therefore, to what

extent do we want students to develop, independent, self-chosen positions for the multitude of basic (eg. literacy, numeracy...) and complex (medical, surgical, ..) skills for which "positions" have already been identified that will greatly enhance and/or facilitate their lives, (and for a surgeon, the lives of their patients!). How effective will the transfer of "self-chosen positions" be in improving learners' performance in the real world, we can well imagine what an orchestra of fifty musicians would sound like if each one was playing a *self-chosen* interpretation along with a *self-chosen* level of instrumentality, even more dramatic with respect to vital basic and complex skills (surgery) where proven, effective positions have already been defined. However, some instructional designers are moving towards a combined approach; using both constructivist and goal-based instruction.

Effective Instructional Planning

In order to organize and plan effective instruction that will be beneficial to the learner, one must ask some basic questions as to the result of the instructional outcome. Can it extend the learner's knowledge base? Will it strengthen prior skills? Can it help promote better attitudes toward learning? Obviously, it is impossible to predict all or any of these outcomes, but with resourceful and imaginative instructional design systems it is feasible that most of these criteria can be achieved. Furthermore the ID process can be applied to either teaching methods (CAL or cooperative learning).

The flow charts in Chapter Two: Figure 2 and 3, give a good idea of the ID process and Keller's motivational model; consequently, in this chapter the author will supply an outline with a broad range of components to be used in an instructional design system, additionally in appendices E, F & G, you will find examples of an instructional analysis, strategy and module, that was developed in 1995 by the author for the learning of a music notation software (MOSAIC by Mark of the Unicorn), this can serve as a supplemental and practical illustration of the use of the ID process. Moreover, Keller's ARCS model will be an essential and inherent component of the instructional plan.

## Systematic Instructional and Motivational Design

Here is a general outline of the instructional design process that could be applied to an undergraduate music program[6].

### *Analysis*

I. Learning Environment

Analyzing the learning context requires a needs assessment and a description of the learning environment. First, the needs assessment will determine the instructional needs and should enable the planning and setting of the proper goals for the instruction. Proper planning usually equals

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6 This is a more detailed explanation of Smith and Ragan's Instructional Design Process (see the flow chart in chapter two, figure 2 & 3.

meaningful teaching. The needs assessment should also determine the gaps between "what is" and "what should be" and then prioritizing these gaps (Smith & Ragan, 1993).

The second part is the description of the learning environment which includes such elements as: a) characteristics of teachers, b) characteristics of existing curricula, c) available hardware (pianos, sound systems, VHS, computers, etc...) d) characteristics of classes and facilities (sizes, rehearsal space etc...) e) characteristics and philosophy of the department or faculty (primary mission, etc...).

A good method of getting the big (and small) picture is to sketch out various blueprints of available facilities and tools utilizing diagrams. This will stimulate perceptual organization. Also, classify motivational problems and appraise environment in terms of allowing for a stimulating instruction.

II. Learners

Analyzing the learner is a critical part of the ID process, since not all learners are alike. Smith and Ragan (1993) state that: "during learner analysis you should not be thinking of what learners should be like or what they need to know, but what they *are* like and what they *do* know". They also have defined two broad types of human characteristics: individual differences *between* people and similarities *among* people. These differences and

similarities were categorized in a matrix of four human characteristics (see figure 4).

1. Stable similarities: similarities among people that are relatively unchanging over time.
2. Stable differences: differences among people that are relatively unchanging over time.
3. Changing similarities: similarities among people that change over time.
4. Changing differences: differences among people that change over time.

**Figure 4**

| | Similarities | Differences |
|---|---|---|
| Stable | • Sensory Capacities<br>• Information Processing<br>• Types and Conditions of Learning | • Intelligence Quotient<br>• Cognitive Styles<br>• Psychological Traits<br>• Gender, Ethnicity, and Racial Group |
| Changing | Development Process<br>• Intellectual<br>• Language<br>• Psychosocial<br>• Moral | Development State<br>• Prior Learning<br>- General<br>- Specific |

Smith and Ragan's matrix of human characteristics

One of the more important factors to consider about the learner is specific prior knowledge, especially when dealing with students that have practical musical experiences. However, Smith and Ragan (1993) warn that: "Just because something has been taught does not mean that it has been learned". In addition to the human characteristics matrix, Smith and Ragan identify major characteristics that could be used in a learners' description, these are:

A) Cognitive Characteristics

- Specific aptitudes
- Developmental level, such as Piaget's levels of cognitive development
- Language development level
- Reading level
- Level of visual literacy, ability to gain information from graphics
- Cognitive processing styles—preferred and most effective
- Cognitive and learning strategies
- General world knowledge
- Specific content knowledge

B) Psychological Characteristics

- Interests
- Motivation
- Motivation to learn
- Attitude toward subject matter

- Attitude toward learning
- Academic self-concept
- Anxiety level
- Beliefs
- Attribution of success, i.e., locus of control
- Relationships to peers
- Feelings toward authority
- Tendencies toward cooperation or competition
- Moral development, such as Kohlberg's stages of moral development
- Socioeconomic background
- Racial/ethnic background, affiliations
- Job position, rank
- Role models

C) Physiological Characteristics

- Sensory perception, such as visual, auditory, and tactile.
- General health, which may influence tendency toward fatigue as well as many other health-related factors
- Age

Obviously, the instructional design need not examine all of these characteristics for all learning tasks and all learners, but information on learner characteristics may facilitate the ID process and foster effective,

efficient, and interesting instructional models. An analysis of the learners motivation, could also prove useful.

III. Learning Task

Once the gaps between "what is" and "what should be" have been determined, the process of task analysis should transform these gap descriptions into an instructional format that can be used to guide the ID process. At this time the designer should also prepare motivational objectives and classify difficult materials into uncomplicated formats by breaking down complicated tasks into smaller and easier to comprehend instructional units. Smith and Ragan (1993), give five primary steps in conducting a task analysis:

1. Write an instructional goal - this should be done using the learners terminology. These instructional goals are accounts of what learners should be able to do at the end of the instruction[7].
2. Determine the types of learning of the goal - The use of Gagné's five domains[8] of learning is convenient for this :

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[7] Performance Objectives are similar but relate to a segment of the instruction or instruction module.

[8] Here is a quick reference to Gagné's five categories: 1. Verbal Information: learners recall *verbatim* various organized information, and are not required to apply the knowledge they have acquired but merely to recall or recognize it. 2. Intellectual Skills: application of rules to previously unencountered examples. 3. Cognitive Strategies: learners are able to manage their own learning or "learning how to learn". 4. Attitudes: a mental state that predisposes a learner to choose and to behave in a certain way (Gagné, 1985). 5. Psychomotor Skills: coordinated muscular movements that are typified by smoothness and precise timing (Gagné, 1985).

- Verbal information (Declarative knowledge)
- Intellectual skills (concepts, rules, problem solving)
- Cognitive strategies
- Attitudes
- Psychomotor skills

3. Conduct an information-processing analysis of that goal.

   (Ask: "What are the mental and/or physical steps that someone must go through in order to complete this learning task?

4. Conduct a prerequisite analysis and determine the type of learning of the prerequisites.

   (Ask: " What must the learner know or be able to do to achieve each step?")

5. Write performance objectives for the instructional goal and each of the prerequisites.

*Assessment*

Typically, one would think that the evaluation should take place after the instruction was given, but the literature (Smith & Ragan,1993; Dick & Carey, 1990) confirms that it is important for the instructional designer to think about assessing learners' performance before and during the instructional design process. It could also be valuable to evaluate the possible outcome of motivational elements and verify if the level of instruction is

well adapted to the learner's level of reception, which in turn would help sustain continued interest. Smith and Ragan (1993), suggest that when designing assessment items for a lesson one must try to accomplish the following:

1. Identify the purpose of the assessment instrument and the type of model that will be followed in its development.
2. Determine what kinds of assessments are necessary and where they should occur in the instructional strategy.
3. Determine what forms the items should take (essay, multiple choice, checklist, etc.) to adequately assess the type of learning that is represented by the objective.
4. Write test items and directions that are clear to the learner, originally in the form of item specifications.
5. Determine how many items are needed to assess learners' performance on an objective and what constitutes an adequate performance.
6. Determine how to select among objectives or what proportion of objectives should appear on the assessment instrument by writing an instrument blueprint.

*Strategy*

Reiguluth (1983) has categorized instructional strategies into three aspects: a) organizational strategy - how instruction will be sequenced; b) delivery strategy - what instructional medium will be used and how learners will be grouped; and c) management strategy - scheduling and allocation of resources. These strategies can be planned at the course level (macro) or at the lesson[9] level (micro) (Smith and Ragan, 1993).

R. Gagné (1972) has suggested that lessons contain nine "events of instruction": 1. Gaining attention; 2. Informing the learner of the objective; 3. Stimulating recall of prerequisite learning; 4. Presenting stimulus materials; 5. Providing learning guidance; 6. Eliciting performance; 7. Providing feedback; 8. Assessing performance; 9. Enhancing retention and transfer.

Smith and Ragan (1993) have expanded these instructional events to include:

Introduction

1. Activate attention to lesson (gain attention to lesson)

2. Establish purpose (inform learner of instructional purpose)

3. Arouse interest and motivation (stimulate learner's attention)

4. Preview the lesson (provide overview)

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[9] A lesson is the amount of instruction that can be completed in one or two sessions.

Body

5. Recall relevant prior knowledge (stimulate recall of prior knowledge)
6. Process information and examples (present information and examples)
7. Focus attention (gain and focus attention)
8. Employ learning strategies (guide or suggest use of learning strategies)
9. Practice (elicit response)
10. Evaluate feedback (provide feedback)

Conclusion

11. Summarize and review (provide summary and review)
12. Transfer learning (enhance transfer)
13. Remotivate and close (provide remotivation and closure)

Assessment

14. Assess performance (conduct assessment)
15. Evaluate feedback and seek remediation (provide feedback and remediation)

These events can be provided by the instructor, by the learners or both. The author noticed that, in both CAL and cooperative learning, students

seem to instinctively generate a natural approach to the sequence of instruction.

The *Introduction* prepares students for what is to come, by first activating attention so that they may focus on the task at hand, using various forms of motivational techniques[10] (ex: listening to original music while reading from the score, describing a concert, playing student works, etc...) . Secondly, informing the students of what they are about to learn (establish purpose) will help clarify the intention of the teacher, provide purpose and will allow students to compare what they should know, to what they already know (prior knowledge). Third, learners should be encouraged to relate to past experiences as to create a solid relevance to the lesson, arouse their interest and motivate students to go on. If a learner analysis was conducted, the instructor should have adequate information on what is important to the student. Fourth, by providing an overview of the lesson, students can visualize the sequence of the instructional procedure.

The *Body* is where learners participate more actively in the instructional process. Students should be encouraged to retrieve information from previous experiences (recall relevant prior knowledge). The instructor can also make use of comparative advance organizers; a comparative advance organizer (Ausubel, Novak, & Hanesian, 1968) provides a framework, or schema, for new learning by comparing a similar known entity to it (for

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10 Refer to Keller's ARCS model, Chapter Two, p.22.

example, learning intervals by relating them to a well known song). During the 'process information and examples' strategy, students gather and learn new information. It is the belief of the author that this information should be introduced (where possible) in a pragmatic fashion in which concepts, definitions, statements of rules are presented with relevant practical examples (auditive or visual) or associated to past experience. During this stage of the instruction it is advisable to refocus attention in order to bring emphasis on important elements of the lesson. Students can 'employ learning strategies' that they are familiar with and are characteristic of the way they work. Here the instructor can help foster good working habits by advising students on how to design effective learning strategies and help them overcome obstacles. Eliciting a response (practice) can provide the learners with a chance to participate more actively in the learning process, and also allow the instructor to assess progress. Smith and Ragan (1993) state that:

> "It is important that the learner have the opportunity to practice across the range of variability of the learning objective. You have defined this range in your assessment specifications, so you can use these specs to help you determine what practice should be made available to the learners. This means that they should have the opportunity to practice across the range of the content with which they should be skilled and that they should be able to practice across the range of difficulty of the objective. Although

practice may be sequenced from simpler to more complex items, the need remains for the complete range of complexity to be practiced. It is not uncommon for designers to feel that since learners are just encountering the content they should not be required to practice at the level of complexity they will be tested on later. However, this decision is predicated on the assumption that learners will experience spontaneous learning over time. Although this is feasible, the active practicing of new learning (especially at more complex levels than learners have been exposed to) should not be left to chance. Novices in a content area may not have the experience to imagine how the content might be applied; consequently, provision of instruction with explicit practice items is very important."

The author believes that this is a critical strategy for the development and refinement of musical skills (ear-training, learning a repertoire, etc...); it also helps cognitive processing and facilitates the comprehension of the various and sometime complex concepts. Feedback is also an essential part of any instruction and should be given whenever it is required; immediate feedback is indispensable for any music student since timely information of accuracy can save students from the pains of re-learning, and it can also help students assess their responses during practice.

The *Conclusion* gives the learners a chance to evaluate and clarify their newly acquired knowledge, salient points are reviewed and appraised (summarize and review); this helps learners assimilate the new to the old and allows them to conceive and possibly foresee subsequent application and use of their newly acquired skills (transfer learning). Self-study exercises can be useful and will allow the student to learn in a non-linear fashion. The instructor should remotivate students by indicating the various possibilities and uses for this newly acquired knowledge or skill (remotivate and close).

*Assessment* allows instructors to gauge the level of comprehension of the learners (assess performance). At this time the instructor can determine what kind of remediation (if any), is needed (evaluate feedback and seek remediation).

Final Notes

As I write this study, our society and consequently our educational system are becoming more and more dependent upon various forms of new technology, computerised systems and electronic communication. This consistent transformation is affecting the world at large, empowering the worldwide community with innovative means of connectivity and productivity. How do we prepare today's learners for success in a society that is constantly changing? Our institutions must create an extended learning environment, guided by an efficient underlying conceptual

framework, and thus be able to organize effective network-based learning environments. All of the above guidelines and recommendations can be applied to various teaching conditions, be it cooperative learning, computer-assisted learning, distance education or supported self-study. The synthesis of CAL and cooperative learning is an obvious imminent outcome, both methods are teaching strategies that foster student achievement by reducing ambivalent competitiveness and encouraging alliance. In cooperative learning, individuals work with their peers to achieve a common goal rather than competing against each other or working separately from them. In CAL students can join in virtual concerts, learn or exchange musical ideas with classrooms all over the world, have immediate access to the scores of contemporary and classic composers, even listen to excerpts. In a network-based learning environment, learners can benefit from the advantages of both teaching conditions. Nonetheless, it is the author's ardent belief that proper and systematic instructional design should be an essential part of all academic planning.

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## Appendix A

## INFORMED CONSENT FORM

Name of Student: _____

You have agreed to participate in a research study entitled:
"Music Literacy: Collaborative Learning versus Computer-Assisted Learning".

Your involvement in this study will consist of the following:

- Participating in a one hour training session once a week (Thursday, 9:30 to 10:30 am), starting September 12th 1996;
- Taking a test to evaluate the effectiveness of the training program you completed;
- Answering a questionnaire to assess attitude toward learning in relation to this study.

These activities will last for one academic term ( 13 sessions) of training plus the time necessary to complete the test and questionnaire.
There are no feasible risks to you upon participation in this study. You may discontinue participation at any time, without reprisal of any kind.
Specific information about you will be kept strictly confidential, and will be obtainable from the researcher if desired.
The results that are published will not refer to any individual student, since the study will only analyze relationships among groups of data.
The purpose of this form is to confirm your voluntary participation and to allow the researcher to use the information collected as a result of your participation in the research study.
If you have additional questions regarding this study, the rights of participants or potential problems, please speak to the researcher Michel-Charles Therrien.

Signature of Student: _____

Date: Sept. 12Th 1996

# Appendix B
## Tests (Theory & Dictation Pre/Post-tests)

Name *Nom* : _____

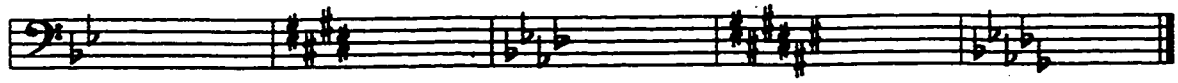
## Concordia University / Université Concordia
## Department of Music / Département de musique
## Theory Placement Test

Section I: 40 minutes (maximum)

1. Write the following intervals (note direction: ascending or descending)
*Écrivez les intervals suivants: (nb : ascendante ou descendante)*

**Maj 6 asc** 6xte maj asc | **Perf 5 desc** 5te juste desc | **Dim 7 asc** 7e dim asc | **Perf 4 asc** 4te juste asc | **Aug 5 asc** 5te aug asc

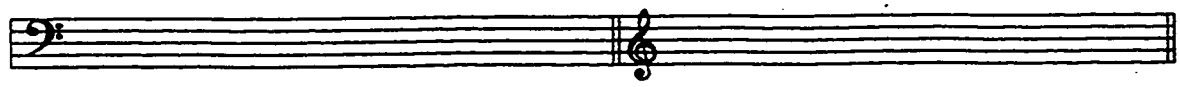
2a. Name the keys: Major and Minor
*Identifiez les tonalités: majeur et mineur*



2b. Write the following minor scales
Show the key-signature
*Écrivez les gammes mineures indiquées*
*Indiquez l'armature de la tonalité*

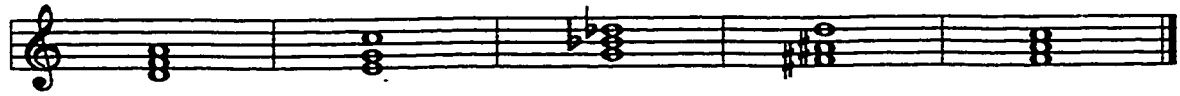
**c♯ harmonic minor descending**
**do # mineure, harmonique, descendante**

**c melodic minor ascending**
**do mineure, melodique, ascendante**



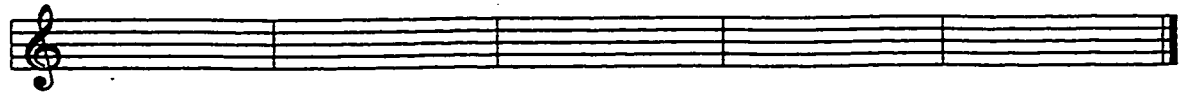
3a. Identify the following chords (jazz notation)
*Identifiez les accords (notation jazz)*

**Dm**
**min root pos**



3b. Write the triads
*Écrivez les accords indiqués*

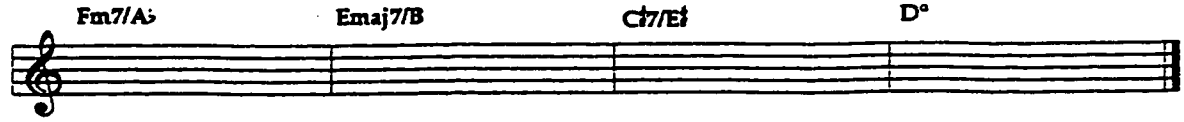
**A** | **B min** | **E♭ min (♭5)** | **F♯ / A♯** | **D min / F**



4a. Identify the following chords (jazz notation)
*Identifiez les accords (notation jazz)*

4b. Write the chords
*Écrivez les accords indiqués*

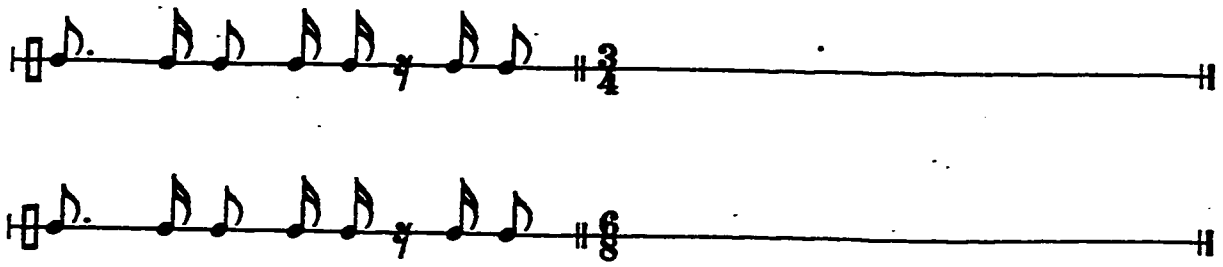
**Fm7/A♭** | **Emaj7/B** | **C♯7/E♯** | **D°**



5. Transpose the following down a major ninth:

6. Group each measure correctly according to the time signature

*Regroupé correctement en accord avec l'armature*

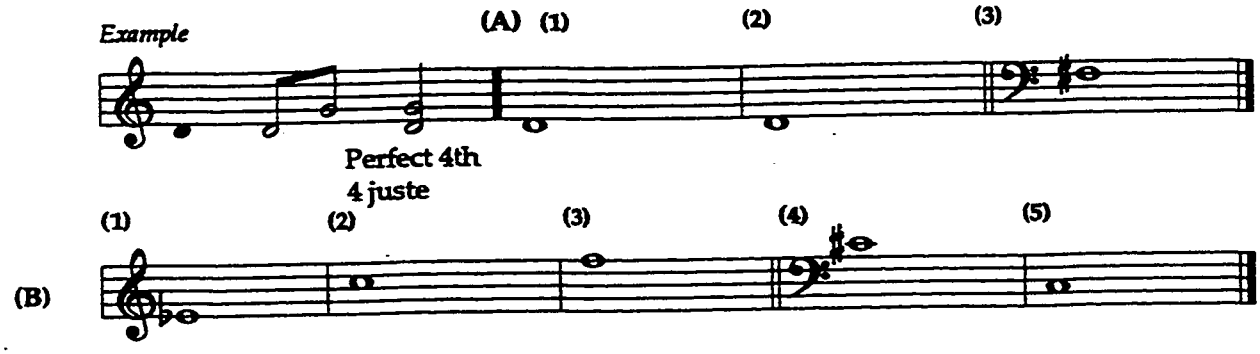


7. Name the seven modes:

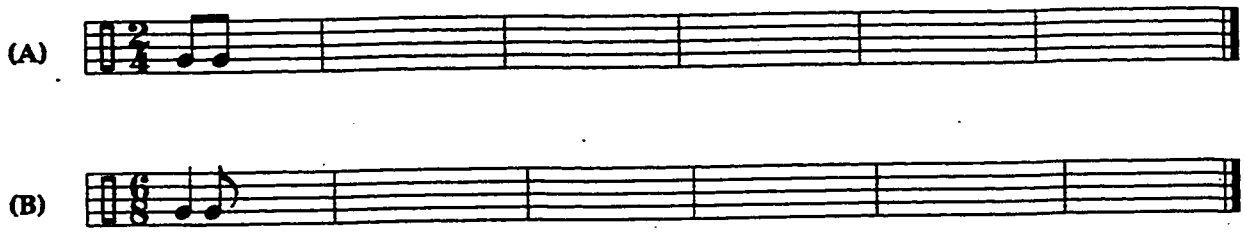
Name: _____

# Concordia University
## Dictation Placement Test

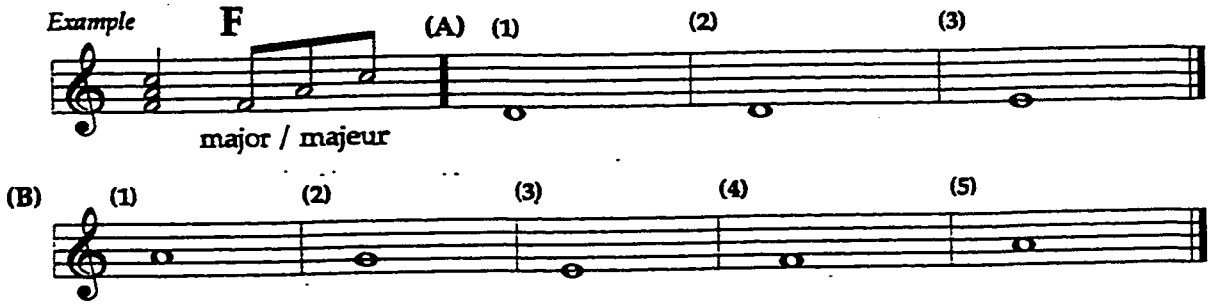
1. Identify and write the interval (Each interval is played twice: once melodic, then once harmonic)




2. Rhythmic Dictation Played five times.
(Once complete; first 1/2 three times; second 1/2 three times; once complete.)




3. Identify the chord and inversion Use jazz notation. Write the chord.
(The chord is played harmonically, then melodically.)

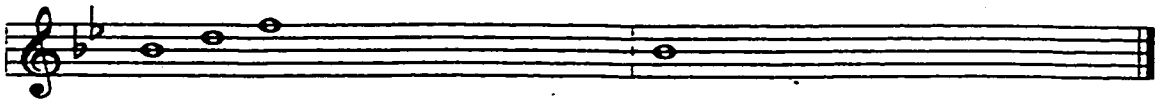


**Placement Dictation.f**

Name: _____

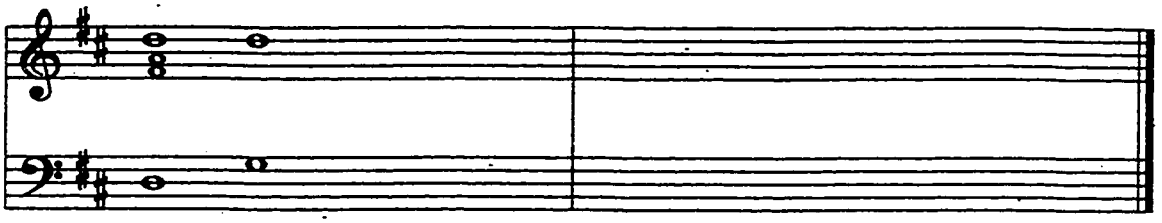
4. Notate the 16 notes; (8 notes in each half) Played five times.
(Once complete; first 1/2 three times; second 1/2 three times; once complete.)

(A)



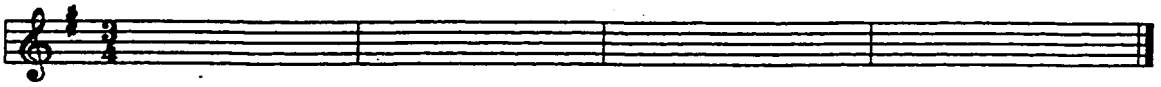
(B)

5. Write the soprano and the bass. Identify the key and progression (8 chords).
Played five times. (Once complete; first 1/2 three times; second 1/2 three times; once complete.)

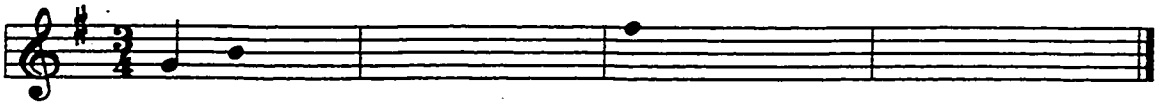


6. Melodic Dictation Played five times.
(Once complete; first 1/2 three times; second 1/2 three times; once complete.)

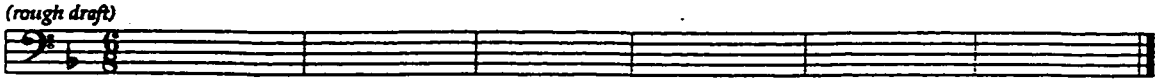
*(rough draft)*



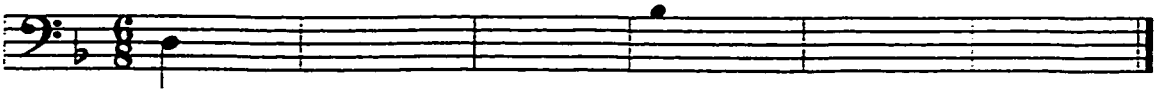
(A)



*(rough draft)*



(B)

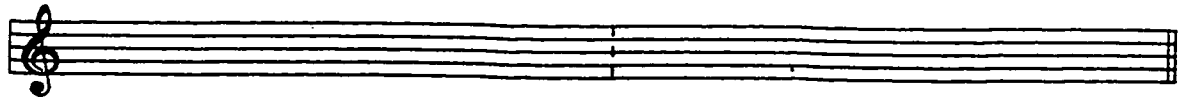


Name: _____

# Mid-term Theory Test

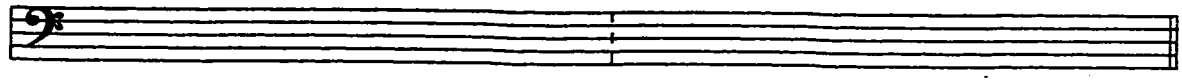
1. Give the key signature;
   Write the minor scale ascending and descending *(show semitones)*

**c minor - melodic**



**f ♯ minor - harmonic**

**e minor - melodic**



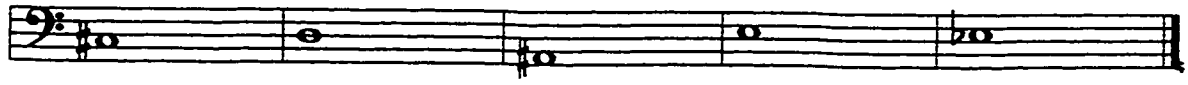
**d minor - harmonic**

Give the key signature; Write the major scale:

**Bb major ascending** **E major descending**

2. Write the following intervals

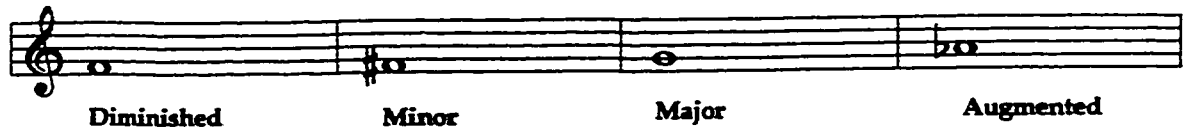
**+ 6 asc** **– 3 desc** **+ 2 asc** **– 7 asc** **– 6 desc**



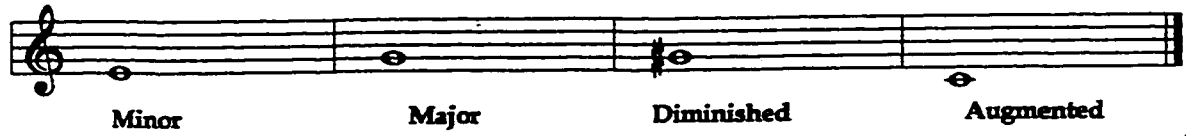
**P 4 asc** **P 5 asc** **– 3 desc** **+ 3 asc** **° 5 desc**

Name: _____

3a. Write the triad in root position. Give the jazz notation.

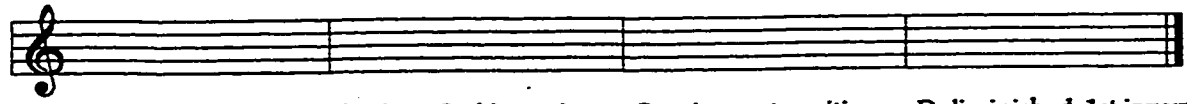


Diminished Minor Major Augmented



Minor Major Diminished Augmented

3b. Write the triad. Note the inversion!



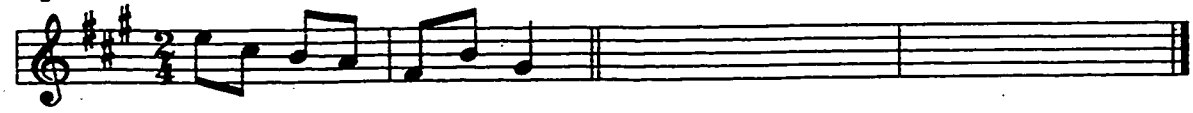
F major, 1st inversion C minor, 2nd inversion G major, root position D diminished, 1st inversion

3c. Write the following chords

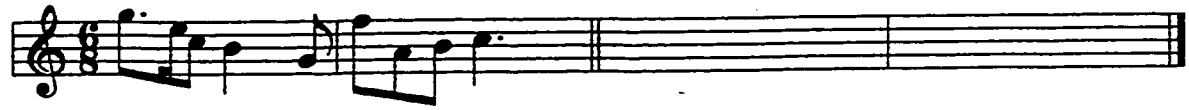
D: IV g-: i6 A: II6 d-: V

4. Transpose by the interval indicated. (Note direction. Give the new key signature!)

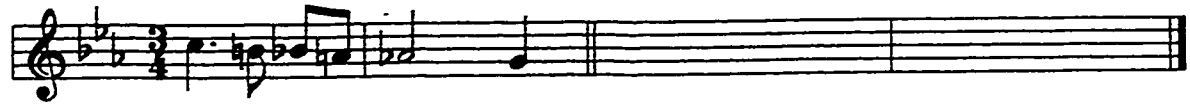
**Up minor 3rd**



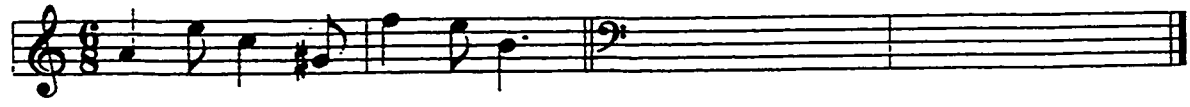
**Down perfect 5th**



**Down minor 3rd**

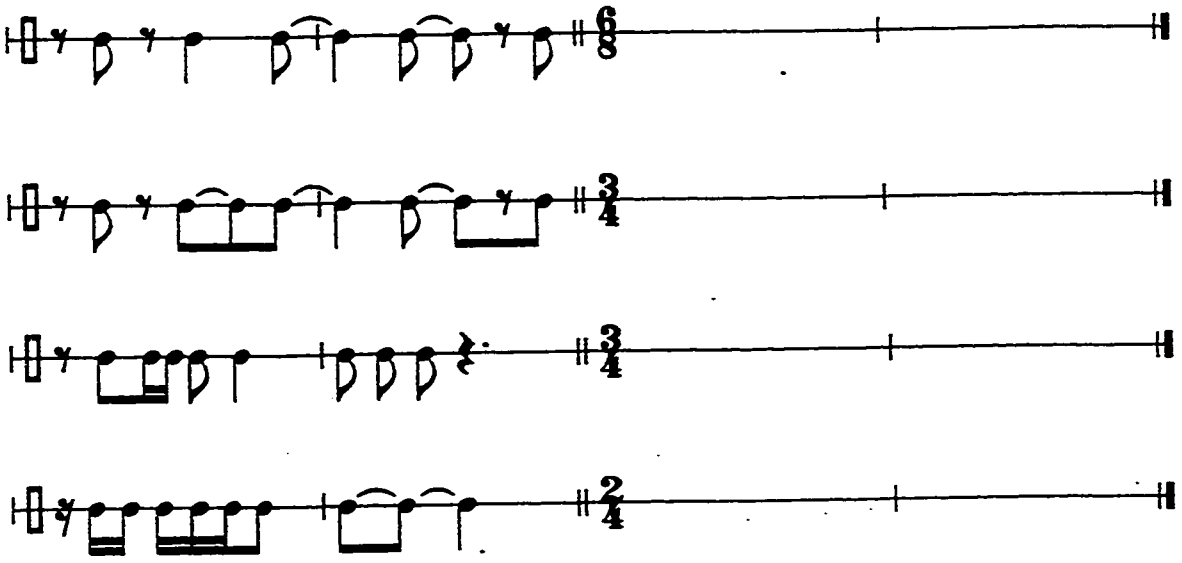


**Down major 9th**



Name: _____

5. Group the following correctly.

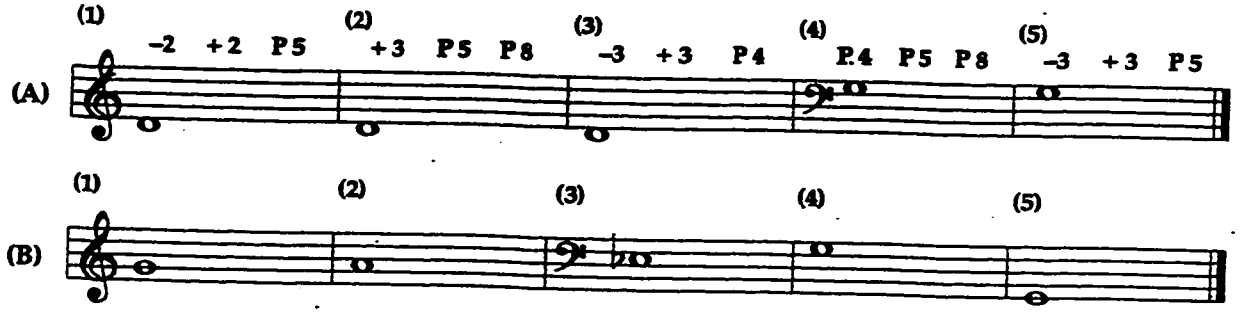



**Scrap staffs to work on**

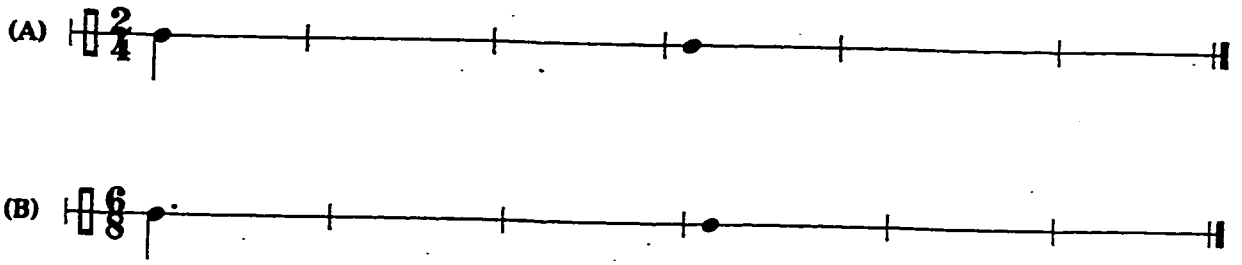
# MUSI 200 :: Quiz III - Dictation

Name: _____

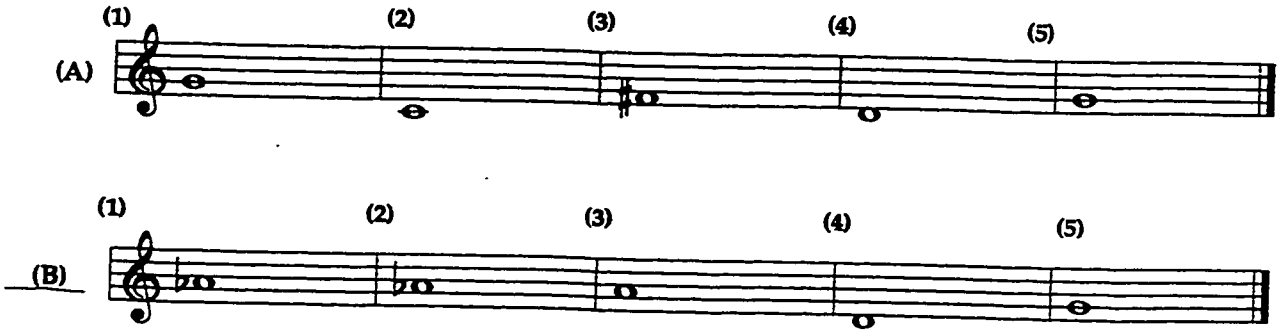
1. Identify and write the interval




2. Rhythmic Dictation




3. Identify the triad, and write it. *(Root position)* Give jazz notation.

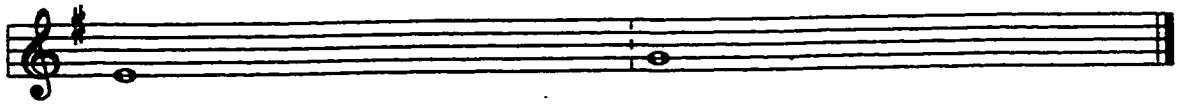


Mid-term - Dictation

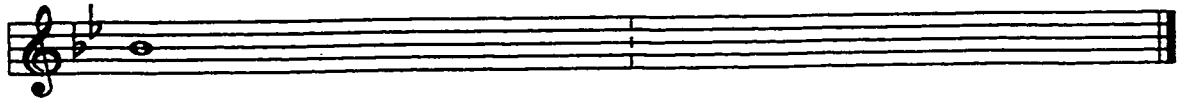
Name: _____

5. Notate the sixteen notes *(no rhythms) (5 times each)*

(A)



(B)

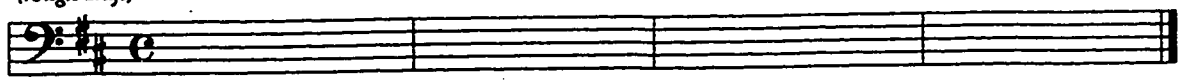


6. Melodic Dictation

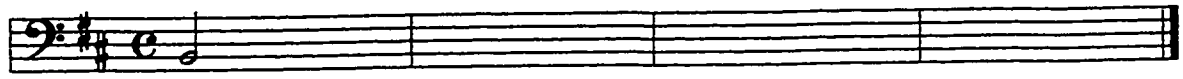
*(rough draft)*

(A)

*(rough draft)*



(B)



## Appendix C

# Collaborative Group Evaluation

Name:_____

**RESULTS ARE CONFIDENTIAL**

Please answer the following questions:
(N.B. CAL refers to Computer-Assisted Learning)

Prior or during this study did you use:

| | |
|---|---|
| CAL | _____ |
| Practica Musica | _____ |
| Other Music Software | _____ |

If yes to either one, please explain briefly:

_____

_____

_____

Indicate your opinion about the following statements by circling the opinion closest to yours.

[1] I enjoyed working in collaboration with my peers:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[2] I feel I would have learned more in a classroom with a teacher:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[3] I enjoyed getting immediate feedback:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[4] I thought working in collaboration with my peers was more efficient (e.g. Better control of schedule):

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[5] I enjoyed working in collaboration with my peers but I think CAL would have been more enjoyable:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[6] I thought working in collaboration with my peers was effective (e.g. I learned something):

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[7] I feel working in collaboration with my peers is a good way to learn at a College or University level:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[8] I could easily focus on my problems and work them out:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[9] In relation to question #8, I feel I would have learned more with a teacher:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[10] I general what would you suggest to improve learning if you were given the task to re-design this programme?

## CAL Self-Study Group Evaluation

Name:_____

**RESULTS ARE CONFIDENTIAL**

Please answer the following questions:
(N.B. CAL refers to Computer-Assisted Learning)

Prior to this study did you already have experience with:

CAL _____
Practica Musica _____
Other Music Software _____

If yes to either one, please explain briefly:

_____

_____

_____

Indicate your opinion about the following statements by circling the opinion closest to yours.

[1] I enjoyed CAL:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[2] I feel I would have learned more in a classroom with a teacher:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[3] I enjoyed getting immediate feedback:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[4] I thought CAL was more efficient (e.g. Better control of schedule):

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

[5] I enjoyed CAL but I think working in collaboration with others would have been more enjoyable:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

6 I thought using CAL was effective (e.g. I learned something):

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

7 I feel CAL is a good learning tool at College or University levels:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

8 I could easily focus on my problems and work them out:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

9 In relation to question #8, I feel I would have learned more with a teacher:

| 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Undecided | Disagree | Strongly disagree | Does not apply |

10 I general what would you suggest to improve learning if you were given the task to re-design this programme?

# Appendix D
# Minitab Data Sheets

**Pretest Theory / CAL vs Coop**
(1 = CAL / 2 = Coop)
Descriptive Statistics

| Variable | calvscol | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| pretheor | 1 | 9 | 38.4 | 32.0 | 38.4 | 32.0 | 10.7 |
| | 2 | 9 | 38.44 | 53.00 | 38.44 | 25.07 | 8.36 |

| Variable | calvscol | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| pretheor | 1 | 0.0 | 86.5 | 11.5 | 72.7 |
| | 2 | 0.00 | 68.00 | 17.00 | 59.00 |

**Pretest Dictation / CAL vs Coop**
(1 = CAL / 2 = Coop)
Descriptive Statistics

| Variable | calvscol | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| predict | 1 | 9 | 16.00 | 10.00 | 16.00 | 15.02 | 5.01 |
| | 2 | 9 | 25.61 | 26.00 | 25.61 | 19.32 | 6.44 |

| Variable | calvscol | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| predict | 1 | 0.00 | 39.00 | 4.00 | 32.50 |
| | 2 | 0.00 | 54.00 | 6.00 | 44.00 |

**Post-test Theory / CAL vs Coop**
(1 = CAL / 2 = Coop)
Descriptive Statistics

| Variable | calvscol | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| posttheo | 1 | 9 | 83.28 | 93.00 | 83.28 | 21.25 | 7.08 |
| | 2 | 9 | 79.61 | 90.00 | 79.61 | 23.15 | 7.72 |

| Variable | calvscol | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| posttheo | 1 | 32.50 | 98.00 | 75.25 | 96.75 |
| | 2 | 26.50 | 100.00 | 67.25 | 94.75 |

**Post-test Dictation / CAL vs Coop**
(1 = CAL / 2 = Coop)
Descriptive Statistics

| Variable | calvscol | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| postdict | 1 | 9 | 79.72 | 84.00 | 79.72 | 17.13 | 5.71 |
| | 2 | 9 | 73.83 | 77.00 | 73.83 | 20.92 | 6.97 |

| Variable | calvscol | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| postdict | 1 | 44.00 | 98.00 | 69.00 | 93.75 |
| | 2 | 41.00 | 100.00 | 54.00 | 93.50 |

**Pretest Theory / Experienced vs Non-Experienced**
(1 = Exp./ 2 = Non-Exp)
Descriptive Statistics

| Variable | exp_lev | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| pretheor | 1 | 8 | 43.31 | 42.50 | 43.31 | 23.13 | 8.18 |
| | 2 | 10 | 34.5 | 26.5 | 32.4 | 31.9 | 10.1 |

| Variable | exp_lev | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| pretheor | 1 | 17.00 | 81.50 | 21.75 | 60.00 |
| | 2 | 0.0 | 86.5 | 1.5 | 65.0 |

**Pretest Dictation / Experienced vs Non-Experienced**
(1 = Exp./ 2 = Non-Exp)
Descriptive Statistics

| Variable | exp_lev | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| predict | 1 | 8 | 31.62 | 34.00 | 31.62 | 15.65 | 5.53 |
| | 2 | 10 | 12.15 | 9.50 | 9.81 | 14.17 | 4.48 |

| Variable | exp_lev | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| predict | 1 | 8.00 | 54.00 | 16.25 | 43.50 |
| | 2 | 0.00 | 43.00 | 0.00 | 22.13 |

**Post-test Theory / Experienced vs Non-Experienced**
(1 = Exp./ 2 = Non-Exp)
Descriptive Statistics

| Variable | exp_lev | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| posttheo | 1 | 8 | 93.69 | 95.25 | 93.69 | 5.96 | 2.11 |
| | 2 | 10 | 71.65 | 77.25 | 74.00 | 24.84 | 7.85 |

| Variable | exp_lev | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| posttheo | 1 | 81.50 | 100.00 | 90.38 | 98.00 |
| | 2 | 26.50 | 98.00 | 57.62 | 91.12 |

**Post-test Dictation / Experienced vs Non-Experienced**
(1 = Exp./ 2 = Non-Exp)
Descriptive Statistics

| Variable | exp_lev | N | Mean | Median | TrMean | StDev | SEMean |
|---|---|---|---|---|---|---|---|
| postdict | 1 | 8 | 88.31 | 93.75 | 88.31 | 14.02 | 4.96 |
| | 2 | 10 | 67.55 | 71.75 | 68.19 | 17.36 | 5.49 |

| Variable | exp_lev | Min | Max | Q1 | Q3 |
|---|---|---|---|---|---|
| postdict | 1 | 60.00 | 100.00 | 78.75 | 99.50 |
| | 2 | 41.00 | 89.00 | 47.00 | 79.50 |

# General Linear Model

| Factor | Levels | Values |
|---|---|---|
| calvscol | 2 | 1 2 |
| exp_lev | 2 | 1 2 |

**Analysis of Variance for Pretest Theory**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|---|---|---|---|---|---|---|
| calvscol | 1 | 31 | 3 | 3 | 0.00 | 0.965 |
| exp_lev | 1 | 439 | 439 | 439 | 0.28 | 0.603 |
| calvscol*exp_lev | 1 | 252 | 252 | 252 | 0.16 | 0.693 |
| Error | 14 | 21725 | 21725 | 1552 | | |
| Total | 17 | 22447 | | | | |

F-test with denominator: Error
Denominator MS = 1551.8 with 14 degrees of freedom

| Numerator | DF | Seq MS | F | P |
|---|---|---|---|---|
| exp_lev | 1 | 438.75 | 0.28 | 0.603 |
| calvscol | 1 | 31.08 | 0.02 | 0.889 |

**Means for Pretest Theory**

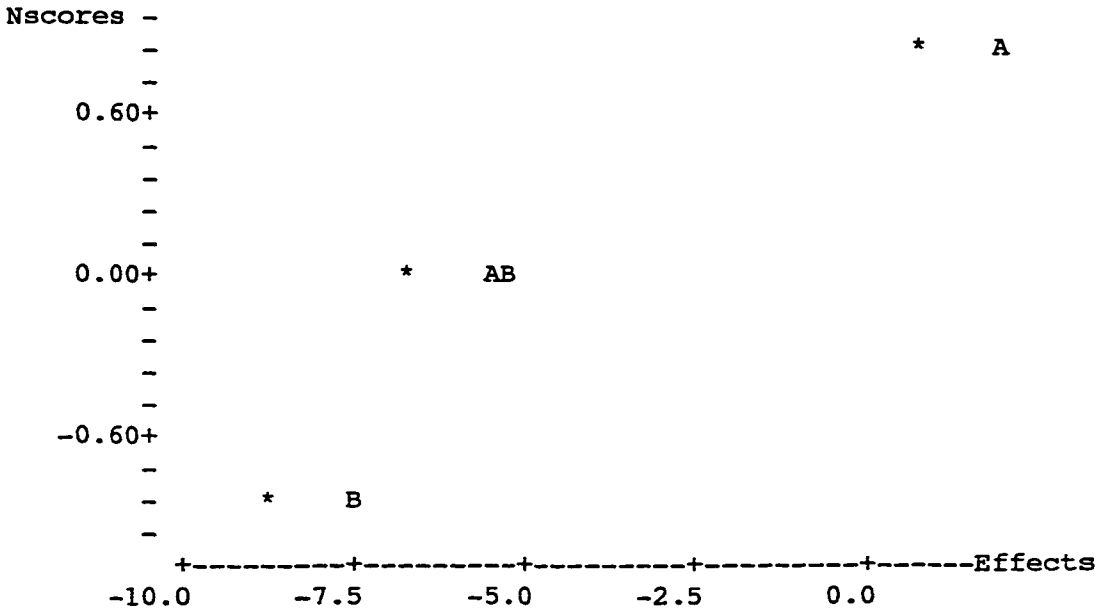
| | Mean | Stdev |
|---|---|---|
| calvscol | | |
| 1 | 38.56 | 11.653 |
| 2 | 39.30 | 11.653 |
| exp_lev | | |
| 1 | 43.31 | 13.927 |
| 2 | 34.55 | 8.808 |

**Estimated Effects and Coefficients for Pretest Theory**

| Term | Effect | Coef | Std Coef | t-value | P |
|---|---|---|---|---|---|
| Constant | | 38.931 | 7.138 | 5.45 | 0.000 |
| calvscol | 0.738 | 0.369 | 7.138 | 0.05 | 0.960 |
| exp_lev | -8.762 | -4.381 | 7.138 | -0.61 | 0.549 |
| calvscol*exp_lev | -6.637 | -3.319 | 7.138 | -0.46 | 0.649 |

**Analysis of Variance for Pretest Theory**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|---|---|---|---|---|---|---|
| Main Effects | 2 | 341.3 | 343.7 | 171.8 | 0.19 | 0.829 |
| 2-Way Interactions | 1 | 195.8 | 195.8 | 195.8 | 0.22 | 0.649 |
| Residual Error | 14 | 12679.9 | 12679.9 | 905.7 | | |
| Pure Error | 14 | 12679.9 | 12679.9 | 905.7 | | |
| Total | 17 | 13216.9 | | | | |




A = calvscol B = exp_lev

**Means for pretest theory**
(-1=CAL/1=Coop)

| | | Mean | Stdev |
|---|---|---|---|
| calvscol | | | |
| -1 | | 38.56 | 10.094 |
| 1 | | 39.30 | 10.094 |
| exp_lev | | | |
| -1 | | 43.31 | 10.640 |
| 1 | | 34.55 | 9.517 |
| calvscol*exp_lev | | | |
| -1 | -1 | 39.63 | 15.047 |
| 1 | -1 | 47.00 | 15.047 |
| -1 | 1 | 37.50 | 13.459 |
| 1 | 1 | 31.60 | 13.459 |

**Estimated Effects and Coefficients for Pretest Dictation**

| Term | Effect | Coef | Std Coef | t-value | P |
|---|---|---|---|---|---|
| Constant | | 21.888 | 3.488 | 6.28 | 0.000 |
| calvscol | 10.075 | 5.037 | 3.488 | 1.44 | 0.171 |
| exp_lev | -19.475 | -9.738 | 3.488 | -2.79 | 0.014 |
| calvscol*exp_lev | -4.175 | -2.088 | 3.488 | -0.60 | 0.559 |

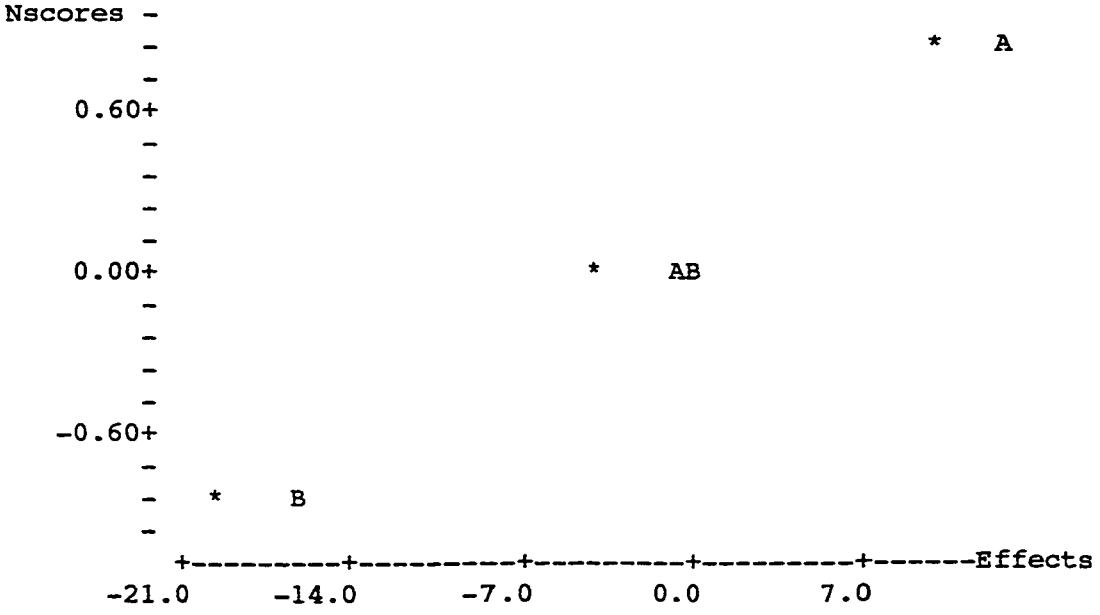
**Analysis of Variance for Pretest Dictation**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|---|---|---|---|---|---|---|
| Main Effects | 2 | 2101.35 | 2136.81 | 1068.40 | 4.94 | 0.024 |
| 2-Way Interactions | 1 | 77.47 | 77.47 | 77.47 | 0.36 | 0.559 |
| Residual Error | 14 | 3027.75 | 3027.75 | 216.27 | | |
| Pure Error | 14 | 3027.75 | 3027.75 | 216.27 | | |
| Total | 17 | 5206.57 | | | | |

**Unusual Observations for Pretest Dictation**

| Obs. | predict | Fit | Stdev.Fit | Residual | St.Resid |
|---|---|---|---|---|---|
| 14 | 43.0000 | 15.1000 | 6.5767 | 27.9000 | 2.12R |

R denotes an obs. with a large st. resid.




A = calvscol B = exp_lev

**Means for Pretest Dictation**

| | | Mean | Stdev |
|---|---|---|---|
| calvscol | | | |
| -1 | | 16.850 | 4.933 |
| 1 | | 26.925 | 4.933 |
| exp_lev | | | |
| -1 | | 31.625 | 5.199 |
| 1 | | 12.150 | 4.650 |
| calvscol*exp_lev | | | |
| -1 | -1 | 24.500 | 7.353 |
| 1 | -1 | 38.750 | 7.353 |
| -1 | 1 | 9.200 | 6.577 |
| 1 | 1 | 15.100 | 6.577 |

**Estimated Effects and Coefficients for post-test theory**

| Term | Effect | Coef | Std Coef | t-value | P |
|---|---|---|---|---|---|
| Constant | | 82.67 | 4.748 | 17.41 | 0.000 |
| calvscol | -3.06 | -1.53 | 4.748 | -0.32 | 0.752 |
| exp_lev | -22.04 | -11.02 | 4.748 | -2.32 | 0.036 |
| calvscol*exp_lev | -5.44 | -2.72 | 4.748 | -0.57 | 0.576 |

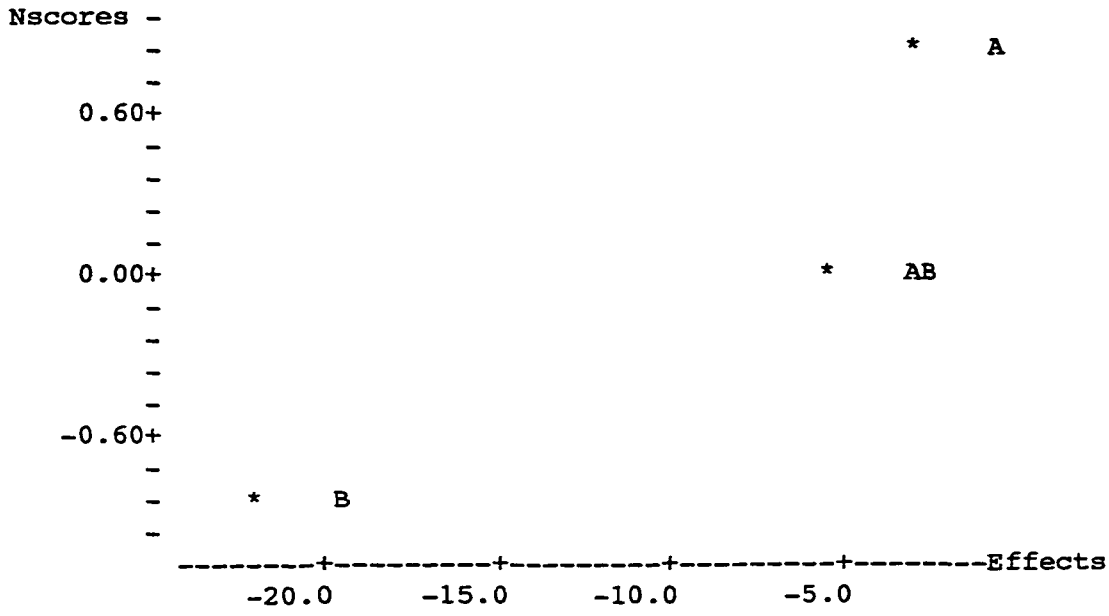
**Analysis of Variance for post-test theory**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|---|---|---|---|---|---|---|
| Main Effects | 2 | 2218.95 | 2200.13 | 1100.1 | 2.75 | 0.099 |
| 2-Way Interactions | 1 | 131.41 | 131.41 | 131.4 | 0.33 | 0.576 |
| Residual Error | 14 | 5610.09 | 5610.09 | 400.7 | | |
| Pure Error | 14 | 5610.09 | 5610.09 | 400.7 | | |
| Total | 17 | 7960.44 | | | | |

**Unusual Observations for post-test theory**

| Obs. | posttheo | Fit | Stdev.Fit | Residual | St.Resid |
|---|---|---|---|---|---|
| 4 | 32.500 | 75.900 | 8.952 | -43.400 | -2.42R |
| 11 | 26.500 | 67.400 | 8.952 | -40.900 | -2.28R |

R denotes an obs. with a large st. resid.




A = calvscol B = exp_lev

**Means for post-test theory**

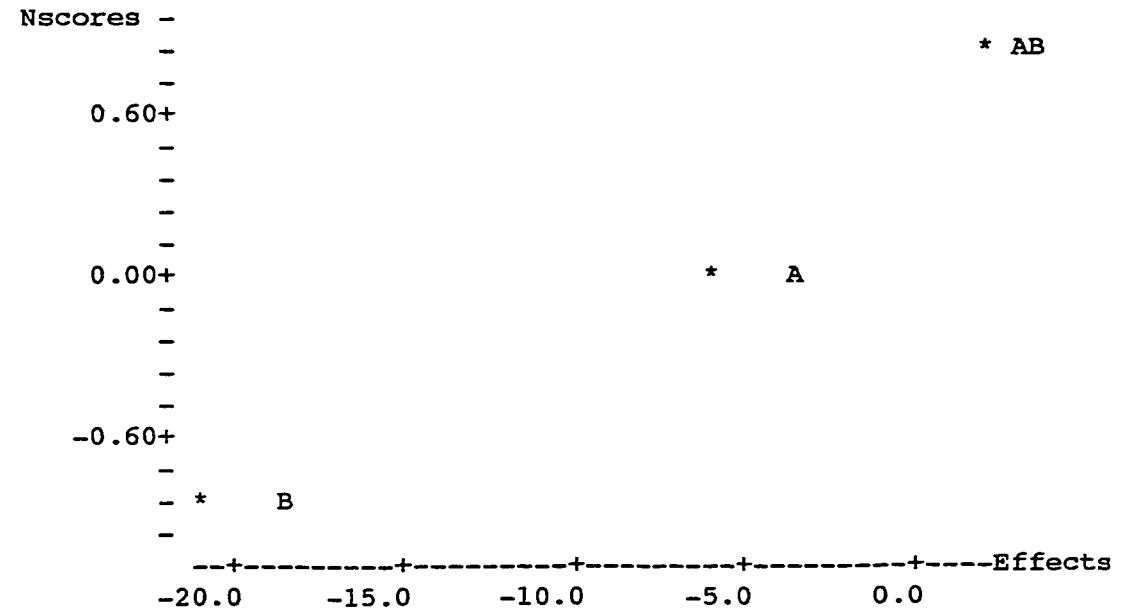
| | | Mean | Stdev |
|---|---|---|---|
| calvscol | | | |
| -1 | | 84.20 | 6.714 |
| 1 | | 81.14 | 6.714 |
| exp_lev | | | |
| -1 | | 93.69 | 7.077 |
| 1 | | 71.65 | 6.330 |
| calvscol*exp_lev | | | |
| -1 | -1 | 92.50 | 10.009 |
| 1 | -1 | 94.87 | 10.009 |
| -1 | 1 | 75.90 | 8.952 |
| 1 | 1 | 67.40 | 8.952 |

**Estimated Effects and Coefficients for post-test dictation**

| Term | Effect | Coef | Std Coef | t-value | P |
|---|---|---|---|---|---|
| Constant | | 77.93 | 3.965 | 19.66 | 0.000 |
| calvscol | -6.11 | -3.06 | 3.965 | -0.77 | 0.454 |
| exp_lev | -20.76 | -10.38 | 3.965 | -2.62 | 0.020 |
| calvscol*exp_lev | 2.01 | 1.01 | 3.965 | 0.25 | 0.803 |

**Analysis of Variance for post-test dictation**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|---|---|---|---|---|---|---|
| Main Effects | 2 | 2071.97 | 2081.97 | 1040.99 | 3.72 | 0.050 |
| 2-Way Interactions | 1 | 18.00 | 18.00 | 18.00 | 0.06 | 0.803 |
| Residual Error | 14 | 3912.64 | 3912.64 | 279.47 | | |
| Pure Error | 14 | 3912.64 | 3912.64 | 279.47 | | |
| Total | 17 | 6002.61 | | | | |




A = calvscol B = exp_lev

**Means for post-test dictation**

| | | Mean | Stdev |
|---|---|---|---|
| calvscol | | | |
| -1 | | 80.99 | 5.607 |
| 1 | | 74.88 | 5.607 |
| exp_lev | | | |
| -1 | | 88.31 | 5.911 |
| 1 | | 67.55 | 5.287 |
| calvscol*exp_lev | | | |
| -1 | -1 | 92.37 | 8.359 |
| 1 | -1 | 84.25 | 8.359 |
| -1 | 1 | 69.60 | 7.476 |
| 1 | 1 | 65.50 | 7.476 |

**One-Way Analysis of Variance for Experience Group**

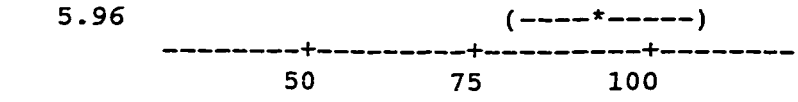
Analysis of Variance on outcomeT

| Source | DF | SS | MS | F | p |
|---|---|---|---|---|---|
| prepostT | 1 | 10151 | 10151 | 35.59 | 0.000 |
| Error | 14 | 3992 | 285 | | |
| Total | 15 | 14143 | | | |

| Level | N | Mean | StDev |
|---|---|---|---|
| 1 | 8 | 43.31 | 23.13 |
| 2 | 8 | 93.69 | 5.96 |

Pooled StDev = 16.89

Individual 95% CIs For Mean
Based on Pooled StDev




Tukey's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 3.03

Intervals for (column level mean) - (row level mean)

| | 1 |
|---|---|
| 2 | -68.47<br>-32.28 |

Fisher's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.0500

```
Critical value = 2.145

Intervals for (column level mean) - (row level mean)

               1

     2    -68.49
          -32.26


MTB > Oneway 'outcomeD' 'prepostD';
SUBC>   Tukey 5;
SUBC>   Fisher 5.

One-Way Analysis of Variance

Analysis of Variance on outcomeD
Source     DF        SS        MS        F        p
prepostD    1     12854     12854    58.25    0.000
Error      14      3089       221
Total      15     15943

                                  Individual 95% CIs For Mean
                                  Based on Pooled StDev
 Level      N      Mean     StDev  --+---------+---------+---------+----
     1      8     31.62     15.65  (----*---)
     2      8     88.31     14.02                       (---*----)
                                  --+---------+---------+---------+----
Pooled StDev =    14.85              25        50        75       100

Tukey's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 3.03

Intervals for (column level mean) - (row level mean)

               1

     2    -72.60
          -40.77


Fisher's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 2.145
```

Intervals for (column level mean) - (row level mean)

| | 1 |
|---|---|
| 2 | -72.62<br>-40.76 |

**One-Way Analysis of Variance for Non-Experience Group**

Analysis of Variance on outcomeT

| Source | DF | SS | MS | F | p |
|---|---|---|---|---|---|
| prepostT | 1 | 6882 | 6882 | 8.44 | 0.009 |
| Error | 18 | 14685 | 816 | | |
| Total | 19 | 21567 | | | |

| Level | N | Mean | StDev |
|---|---|---|---|
| 1 | 10 | 34.55 | 31.85 |
| 2 | 10 | 71.65 | 24.84 |

Pooled StDev = 28.56

Individual 95% CIs For Mean
Based on Pooled StDev

```
----+---------+---------+---------+--
(-------*------)
                (-------*------)
----+---------+---------+---------+--
   25        50        75       100
```

Tukey's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 2.97

Intervals for (column level mean) - (row level mean)

| | 1 |
|---|---|
| 2 | -63.93<br>-10.27 |

Fisher's pairwise comparisons

Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 2.101

```
Intervals for (column level mean) - (row level mean)

               1

     2    -63.94
          -10.26


MTB > Oneway 'outcomeD' 'prepostD';
SUBC>   Tukey 5;
SUBC>   Fisher 5.

One-Way Analysis of Variance

Analysis of Variance on outcomeD
Source     DF        SS        MS         F        p
prepostD    1     15346     15346     61.14    0.000
Error      18      4518       251
Total      19     19864
                                    Individual 95% CIs For Mean
                                    Based on Pooled StDev
 Level      N      Mean     StDev  ----------+---------+---------+------
     1     10     12.15     14.17   (---*---)
     2     10     67.55     17.36                      (---*---)
                                    ----------+---------+---------+------
Pooled StDev =    15.84              25        50        75

Tukey's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 2.97

Intervals for (column level mean) - (row level mean)

               1

     2    -70.28
          -40.52


Fisher's pairwise comparisons

    Family error rate = 0.0500
Individual error rate = 0.0500

Critical value = 2.101

Intervals for (column level mean) - (row level mean)

               1

     2    -70.29
          -40.51
```

## Appendix E
## Example of an Instructional Analysis for a Lesson Unit on Teaching Learners How to Use MOSAIC (A Notation Software)

### Goal

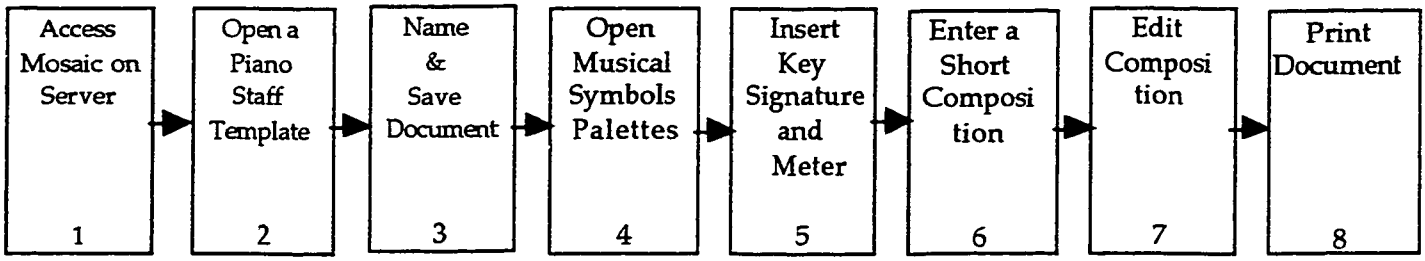
Student will be able to operate MOSAIC (a Music Notation Software) by entering, editing, saving and printing a short composition on a Piano Staff.

### Type Of Learning

This is an intellectual skill goal, using concrete concepts because it requires the selection, identification and use of a number of acquired concepts.

### Information Processing Analysis

The information-processing analysis starts with the expert accessing the Music Notation Program and transcribing a short composition, using the various functions of the MOSAIC software, then ending with the expert naming, saving and printing the document.



## Prerequisite Analysis

1.- Access Mosaic on server

1.1.- Given User Name and Password log on Server.

1.2.- Once on Server can locate and open MOSAIC application.

2.- Open a Piano Staff Template

2.1.- Given opened MOSAIC application can locate and open template folder

2.2.1.- Given a series of Templates, can locate a Piano Staff file.

2.2.2.- Can describe what is meant by Template and File.

2.3.- Given menus in application can locate Views from Windows menu and open page view

2.3.1.- Can describe page view and window menus

2.4.- When in Views from window menu, can locate page view

3.- Name and Save Document

3.1.- Given opened MOSAIC application can locate and open Text Palette

3.1.1.- Can select a Text Palette and recognize the various Text Types

3.1.1.1.- Given various Text Types can identify Page Text

3.2.- Can select Font Types, Sizes and Styles from Text menu

3.2.1.- Define Fonts

3.3.- Can create a Header or a Footer

3.3.1.- Can enter "New Title" in Header

3.4.- Can locate Save as... from File Menu

3.4.1.- Summarize Name and Save New File

3.4.1.1 {Entry Level}.- Knows the basics of Macintosh Commands

4.- Open Musical Symbols Palette

4.1.- In a page view can locate Articulation Palette from the Palettes Window.

4.1.1.- Can identify the various symbols from an Articulation Palette

4.2.- In a page view can locate Barlines Palette from the Palettes Window.

4.2.1.- Can identify the various symbols in a Barlines Palette

4.3.- In a page view can locate Dynamics Palette from the Palettes Window.

4.3.1.- Can identify the various symbols in a Dynamics Palette

4.4.- In a page view can locate Groupings Palette from the Palettes Window.

4.4.1.- Can identify the various symbols in a Groupings Palette

4.5.- In a page view can locate Notes Palette from the Palettes Window.

4.5.1.- Can identify the various symbols in a Notes Palette

4.6.- In a page view can locate Rests Palette from the Palettes Window.

4.6.1.- Can identify the various symbols in a Rests Palette

4.7.- In a page view can locate Text Palette from the Palettes Window.

4.7.1.- Can identify the various symbols in a Text Palette

4.X.- Define Musical Symbols

5.- Insert Key Signature and Meter

5.1.- In a page view can locate upper Grand Staff

5.1.1.- Can identify Bass and Treble Clef

5.1.1.1- Can place correct Clefs on a Grand Staff

5.2.- In page view insert cursor on upper Grand Staff

5.3.- In a page view with a Grand Staff can locate Change Key from Region menu

5.3.1.- Given a Change Key window choose correct Key Signature

5.3.1.1.- Can describe a Key Signature

5.4.- In a page view with a Grand Staff can locate Change Meter from Region menu

5.4.1.- Given a Change Meter window can identify correct Time Signature

5.4.1.1.-Can describe and differentiate Meter and Time Signatures

6.- Enter a short Composition

6.1.- In a page view with a Grand Staff and correct Time and Key Signatures can select proper palettes for Notation

6.1.1.- Can recognize Whole, 1/2, 1/4, 1/8, 1/16, 1/32 Notes and Rests

6.1.2.- Can recognize the various Groupings

6.1.3.- Can recognize the various Dynamics

6.1.4.- Can recognize the various Barlines

6.1.5.- Can recognize the various Articulations

6.2.- In a page view with a Grand Staff can select correct staff for Note entry

6.2.1.- Can classify Notes as Treble or Bass

6.3.- In a page view with a Grand Staff can enter Notes, Groupings, Dynamics, Barlines and Articulations using Mouse And Qwerty Keyboard

6.3.1 {Entry Level}.- Knows the basics of music notation.

6.3.2 {Entry Level}.- Knows the basics of Macintosh Commands

7.- Edit Composition

7.1.- In a page view with a Short Composition on a Grand Staff can select Notes and Rests using Mouse or Qwerty Keyboard

7.1.1.- Can modify, replace or delete selected Notes or Rests

7.1.1.1.- Given Selected Notes to modify can recognize different Note Values from Notes Palette

7.1.1.2.- Given Selected Notes to modify can recognize Sharps, Flats and Naturals from Notes Palette

7.2.- In a page view with a Short Composition on a Grand Staff can select Groupings, Dynamics, Barlines and Articulations using Mouse or Qwerty Keyboard

7.2.1.- Can modify, replace or delete selected Groupings, Dynamics, Barlines and Articulations

7.2.1.1.- Given Selected Groupings, Dynamics, Barlines and Articulations to modify can recognize different Groupings, Dynamics, Barlines and Articulation Values from Groupings, Dynamics, Barlines and Articulations Palettes

8.- Print Document

8.1.- In a page view in MOSAIC with a Short Composition on a Grand Staff can locate Print from File menu

8.1.1.- Can open Print Dialogue Box

8.1.2.- Can identify Print attributes in Print Dialogue Box

## Performance Objectives

**Terminal Objective for #6.- Enter a short Composition :**

Given a page view with a Grand Staff and correct Time and Key Signatures, and having the proper palettes for Notation selected, the learner will be able to enter a short composition with the correct pitches, groupings, dynamics and bar line delimitation.

**Objective 1.** Given a page view with a Grand Staff and correct Time and Key Signatures, the learner will be able to choose the proper palettes necessary for correct note entry of a music partition.

**Objective 2.** Given the opened Note and Rest palettes the learner will be able to identify and select the appropriate note and rest classification required for the composition, then insert them on the Grand Staff.

**Objective 3.** Given the opened Groupings palette the learner will be able to select and insert the appropriate grouping classification required for the composition.

**Objective 4.** Given the opened Dynamics palette the learner will be able to select and insert the appropriate dynamics required for the composition. Example: choosing from *p* to*ppp* and *f* to *fff*.

**Objective 5.** Given the opened Barlines palette the learner will be able to select and insert barlines for the proper division of the composition, including repeat and end barlines.

**Objective 6.** Given the opened Articulation palette the learner will be able to select and insert the appropriate dynamics required for the composition, this palette gives a variety but the learner will be able choose the ones he is familiar with.

**Objective 7.** Given a page view with a Grand Staff, the learner can correctly identify the sections of a Grand Staff and decide where the notes need to be entered.

**Objective 8.** Given two staves in Bass and Treble clef the learner can identify and name each spaces and lines on the appropriate staff.

**Objective 9.** Given a page view with a Grand Staff the learner can enter Notes, Groupings, Dynamics, Barlines and Articulations using Mouse And Qwerty Keyboard .

**Objective 10.** Given a composition the learner can identify all the major components and rules associated with the writing of a musical piece.

**Objective 11.** The learner can identify all the major commands of the Macintosh environment.

**Terminal Objective for #7.- Edit Composition :**
Given a page view in MOSAIC with a Composition on a Grand Staff, the learner can access the different editing tools and various palettes, in order to perform concise editing functions.

**Objective 1.** Given a page view with a Short Composition on a Grand Staff the learner can identify and select correct Notes and Rest values using Mouse or Qwerty Keyboard.

**Objective 2.** Given a page view with a Short Composition on a Grand Staff the learner can modify, replace or delete selected Notes or Rests using Mouse or Qwerty Keyboard.

**Objective 3.** Given Selected Notes to modify, the learner can manipulate the various Note Values from Notes Palette.

**Objective 4.** Given a page view with a Short Composition on a Grand Staff the learner can discriminate and select from among the various Groupings, Dynamics, Barlines and Articulations using Mouse or Qwerty Keyboard.

**Objective 5.** Given a page view with a Short Composition on a Grand Staff , the learner can modify, replace or delete selected Groupings, Dynamics, Barlines and Articulations.

**Objective 6.** Given Selected Groupings, Dynamics, Barlines and Articulations to modify, the learner can recognize different Groupings, Dynamics, Barlines and Articulation Values from the appropriate Palettes.

## Purpose Of Assessment And Model

The purpose of the assessment is to evaluate how fluently the learner can use software to notate a musical composition, and assess his overall knowledge and skills in using this new tool to perform a familiar task. Therefore, a criterion-referenced model will be used.

## Types Of Assessments

Entry level tests will not be needed, as all learners will be composition students or teachers, seeking to apply a prior knowledge craft (notation on paper) using a new media. But a pre-assessment test could be conducted on the student learners to determine the *degree* of prior knowledge. The post assessment will be given immediately following the instruction.The assessment will be done in lab, using both pencil and paper test and computer.

## Instrument Blueprint

**Objectives.-**

Due to the nature of the instruction and time constraints only the following steps and their corresponding top levels will be assessed: 2-3-4-5-6-8. Step 7 is omitted because of the response characteristics of step 6 should indicate sufficient knowledge to successfully accomplish step 7.

**Forms of Items.-**

The item will be in multiple-choice (containing foils) and short answer form. Part of the item will also contain diagrams.

**Total # of items in instrument.-**

13

**Proportionality of items.-**

The number of items that should be used to assess each step is as follows:
Step 2 (2) - Step 3 (2) - Step 4 (2) - Step 5 (2) - Step 6 (3) - Step 8 (2)

**Directions for administration.-**

During the exam, the student may have his/her notes, and the use of the computer is permitted. Answers will be written on a supplied answer sheet.

**Scoring methods.-**

A scoring key will be attached.

**Weighting of items.-**

Each correct item in Steps 2, 3 and 4 should be scored with 1 point and each correct item in Steps 5, 6 and 8 should be scored with 2 points, for a total of 20.

**Passing or cutoff level.-**

At least two of three items must be correct for step 6, and the total score should be 13.

**Examples Of Assessment Items**

**Test example for Step 2**

Place the following list of opening a template in the correct chronological order.

Go to FILE and choose SAVE AS...
Open application
Give the file a name and SAVE
Find TEMPLATE folder
Choose correct file
Go to FILE and choose Open
Open TEMPLATE folder

**Test example for Step 3**

Associate the list of commands on the left to the correct chronological steps from the list on the right.

• List of Commands

a) Click on Page Text
b) Enter Name In Header Area
c) Go to FILE and choose SAVE AS...
d) Go to Palette menu and choose
Text Palette
e) Click SAVE
f) Delimit Header area
g) Give the File a name
h) Go to Text Palette and choose Page Text

• List of Steps

1. Naming Step 1.-
2. Naming Step 2.-
3. Naming Step 3.-
4. Naming Step 4.-
5. Naming Step 5.-
6. Saving Step 1.-
7. Saving Step 2.-
8. Saving Step 3.-

**Test example for Step 4**

Write the Music Symbols for the following:

1. Soft
2. Crescendo
3. Quarter-note
4. Eighth rest
5. 2 half-notes tied
6. Quarter-note triplet
7. Numbered Box Ending
8. Hairpin Decrescendo
9. Medium Loud
10. Fermata
11. Staccato Eighth-note
12. Left and right repeat barlines

**Test example for Step 6**

Associate the appropriate Palettes from the list to the correct Procedure.

• List of Palettes

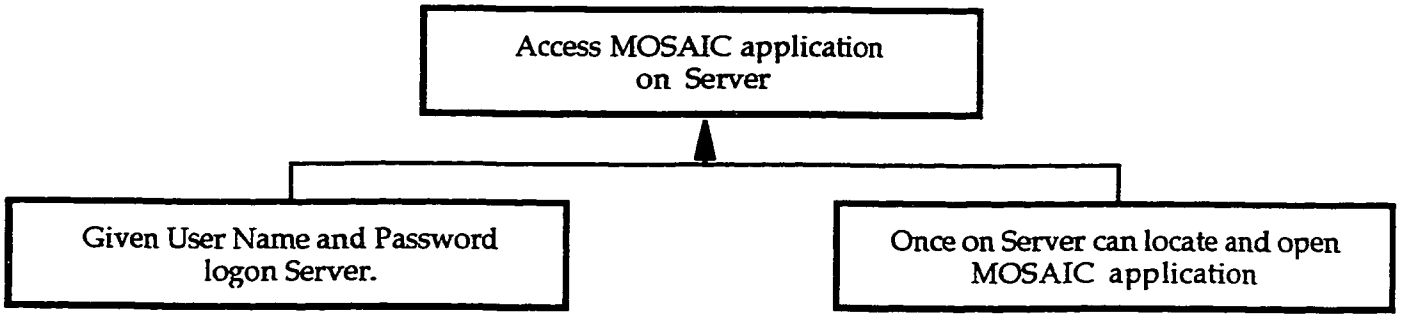
a) Articulation Palette
b) Notes Palette
c) Barline Palette
d) Dynamics Palette
e) Groupings Palette
f) Ornaments Palette
g) Rests Palette
d) Text Palette

• Procedure

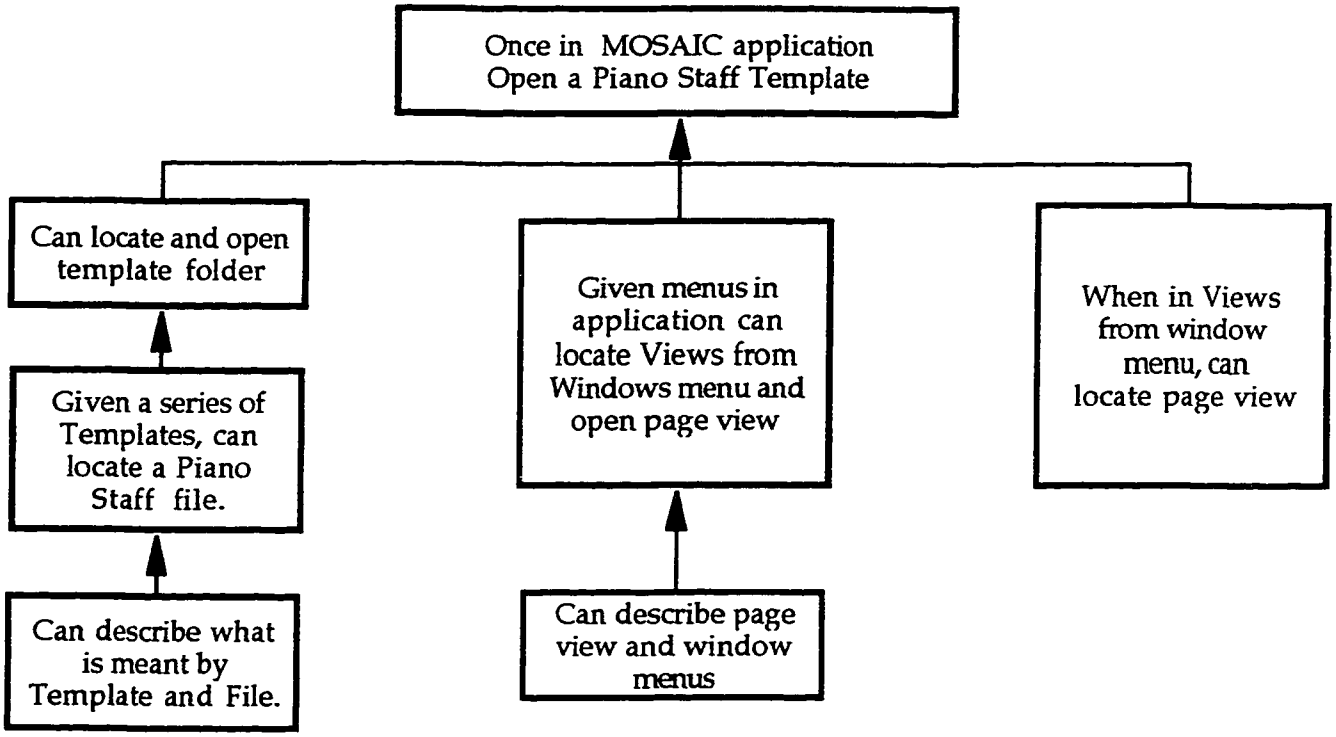
1. You want to put a slur over a 4 notes.
2. You want to add a sharp.
3. You want to write Rehearsal Mark.
4. You want to change a half note to a quarter note and a rest.
5. You want to add a Staff Brace.
6. You want to add a doted value to a note.
7. You want to put in a Metronome Marking.
8. You want to add a crescendo.
9. You want to put in a repeat.
10. You want to accent a note.

## Prerequisite Analysis Diagrams

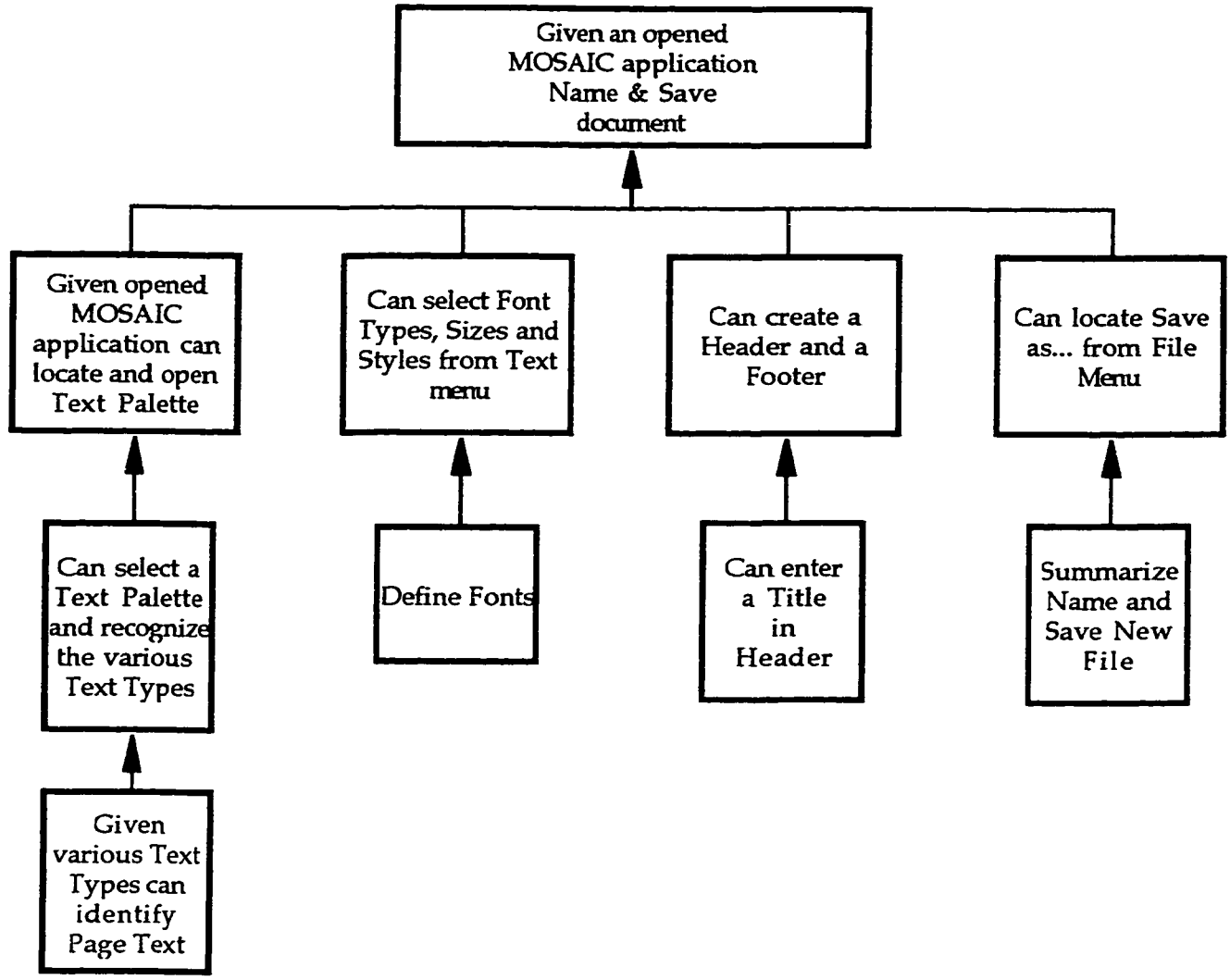
STEP # 1




STEP # 2



STEP # 3

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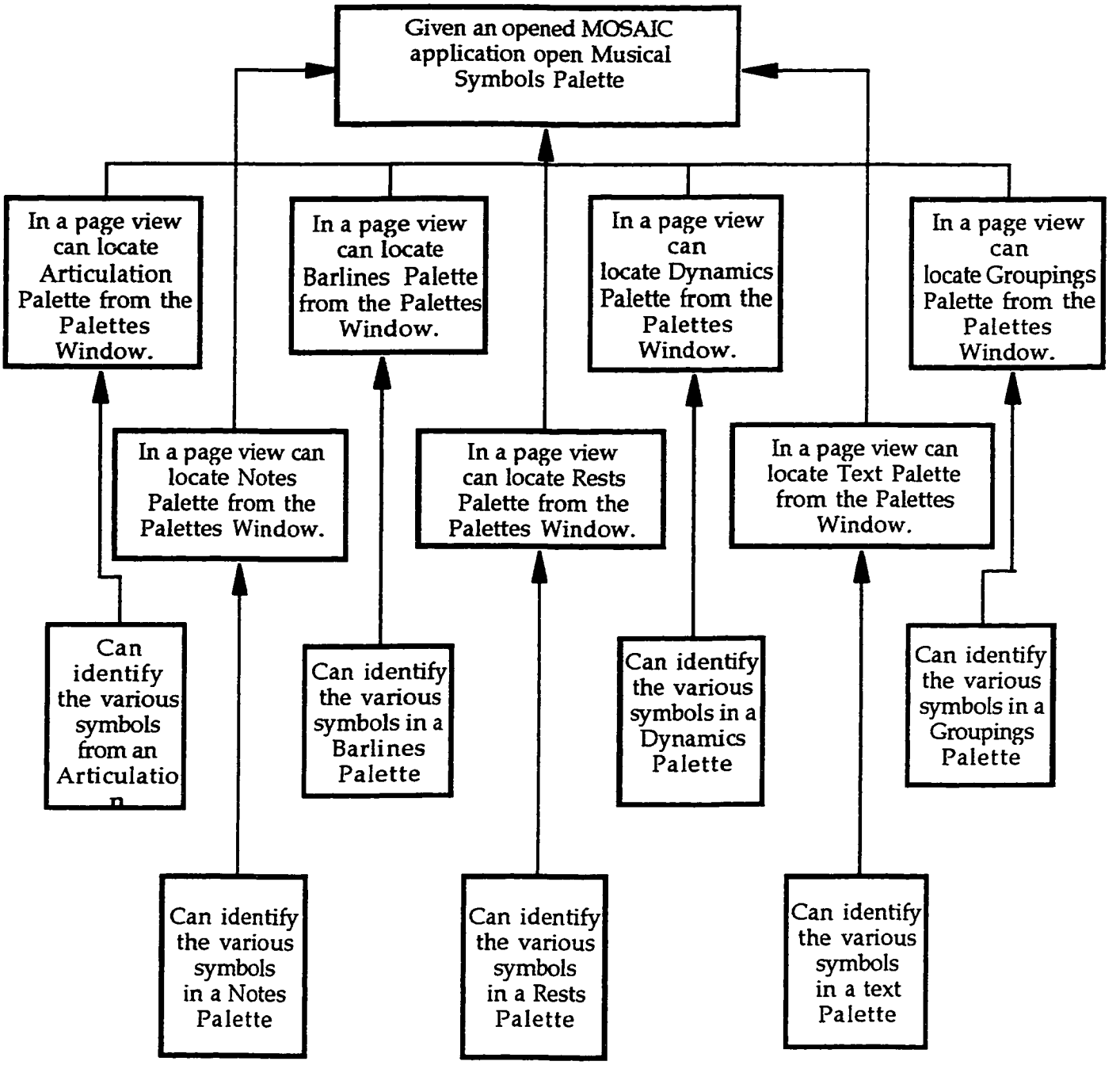
Knows the basics of Macintosh Commands

STEP # 4

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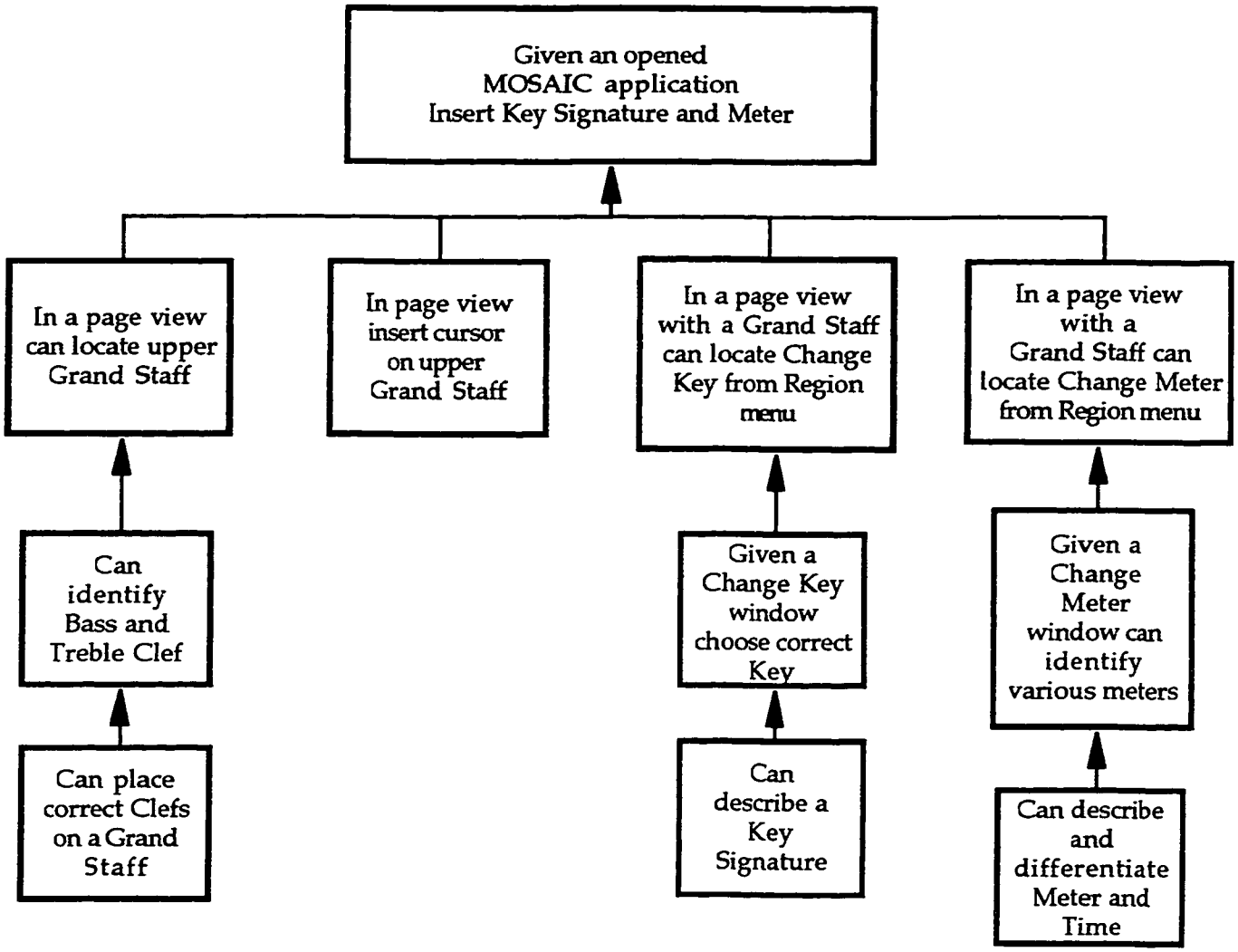
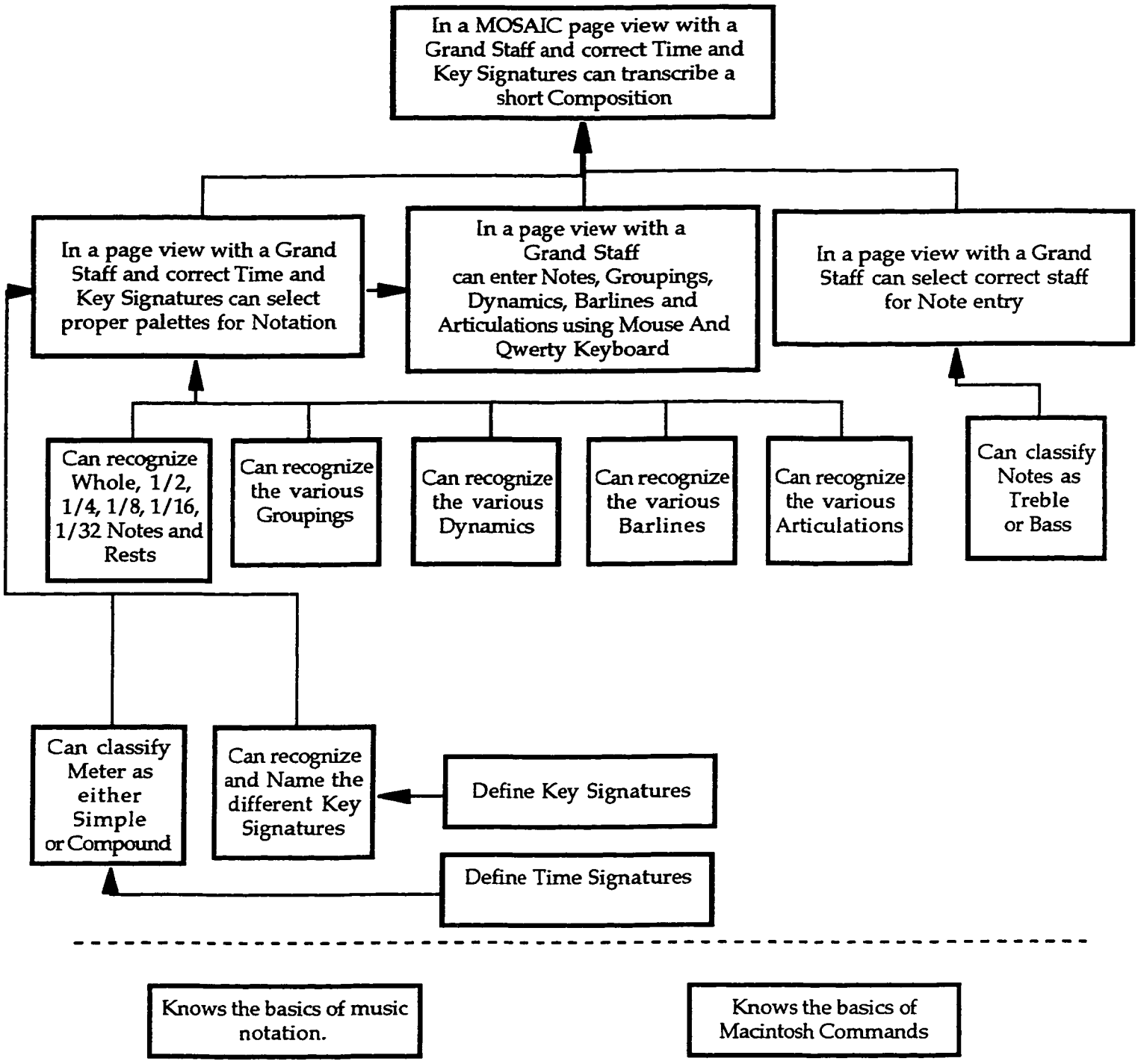
Define Musical Symbols

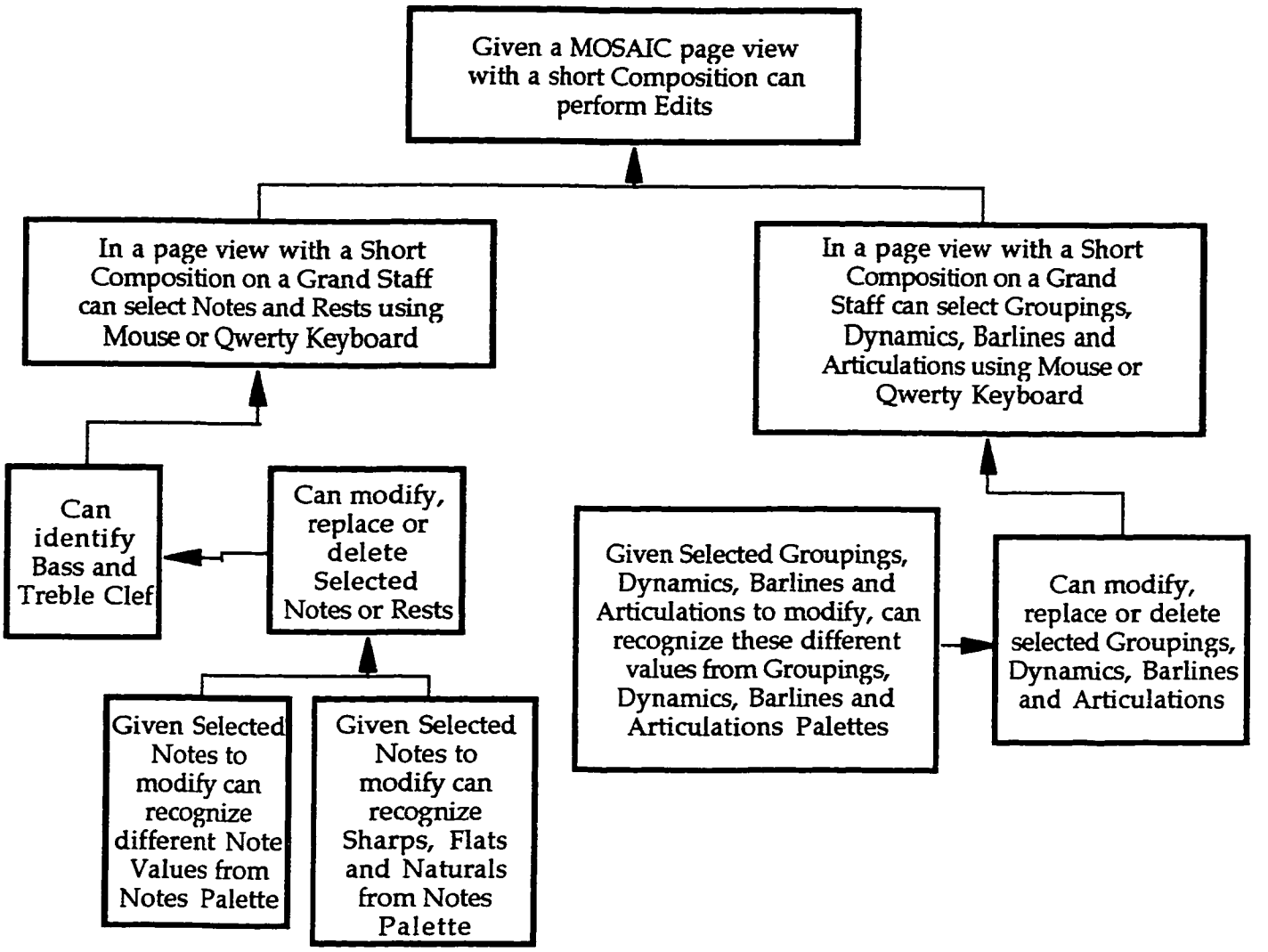
STEP # 5


Given an opened MOSAIC application Insert Key Signature and Meter
In a page view can locate upper Grand Staff
In page view insert cursor on upper Grand Staff
In a page view with a Grand Staff can locate Change Key from Region menu
In a page view with a Grand Staff can locate Change Meter from Region menu
Can identify Bass and Treble Clef
Can place correct Clefs on a Grand Staff
Given a Change Key window choose correct Key
Can describe a Key Signature
Given a Change Meter window can identify various meters
Can describe and differentiate Meter and Time

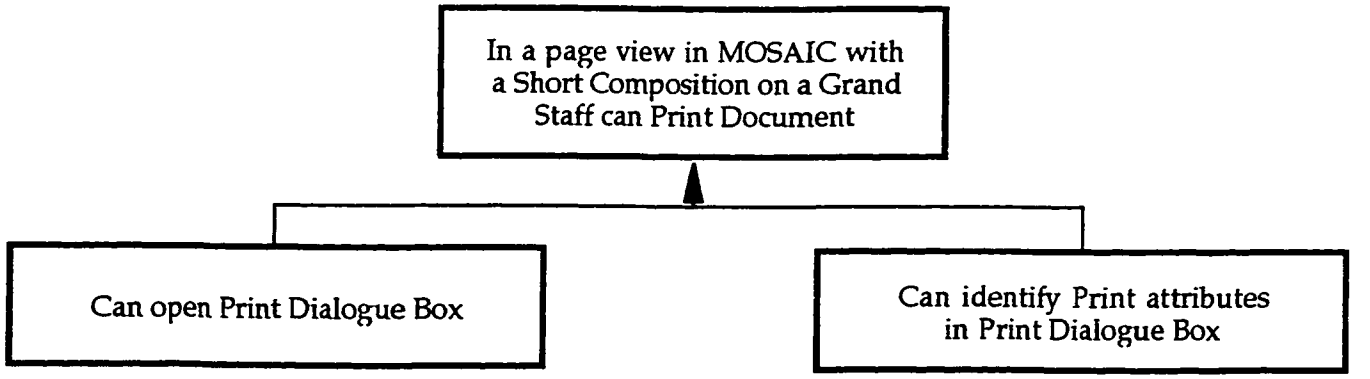
STEP # 6


In a MOSAIC page view with a Grand Staff and correct Time and Key Signatures can transcribe a short Composition
In a page view with a Grand Staff and correct Time and Key Signatures can select proper palettes for Notation
In a page view with a Grand Staff can enter Notes, Groupings, Dynamics, Barlines and Articulations using Mouse And Qwerty Keyboard
In a page view with a Grand Staff can select correct staff for Note entry
Can recognize Whole, 1/2, 1/4, 1/8, 1/16, 1/32 Notes and Rests
Can recognize the various Groupings
Can recognize the various Dynamics
Can recognize the various Barlines
Can recognize the various Articulations
Can classify Notes as Treble or Bass
Can classify Meter as either Simple or Compound
Can recognize and Name the different Key Signatures
Define Key Signatures
Define Time Signatures
Knows the basics of music notation.
Knows the basics of Macintosh Commands

STEP # 7


Given a MOSAIC page view with a short Composition can perform Edits
In a page view with a Short Composition on a Grand Staff can select Notes and Rests using Mouse or Qwerty Keyboard
In a page view with a Short Composition on a Grand Staff can select Groupings, Dynamics, Barlines and Articulations using Mouse or Qwerty Keyboard
Can identify Bass and Treble Clef
Can modify, replace or delete Selected Notes or Rests
Given Selected Groupings, Dynamics, Barlines and Articulations to modify, can recognize these different values from Groupings, Dynamics, Barlines and Articulations Palettes
Can modify, replace or delete selected Groupings, Dynamics, Barlines and Articulations
Given Selected Notes to modify can recognize different Note Values from Notes Palette
Given Selected Notes to modify can recognize Sharps, Flats and Naturals from Notes Palette

STEP # 8


In a page view in MOSAIC with a Short Composition on a Grand Staff can Print Document
Can open Print Dialogue Box
Can identify Print attributes in Print Dialogue Box

## Appendix F

## Instructional Strategies for a Lesson Unit on Teaching Learners How to Use MOSAIC (A Notation Software)


### Abstract

The following lesson is part of a larger instructional unit. This section of the unit, however, is most important, as it is the core of the unit. Since we are dealing with an intellectual skill, the instruction will be designed according to both concept and prerequisite-based strategies. Therefore, the macro-strategy was based on the Elaboration Theory devised by Reiguluth.

This Lesson-level instruction uses Smith and Ragan's Expanded Instructional Events (based on R. Gagné's nine events of instruction) as the Organizational Strategy. In order to produce meaningful and interesting instruction, Keller's ARCS Model was also used throughout the lesson.This was done by weaving Keller's motivational strategies throughout the instructional design process.

## Instructional Strategies

### 1. Course and Lesson Organization Plan

- The following diagrams show how the lesson on Entering a Short Composition in computer- based notation software (#6 in my Information Processing Analysis) fits within a course or unit.

- The Elaboration Model was chosen as the macro-strategy for the course: Introduction to MOSAIC's Music Notation Program.

- Figure 1.1 shows the structure of the overarching concepts and procedures (the epitome) for the unit on how to enter a composition in a computer based application. Comparing standard notation and MOSAIC's computer- based notation software.

- Figure 1.2 shows the first level of elaboration, introducing the relationship between standard notation symbols and symbols palettes in more detail.

- Figure 1.3 shows the second level of elaboration, which relates the symbols palettes and the use of different input devices as tools for notating and entering a music composition.

# Figure 1.1
# Epitome

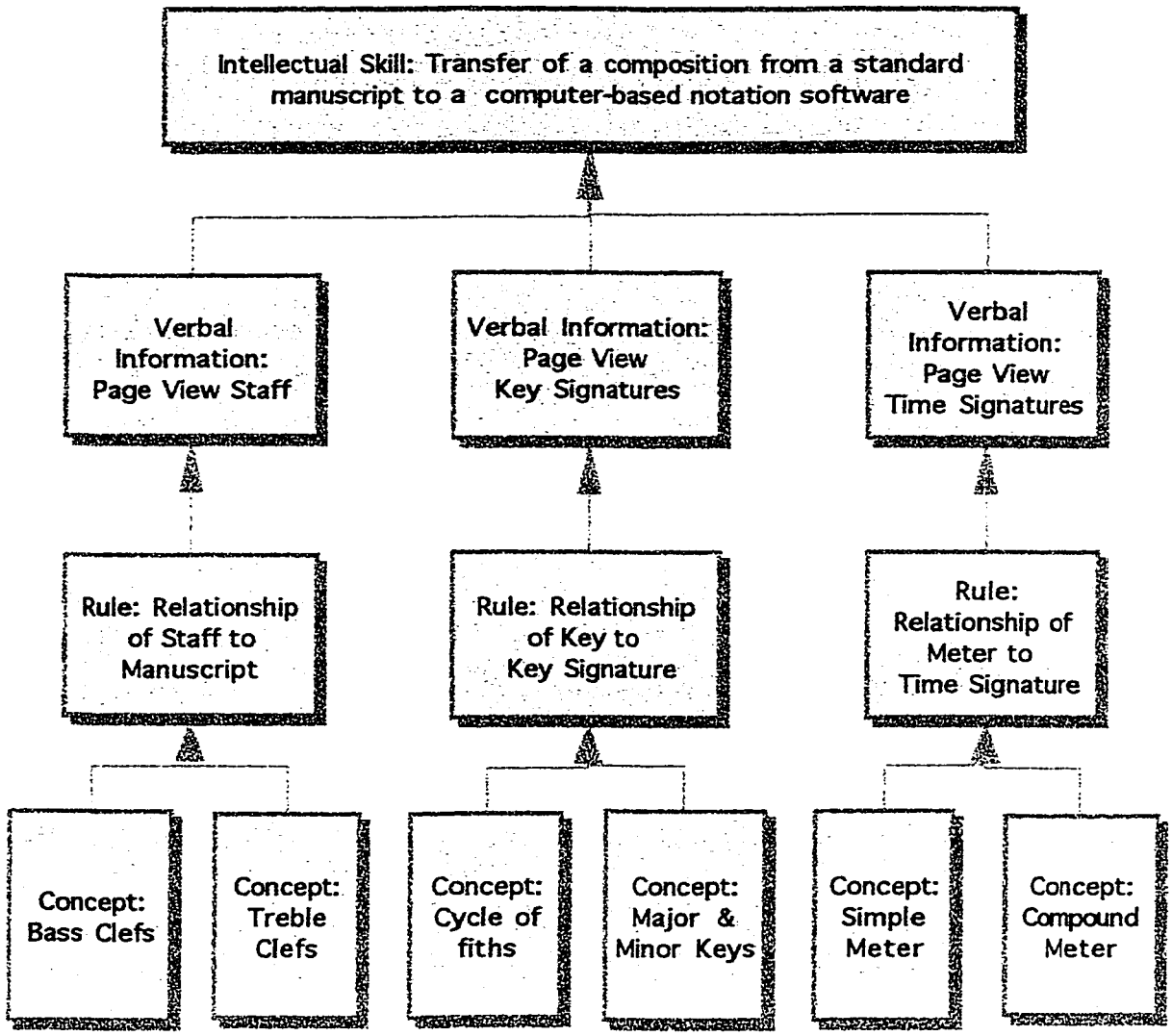


**Figure 1.2**
**Elaboration Level 1**

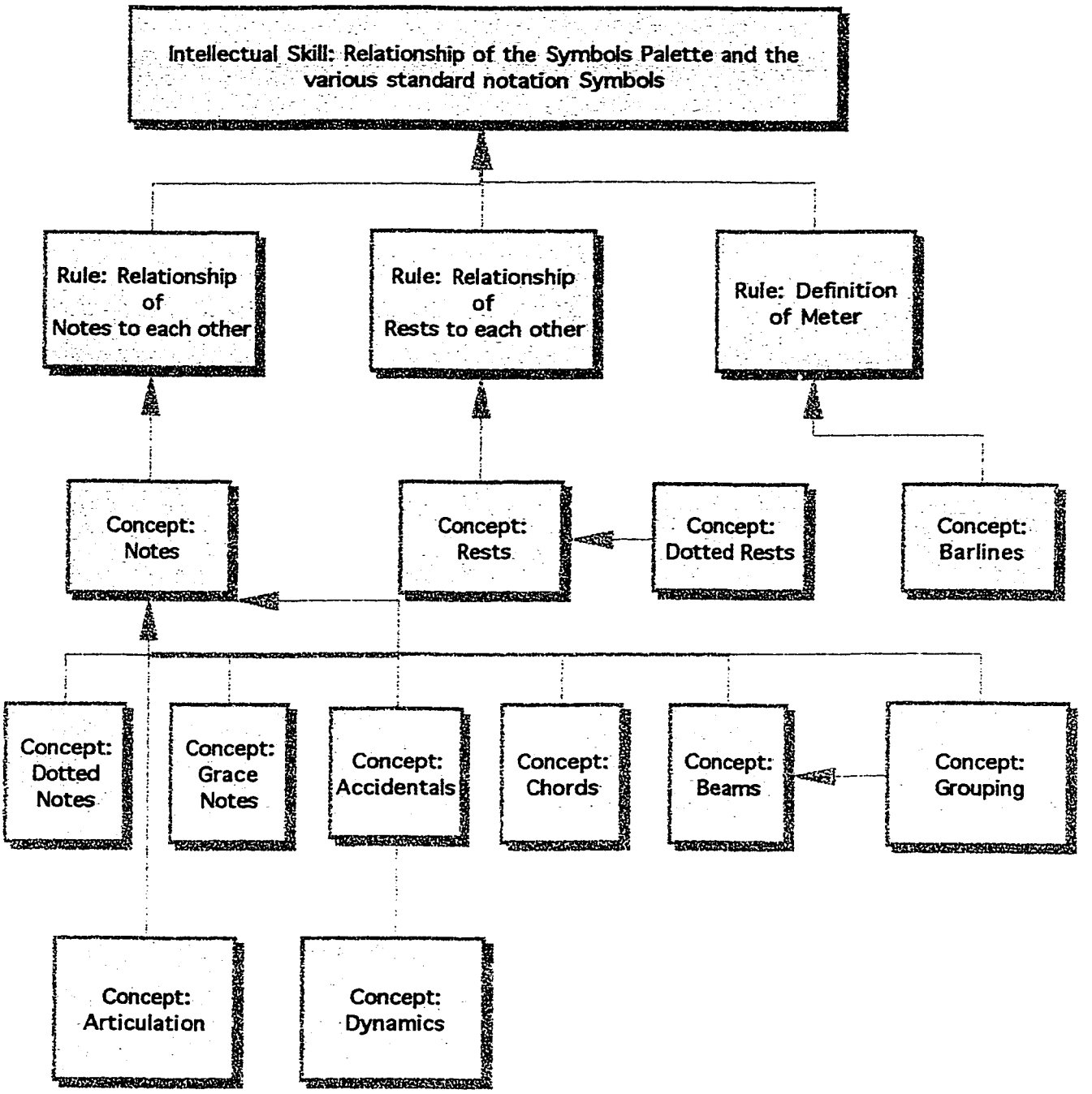
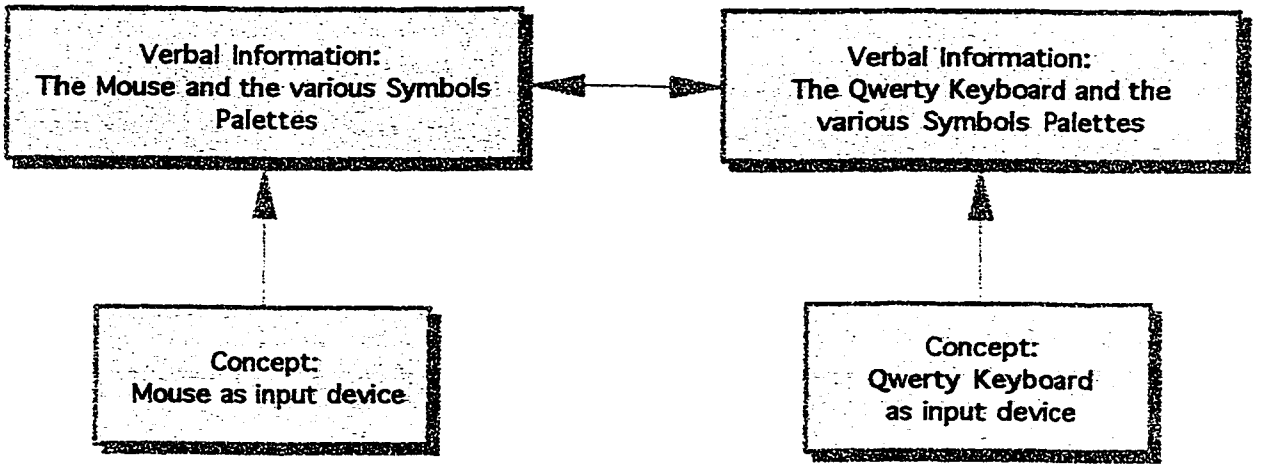
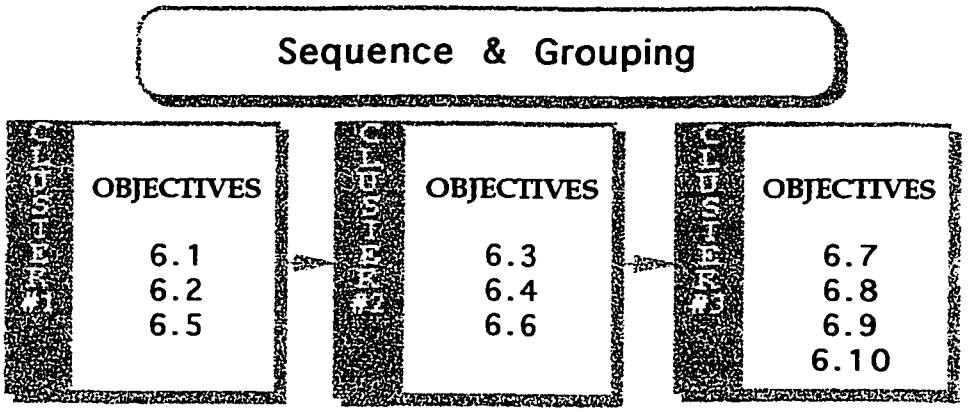


**Figure 1.3**
**Elaboration Level 2**




## 2. Lesson Organization Strategy Plans

- The sequencing and grouping of the lesson objectives have been done, using Dick & Carey's cluster of subskill method, represented in the following diagram:



## Objectives

Given an opened Page View in MOSAIC with a Grand Staff and proper Key and Time Signatures, and a short composition example, the learner will:

1. Locate, open and organize Notes, Rests and Bar-lines Palettes. Then correctly identify Notes and Rests and Bar-lines from the example, and establish the relationship to the opened Symbols Palette.
2. Locate, open and organize Dynamics, Articulations and Groupings Palettes. Then correctly identify Dynamics, Articulations and Groupings from the example and establish the relationship to the opened proper Symbols Palette.
3. Correctly identify Bass and Treble Clef on a Grand Staff, then copy the short composition from the example on to MOSAIC's Page View, using Mouse and Qwerty Keyboard.

This lesson will be given in a Computer Laboratory, with one learner per station and supervised by the instructor.

## Introduction

Deploy Attention

Arouse Interest and motivation

Show two examples of a manuscript - one *hand written,* and the other a *print out* from the MOSAIC software. Make sure the hand written manuscript is of poor calligraphy (to bring home the point) and hard to make out. Then ask students which one they would prefer to sight read. Discuss the inherent qualities of a publisher quality manuscript. Give other examples of situation where:

- they may need to send their manuscripts to universities
- they need to show their manuscripts to musicians for performance.
- etc...

Establish Instructional Purpose

Preview Lesson

The instruction should inform the learners they will be using a Computer Based Interface (CBI), namely **MOSAIC,** to write a short composition, using a *given example* as the model. Explain this lesson will allow them to practice most of the basics for writing (or copying) music, using some of the latest tools available to the composer. The following lesson will teach learners how to modify and enhance (edit) the composition.

## Body

Recall/Review Relevant Prior Knowledge

The instructor will point out that the learner's current knowledge of composition techniques, and its rules, will be vital to the identification of all the necessary components in a CBI and will be very important to the writing of a composition. If these techniques and rules are well learned, it will also make it easier to concentrate on the new mechanisms of note entry in the CBI. Review the basic concepts of notation.

Process Information

Focus Attention

The instructor will call attention on the given example, and will point out how well laid out Notes, Rest and Bar-lines are in the manuscript.

Employ Learning Strategies

Define *layout.* Using an overhead or blackboard, the instructor will demonstrate poor and good Notes, Rest and Bar-lines organization and layout. Using high quality published scores the instructor may show good examples of proper layouts.

Practice

Feedback

The instructor asks learners if they ever encountered sheet music with bad layouts of Notes, Rest and Bar-lines and asks their impressions on this. Learners may discuss and compare advantages of a good layout versus a poor layout.

Recall/Review Relevant Prior Knowledge

Review the basic concepts of Dynamics, Articulations and Groupings.

Process Information

Focus Attention

Employ Learning Strategies

Using an overhead or blackboard, the instructor will demonstrate poor and good Dynamics, Articulations and Groupings organization and layout. Demonstrate the utility of proper usage of these tools as an extension of musical thought.

Show examples of scores from known composers, discuss how they used Dynamics, Articulations and Groupings to enhance and fine tune their musical ideas. Emphasize the fact that Dynamics, Articulations and Groupings are like the musical equivalent of depth of field in photography or like accents and punctuation in writing.

Practice

Feedback

The instructor asks learners if they ever encountered sheet music with no Dynamics, Articulations and Groupings and their impressions on this. Learners may discuss and compare advantages of adding Dynamics, Articulations and Groupings.

Recall/Review Relevant Prior Knowledge

The concepts and knowledge of Treble and Bass Clef on a Grand Staff should be well established. Review the basic concepts if necessary.

The basics of navigation in a Macintosh Environment have been taught or reviewed in lesson 1.

Process Information

Instruction will be computer-based. Due to the limited prior knowledge of some learners in the field of the CBI, and time constraints, the instruction will first use a more *Supplantive Strategy,* involving *Concrete Concepts:*

a) Demonstrate to students by using computer and overhead, how to input Notes, Rests and all the various functions needed to complete the copying of the short composition example.

b)Time permitting, give a tour of the various tools of MOSAIC, but stress the fact that THEY ARE NON-RELEVANT ATTRIBUTES FOR OUR PROJECT, but they will eventually incorporate them, as skill and knowledge progresses.

Focus Attention

Employ Learning Strategies

Practice

Have students replicate the instructors' actions of inputting Notes, Rests, etc. . . . As the lesson progresses and learners show more facility, the instructor should introduce a more Inquiry based Approach. Let learners experiment with the various Symbols Palettes and what they do in the Page View (Score).

Feedback

Have the student play back their Score and hear what they have created. Discuss the advantages of having professional quality calligraphy along with immediate feedback and interaction of what they have written.

## Conclusion

Summarize and Review

Restate the importance of a good quality Score. Review the steps for opening and organizing Symbols Palettes. The instructor should also repeat his demonstration on how to input Notes, Rests and all the various functions needed to complete the copying of the short composition example.

Transfer Knowledge

Suggest that learners go to the music library and examine various Scores. They should examine the use of Dynamics, Articulations and Groupings and how

the published product is laid out. Ask learners to consider and compare the pen written manuscripts and the CBI output of manuscripts.

Remotivate and Close

Remind learners how useful high quality manuscripts can be to a professional career, and how it makes for a better vehicle for their creative processes. Point out that by providing other musicians with good quality Scores they will be assured of giving them all the tools necessary for a precise interpretation of the music.

## Assessment

Assess Performance

A performance assessment will be done only after the completed unit of instruction. Both computer-based and pen-and-paper test will be given. Provide several items similar to the short composition example.

Evaluate Feedback and Seek Remediation

Feedback in the form of on hands help using the CBI will be provided. Remediation may involve giving the learners photocopied texts of the MOSAIC handbook, concerning the areas that seem to have the weakest assimilation. Time in the Macintosh Laboratory will be available for free practice.

Media Selection

a. Attributes required by context, task and/or learners:

As mentioned earlier learners are of varied levels both cognitively and in terms of prior knowledge. Being in a university, the environment is conducive to both individualized learning and classroom lectures.

b. Ideal medium/media:

Computer-based instruction and live instruction.

c. The medium/media of choice:

As above.

d. The rationale for medium/media selection:

Being an intellectual skill, the needs to be addressed are many. Learners need immediate feedback, accuracy of response, and selective interpretation to whatever questions may arise during a lesson. Therefore, both computer and teacher can:

- deliver dynamic instruction.
- respond to individual demands.
- maintain a high level of control over what the learner must work on in one lesson.
- use the various elements of instruction interactively.

Grouping Strategies

a. Grouping plans by events:

The type of grouping used should be of small groups (5 to 10 learners) in a computer laboratory, each with their own workstation. Due to the nature of the instructional unit we may also categorize this strategy as individual learning.

b. Rationale for grouping strategies:

Grouping choice was decided in relationship with the media selection and context factors directed these decisions.

## Appendix G

## Instructional Module for a Lesson Unit on Teaching Learners How to Use MOSAIC (A Notation Software)

### Introduction

This lesson is based on Cluster #2 under my Sequence & Grouping heading of my Instructional Strategies paper. Since my lesson is instructor-led, I chose to use the lesson plan built around the three column model. You will notice that the lesson relates quite closely to Cluster #2 of my Instructional Strategies and therefore I have used some examples from these strategies for the teacher's guide, you will find these in Appendix A.

As mentioned in my analysis, the course was designed for University students with an interest in composition or arrangement. The Instruction will be given by specialists in the field of composition and arrangement and will always keep in mind the possible applications in a real world environment.

Appendix B is the Learner Validation section, containing a One-to-One Evaluation and an Experts Evaluation.

**Lesson Title:** Input, Save and Playback a short Musical Composition on MOSAIC's CBI (Computer-Based Interface)

**Course:** Music Technology 1

**Instructor:** Michel-Charles Therrien

**Office:** Music Dept. RF-316

**Lesson Goal:** For the students to understand the basic principles of how to input a musical score in MOSAIC's Notational Software.

**Terminal Objectives:** Given a Page View in MOSAIC, the student should be able to correctly open and identify the various Symbols Palettes and using these to input a short composition. Then Name and Save the document.

**Desired Learning Outcomes:**

- Able to recognize a good score layout
- Given a Page View in MOSAIC, open the Symbols Palettes.
- Given a Page View in MOSAIC, with open Symbols Palettes, identify the various symbols.
- Given an opened document in MOSAIC, name and save the document.
- Can input Notes, Rests, Barlines, Dynamics, Articulations and Groupings.
- Able to *open* the playback Control Panel & play back the music on the score, using the Control Panel.

**Purpose of Lesson:** To assist learners in creating professional quality Music Scores and allowing them to have increased creative control in their music by giving them the tools to produce, edit and audit all their works.

**Equipment Needed:** Macintosh Computers; MOSAIC Notational Software; one computer with an overhead projector attachment.

**Time Required:** 2 Hours, 45 Minutes. (Including a 15 minute break)

**Location:** Macintosh Laboratory.

**Synopsis of Lesson:** In the *Introduction,* the instructor will hand out copies of good quality and poor quality manuscripts (See Fig. 1a &1b), then proceed to describe the purpose of the lesson and the usefulness of the learning task of the lesson to the learners professional career. The instructor will overview the lesson and describe how the lesson will proceed. In the *Body* of the lesson, the instructor will describe and illustrate the differences between good and bad notation layouts, demonstrate how to locate the various Symbols Palettes in MOSAIC and instruct in their proper usage. Next, using an overhead connected to one of the computers, the instructor will demonstrate how to input Notes, Rests, Barlines, Dynamics, Articulations and Groupings. The instructor will also explain how Dynamics, Articulations and Groupings are important elements of good notation. The learners will then practice by inputting the given example on to MOSAIC's Page View. The lesson will *Conclude* with the instructor remotivating the learners by emphasizing how their new knowledge can be put to use.

| Desired Learning Outcomes | Student Activity | Instructor Activity |
|---|---|---|
| *Introduction: 15min.* | | |
| 1. Becomes aware that lesson has begun. | 1. Observes instructor. | 1. *Attention:* Opens lesson |
| 2. Becomes interested and intrigued about using CBI to create good quality scores. | 2. Sees a good quality print out of a MOSAIC score and a poorly hand written manuscript. (See Fig.1a &1b) | 2. *Motivation:* Shows two examples of a score one *hand written*, and the other a *print out* from the MOSAIC software. (See Fig. 1a &1b and Appendix A-1) |
| 3. Knows the content of the lesson and how the lesson will proceed. | 3. Listens to explanation of lesson. | 3. *Preview:* Lesson main points and how the lesson will proceed. (See Appendix A-2) |
| *Body: 2 Hours, 15 Min.* | | |
| *30 Minutes* | | |
| 1. Understands notation techniques. | 1. Listens and reviews the basics of notation. (See Fig. 2) | 1. Reviews the basics of notation. (See Fig. 2) |
| 2. Is able to differentiate between the concepts of good and bad notation layouts. | 2a. Listens to and observes explanation and examples of layouts.<br>2b. Discusses the benefits of proper layout. | 2a. Defines layout and using overhead demonstrates proper layout.<br>2b. Shows scores with proper layouts. Guides discussion. (See Appendix A-3) |

30 Minutes

| | | |
|---|---|---|
| 3. Understands and recognizes the various palettes in MOSAIC. | 3. Opens the various palettes found in MOSAIC. | 3. Using Computer with overhead, shows the different steps to opening the various palettes. (See Fig. 3) |
| 4. Is able to recognize the various symbols within each palette. | 4. Answers the teachers questions. | 4. Using overhead, points to the various symbols in the palettes and asks individual learners to identify. (See Fig. 3) |

*Break: 15 Minutes*

*60 Minutes*

| | | |
|---|---|---|
| 5. Can Name and Save Document. | 5. Follows instruction and reproduces instruction by Naming and Saving Document. | 5. Instructs and demonstrates how to Name and Save Document. |
| 6. Can input Notes, Rests and Barlines. | 6. Follows instruction and reproduces instruction by inputting Notes, Rests and Barlines. | 6. Instructs and demonstrates how to input Notes, Rests and Barlines. |
| 7. Can input Dynamics, Articulations and Groupings. | 7. Follows instruction and inputs Dynamics, Articulations and Groupings. | 7. Instructs and demonstrates how to input Dynamics, Articulations and Groupings |
| 8a. Is able to *open* the playback Control Panel. | 8a. Follows instruction and *opens* the playback Control Panel. | 8a. Instructs and demonstrates how to *open* the playback Control Panel. |

| | | |
|---|---|---|
| 8b. Is able to play back the music on the score, using the Control Panel. | 8b. Follows instruction and plays back the music on the score, using the Control Panel. | 8b. Instructs and demonstrates how to playback the music on the score, using the Control Panel. |
| ***Conclusion: 15 Minutes*** | | |
| 1. Recalls and consolidates experiences. | 1. Listens and recalls | 1. Reviews main points of lesson. |
| 2. Realizes applicability of skill learned. | 2. Listens and imagines. | 2. Remotivation: Describes how scores with good layouts can be useful professionally. |
| 3. Knows that lesson is finished. | 3. Listens. | 3. Closure: Reminds of next lesson and close. |

*Appendix A*

1. *Motivation:*

Show two examples of a manuscript one *hand-written,* and the other a *print out* from the MOSAIC software. Make sure the hand written manuscript is of poor calligraphy (to bring home the point) and hard to make out. Then ask students which one they would prefer to sight read. Discuss the inherent qualities of a publisher quality manuscript. Give other examples of situation where:

- they may need to send their manuscripts to universities
- they need to show their manuscripts to musicians for performance.
- etc...

2. *Preview Lesson:*

Inform learners they will be using a Computer Based Interface (CBI), namely **MOSAIC**, to write a short composition, using a *given example* as the model. Explain how this lesson will allow them to practice most of the basics for writing (or copying) music, using some of the latest tools available to the composer. The following lesson will teach learners how to modify and enhance (edit) the composition.

3.

Using an overhead (or blackboard), demonstrate poor and good Dynamics, Articulations and Groupings organization and layout. Demonstrate the utility of proper usage of these tools as an extension of musical thought.

Show examples of scores from known composers, discuss how they used Dynamics, Articulations and Groupings to enhance and fine tune their musical ideas. Emphasize the fact that Dynamics, Articulations and Groupings are like the musical equivalent of depth of field in photography or like accents and punctuation in writing.

*Appendix B*

## Formative Evaluation

Expert Reviews

The materials for the Instructional Module, were reviewed by two experts. Both were Instructional Designers doing their Masters Program at Concordia University. The reviewers were very helpful in their comments as regards to the content of the module as well as the final format of the course. Most of these suggestions were incorporated in the final output, this allowed me to add more detail to the body of the module. Certain inconsistencies in my introduction were also noted and remedied.

Learner Reviews

For my Learner Validation, a One-to-One Evaluation was chosen. This form of evaluation was more realistic than the Small Group Evaluation in terms of time management and detail accuracy. The Learners were of Higher and Average Ability. The One-to-One Evaluation was performed in a small room with a Macintosh Computer and a full page screen. I first started with an explanation of where we were in relation to the entire course and made the required preparations (ie. Opened Page View in MOSAIC with a Piano Staff Template).

Then another explanation of the procedures involved in this particular module was given; at this point questions were abundant and all were addressed to the fullest. Then came a practice period where the learners were asked to perform the steps demonstrated earlier. There was some discussion as to whether the time frame was sufficient or if it would be better to divide the instruction further. In conclusion, we felt it was better to keep this cluster unified as all the elements are interdependent and dividing the instruction might cause more confusion, especially if the instruction was spread out in time.

The procedure revealed that the concepts were well-established and could be assimilated in the time frame allotted to the instruction. And most steps in the progression of the instruction needed little or no clarification once they were practiced a few times.

**Fig. 1a & b**

[An example of a good quality print out of a MOSAIC score and a poorly hand-written manuscript goes here]

# Notation Basics

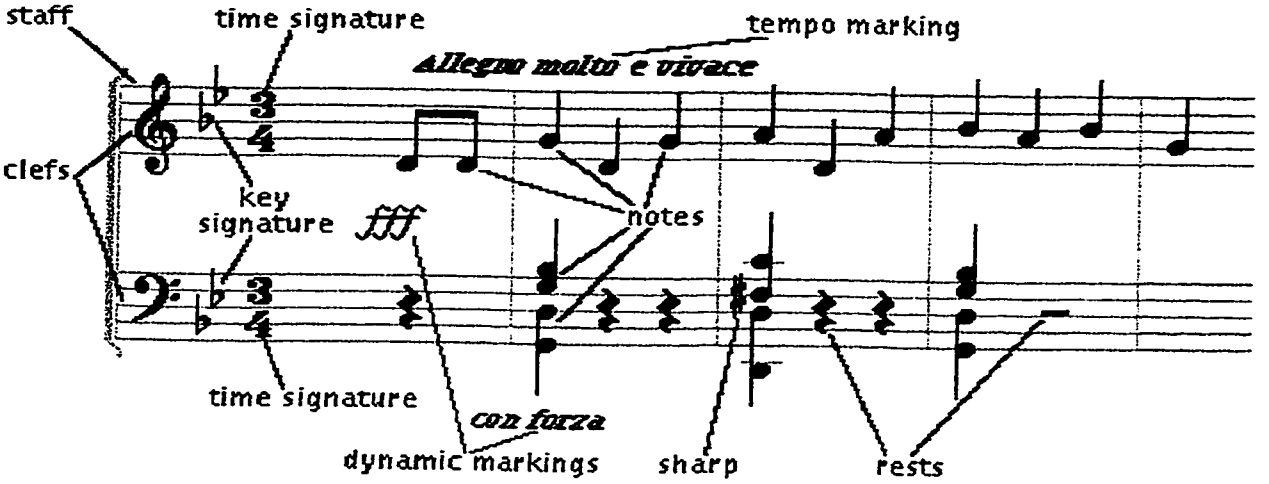
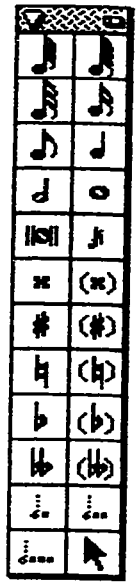



Fig. 2

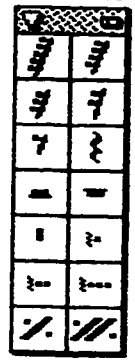
Top of Window in MOSAIC Environment

File Edit Region Format Text Windows Palettes

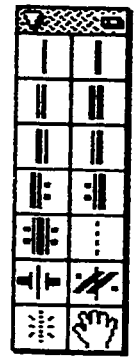
Notes Palette



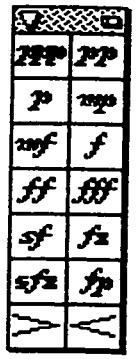
Rests Palette



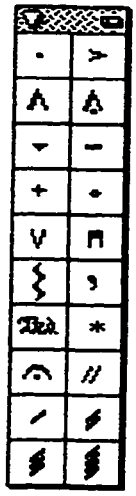
Barlines Palette



Dynamics Palette



Articulations Palette



Groupings Palette

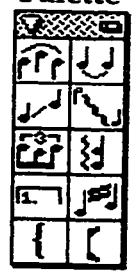


Fig. 3