DOCUMENT RESUME

ED 393 757 SO 026 114

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TITLE The Relationship between Musical Instrumental Performance Skills and Postsecondary Musical Independence (How Important Are Scales, Etudes, Solos, Sight-Reading, Improvisation, Etc.?)
PUB DATE 94
NOTE 45p.; For related study papers, see SO 026 112-113.
PUB TYPE Speeches/Conference Papers (150) -- Reports - Evaluative/Feasibility (142) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Bands (Music); Educational Research; Fine Arts; Higher Education; *Music; *Music Activities; *Music Education; *Musicians; Secondary Education; *Student Characteristics; Student Experience; Student Surveys

ABSTRACT

This study examines the relationships among a variety of secondary/postsecondary experiences and activities and postsecondary students' musical independence (MI). The paper reports on the impact Instrumental Performance Skills (IPSs) have on the students" MI development during private lessons, band rehearsal, and individual practicing. The study also explores whether excellent or good MI students emphasize these IPSs differently than poor or weak MI students and identifies ISPs that might have a negative impact on MI. The Instrumental College Survey-2 (ICS-2), Colwell's Music Achievement Test 3 (MAT3), and Colwell's Music Achievement Test 4 (MAT4) were administered to 354 instrumentalists in the bands at Ball State University, Florida State University, and Wichita State University. The study concluded that: (1) individual practicing is the primary means by which instrumental music majors learn and master instrumental performance skills; (2) private teachers guide the students, but the students must make the trip by themselves; (3) students should emphasize a different selection of IPS during practicing than they do during private lessons; (4) perceptions are often very misleading and do not have an important relationship on the student's MI growth; (5) music fundamentals represent the foundation by which a student develops MI skills; (6) the sequencing of IPS may have a large impact on the development of student MI; (7) the use of a particular statistical treatment has a major impact on the study's findings and conclusions; and (8) college music majors do not know how and when to use a metronome. Extensive charts and graphs accompany the text. (EH)

THE RELATIONSHIP BETWEEN MUSICAL INSTRUMENTAL PERFORMANCE SKILLS AND POSTSECONDARY MUSICAL INDEPENDENCE

(How important are scales, etudes, solos, sight-reading, improvisation, etc. ?)

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1994 National Band Association
(NBA)
Chicago, IL
December 14, 1994

THE RELATIONSHIP BETWEEN MUSICAL INSTRUMENTAL PERFORMANCE SKILLS AND POSTSECONDARY MUSICAL INDEPENDENCE (HOW IMPORTANT ARE SCALES, ETUDES, SOLOS, SIGHT-READING, IMPROVISATION, ETC. ?)

I. INTRODUCTION

College graduation requirements expect instrumental music majors to master and become proficient on at least one band instrument. What are the experiences, activities, and respective instrumental skills needed to become proficient on an instrument? Music majors develop instrumental skills through private lessons, solo and ensemble rehearsal and performance, and individual practice. During these instrumental activities, common instrumental performance skills (IPSs) such as scales, thirds, arpeggios, etudes, solos, sight-reading, improvisation, and are other areas are addressed and refined. Are these instrumental performance skills equally common to private lessons, solo and ensemble rehearsal and performance, and individual practice and are they equally important in each activity? Music educators have developed and included these IPSs into the curriculum through custom, tradition, and personal experience. How valuable are each of these IPSs in developing instrumental musicianship?

Historically, the authors of the research project have used the notion of musical independence (MI) as the key indicator of student outcomes in music (see references). For example, in the area of instrumental performance, a beginner requires constant instruction, a college student requires some but not constant instruction, and a professional performer requires little instruction: the beginner would be musically dependent on the teacher, the college student would be moderately musically independent, and the professional would be musically independent. The authors of this paper make a subtle difference between musical independence (MI) and musical achievement. Musical achievement represents the mastery of any academic skill related to music, but MI is directly related to the actual production and performance of music. The link between knowledge acquisition and the application and use of that knowledge in performance is the key: music knowledge may exist without MI, but MI may not exist without music knowledge.

This paper (using the same title) was presented at the 1994 annual meeting of the 1994 *Mid-South Education Research Association*. It is one in a series of papers that examines the relationships among a variety of secondary/postsecondary experiences and activities and the postsecondary student's musical independence. The authors have presented other research (i.e., using other aspects of the Florida State, Ball State, and Wichita State data) to educational conferences including: *Mid-South Education Research Association* (1992, 1993, & 1994); *National Band Association* (1992, 1993, & 1994); and the *American Educational Research Association* (1994 & 1995).

The authors have developed a hierarchy of MI (see Figure 1). The five MI skill levels, progressing from the lowest to highest levels, are thinking (to know), listening (to sense), performing (to make), conducting (to direct), and composing (to originate). The hierarchy implies that to perform an instrument, the instrumentalist must master certain knowledge skills (Level 1), listening skills (Level 2), and performance skills (Level 3); to compose music (Level 5), the musician must master thinking, listening, performing, conducting skills, and composition skills.

Knowing the important and unimportant IPS's and how they impact MI is essential to the music majors personal MI development and to the development of their future students. Should our excellent, average, and poor music majors be expected to know which IPS's are the most and least important in developing the student's instrumental skills? Student outcome is a reflection of a clearly defined educational and pedagogical philosophy which focuses on those IPS's which are essential in developing MI. Ideally, the private teacher, band director, and advanced music major will share the same basic musical philosophy. Should the goal of music education majors be that stated by the late William D. Revelli (Revelli, 1975): "*. . . to become the best possible musician you can on your instrument. That is the first step to becoming a great teacher and band director?*" Further, does one have to be able to make great music in order to be able to teach others how to make great music? In today's music education, do private teachers, band directors, and music majors reflect the same or a different musical agenda in the development of musicianship?

The music major's private instrumental teacher is the cornerstone of the student's MI development. Private teachers are largely responsible for whether or not the students master their instrument. During the lesson, the teacher first observes and diagnoses the student's strengths and weaknesses, then prescribes specific instrumental "performance" skills to remediate a specific instrumental deficiency. For every deficiency, there is a remedy. If the student cannot play a technical passages musically, the private teacher might assign scales, thirds, and arpeggios. If the student has a problem with phrasing or articulation, the teacher might assign a specific etude or solo. If the student has a problem playing alone, the teacher may assign a solo performance or recommend participation in a small ensemble. Or if the student has trouble getting through a piece on the first reading, the teacher might emphasize sight-reading. Teachers are then expected to evaluate the student's performance and assign a grade. The assigned grade should reflect the degree to which the student has mas[illegible]erformance on their instrument during the lessons.

Individual practicing is the primary means through which a student develops MI. Private teachers, music faculty, and band directors should emphasize this essential activity in the development of instrumental musicians. While the teacher or band director guides the student, the student must develop by themself, in much the same way that an infant learns to walk. During practicing, the student refines the MI skills taught by

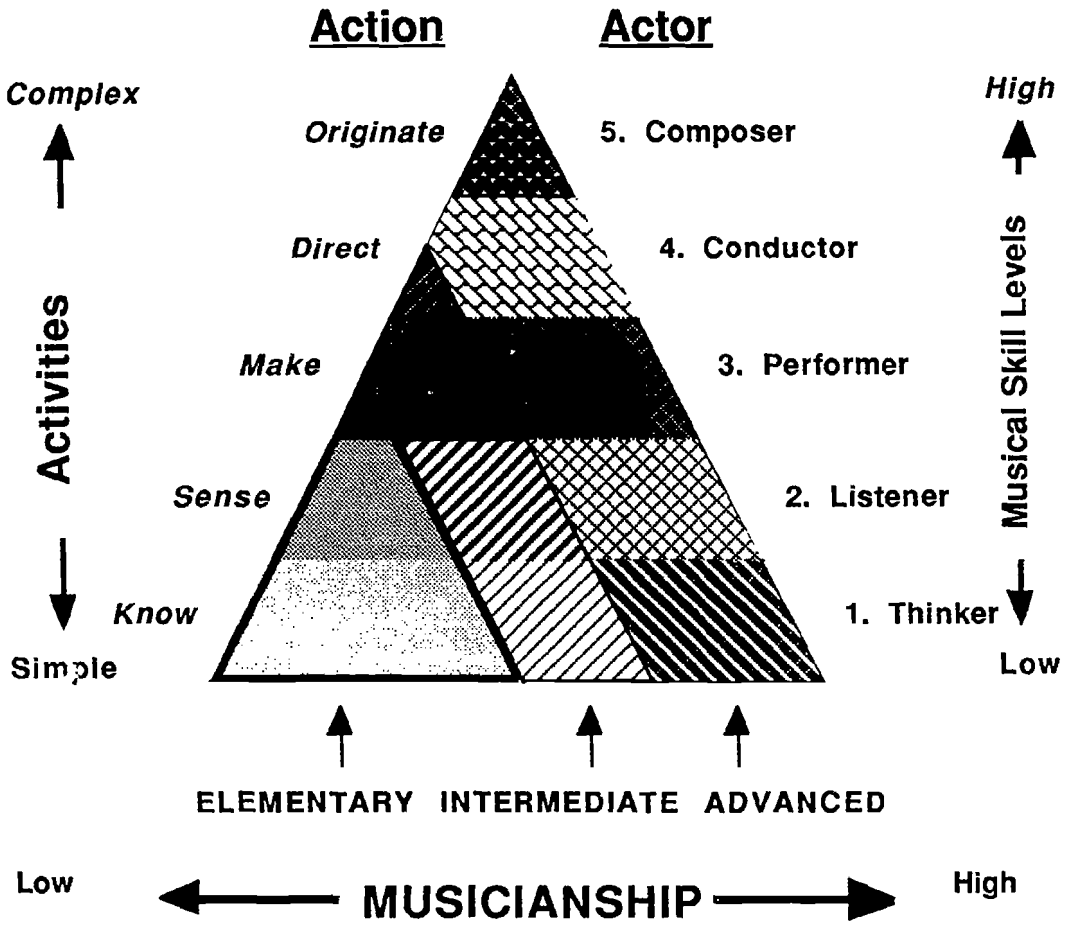


Figure 1. Hierarchy of Musical Independence (MI) characteristics, Bobbett, 1989.

their private teacher or band director. When students practice the correct things, they will progress and grow; but practicing the wrong things might stall or even harm their instrumental growth.

Band directors strive for excellent ensemble performances. If, in rehearsal, the clarinets are having a problem with a particular passage in E or the brass are having difficulty with double-tonguing the director might give an assignment of "practice your band music." An alternative assignment, with the emphasis placed on individual rather than ensemble outcome, might be "practice your scales, thirds, and arpeggios in the key of E" or "practice these etudes and exercises which address advanced articulation." The authors contend that the best path to an outstanding ensemble is the advancement of individual MI achieved through the development and refinement of a variety of IPSs.

II. POSTSECONDARY INSTRUMENTAL PERFORMANCE SKILLS (IPS)--AN OVERVIEW

Students participate in a variety of musical training activities while developing instrumental musical skills. Practicing their instrument is a time consuming activity. Time-on-task and emphasizing the right things are the two primary distinctions between excellent and weak instrumentalists. Excellent instrumentalists practice often and emphasize specific skills and activities, while weak instrumentalists practice less and often emphasize the wrong skills, activities and related IPSs. What are the activities and related IPSs that excellent instrumentalists emphasize during their practicing? If students address a variety of activities while practicing, are some instrumental performance skills more valuable to their musical instrumental development than others?

This study examined eight activities that students could emphasize when practicing. Scales are one of the fundamental performance skills. Garofalo (1992) identifies intervals, scales, chords, rhythm, dynamics, form and style as areas which should be included in the instrumental music curriculum (p. 116). In addition he states "to play, sing, and identify by ear and eye intervals, chords, scales and rhythms derived from the score" as one of his five basic learning goals (p. 1). Middleton and Garner emphasize the importance of fundamental performance skills: "Technical drill geared toward increasing fluency, flexibility, control, and articulation skills should be a regular part of the rehearsal routine. Scales and arpeggios, in all keys, should receive major emphasis" (p. 94). Prentice (1987) writes: "Scales are good for everyone. Practice slow and fast, major, minor, and chromatic; tongued and slurred; with arpeggios; in as many octaves as possible"(p. 108).

When performing scales, students master one of the most fundamental components of musical performance--the intervals of a major and minor second. Gilbert (1987) writes: "Almost all music is built on the simple basic elements of music: scales, thirds, and arpeggios. If you had learned to play these before you started working on the piece then there would be only limited portions of it you would have to

practice" (p. 58). In all tonal western art music, scales, or portions of scales, are present. Mastery of scales, therefore, reflects not only the mastery of their instrument, but also the mastery of one of the most basic melodic constructs of western music. Students rehearse and are evaluated on their performance of scales in private lessons, auditions, and ensemble rehearsals. During the performance of a scale, students listen, learn, and perform the intervalic relationships between different notes. In an ensemble environment, scales help the students develop intonation skills (listening and knowing) along with other ensemble skills such as the ability to play together.

While scales represent the mastery of seconds, the performance of thirds represents the mastery of intervals of a major and minor third. Thirds are slightly more difficult to master than seconds because they move around in skips rather than step-wise. Arpeggios include the technical mastery of both major and minor thirds along with the mastery of fourths. Again, more technical skill is required in mastering arpeggios. Western tonal music is based on tertial harmony and the dominant-tonic root movement of the fourth. Although students are not usually expected to perform thirds and arpeggios as part of all-state auditions, thirds and arpeggios are usually taught by the private teacher and sometimes incorporated as part of the warm-up portion of an instrumental ensemble rehearsal.

Etudes are pieces specifically written to address one or more specific instrumental skills such as technique, breath support, embouchure control, the mastery of large or small intervals, dynamics, tonal color, phrasing, or articulation. The primary purpose of etudes is for the student to master one or more of these different performance skills. Etudes may be used as a portion of the all-state audition or as a segment of the student's audition to a postsecondary institution.

Performing an instrumental solo represents the application of knowledge and performance skills into an artistic experience for both the listener and the instrumentalist. The musical skills necessary to perform a solo cover the full gamut of musical skills. Where etudes are a mechanism to teach specific instrumental performance skills, a solo represents the application of these skills. Solos are usually taught by the private teacher during private lessons and are sometimes a portion of an ensemble piece. Solos are often included as a segment of all-state or college band auditions. While performing solos, instrumentalists demonstrate the accumulation of all their performance skills, including scales, thirds, arpeggios, phrasing, articulation, intonation, dynamics, plus a variety of other ensemble skills related to their level of MI.

Sight-reading has been used from Bach to the present as a method of evaluating a performer's level of MI. From the middle 1960's to the present, and in part, because of the tremendous impact the Watkins-Farnum Performance Scale (Watkins and Farnum, 1962) had on music education in America, sight-reading is one of the common methods used in music education when evaluating a student's instrumental performance skills. In many states, sight-reading is used as a portion of the all-state

audition process or as a portion of the Concert Festival. At the secondary and postsecondary level, it is often used as a method of evaluating student instrumental growth. Sight-reading has become very popular for music educators, perhaps because it provides an easy way to quantitatively evaluate a student's performance. For example, if student "A" misses three notes and student "B" misses five notes, then student "A" must be the best instrumentalist. Music is a complex activity to evaluate. The weakness of using sight-reading as a primary indicator of MI is that counting the number of correct or wrong notes does not always accurately indicate the student's level of instrumental excellence.

Since all of the study's participants were members of their college band, they had to master their band music to maintain their music scholarship or their chair placement. The mastery of band music can be a portion of the activity used to develop MI just as instrumentalists at the music conservatory level, learn and master different orchestral excerpts as part of their musical training.

Because of the popularity of contemporary music, including jazz, many private teachers or ensemble directors encourage student improvisation. There are many accounts of J.S. Bach using improvisation as a means of demonstrating his musical abilities. Today, improvisation is an essential component of much contemporary music. Instrumentalists need improvisational skills to play jazz, rock, country, soul, new-age, or dixie-land music. Improvisation is a unique training activity. Where the other activities might be categorized as skills represented in the third level of the MI hierarchy, improvisation implies mastery of the top level of MI. To improvise, the instrumentalist is essentially composing music. Also, the improvisers are constantly balancing their performance with the rhythmic, harmonic, melodic, and textural/tonal constraints of the ensemble.

During this study, students were asked to specify to what extent they practiced scales, thirds/arpeggios, etudes, solos, band music, improvisation, or "other." Students defined "other" as cleaning their instrument (woodwind and brass), seating and adjusting pads (woodwinds), adjusting drum heads (percussion), and fixing and making reeds (woodwinds) (Bobbett--Ball State Study).

III. BACKGROUND

Secondary and Postsecondary Musical Independence Research

In the authors' secondary MI research (i.e., 9th or 10th grade through 12th grade), the findings indicated identifiable and measurable differences between average (randomly selected) and outstanding (nominated) instrumental music programs (Bobbett, 1987a and b). Other research examined students and band directors participating in "good" Appalachian high school instrumental programs. The student portion of the project noted a positive relationship between high school music activities such as marching contests, concert festival, solo-ensemble, solos, other ensembles, etc., and the student's MI (Bobbett,

1991a). The band director segment examined the grading procedures that influence a student's musicianship and the relationships that exist between demographic data and band directors' and students' MI (Bobbett, and Bobbett, 1990b).

Student's MI and high school activities that impacted MI were studied from the post-secondary perspective as well. When the students participating in the University of Tennessee band were evaluated (Bobbett, 1989, 1990a), the findings indicated that participation in all-state band, solo-ensemble, concert festival, private lessons, and church/community choir had a positive impact on the student's MI. The authors expanded the early post-secondary research and examined the students participating in the three instrumental ensembles at Ball State University (Bobbett, 1991b, 1992). The findings suggested positive links between high school activities such as all-state band, concert festival, solo-ensemble, private lessons, and student/program MI. Next, the authors examined the high school music activities in which instrumental students at Ball State University, Florida State University, and Wichita State University participated. The findings suggested that many activities such as high school private lessons and all-state band had a positive impact on the student's MI. Music activities that did not have a positive impact included all-state orchestra, all-state jazz band, all-state choir, concert festival, marching contests, church/community choir, and high school jazz band (Bobbett, 1993, 1994).

IV. PURPOSE

The study's primary purpose is to examine the impact Instrumental Performance Skills (IPSs) have on the student's MI development during private lessons, band rehearsal, and individual practicing. The second purpose is to examine whether excellent or good MI students emphasize these IPSs differently than poor or weak MI students. The third purpose is to identify IPSs that might have a negative impact on MI.

V. TESTS AND QUESTIONNAIRES

The Instrumental College Survey-2 (ICS-2) (see Appendix A), Colwell's Music Achievement Test 3 (MAT3), and Colwell's Music Achievement Test 4 (MAT4) were administered to 354 instrumentalists participating in Ball State University, Florida State University, and Wichita State University bands.

The five postsecondary ICS-2 areas examined in the study are as follows:

1. **Metronome usage during practice.** Students were asked to indicate the percentage (%) of time they used a metronome during their individual practicing.

2. **College Training Activities.** Students indicated the percentage of time they spent during their individual

practicing and during their instrumental private lessons on each of the eight IPS's. The eight IPS's included: Scales (SC), Etudes (ET), Thirds/Arpeggios (TA), Band Music (BM), sight-reading (SR), Solos (SO), Improvisation (IM), and other (OT).

3. **Perceptions.** Using a 5-point Likert-type scale, the students were asked to respond to the eight IPS's by rating each skill's importance in developing their instrumental musicianship.

4. **Audio/video recordings.** Students were asked to approximate the number of minutes per month that they used an audio/video tape recording to self-examine their instrumental performance.

5. **External Evaluation.** Students were asked to identify the number of minutes each month they asked a classmate, friend, or faculty member to listen and critique their instrumental playing.

VI. METHODOLOGY

The study's seven questions include:

1. How much do music majors (MMs) use the metronome during individual practicing?

2. What training activities do MMs emphasize most and least during practicing and private lessons, and how do they rate each activity in developing MI?

3. Do auxiliary training activities such as (A) metronome usage during practicing, (B) recording of instrumental performances to enhance MI, or (C) external evaluations to enhance MI, differ between top and bottom MI students?

4. How do training activities during the MM's practicing, private lessons, and their MM's ratings differ between the top and bottom MI students?

5. What are the relationships between the training activities and the student's MI (i.e., both grand total score and individual subtest scores on the MAT3 and MAT4)?

6. What individual training activities have a significant impact on the student's MI score?

7. What IPS's have an impact on each of Colwell's 9 subtests, two total tests (i.e., MAT3 and MAT4), and grand total of both tests?

In response to question 1, descriptive statistics were used to evaluate the percentage of time a metronome was used during the time the MM's practiced. *Means, mode, kurtosis*, and *skew* data analysis were developed. The percentages were organized into increments of 10% intervals, and a *Frequency Distribution* statistic was used to examine the 10 different groups. A trend-line was used to compare the student's grand total score on the MAT3 and MAT4 and the percentage of time students used the

metronome during their practice. The *One-Way ANOVA* was used to evaluate differences between low and high outcome groups.

To answer question 2, mean scores, standard deviations (SD), and median scores were developed for the percentage of time the students spent on each of the eight training activities during their practicing and private lessons, and their perceptions of how important each of the eight training activities were in developing MI. The Shapiro Wilk W test was used to examine the nominal distribution for each of the eight training activities from the three perspectives. Finally, to compare the mean scores between activities, the mean scores were converted to z-scores and ranks.

Before questions 3 and 4 were answered, the MM's grand total scores were converted to a z-score. Z-score test data was used to organize music majors into five MI outcome groups: **high outcome** (HI) (+2.05 to +1.0 [n=48]), **medium high outcome** (MH) (+.99 to +.25 [n=92]), **average outcome** (AV) (+.24 to -.24 [n=64]), **medium low outcome** (ML) (-.25 to -.99 [n=45]), and **low outcome** (LO) (-1.00 to -4.00 [n=27]). The statistical treatments below were used to evaluate both the MM's auxiliary training activities (question 3) and their training activities (question 4). The *Welch ANOVA* and the *One-Way ANOVA* was used to examine the differences between outcome groups, and the *Student's t-test* and the *Scheffe* were used to identify the differences between MI groups. The *permutation* statistic was used to examine trend-lines between outcome groups.

In response to question 5, the *Pearson Product Moment Correlation* Matrix was developed between the MAT3 and MAT4 and all their subtests plus the eight training activities evaluated from three perspectives: (1) percent during practicing, (2) percent during private lessons, and (3) student's ratings. Study items with a significant positive or negative impact on MI were identified and evaluated.

In response to Question 6, three different statistical analyses were applied to the study's data. First, both Simple Regression and Stepwise Regression (Forward) were used for preliminary data analysis. Next, Exploratory Multiple Regression was used to confirm the preliminary data analysis. Finally, Guttman's partial correlation statistic was used to examine the percentage of impact each of the independent variables had on the student's MI score.

VII. FINDINGS

1. How much do MM's use a metronome?

Of the 376 participants, 276 were music majors (MM). Of the 276 MM's, 272 responded to the question: "what percentage of time was a metronome used during their individual practice?" Although MMs used a metronome an average of 32% of the time (M=32.2), the Shapiro-Wilk analysis suggested that these

responses were not normally distributed (see Appendix B). The Mode for the 10 equal intervals was between 0% and 10% (Table 1). The Frequency Distribution analysis indicated that ≈13% of the MMs used the metronome more than 70% of the time, ≈6% used it more than 80% of the time, and ≈3% used it more than 90% of the time. Many MMs rarely used the metronome during practicing: 47% of the students used it less than 20% of the time, while ≈36% of the MMs—approximately one-third of the instrumental students—used a metronome less than 10% of the time during practicing.

A Simple Regression trend line was developed to compare the MMs grand total (GT) scores and the percentage of time they used a metronome during practicing. Figure 2 illustrates a flat trend-line (r^2=0.00) between the student's GT score and the percentage of time the MMs used a metronome.

The Brown-Forsythe, Welch ANOVA, and the One-Way ANOVA statistics (see Appendix C, top portion) were used to examine the five different outcome groups and the students' use of a metronome during practicing. This analysis suggested that there was no significant difference between the five outcome groups (F=2.2, p≤.07; F=1.5, p≤.21, F=1.522, p≤.196, respectively).

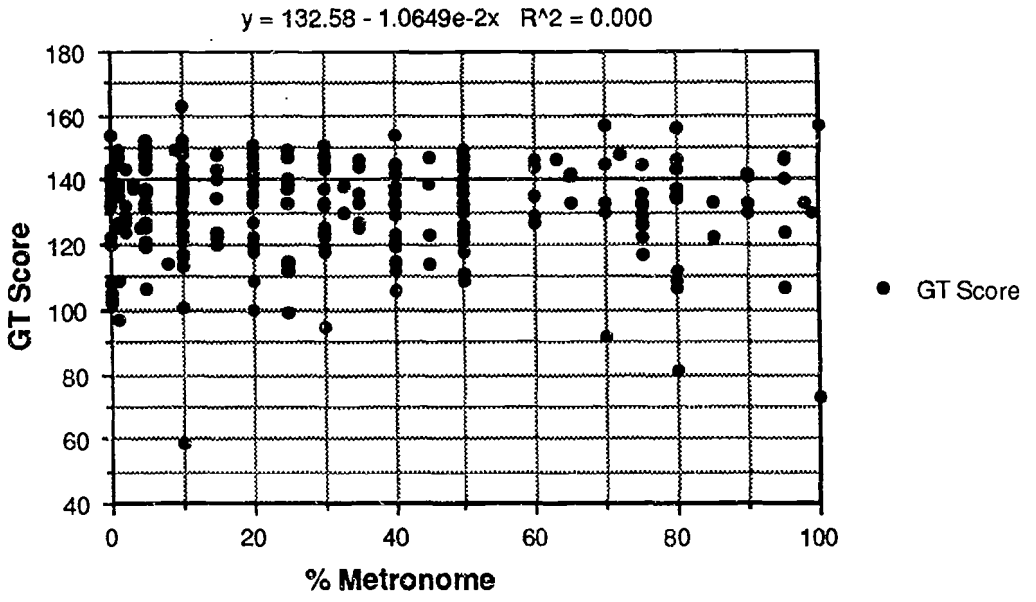
Table 1. Frequency Distribution used to evaluate the percentage of time 272 instrumental music majors used a metronome during practicing.

Bar:	From: (≥)	To: (<)	Count:	Percent:	
1	0	10.1	98	36.0%	--Mode
2	10.1	20.2	31	11.4%	
3	20.2	30.3	29	10.7%	
4	30.3	40.4	26	9.6%	
5	40.4	50.5	37	13.6%	
6	50.5	60.6	5	1.8%	
7	60.6	70.7	9	3.3%	
8	70.7	80.8	21	7.7%	
9	80.8	90.9	7	2.6%	
10	90.9	101	9	3.3%	

2. **What training activities do music majors (MMs) use most and least during practicing and private lessons, and rate most and least important in developing MI?**

A. Individual Practicing The students spent approximately two-thirds of their practice time on Solos, Scales, and Etudes (33%, 21%, and 13%≈67%, respectively), while less than one-third of the time on the other instrumental performance skills including Thirds/Arpeggios, Band Music, sight-reading, Improvisation, and Other (7%, 8%, 7%, 4%, and 7%, respectively) (see Appendix B). The Shapiro-Wilk W test indicated that none of the eight activities were normally distributed. Next, the mean scores for the

Figure 2. Simple Regression used to examine the relationship between the percentage of time music majors used a metronome during practicing and the student's musical independence (student outcome as measured by the study's GT score).



eight instrumental performance skills were converted to z-scores. The Solos activity reflected a ≈2 SD (2.1 z-score) above the mean and practicing Etudes reflected ≈1 SD above the mean (0.85 z-score), while the Improvisation activity was ≈1 SD (-0.9 z-score) below the mean.

B. **Private Lessons** The MMs strongly emphasized Solos and Etudes (27%, 39%, respectively) during their instrumental private lessons, and moderately emphasized Scales, Thirds/Arpeggios, sight-reading, and Other (11%, 5%, 6%, 7%, respectively) (see Appendix B). The Band Music and Improvisation IPS's were de-emphasized during the student's private lessons (2%, 1%, respectively). Although the median scores were very close to each training activity's mean score, the Shapiro Wilk W test indicated that data for each activity was not normally distributed. When the mean scores for each of the activities were compared, the z-score analysis suggested that Solos and Etudes were more than 1

SD above the mean (2.0, 1.1, respectively) and the Band Music and Improvisation training activities were close to 1 SD below the mean (-0.8, -0.8, respectively).

C. **Student's Rating** Using a 5-point Likert-type scale, the MMs rated each training activity in terms of importance in developing instrumental musicianship (MI). The MMs rated Solos, Scales, Etudes, and sight-reading as important (M=4.7, 4.3, 4.4, 4.3, respectively), Thirds/Arpeggios and Other as moderately important (M=3.9, 3.5, respectively) and Band Music and Improvisation least important (M=3.3, 3.0, respectively) (see Appendix B). The median scores paralleled the mean scores; Scales, Etudes, and Solos received a median score of five, Band Music and Improvisation and received a median score of three, and Thirds/Arpeggios, sight-reading, and Other received a median score of four. The Shapiro-Wilk W test indicated that the data was not normally distributed for each of the eight training activities. The mean scores were converted to z-scores for each of the training activities. Solos and Scales received a z-score of approximately one SD above the mean (1.2, .9, respectively), while Improvisation and Band Music received a z-score more than one SD below the mean (-1.5, -1.0, respectively).

D. **Comparison Between Individual Practicing, Private Lessons, and Student Ratings** (Appendix B). The training activities emphasized during private lessons were parallel to training activities emphasized during the MM's instrumental practice. The Solos, Etudes and Scales were ranked as the most important (8th, 7th and 6th) while Improvisation was ranked the least important among all three activities (1st). Note that MMs listen and apply during practicing what they are taught during their private lessons. When z-scores and ranks were examined for Thirds/Arpeggios, Band Music, sight-reading, Improvisation, and Other, there was a slight difference in rankings (e.g., Other: 2nd [Practicing] and 5th [Private Lessons], but the z-scores were very similar. Again, the activities the students practice are very similar to the activities the student is taught during private lessons. When the eight training activities were compared from the three perspectives, Solos, Etudes, and Scales were generally identified as most important IPS's and Improvisation and Band Music were generally considered the least important.

3. **Do auxiliary training activities such as (A) metronome usage during practicing, (B) recording of instrumental performances to enhance MI, or (C) external evaluations to enhance MI, differ between top and bottom MI students?**

A. **Metronome usage during practicing** Of 276 MMs, 272 reported the percentage of time they used a metronome during practicing—4 did not respond. Mean scores were developed for each outcome group (see Appendix C). The Average Outcome group (AV) used the metronome the largest

percentage of time during (M=39%), the Low Outcome group (LO) used it the second most (M=36%), the High Outcome Group (HI) used it the third most (M=33%), the Medium High Outcome group (MH) used it the fourth most (M=29%), and the Medium Low Outcome group (ML) used it the least (M=28%). Although the student's t-test suggested that there was a significant difference between the MH and the AV, and the AV and the LO, the Scheffe statistical treatment showed no significant difference between outcome groups. The permutation statistic reported no clear trend-line between the five different MI outcome groups. Although ranging from 28% to 39%, the analysis suggested that generally, MM used a metronome approximately one-third of the time during individual practicing.

B. **Number of minutes per month MMs record their instrumental playing** Of 276 MMs, 259 students responded to the question addressing the number of minutes they used an audio/video recorder to assist in developing their MI. Mean scores were developed for each outcome group (see Appendix C). The ML used an audio/video recorder the most (M=40%), while the other four outcome groups used it approximately 17 minutes less than the ML. The Brown-Forsythe, Welch ANOVA and the One-Way ANOVA statistical analyses showed no significant difference between outcome groups. Also, the permutation analysis between outcome groups did not reflect an important trend-line between the five MI outcome groups.

C. **Classmate/faculty member to listen to the MM's instrumental performance.** Out of the study's total population of 276 MMs, 259 responded to the question asking them to identify the number of minutes they typically used another music student or faculty member to listen to their instrumental performance (see Appendix C). Mean scores were developed for each outcome group. The HI asked other musicians to critique their instrumental performance the most (M=31%), the LO the second most (M=23%), the MH the third most (M=22%), the ML the fourth most (M=22%), and the AV the least (M=16%). The HI generally used outside advice approximately 10% more than other outcome groups. Although the Brown-Forsythe, Welch ANOVA, and the One-Way ANOVA statistical analysis reflected no difference between outcome groups, the Student's t-test statistic suggested differences between the MH and LO, and between the ML and LO. When the permutation statistic was used to examine the trend-line between outcome groups, no meaningful trend-line emerged.

4. **How the training activities during the MM's practicing, private lessons, and their MM's ratings differ between the top and bottom MI students?**

A. **Percentage of time during practicing** The percentage of time the MM's practiced each of the

eight training activities were compared between the HI and the LO (see Appendix C). The HI and the LO practiced approximately the same amount of time on during Scales, Thirds/Arpeggios, sight-reading, and Other. The HI emphasized some training activities more than the LO. The HI emphasized Etudes (M=24%, 17%, respectively) and Solos (M=35%, 25%, respectively), and de-emphasized Band Music (M=6%, 12%, respectively) and Improvisation (M=3%, 7%, respectively). When Scales, Etudes, and Thirds/Arpeggios are grouped together and used as an indicator of instrumental performance fundamentals, the HI spent more time collectively on these training activities than the LO (M=42%, 35%, respectively—a 7% difference). Further, when musical performance fundamentals plus the Solos activity are grouped, the HI spent 74% on these collective activities while the LO spent 59%—a 15% difference.

When the five outcome groups were compared by each of the eight training activities, the HI spent the most time on Etudes and the least time on Scales, Band Music, sight-reading, and Improvisation. The MH spent the most time on Solos, the AV spent the most time on sight-reading, the ML emphasized Scales, Thirds/Arpeggios, and least on Other, while the LO spent the most time during practicing on Band Music, Improvisation, and Other, but the least time on Etudes and Solos. The Brown-Forsythe analysis suggested a significant difference between the five outcome groups for Etudes and Other, Welch ANOVA statistical analysis showed differences between the five outcome groups for Band Music and Solos, and the One-Way ANOVA identified differences between groups for Band Music, Solos, and Other. The Student's t-test identified specific differences between the Scales, Thirds/Arpeggios, Band Music, Solos, Improvisation, and Other, but the Scheffe identified differences for the Solos training activity only.

The permutation statistic suggested a strong trend-line ($p \leq .01$) for Band Music and Improvisation, and a moderate ($p \leq .05$) trend-line between outcome groups for Scales, Solos, and Other. The trend-line analysis suggests that as weaker MI students progress to advanced MI students, they gradually diminish their emphasis on scales, band music, and improvisation and gradually increase their emphasis on solos.

B. **Percentage of time during Private Lessons** The percentage of time the MMs emphasized each of the eight training activities during private lessons were compared between the HI and the LO. The HI and the LO emphasized approximately the same amount of time (≤2% difference) on Etudes, Thirds/Arpeggios, Band Music, and Other. The LO spent 8% more time practicing Scales (M=15%, 7%, respectively), 3% more on sight-reading (M=7%, 4%, respectively), and 20% less time practicing Solos than the HI (M=21%, 41%, respectively). When the five groups were compared by activity, the HI spent the largest percentage of time during their lessons on Etudes and Other and the least on Scales, Thirds/Arpeggios, sight-reading, and Improvisation. The MH spent the most time on Solos and the least on Etudes. The AV spent the least time on Band Music, the ML spent the largest percentage of time on

Thirds/Arpeggios, Band Music, sight-reading, and Improvisation, and the LO spent the most time on Scales and the least time on Solos.

The Brown-Forsythe statistical analysis suggested a significant difference between the five outcome groups for Other, while the Welch ANOVA and the One-Way ANOVA statistical analyses suggested that there were differences between outcome groups for Scales, Thirds/Arpeggios, Solos, and Other. The Student t-test identified specific differences for Scales (six different combinations), Thirds/Arpeggios (four combinations), sight-reading (one combination), Solos (six combinations), and Other (six combinations), while the Scheffe identified a significant difference between Scales and Solos training activities.

The permutation statistic was used to identify a significantly large ($p \leq .01$) trend-line for Scales, and a moderate trend-line for Thirds/Arpeggios, sight-reading, and Solos. The trend-line analysis suggests that as students progress from elementary to advanced MI, they gradually diminish their emphasis on Scales, Thirds/Arpeggios, Band Music, and sight-reading and gradually increase the percentage of time they emphasize Solos during private lessons.

C. **Practicing v. Private Lessons** The practice and lesson activities were compared between the HI and the LO MMs. The HI placed more emphasis during their practicing on Scales (5%), Thirds/Arpeggios (3%), Band Music (4%), sight-reading (2%), and Improvisation (2%) than during private lessons. The HI placed less emphasis during private lessons than during practicing on Etudes (5%), Solos (6%), and Other (4%). The LO placed more emphasis during practicing on Thirds/Arpeggios (1%), Band Music (9%), sight-reading (0.3%), Solos (4%), and Improvisation (5%) than during private lessons. The LO de-emphasized Scales (2%), Etudes (9%), and Other (0.6%) during practicing more than in private lessons. As expected, the HI students generally have different practice habits and private lessons than the LO students.

D. **Student's rate each training activity in developing MI** Using a five-point Likert-type scale, the students rated the importance of each of the eight training activities in developing MI. Among the five outcome groups, the HI rated Solos most important and Thirds/Arpeggios least important. Among all outcome groups, the LO rated Band Music, Sight-Reading, Improvisation, and Other most important and rated Scales and Etudes least important. Note that the HI students identified three of the four important performance skills as their top three rankings (Solos, Etudes, and Scales, but not Thirds/Arpeggios). Using an elimination process, the single item that HI ranked important but the LO did not rate important was the Etudes training activity.

When the mean scores were summed by outcome group, the HI, MH, and the AV had the lowest

cumulative mean score (M=30.8, 31.8, 30.8, respectively) and the ML and LO had the largest means collective mean score (M=32.0, 33.1, respectively). This analysis suggests that the ML and LO had cumulative higher ratings than the HI, MH, and AV students. HI mean scores ranged from 2.6 to 4.9 (i.e., a 2.3 difference) and the LO ranged from the 3.5 to 4.8 (1.3 difference)—HI students reflect a larger range of rating for important and non-important IPS. The data analysis suggests that the LO students either have more difficulty in rating the important and less important MI training skills (levels of discrimination), or are unwilling to openly comment about these skills. Where the LO rates most MI training skills relatively important (M≤3.0), the HI students know, and are willing to openly rate, certain IPS's over others.

5. **What is the relationships between the training activities and the student's MI (i.e., both GT score and individual subtest scores)?**

A Pearson Product Moment (PPM) correlation statistic was used to compare the three areas and their respective items with the student's MI. A correlation matrix was developed (see Appendix D). The data analysis was examined from both the GT perspective and from the individual subtest perspective.

A. Grand Total Scores (MAT3 plus MAT4)

i. **Negative impact on MI** The correlation analysis suggested that several of the study's items have a significantly negative impact on the student MI. If students de-emphasize Band Music or Improvisation during their individual practice (GT: r= -.13, -.17), or Scales, Improvisation, and Sight-reading during their private lessons (GT: r= -.17,-.13, -.14 respectively), they generally had a significant higher MI than students who emphasized these activities. If students rated Band Music or Improvisation important, they were significantly weaker MI students than students who did not rate these activities important.

II. **Positive impact on MI** The percentage of time a student played Solos (D3SO) during private lessons and during practicing (r=.19, .26 respectively) had a significantly positive impact on the student's MI. Note that seven of the eight IPS's for both practicing and private lessons did not have a meaningful impact on the student's level of MI, while the MM rating of none of these IPS suggested a positive impact on the student's level of MI.

B. Subtest Analysis

Colwell's MAT3 and MAT4 and respective subtests were administered to the study's MMs. For clarification, Colwell's music skills identified in each respective subtest will be used in the discussion below.

I. **Instrumental Performance Skills that have a Negative Impact on MI** When the MMs emphasized Band Music during their **practicing**, they received significantly lower scores in Melody Recognition (MAT3, ST2: r= -.14), Pitch Recognition (MAT3, ST3: r= -.14), and Musical Style (MAT4, ST1: r= -.20). When they de-emphasized Improvisation, they received better scores in Tonal Memory (MAT3, ST1: r= -.16), Instrument Recognition (MAT3, ST4: r= -.15), and Auditory-Visual Discrimination (MAT4, ST2: r= -.15). When the MM's de-emphasize Other, they have a positive impact on Chord Recognition (MAT4, ST4: r=-.40), and Cadence Recognition (MAT4, ST5: r=-.19).

During the MM's **private lessons**, when MM's de-emphasized Scales, they have significantly better Melody Recognition (MAT3, ST2: r=-.16), Pitch Recognition (MAT3, ST3: r=.-18), Composer Recognition (MAT4, ST1: r= -.31), and Auditory-Visual Discrimination (MAT4, ST3: r= -.17). When they de-emphasized Etudes, they had a positive impact on Tonal Memory (MAT3 ST1: r=-.17). When the MM's de-emphasized Band Music, they received significantly higher scores in Musical Style (MAT4, ST2: r= -.14). When they de-emphasized Sight-reading, they had higher Melody Recognition (MAT3, ST2: r= -.18). When the MMs de-emphasized Improvisation, they had higher Composer Recognition (MAT4, ST1: r = -.20). Lastly, when they de-emphasize Other, they have a positive impact on Chord Recognition (MAT4, ST4: r = -.32).

Do students ratings have a negative impact on MI? When MM's rate Band Music important in developing MI, they received lower scores in Tonal Memory (MAT3, ST1: r= -.22), Pitch Recognition (MAT3, ST3: r= -.22), Musical Style-Composer (MAT4, ST1: r= -.26), Musical Style-Texture (MAT4, ST2: r= -.19), and Auditory-Visual Discrimination (MAT4, ST3: r= -.22). When the MM rated Improvisation important, they received lower scores in Tonal Memory (MAT3, ST1: r= -.16), Melody Recognition (MAT3, ST2: r= -.18), Pitch Recognition (MAT3, ST3: r= -.15), Instrument Recognition (MAT3 ST4: r= -.15), and Musical Style-Composer (MAT4, ST1: r= -.26). When the MMs rated Other important in developing MI, they received significantly lower scores in Chord Recognition (MAT4, ST4: r= -.15) and Cadence Recognition (MAT4, ST5: r= -.19).

II. **Musical Skills that have a positive Impact on MI** When the MMs emphasized Etudes during practicing, they had significantly higher Melody Recognition (MAT3, ST2: r=.17). When the MM's emphasized Sight-reading, they had significantly higher Cadence Recognition (MAT4, ST5: r=.16). When they emphasized Solos, they received significantly higher scores in Tonal Memory (MAT3, ST1: r=.17), Musical Style-Texture (MAT4, ST2: r=.15), and Auditory-Visual Discrimination (MAT4, ST3: r=.14), and Cadence Recognition (MAT4, ST5: r=.14). Finally, when the MMs emphasized Other during their practicing, they scored higher on Musical Style-Composer (MAT4, ST1: r=.19).

When the MMs emphasized Solos during their private lessons, they received significantly higher scores in Tonal Recognition (MAT3, ST1: r=.17), Melody Recognition (MAT3, ST2: r=.18), Pitch Recognition (MAT3, ST3: r=.14), Instrument Recognition (MAT3, ST4: r=.15), Musical Style-Composer (MAT4, ST1: r=.24), Musical Style-Texture (MAT4, ST2: r=.19), Auditory Visual Discrimination (MAT4, ST3: r=.19), and Cadence Recognition (MAT4, ST5: r=.15)--***eight of the nine subtests***. Pitch Recognition (MAT3, ST3: r=.18) was the single instance where there was a significant positive relationship between the student's ratings and any of Colwell's subtests—all other positive relationships were not significant.

Finally, examine Appendix D and observe the number of shaded boxes and regular boxes under each of the subtests. Note that 42 are shaded, indicating a significantly negative relationship between one of the subtests and the study's IPS, while 19 unshaded boxes indicated a positive relationship—almost a 2:1 ratio.

6. What individual training activities have a significant impact on the student's MI score?

A. Simple Regression The Simple Regression statistic was used to examine the Instrumental Performance Skills (IPS) from three perspectives: (1) the percentage of time the student emphasized each of the eight IPS's during practicing, (2) the percentage of time the student emphasized each IPS during private lessons, and (3) the student's rating of each IPS in developing MI.

Of the study's 24 Simple Regression analyses (see Appendix E), 14 had a negative slope and 10 had a positive slope. There was a consistently negative trend-line (slope) for Band Music, Sight-reading, and Improvisation from all three perspectives (*i.e., practicing, private lessons, and student ratings*).

When the probabilities for the 24 Simple Regression analyses were examined collectively, there were significant relationships between 9 of the 24 analyses. The items with a significant relationship to the student's GT score were: (1) during practicing: Band Music and Improvisation (negative) and Solos (positive); (2) during private lessons: Scales, Sight-reading, and Improvisation (negative) and Solos (positive); and (3) ratings: Band Music and Improvisation (negative).

When the R^2's were converted to percentage of variance between the independent variables and the dependent variable (GT score), items with the largest (≥3.0%) impact on MI included the two practicing IPS's [Band Music (3.3%) and Solos (4.7%)], the two private lesson IPS's [Scales (5.0%) and Solos (6.0%)], and the two IPS's that the student rated [Band Music (4.5%) and Improvisation (3.6%)]. Note that the study's data analysis suggested that 18 of the 24 IPS's have little or no impact on the student's MI.

When the three areas (*i.e., practicing, lessons, and rating*) were examined collectively, none of

the eight IPS's had a consistently important impact on the student's GT score. For example, when the "Solo" IPS was examined, the data analysis suggested that solos had a significantly positive impact on GT during practicing (4.7%), a larger impact during private lessons (6.0%), but NO impact (0.8%) reflected by the student's ratings. In another instance, "Scales" reflected a negative impact during practicing and during private lessons, but no significant impact during practicing or by the student's ratings. The analysis for Etudes, Thirds/Arpeggios, and Other during the student's practicing, private lessons, or student's ratings reflected no significant relationship to the student's GT score. Does this segment of the preliminary data analysis suggest that Etudes, Thirds/Arpeggios, and Other are not educationally viable IPS's and should be excluded from the music education curriculum?

When the R^2 were summed, each of the three general areas accounted for a small impact on the student's MI. The IPS accounted for 10% during practicing, 14% during private lessons, and 9% when the ratings were summed.

B. Stepwise Regression (Forward) The Stepwise Regression (Forward) suggested that three independent variables accounted for 14% (i.e., R^2=.144) of the variance on the student's MI. The three items with a significant impact included: (1) the percentage of time they emphasized Etudes (D2 Etudes) during practicing, (2) the percentage of time the teacher emphasized solos during private lessons, and (3) the negative perception the student rated Band Music (D4 BM). Other items with a marginal impact included the student's negative ratings of Improvisation (D4 Improvisation), the percentage of time the student emphasized Thirds/Arpeggios (D2 Thirds/Arpeggios) during practicing, and the percentage of time the MMs emphasized sight-reading (D2 SR) during practicing. Note that most of the IPS the MMs emphasized during both practicing and during private lessons did not have a meaningful impact on the student's level of MI.

C. Exploratory Multiple Regression

Using the results from the preliminary analysis (i.e., High/Low outcome analysis, correlation analysis, ANOVA analysis, and Simple Regression), plus the Stepwise regression model, Exploratory Multiple Regression (EMR) was used to examine the importance that each of the 25 independent variables had on the student's MI. The authors analyzed the data many times by adding and eliminating variables during the exploratory multiple regression process. If the F-score and corresponding p-value indicated the independent variable was not significant at the .05 level, the independent variable was eliminated from the EMR model. Each of the study's variables were added to the EMR model until only the items that were significant remained.

The EMR analysis suggested that eight variables accounted for 19% of the variance. The percentage of time the student practiced Band Music had a *negative* impact on MI. The IPS's with a *positive* impact on MI included the percentage of time the students emphasized Etudes (D2 ET), Thirds/Arpeggios (D2 TA), Sight-reading (D2 SR), and Solos (D2 SO) during lessons, and the percentage of time they emphasized Solos (D2 SO) and "Other" (D2 OT) during lessons (see Appendix G).

D. Guttman's' Partial Correlation

The Guttman's partial correlation statistic was used to examine the percentage of variance between each of the 25 IPS's and the student's MI score. Items with 1% or larger impact were identified (see Appendix G). Items with a *positive* impact included the percentage of time the student emphasized Etudes (D2 ET=1.9%) and Sight-reading (D2 SR=2.3%) during **practicing**, and the percentage of time the student emphasized Solos (D3 SO=1.4%) and Other (D3 OT=1.3%) during **private lessons**.

The four IPS's with a *negative* impact on MI were the percentage of time the MMs emphasized Other (D2 OT= -1.3%) during practicing, the student's rating of Band Music (D4 BM= -4.8%), Improvisation (D4 IM= -1.0%), and the percentage of time they used a metronome during practicing (-1.8%). When the *positive* IPS's were summed, they accounted for 6.9% of the variance, yet when the *negative* IPS's were summed they accounted for 8.9% of the variance. After the collective impact for both the positive and negative items were summed, the eight items accounted for 15.8%, while the other 17 items accounted for 4.2% of the variance.

7. **What IPS have an impact on each of Colwell's 9 subtests, two total tests (i.e., MAT3 and MAT4), and grand total of both tests?**

Type III Sum of Squares analysis was used to examine the significance of each of the 24 IPS's on each of the 9 subtests. These relationships were examined from three perspectives: (A) the IPS's that were significant at the .05 level of significance, and (B) items that impact Colwell's MAT3 and MAT4 tests.(see Appendix H).

A. **Items with a significantly ($p \leq .05$) positive impact on Colwell's MAT3 and MAT4 subtests.**

The student's rating of Band Music had a significantly negative impact on Colwell's Tonal Memory (MAT3 ST1). The percentage of time the student emphasized Etudes, Thirds/Arpeggios, and Solos had a significant impact on Melody Recognition (MAT3 ST2). The percentage of time the student emphasized Etudes, Thirds/Arpeggios, Solos, and Other during practicing impacted Pitch Recognition (MAT3 ST3), as did the students' rating of Solos. Note that none of the 24 items impacted Instrument Recognition.

When MAT4 subtests were examined, the percentage of time the MM emphasized

Thirds/Arpeggios during practicing, the percentage of time they de-emphasized Scales during private lessons, and the student's low ratings of Band Music and Improvisation had an impact on Musical Style-Composer (MAT4 ST1). The percentage of time the MM's practiced Solos and Etudes, and their ratings of Etudes (high) and Band Music (low) impacted Musical Style-Texture (MAT4 ST2). The percentage of time the MMs emphasized Etudes, Thirds/Arpeggios, and Solos during practicing and the student's low ratings of Band Music impacted Auditory-Visual Discrimination (MAT4 ST3). The percentage of time the students practiced Thirds/Arpeggios and Other, the percentage of time Other is de-emphasized during private lessons, and the student's high rating of Thirds/Arpeggios and low rating of Other all impact Chord Recognition (MAT4 ST4). The percentage of time the MMs emphasized Etudes, Thirds/Arpeggios, Sight-reading, and Solos during practicing and the student's low rating of Other appeared to impact Cadence Recognition (MAT4 ST5).

Note that the data analysis identified 30 analyses where one of the nine subtests were impact by one or more of the of the study's eight IPS's. The study's collective analysis suggested that there were five analysis each where Pitch Recognition (MAT3 ST3), Melody Recognition (MAT4 ST4), Chord Recognition (MAT4 ST4) and Cadence Recognition (MAT4 ST5) were identified, and four separate analysis where Melody Recognition (MAT3 ST2), Musical Style (MAT4 ST1), and Chord Recognition (MAT4 ST3) were identified. None of the practicing, private lessons, or student ratings had a significant impact on Instrument Recognition (MAT3 ST4), and one analysis where Tonal Memory (MAT3 ST1) was identified. Note that 19 positive relationships between the study's items and Colwell's subtests were identified in the practicing area, 2 in the private lessons area, and 10 in the student's rating area.

B. Area items with a significant impact on the study's MAT3 and MAT4 and the study's Grand Total Test (GT).

During practicing, the same IPS's that impacted MAT3 also impacted MAT4 and the GT score. Emphasizing Etudes, Thirds/Arpeggios, and Solos during practicing had a positive impact on the student's MI level, while emphasizing Scales, Band Music, Sight-reading, Improvisation and Other appeared not to have an impact on the student's MI growth. Emphasis on none of the study's eight IPS's during private lessons appeared to have an important impact on the student's level of MI. In the student's rating area, the analysis suggested that there was a significantly negative impact on MI when the student rated Band Music and Improvisation important but the rating of the other six IPS's appeared not to have any impact on the student's MI growth.

VIII. CONCLUSIONS

A. Individual practicing is the primary means by which instrumental music majors learn and master instrumental performance skills.

The activities and experiences with a positive impact on the student's MI are clustered in the practicing area and not in the private lessons area. Are students weak because they don't put in the time necessary to obtain instrumental excellence or do they spend sufficient time but practice the wrong things? Too often, music educators and lay amateurs do not differentiate between "talent" and the necessary time and work associated with mastering instrumental performance skills To the naive, the term talent is used too often, representing their lack of understanding conceming the acquisition of MI excellence.

Knowing all the ingredients that make up MI, as opposed to knowing a few important aspects is essential. The Low MI students rated Thirds/Arpeggios and Solos less important during lessons than did the High MI students. Further, the Low MI students rated Improvisation, Sight-Reading, and Band Music more important during practicing than the High MI students. Perhaps the Low MI students are low because they do not understand which things are, and are not, important in developing MI.

Teachers spend twice as much time on Sight-Reading with Low MI MMs than they do with High MI Mms (4% v. 7%). Could this suggest that the weaker students might not be prepared for their private lessons, resulting in the use of Sight-Reading to help fill up the time? Since the relative importance of IPSs is perceived differently between weak and strong students, perhaps more time and attention is needed in correcting the misconceptions of the weaker students.

B. Private teachers guide the students, but the students must make the trip by themselves.

MMs begin to learn and master IPSs during private lessons. Private teachers are responsible for guiding the MMs down the correct road. If the student veers from the correct road, the private teacher guides the student back to the essential activities.

Have music educators been too willing to accept "quick fixes, short-cuts, and rote teaching" as alternative solutions for a host of issues? This study's findings suggest that "High" MI students are more likely to emphasize the mastery of specific IPSs, such as Thirds/Arpeggios, Etudes, and Solos, than other less MI students. Simply stated, there is no substitute for a strong foundation of essential fundamentals, mastered over time, through hard work.

C. Students should emphasize a different selection of IPS during practicing than they do during private lessons.

The study's data analysis suggests that during practicing, the students should emphasize Solos, Etudes, Thirds/Arpeggios, Etudes, and Sight-reading, de-emphasize the student's rating of Improvisation, and importance of Band Music, emphasize Solos and Other during private lessons (see Appendix I). *The findings on Sight-Reading are, however, inconclusive. In an earlier study, Sight-Reading appears to be related to practicing improvisation and band music (a multicollinearity issue or overlap between other independent variables) (Bobbett, et al. (1994)). Therefore, Sight-Reading might not be an independent variable with a positive impact on the student's level of MI. The authors suggest that much additional research is needed to clearly examine the impact sight-reading has on the student's MI development.*

During private lessons, the MMs should emphasize Solos and Other (reed adjustment, embouchure, instrument repair and maintenance, etc.), moderate the percentage of time they use the metronome, Etudes, and Scales, and de-emphasize Thirds/Arpeggios, Sight-Reading, Improvisation, and Band Music. Scales, Thirds/Arpeggios, and "specialty" Etudes, emphasizing specific skills such as articulation, breath control, or phrasing, represent lower-level IPSs, while Solos represent upper-level IPSs.

Is it common in music education for a private teacher to make suggestions about the percentage of time students should practice these different IPSs? A typical private lesson assignment might include an etude; several scales, thirds, or arpeggios; a solo; and maybe an ensemble piece (chamber piece or band piece). It is then up to the student to determine how much they practice and what percentage of time they allocate to each activity. The authors suggest that private teachers should also make recommendations regarding the percentage of time allocated to each of these practice activities. The private teacher should assist the student in prioritizing practice activities for best results. These priorities can be upset when undue emphasis is placed on practicing Band Music, Sight-Reading (Bobbett, et al, 1994), or Improvisation during practice time. It appears that the road to MI may be more narrow than we, as music educators, have led our students to believe.

D. Perceptions are often very misleading and do not have an important relationship on the student's MI growth.

When the students were asked to rate the importance of the eight IPSs in developing MI, their responses appeared to have very little relationship to their MI. Only two of the nine significant relationships for the nine different subtests were positive while the other seven were negative (see Appendix I). In addition, both of the significant relationships for the GT scores were also negative while none were positive. Finally, the two items identified as important were both negative (i.e., the importance of practicing Band Music and Improvisation).

When MMs were asked to identify IPSs that contributed to MI, their responses can be generally categorized as "meaningless" or negative? What does this say about the general state of music education? Should high, average, or low MMs be expected to know and understand the differences between important and unimportant IPSs? If MMs do not know the difference between important and unimportant IPSs, how will they be able to effectively and efficiently promote student outcome? Finally, with all the volumes of research, numerous articles in refereed journals, and trained educators in music education, why is there so much confusion among our music majors?

E. **Music fundamentals represent the foundation by which a student develops MI skills.**

Should IPSs be organized into some type of hierarchy, where their mastery of basic IPSs would be prerequisite to the mastery of more advanced IPSs? Advanced musicians acknowledge that the mastery of scales, thirds, and arpeggios are a prerequisite to the introduction and mastery of Etudes, and that the mastery of specialty Etudes are a prerequisite to the mastery of Solos. Although the study's data analysis suggested no significant relationships between Scales and MI for any of the subtests, tests, or GT scores, all the relationships between these two were positive. The introduction and mastery of Thirds is nothing more than the extension of the mastery of Scales. The same applies to the mastery of Arpeggios, for they are an extension of the mastery of Thirds.

The data analysis strongly suggests that the mastery of Thirds/Arpeggios, Etudes, and Solos are fundamental to the development of the student's MI. Of the study's 276 instrumental music majors, the authors wonder what percentage of these students can perform the major and minor Scales, Thirds, and Arpeggios in all keys. The authors also suggest that if all the MMs could pass such a hypothetical test on their performance fundamentals, there would be a dramatic improvement in their GT score, as measured by Colwell's MAT3 and MAT4. The same logic might apply to the mastery of both Etudes and Solos.

Is time and energy being spent on non-essential areas at the expense of knowledge and skills that are essential? Has our profession adequately determined and differentiated between the essential and the superfluous? Do current curricular requirements serve our students in the best possible manner?

F.. **The sequencing of IPS may have a large impact on the development of student MI.**

In private lessons Low MMs spend twice as much time on Scales (15% v. 7%) and half as much time on Solos (21% v. 41%) as do High MMs. The proper sequencing of knowledge and performance skills should progress from simple to complex. Private teachers recognize this and assign work appropriate to the student's level. Just as a child must learn to walk before running, the student instrumentalist must assemble a foundation of essential fundamentals.

G. The use of a particular statistical treatment has a major impact on the study's findings and conclusions.

This study used a variety of statistical techniques to examine the impact eight IPS's had on the student's mastery of MI. As Appendix I illustrates, different statistical treatments produce different findings and conclusions. For this reason, the authors organized the 11 different statistical treatment into two different categories including preliminary and primary analysis.

1. Preliminary analysis

This study used seven statistical treatments during the preliminary data analysis. Note that when the MMs were asked to identify important or unimportant IPSs, or when the study used permutation analysis, correlation analysis, ANOVA analysis, or simple regression analysis, different findings and conclusions were obtained. Today, a very large percentage of most research projects or research journal articles in music education use few of these seven different statistical treatments in their analysis. The authors observed during the study's data analysis that many of these preliminary statistical treatments produced vastly different findings. The authors also acknowledge that in order to be truly valid, an important variable should be identified as important using a variety of statistical treatments where one treatment validates the findings of another statistical treatment. Being uncomfortable with the unreliability of these study's seven preliminary statistical treatments, the authors used more rigorous data analysis in hopes of isolating the independent variables with an important impact on the student's MI.

2. Primary analysis

Stepwise Regression (Forward), Exploratory Multiple Regression, Guttman's Partial Correlation, and Type III Sum of Squares (Beta Coefficient) statistical treatments were used to re-examine the study's data. When these analyses were compared to the preliminary data analysis, it seemed obvious that most of the preliminary data analysis produced misleading findings. All items with an important rating or a significant relationship to the student's MI level (as measured by the student's GT score) were identified. Each item was examined from two perspectives: (1) sum of the 10 interaction = grand total interactions, and (2) sum of the primary interactions = Primary Total interactions. The authors made the assumption that if an item was really important (significant), the item would reflect a significant interaction for at least two or more of the four primary interactions.

All the study's items were arranged by the total number of primary interactions. Important items had 2 to 4 primary interactions, Questionable items reflected one or fewer primary interactions and/or more than 3.5 total interactions, and Unimportant items reflected no primary interactions and fewer than 3.0 total interactions.

Note that if the data analysis suggested a significant importance for a particular item; but was not identified at least twice in the primary interactions, the authors disregarded the item's importance.

All the study's items were arranged by the total number of primary interactions. Important items had 2 to 4 primary interactions, Questionable items reflected one or fewer primary interactions and/or more than 3.5 total interactions, and Unimportant items reflected no primary interactions and fewer than 3.0 total interactions. Note that if the data analysis suggested a significant importance for a particular item; but was not identified at least twice in the primary interactions, the authors disregarded the item's importance.

As Appendix I illustrates, if preliminary analysis was used as the only basis for determining whether or not an item reflected a significant impact on MI, then 13 additional items would have been discussed and included as having an important impact on the student's MI. Since 8 items had an important impact on MI and 13 additional items might have some impact on MI, a naive researcher might have concluded that 21 of the 24 items had a meaningful impact on the student's MI.

G. **College music majors do not know how and when to use a metronome.**

When the ICS-2 was being developed, the authors hypothesized that the use of a metronome has a strong, positive impact on the student's MI development. The study's data analysis (i.e., Stepwise Regression, Guttman's Partial Correlation, Multiple Regression, etc.) suggested that the use of a metronome during practicing has no linkage to the student's MI.

In retrospect, this finding is not unusual since none of Colwell's MAT3 or MAT4 subtests were intended specifically to examine rhythmic discrimination. The data analysis did reflect a significantly positive relationship (r=.18) between the use of a metronome and the percentage of time the student practiced Scales, a significantly negative relationship when the MM practiced Etudes (r= -.16) and Sight-Reading (r= -.11). During the student's private lessons, there was a significantly negative relationship when the student performed Scales and Thirds/Arpeggios during private lessons (r= -.23, -.19, respectively) and a marginally negative relationship when the MMs performed Etudes (r= -.08). A second bit of information needs to be examined before a final conclusion is made. Note the significantly positive relationships between the percentage of time MMs practice a specific IPS and the percentage of time they emphasize that IPS during their lessons. If students practice and emphasize what the private teacher emphasizes during the lesson, then maybe the data analysis related to metronome usage is skewed. Therefore, the study's data analysis may not be a good reflection of the importance of the usage of a metronome but a verdict on the relative emphasis placed on the metronome by the teacher during the lessons. If Scales, Etudes, and Thirds/Arpeggios have a positive impact on the student's MI during practicing, would it seem reasonable that these same fundamental IPS would also be positive

during the MMs individual private lessons (see Appendix H)? Remember, the Pearson Product Moment analysis (see Appendix D) reflected a significantly postive relationship between the student's practicing and private lessons for each of the eight IPSs. Does this suggest the profound impact of the overlap between the independent variables?

Earlier the authors (Bobbett, et al, 1994) wrote:

> Historically, a metronome has been used to help teach discipline, inner-rhythm, and precision. The usage of a metronome has always been an important component in the development of professional instrumentalists. It is constantly used by the world's top instrumental teachers at the elite music conservatories. The instrumentalist masters many important musical skills by using a metronome such as inner-rhythm, phrasing, the development of a musical line, discipline, and musical organization.

Since music educators do not emphasize the importance and usage of the metronome, are they tacitly implying that music majors are never expected to develop high levels of MI?

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Authors Notes

The authors would like to thank Dr. James Croft, Director of Bands at Florida State University, Dr. Joseph Scagnoli, Director of Bands at Ball State University, and Dr. Victor Markovich, Director of Bands at Wichita State University, and their instrumental students for participating in this research project. The authors would like to make a special thanks to Dr. Richard Colwell for developing these music achievement tests plus his enthusiastic sponsorship and encouragement for this and many past projects.

This study reflects a variety of expertise in many additional fields outside of "music education". The authors would like to extend their thanks the University of Tennessee-Knoxville's Statistics Department, and especially Dr. Esteban Walker and Dr. John Philpot for their statistical consultation throughout the organization and writing if this paper. In addition, the authors extend a special thanks to Dr. Charles "Chuck" M. Achilles at the University of Eastern Michigan-Ypsilanti, for his past and present suggestions regarding research design plus many editorial revisions. Simply, without the assistance of variety of experts, representing variety of specialities, and assisting in a variety of ways, this paper could not have been completed.

INSTRUMENTAL COLLEGE SURVEY-2

A. General

Social Security Number_____ **Instrument** _____

1. Instrumental Organization _____
2. College rank: (Fr) (So) (Jr) (Sr) (Masters) (Doctoral)
3. College major: Music ( ), Non-music ( )
4. Total years you have played your band instrument (*grade school to present*): _____
5. What grade did you start band?_____

- Gender (M) (F)
- College GPA _____
- Age _____

B. College Course Work

1. How many hours a week do you:
   a. Practice Instrument _____
   b. Study non-music course work _____
2. Number of semester (quarter) classes you have completed in each area
3. Your average grade in each area (*A-B-C-D-F*)

*Using the following scale for Questions 4-5, **RATE** each activity as to its importance in:*

4. Developing musicianship
5. In your opinion, how would the music faculty **RATE** each area's importance?

Private (Inst.) Lessons	Ear training	Theory	Keyboard/Piano	Music History	Conducting	Music Education	Voice/Choir	Inst. Ensemble	General Academic
5 = VERY important, 4=Important, 3=Somewhat Important, 2=Little Importance, 1=NOT important									

6. The music course(s) that helped your musicianship the **most**? _____ **Least**? _____

C. High School Music Activities

1. High school GPA _____
2. ACT score _____ SAT score _____
3. Excellent high school musicians emphasize _____
4. How many **YEARS** did you participate in each of these high school activities?

*Using the following scale for Questions 5-6, **RATE** each activity as to its importance in developing **MUSICIANSHIP**:*

5. Your **Musical Development**
6. In your opinion, how would your high school **Band Director** rate each area's importance?

All-State Band	All-State Orchestra	All-State Jazz Band	All-State Choir	Concert Festival	Solo-Ensemble	Marching Contests	Private Lessons	Church/Community Choir	High School Jazz Band	Community Band
5 = Very important, 4 =Important, 3 =Somewhat Important, 2 =Little Importance, 1 = Not important										

OVER

D. College Music Activities

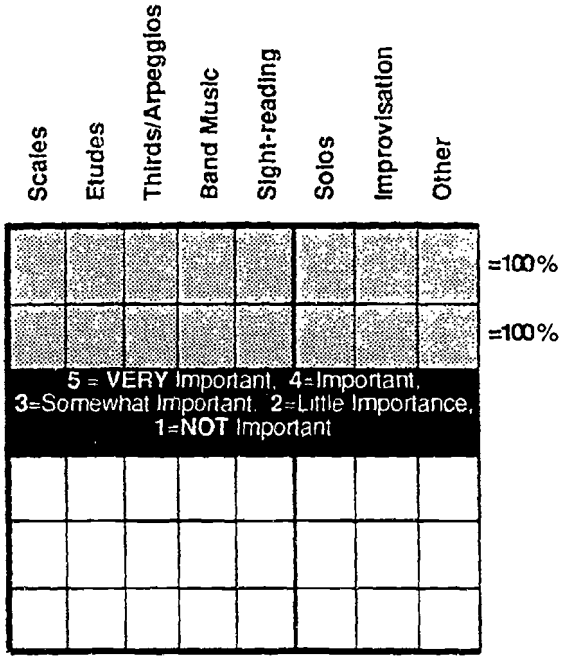
1. The percentage (%) of time you use a metronome during practicing?_____

Make sure Questions 2 and 3 each add up to 100%
What percentage (%) of time do you spend on the following activities during:

2. **Individual Practicing**
3. **Private Lessons** (*Major Inst.*)

Using the following scale for Questions 4-6, give YOUR PERCEPTION of how the following individuals would **RATE** each activity's importance in developing **MUSICIANSHIP**:

4. **Yourself**
5. Your private instrumental **Teacher**
6. Your college **Band Director**



7. Number of minutes per month you make a audio/video recording of your playing _____
8. Number of minutes per week you ask a **classmate/friend/faculty member** (*exclude private instrument teacher*) to listen/critique your instrument playing _____

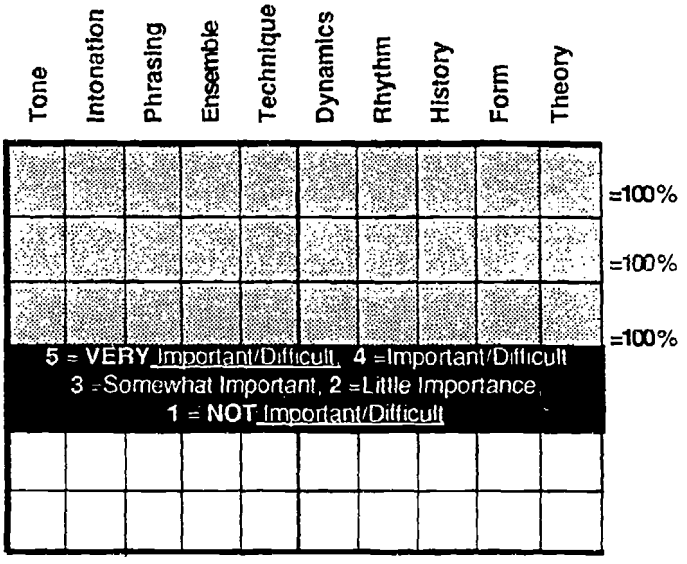
E. Musicianship

Make sure Questions 1, 2, and 3 each add up to 100%
What percentage (%) of time is spent practicing / thinking about these music items during:

1. **Individual Practicing?**
2. **Band Rehearsal?**
3. **Private Lessons ?**

*Using the following scale for Questions 4-5, **RATE** each activity in developing musicianship from the following perspectives:*

4. Its **Importance**
5. How **Difficult** is it to learn/master



6. When Performing, **excellent** instrumental musicians listen to/emphasize_____ while **poor** instrumental musicians listen to/emphasize _____

Appendix B

Music Majors

n=275

Ball State U., Floridat State U., and Wichita State U. (Spring,1992 data)

#1. College Student's Additional Music Activities

	Training Activities	MEAN %	SD	Minimum	Maximum	Range	Shapiro-Wilk	p	Z-Score	Rank
1	% Metronome/Practicing	32.3	27.7	0	100	100	0.88	.000		
2	#of Min./month:record	25.3	85.2	0	1000	1000	0.34	.000		
3	# of min./wk: consult	24.2	40	0	300	300	0.64	.000		

#2. Individual Practicing

Percentage of Time Spent During

	Training Activities									
1	Scales	12.9	8.0	0	40	40	.87	.000	0.04	6
2	Etudes	**20.8**	14.7	0	75	75	.91	.000	0.85	7
3	Thirds/Arpeggios	7.3	6.0	0	45	45	.85	.000	-0.53	4
4	Band Music	8.4	8.6	0	50	50	.82	.000	-0.43	5
5	Sight-reading	7.3	7.0	0	50	50	.82	.000	-0.54	3
6	Solos	**33.0**	18.1	0	85	85	.95	.000	2.09	8
7	Improvisation	3.7	7.9	0	50	50	.54	.000	-0.91	1
8	Other	6.9	11.6	0	80	80	.65	.000	-0.57	2

#3. Private Lessons

Percentage of Time Spent During

	Training Activities									
1	Scales	11.2	11.1	0	55	55	.82	.000	-0.10	6
2	Etudes	**26.8**	18.5	0	85	85	.93	.000	1.10	7
3	Thirds/Arpeggios	5.2	6.4	0	35	35	.77	.000	-0.50	3
4	Band Music	2.0	4.9	0	30	30	.49	.000	-0.80	2
5	Sight-reading	6.4	9.2	0	60	60	.71	.000	-0.40	4
6	Solos	**39.1**	22.9	0	100	100	.95	.000	2.00	8
7	Improvisation	1.2	4.8	0	40	40	.30	.000	-0.80	1
8	Other	7.1	11.9	0	70	70	.65	.000	-0.40	5

#4. Student's Rating in Developing Musicianship

	Other Activities									
1	Scales	**4.28**	0.88	1	5	4	.27	.000	0.90	7
2	Etudes	4.39	0.82	1	5	4	.07	.000	0.70	6
3	Thirds/Arpeggios	3.90	0.93	1	5	4	.84	.000	-0.10	4
4	Band Music	3.31	1.04	1	5	4	.88	.000	-1.00	2
5	Sight-reading	4.25	0.85	1	5	4	.77	.000	0.50	5
6	Solos	**4.73**	0.58	2	5	3	.52	.000	1.20	8
7	Improvisation	3.04	1.27	1	5	4	.89	.000	-1.50	1
8	Other	3.49	1.44	1	5	4	.83	.000	-0.80	3

Inferential Analysis

		Mean Scores by Outcome groups					a priori: Brown-Forsythe (1) Homogenoity of Variance		a priori: Welch Anova (2)		a priori: One Way Anova		a posteriori: post hoc		a posteriori: Permutation	
High School Academic Profile		High	Rank	Med. High	Average	Med. Low	Low	Rank	F Ratio	Prob≥F	F Ratio	Prob≥F	F Ratio	Prob≥F	Student's t (3)	Scheffe (4)	p	Range
	n= 272	*47*		*91*	*56*	*51*	*27*											
1 % Time using Metronome during practicing.		33.4		29.2	38.6	*27.9*	36.0		2.237	.065	1.50	.208	1.52	.196	5,8	--	--	--
	n= 259	46		84	53	50	26											
2 # Min./Mo. student records their playing.		22.7		22.3	22.5	40.1	*20.0*		0.456	.748	0.19	.943	0.45	.774	--	--	--	--
	n= 259	*46*		83	54	50	26											
3 # Min./Mo. classmate listens to the student playing.		31.1		22.0	*16.2*	21.56	23.1		1.941	.104	1.82	.130	2.08	.084	7,9	--	--	--
Music Activities				**Q2. % Time spent during practicing**														
1 Scales (SC)		*11.7*	6	12.1	13.2	15.8	12.2	6	.65	.62	1.87	.12	1.99	.10	3,6	--	≤.05	HI - ML
2 Etudes (ET)		21.8	7	18.9	22.2	21.7	*17.1*	7	2.54	.04	1.47	.22	1.48	.21	--	--	--	--
3 Thirds/Arpeggios (TA)		6.7	4	8.0	7.0	8.1	*5.3*	1	.41	.80	1.98	.10	1.46	.21	10	--	--	--
4 Band Music (BM)		*5.8*	2	7.7	7.8	10.8	11.5	5	.81	.52	3.27	.01	3.23	.01	3,4,6,7	--	≤.01	HI - LO
5 Sight-reading (SR)		6.3	3	7.0	7.1	7.8	7.7	3	.87	.48	.58	.68	.49	.74	--	--	--	--
6 Solos (SO)		35.2	8	38.8	35.0	26.0	*24.8*	8	.82	.52	5.36	.00	4.86	.00	3,4,6,7	6,7	≤.05	MH - LO
7 Improvisation (IM)		*2.9*	1	2.9	3.6	4.4	5.7	2	1.43	.23	.98	.42	1.43	.23	4,6	--	≤.01	HI - LO
8 Other (OT)		9.2	5	6.9	5.2	*4.2*	11.5	4	2.58	.04	2.08	.09	2.49	.04	3,9,10	--	≤.05	HI - ML
Music Activities				**Q3. % Time during Private Lessons**														
1 Scales (SC)		*6.7*	5	9.3	13.3	14.6	14.8	6	1.59	.18	6.45	.00	5.17	.00	2,3,4,5,6,7	3	≤.01	HI - LO
2 Etudes (ET)		28.6	7	*24.4*	28.6	27.3	26.3	8	1.52	.20	.69	.60	0.64	.64	--	--	--	--
3 Thirds/Arpeggios (TA)		*3.3*	3	4.9	5.9	7.3	4.1	3	2.14	.08	3.00	.02	2.78	.03	2,3,6,10	--	≤.05	HI - ML
4 Band Music (BM)		1.5	2	1.9	*1.4*	3.1	2.6	2	1.04	.39	.96	.44	1.04	.39	--	--	--	--
5 Sight-reading (SR)		*4.4*	4	5.9	6.8	8.1	7.4	4	.60	.66	1.46	.22	1.15	.33	3	--	≤.05	HI - ML
6 Solos (SO)		41.1	8	46.3	37.5	32.3	*21.0*	7	.87	.48	5.68	.00	5.73	.00	3,4,5,6,7,9	6,7	≤.05	MH - LO
7 Improvisation (IM)		*0.6*	1	1.0	0.8	2.3	2.0	1	1.11	.35	.98	.42	1.11	.35	--	--	--	--
8 Other (OT)		13.0	6	5.7	5.2	*3.4*	12.0	5	6.18	.00	4.52	.00	6.39	.00	1,2,3,7,9,10	--	--	--

Appendix C

Music Activities	High	Rank	Q4. Students Mean Rating in Devoping Musicianship: Med. High	Average	Med. Low	Low	Rank	Brown-Forsythe Homogeneity of Varience: F Ratio	Prob≥F	Welch Anova: F Ratio	Prob≥F	One Way Anova: F Ratio	Prob≥F	post hoc: Student's t	Scheffe	Permutation: p	Range
1 Scales (SC)	4.3	6	4.3	4.3	4.5	4.3	6	.28	.89	.43	.79	.49	.74	--	--	--	--
2 Etudes (ET)	4.4	7	4.4	4.5	4.5	4.2	5	.62	.65	.37	.83	.50	.73	--	--	--	--
3 Thirds/Arpeggios (TA)	3.7	4	4.0	3.9	3.8	3.9	3	.42	.80	1.07	.38	1.02	.40	--	--	--	--
4 Band Music (BM)	3.1	2	3.0	3.5	3.5	3.8	2	.59	.67	4.82	.00	4.96	.00	2,3,4,5,6,7	7	≤.05	MH - LO
5 Sight-reading (SR)	4.2	5	4.3	4.1	4.4	4.4	7	.69	.60	1.02	.40	1.06	.37	--	--	--	--
6 Solos (SO)	4.9	8	4.8	4.6	4.6	4.8	8	2.63	.03	2.73	.03	2.63	.03	2,3	--	≤.05	HI-ML
7 Improvisation (IM)	2.6	1	3.0	3.0	3.4	3.5	1	.92	.45	3.46	.01	3.27	.01	3,4	--	≤.01	HI-LO
8 Other (OT)	3.6	3	3.4	3.0	3.3	4.1	4	1.56	.19	1.94	.11	1.79	.13	9	--	--	--
Mean	30.8		31.8	30.8	32.0	33.1											

Mean Scores
Box = Largest Mean Score, and Shaded = Smallest Mean score.
Variance and Category Analysis
Bold/Underline = significant difference (p≤.05)

Student's & Scheffe

1=High & Med. High	6=Med. High & Med. Low
2=High & Average	7=Med. High & Low
3=High & Med. Low	8=Average & Med. Low
4=High & Low	9=Average & Low
5=Med. High & Average	10=Med. Low & Low

Appendix D

Pearson Product Moment Correlation

(n=276)

	MAT3 Subtests				MAT4 Subtests					MI Outcome			% Individual Practicing							% Private Lessons							Student Ratings (Musicianship)							
	3ST1	3ST2	3ST3	3ST4	4ST1	4ST2	4ST3	4ST4	4ST5	MAT3	MAT4	GT (MAT3+MAT4	D2 SC	D2 ET	D2 TA	D2 BM	D2 SR	D2 SO	D2 IM	D2 OT	D3 SC	D3 ET	D3 TA	D3 BM	D3 SR	D3 SO	D3 IM	D3 OT	D4 SC	D4 ET	D4 TA	D4 BM	D4 SR	D4 SO	D4 IM	D4 OT	D1 Metro.
3ST1	1.00	.33	.42	.40	.29	.39	.30	.35	.30	.70	.48	.63	.04	-.07	-.02	-.11	-.12	.17	-.16	.04	-.07	-.17	-.09	-.08	-.03	.17	-.06	.10	.00	.03	.03	-.22	-.07	-.02	-.16	-.05	-.08
3ST2	.33	1.00	.53	.32	.33	.37	.43	.33	.37	.80	.54	.72	-.01	.17	.02	-.14	-.02	.11	-.13	.02	-.16	.05	.01	-.03	-.18	.18	-.13	.05	-.02	.07	-.03	-.13	-.06	.09	-.18	-.07	-.10
3ST3	.42	.53	1.00	.26	.37	.42	.31	.34	.36	.82	.54	.72	.00	.11	.05	-.14	-.01	.06	-.11	.05	-.18	.02	-.08	-.08	-.06	.14	-.12	.08	-.01	-.01	-.07	-.22	-.10	.18	-.15	-.01	-.06
3ST4	.40	.32	.26	1.00	.38	.25	.12	.38	.15	.56	.38	.51	.03	.04	-.03	.01	-.04	.08	-.15	-.06	-.07	.00	-.10	-.20	-.03	.15	-.12	.05	.02	.01	-.01	-.09	-.04	.04	-.15	-.05	.04
4ST1	.29	.33	.37	.38	1.00	.36	.21	.23	.23	.46	.67	.63	-.05	.01	.06	-.20	-.08	.12	-.11	.19	-.31	.06	-.12	-.10	-.15	.24	-.20	.14	.05	.09	.04	-.26	-.10	.01	-.26	.11	.00
4ST2	.39	.37	.42	.25	.36	1.00	.37	.41	.40	.50	.76	.70	.04	.06	.02	-.06	-.04	.15	-.15	-.06	.01	.08	-.02	-.14	-.13	.19	-.08	-.16	-.01	.16	-.06	-.19	-.07	.08	-.11	-.07	-.10
4ST3	.30	.43	.31	.12	.21	.37	1.00	.29	.33	.42	.63	.59	-.08	.09	.02	-.11	.03	.14	-.02	-.10	-.17	.02	-.04	.00	-.13	.19	-.05	-.03	.08	.01	.01	-.22	.01	.06	-.05	-.11	.08
4ST4	.35	.33	.34	.38	.23	.41	.29	1.00	.51	.46	.65	.62	.07	.06	.10	.12	.03	.11	-.10	-.40	.10	.01	.11	.07	.03	.08	-.03	-.32	.15	.03	.17	.04	.02	.12	-.08	-.15	.00
4ST5	.30	.37	.36	.15	.23	.40	.33	.51	1.00	.42	.67	.61	-.01	.06	-.04	.04	.16	.14	-.08	-.19	-.01	-.01	-.04	-.06	.03	.15	.04	-.15	.08	-.11	.03	-.02	.05	.07	-.04	-.19	-.06
MAT3	.70	.80	.82	.56	.46	.50	.42	.46	.42	1.00	.67	.89	.02	.10	.02	-.15	-.06	.14	-.18	.03	-.18	-.02	-.07	-.11	-.11	.22	-.15	.10	-.01	.03	-.04	-.23	-.09	.11	-.22	-.06	-.08
MAT4	.48	.54	.54	.38	.67	.76	.63	.65	.67	.67	1.00	.93	-.01	.08	.05	-.09	.01	.20	-.14	-.11	-.14	.05	-.05	-.08	-.12	.26	-.12	-.11	.09	.07	.04	-.22	-.04	.09	-.18	-.09	-.03
GT	.63	.72	.72	.51	.63	.70	.59	.62	.61	.89	.93	1.00	.00	.09	.04	-.13	-.02	.19	-.17	-.05	-.17	.02	-.07	-.10	-.13	.26	-.14	-.02	.05	.06	.01	-.25	-.07	.11	-.21	-.08	-.06
D2 SC	.04	-.01	.00	.03	-.05	.04	-.08	.07	-.01	.02	-.01	.00	1.00	.29	.29	-.15	-.10	-.21	-.12	-.29	.23	.06	.21	.03	.03	-.06	.02	-.21	.21	.03	.13	.07	.06	-.12	-.07	-.04	.18
D2 ET	-.07	.17	.11	.04	.01	.06	.09	.06	.06	.10	.08	.09	.06	1.00	-.02	-.16	-.12	-.45	-.23	-.18	.16	.72	-.02	-.14	.01	-.44	-.08	-.18	.02	.41	-.07	.10	.04	-.16	-.13	-.08	-.16
D2 TA	-.02	.02	.05	-.03	.06	.02	.02	.10	-.04	.02	.05	.04	.29	-.02	1.00	.05	-.08	-.29	.00	-.14	.11	.07	.60	.10	-.03	-.12	-.04	-.22	.24	.16	.43	.09	.00	-.06	-.05	.03	.01
D2 BM	-.11	.14	.14	.01	.20	-.05	-.11	.12	.04	-.15	-.09	-.13	.15	.15	.05	1.00	.17	-.21	.04	-.21	.31	-.11	.12	.35	.22	-.21	.01	-.07	-.15	-.15	-.04	.42	.12	-.14	.09	-.05	.04
D2 SR	-.12	-.02	-.01	-.04	-.08	-.04	.03	.03	.16	-.06	.01	-.02	-.10	-.12	-.08	.17	1.00	-.28	.06	.00	.22	-.15	.09	.07	.32	-.24	.11	.04	-.04	-.26	-.14	.03	.33	-.14	.12	-.14	-.11
D2 SO	.17	.11	.06	.08	.12	.15	.14	.11	.14	.14	.20	.19	.31	.45	.29	.21	.28	1.00	-.11	-.11	-.30	-.33	-.21	-.12	-.22	.73	-.14	-.09	.03	-.22	-.06	-.27	-.14	.31	-.09	-.12	.05
D2 IM	.16	-.13	-.11	.18	-.11	.15	-.02	-.10	-.08	.18	-.14	.17	-.12	.23	.00	.04	.06	-.11	1.00	-.12	.01	-.13	.05	.06	.09	-.03	.22	.03	-.03	-.15	.01	.05	-.02	.03	.51	-.08	.04
D2 OT	.04	.02	.05	-.06	.19	-.06	-.10	.40	.19	.03	-.11	-.05	.29	.18	.14	.21	.00	-.11	-.12	1.00	-.25	-.16	-.22	-.13	-.09	-.03	-.04	.68	-.12	.08	-.09	-.28	-.14	.08	-.17	.40	-.12
D3 SC	-.07	.19	.18	-.07	.31	.01	.17	.10	-.01	.19	-.14	.17	.23	.16	.11	.31	.22	.30	.01	.22	1.00	-.01	.36	.04	.03	-.45	-.01	-.24	.13	.00	.07	.20	.05	-.16	.12	-.17	-.23
D3 ET	.17	.05	.02	.00	.06	.08	.02	.01	-.01	-.02	.05	.02	.06	.72	.07	-.11	-.15	.33	-.13	-.16	-.01	1.00	-.11	-.19	-.12	-.43	-.09	-.25	.11	.44	-.09	.05	.00	-.13	-.17	-.02	-.08
D3 TA	-.09	.01	-.08	-.10	-.12	-.02	-.04	.11	-.04	-.07	-.05	-.07	.21	-.02	.60	.12	.09	.21	.05	.22	.36	-.11	1.00	.16	.03	-.25	.02	-.25	.16	.02	.36	.18	.12	-.08	.02	-.10	-.19
D3 BM	-.08	-.03	-.08	-.20	-.10	.14	.00	.07	-.06	-.11	-.08	-.10	.03	-.14	.10	.35	.07	-.12	.06	-.13	.04	.19	.16	1.00	.10	-.18	.16	-.07	-.18	-.10	-.04	.23	-.02	-.15	.09	.15	.11
D3 SR	-.03	.16	-.06	-.03	.15	-.13	-.13	.03	.03	-.11	-.12	-.13	.03	.01	-.03	.22	.32	.72	.09	-.09	.03	-.12	.03	.10	1.00	-.33	.07	-.06	-.11	-.19	-.03	.12	.26	-.26	.06	-.01	-.03
D3 SO	.17	.18	.14	.15	.24	.19	.19	.08	.15	.22	.26	.26	-.06	.44	-.12	.21	.24	.73	-.03	-.03	.48	.43	.28	.18	.33	1.00	-.13	-.17	-.02	-.18	-.04	-.23	-.13	.33	.00	-.15	.10
D3 IM	-.06	-.13	-.12	-.12	.20	-.08	-.05	-.03	.04	-.15	-.12	-.14	.02	-.08	-.04	.01	.11	-.14	.22	-.04	-.01	-.09	.02	.16	.07	-.13	1.00	-.12	-.08	-.12	-.01	.00	-.02	-.04	.15	-.05	.22
D3 OT	.10	.05	.08	.05	.14	-.16	-.03	.32	-.15	.10	-.11	-.02	.21	.18	.22	-.07	.04	-.00	.03	.68	.24	.25	.25	-.07	-.06	-.17	-.12	1.00	-.07	-.09	-.05	-.12	-.07	.06	-.06	.40	.10
D4 SC	.00	-.02	-.01	.02	.05	-.01	.08	.15	.08	-.01	.09	.05	.21	.02	.24	.15	-.04	.03	-.03	-.12	.13	.11	.16	.19	-.11	-.02	-.08	-.07	1.00	.21	.55	.07	.24	.05	.06	.20	.08
D4 ET	.03	.07	-.01	.01	.08	.16	.01	.03	-.11	.03	.07	.06	.03	.41	.16	-.15	.20	.22	-.15	.08	.00	.44	.02	-.10	.19	.18	-.12	-.09	.21	1.00	.13	.14	-.11	.10	-.14	.17	-.18
D4 TA	.03	-.03	-.07	-.01	.04	-.06	.01	.17	.03	-.04	.04	.01	.13	-.07	.43	-.04	-.14	-.06	.01	-.09	.07	-.09	.38	-.04	-.03	-.04	-.01	-.05	.55	.13	1.00	.22	.20	.07	.14	.13	.09
D4 BM	.22	.13	.22	.09	.26	.19	.22	.04	.02	.23	.22	.25	.07	.10	.09	.42	.03	.27	.05	.23	.20	.05	.18	.23	.12	.23	.00	-.12	.07	.14	.22	1.00	.24	.00	.30	.05	-.04
D4 SR	-.07	-.06	-.10	-.04	-.10	-.07	.01	.02	.05	-.09	-.04	-.07	.06	.04	.00	.12	.33	-.14	-.02	-.14	.05	.00	.12	-.02	.26	-.13	-.02	-.07	.24	-.11	.20	.24	1.00	.02	.14	-.03	-.15
D4 SO	-.02	.09	.18	.04	.01	.08	.06	.12	.07	.11	.09	.11	-.12	-.16	-.06	.14	.14	.31	.03	.08	-.16	-.13	-.08	-.15	.28	.33	-.04	.06	.06	.10	.07	.00	.02	1.00	.14	.03	-.02
D4 IM	.16	.18	.15	.15	.28	-.11	-.05	-.08	-.04	.22	.18	.21	-.07	-.13	-.05	.09	.12	-.09	.51	-.17	.12	-.17	.02	.09	.06	.00	.15	-.06	.06	-.14	.14	.30	.14	.14	1.00	.09	.02
D4 OT	-.05	-.07	-.01	-.05	.11	-.07	-.11	.15	.19	-.06	-.09	-.08	-.04	-.08	.03	-.05	-.14	-.12	-.09	.40	-.17	-.02	-.10	.15	-.01	-.15	-.05	.40	.20	.17	.13	.05	-.03	.03	.09	1.00	.11
D1 Metro.	-.08	-.10	-.06	.04	.00	-.10	.08	.00	-.06	-.08	-.03	-.06	.18	-.16	.01	.04	-.11	.05	.04	-.12	.23	-.08	.19	.11	-.03	.10	.22	.10	.08	.18	.09	-.04	-.15	-.02	.02	.11	1.00

Shade = Negative Correlation (p≤.01)

Box = Positive Correlation (p≤.01)

two-tail

n=200:	(p≤.05) r=.138, (p≤.01) r=.181
n=300:	p≤.05) r=.113, (p≤.01) r=.148

Appendix E

Simple Regression

p≤.05

	Code	Speciality Skill	Number	R	R^2	Adjusted R^2	Percentage of Impact	F-test	SLOPE	Probability
		Percentage (%) of Time during INDIVIDUAL PRACTICING								
1	D2 SC	**Scales**	271	.06	.00	.000	0.0%	.94	-.109	.33
2	D2 ET	**Etudes**	271	.08	.01	.002	0.2%	1.61	.077	.21
3	D2 TA	**Thirds/Arpeggio**	270	.04	.00	-.002	-0.2%	.47	.102	.49
4	D2 BM	**Band Music**	270	.19	.04	.033	3.3%	10.11	-.328	.00
5	D2 SR	**Sight-Reading**	270	.10	.01	.007	0.7%	2.91	-.219	.09
6	D2 SO	**Solo**	271	.22	.05	.047	4.7%	14.17	.182	.00
7	D2 IM	**Improvisation**	270	.12	.02	.011	1.1%	4.06	-.229	.04
8	D2 OT	**Other**	265	.04	.00	-.002	-0.2%	.52	-.057	.47
						Total	***9.6%***			
		Percentage (%) of time during PRIVATE LESSONS								
1	D3 SC	**Scales**	267	.23	.05	.050	5.0%	14.88	-.309	.00
2	D3 ET	**Etudes**	268	.01	.00	-.004	-0.4%	.01	.004	.94
3	D3 TA	**Thirds/Arpeggio**	267	.10	.01	.006	0.6%	2.71	-.232	.10
4	D3 BM	**Band Music**	267	.11	.01	.009	0.9%	3.29	-.334	.07
5	D3 SR	**Sight-Reading**	267	.13	.02	.013	1.3%	4.57	-.210	.03
6	D3 SO	**Solo**	268	.25	.06	.060	6.0%	17.97	.163	.00
7	D3 IM	**Improvisation**	267	.12	.02	.011	1.1%	3.92	-.370	.05
8	D3 OT	**Other**	267	.04	.00	-.002	-0.2%	.42	.049	.52
						Total	***14.3%***			
		Student's (%) perception of IMPORTANCE								
1	D4 SC	**Scales**	271	.03	.00	-.003	-0.3%	.19	.122	.66
2	D4 ET	**Etudes**	269	.09	.01	.004	0.4%	2.19	1.620	.14
3	D4 TA	**Thirds/Arpeggio**	268	.01	.00	-.004	-0.4%	.01	.092	.92
4	D4 BM	**Band Music**	268	.22	.05	.045	4.5%	13.64	3.101	.00
5	D4 SR	**Sight-Reading**	269	.10	.01	.006	0.6%	2.61	-1.691	.11
6	D4 SO	**Solo**	268	.11	.01	.008	0.8%	3.09	2.671	.08
7	D4 IM	**Improvisation**	251	.20	.04	.036	3.6%	10.43	-2.286	.00
8	D4 OT	**Other**	165	.07	.00	-.002	-0.2%	.71	-.709	.40
						Total	**9.0%**			
		D1 Metro.	272	.02	.00	-.003	-0.3%	.11	-.011	.742

Shade = negative slope (trend-line); Box = significant at .05 level of significance

Stepwise Regression (Forward)

Practicing, Private Lessons, and Student Ratings

R:	R^R	Adj. R^R	RMS Residual:
0.401	16.1%	14.4%	0.91

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	3	23.864	7.955	9.608
RESIDUAL	150	124.19	0.828	
TOTAL	153	148.055		

Variables in Equation

Variable:	Coefficient:	Std. Err.:	Std. Coeff.:	F to Remove:	R^R
INTERCEPT	*-0.21*				
D2 ET	0.018	0.006	0.26	9.89	**6.4%**
D3 SO	0.015	0.004	0.34	15.55	**11.3%**
D4 BM	0.175	0.069	0.20	6.50	**14.4%**

Variables Not in Equation

Variable:	Par. Corr:	F to Enter:
D4 IM	**-13.9%**	**2.92**
D2 TA	**11.0%**	**1.83**
D2 SR	**11.0%**	**1.82**
D2 IM	-10.3%	1.59
D4 TA	9.2%	1.27
D3 IM	-8.6%	1.11
D2 BM	8.5%	1.09
D4 SC	7.5%	0.84
D3 OT	6.9%	0.72
D3 TA	6.4%	0.62
D1 Metro.	-5.7%	0.49
D2 OT	-5.6%	0.47
D4 SO	4.8%	0.34
D4 ET	4.5%	0.30
D3 BM	4.4%	0.28
D3 SC	-3.1%	0.14
D2 SC	2.0%	0.06
D3 ET	-1.8%	0.05
D4 SR	1.2%	0.02
D2 SO	1.2%	0.02
D3 SR	0.4%	0.00
D4 OT	-0.2%	0.00
Total	**29.8%**	

Items that some impact on MI (student outcome as measured by the study's GT score), but not a significant impact at .05.

Shade = Negative trend-line.

Exploratory Multiple Regression

Count:	R:	R-squared:	Adj. R-squared:	RMS Residual:
258	0.461	0.212	0.19	13.354

Analysis of Variance Table

Source	DF:	SSs:	Mean Sq.:	F-test:
REGRESSION	7	12005	1715	9.618
RESIDUAL	250	44579.1	178.317	p = .0001
TOTAL	257	56584.1		

Identified (Important) Items

Beta Coefficient Table

	Variable:	Coefficient:	Std. Err.:	Std. Coeff.:	t-Value:	Probability:
1	INTERCEPT	107.326				
2	D2 ET	.43	.08	.43	5.60	.000
3	D2 TA	.56	.16	.23	3.46	.001
4	D2 SR	.34	.14	.16	2.43	.016
5	D2 SO	.25	.08	.31	3.24	.001
6	D3 SO	.19	.06	.29	3.43	.001
7	D3 OT	.19	.08	.15	2.52	.013
8	D4 BM	-.23	.82	-.16	-2.71	.007

Code: Shade = negative slope

Guttman's Partial Correlation

GT (R= 0.272) — R

		R	R^2
1	D4 BM	-.22	4.8%
2	D2 SR	.15	2.3%
3	D2 ET	.14	1.9%
4	D1 Met.	-.13	1.8%
5	D3 SO	.12	1.4%
6	D2 OT	-.11	1.3%
7	D3 OT	.11	1.3%
8	D4 IM	-.10	1.0%
9	D4 TA	.09	.9%
10	D2 BM	.08	.7%
11	D4 SR	-.08	.7%
12	D4 SO	.07	.5%
13	D2 TA	.07	.4%

Items with an significant ($p \leq .05$) impact on MI (i.e., student outcome as measured by the study's GT score).

Items that do not have an important impact on MI.

		R	R^2
14	D3 BM	.05	.3%
15	D4 ET	.04	.2%
16	D2 SC	.03	.1%
17	D2 IM	-.03	.1%
18	D4 SC	.03	.1%
19	D3 SC	-.03	.1%
20	D3 IM	.02	.0%
21	D3 ET	.02	.0%
22	D2 SO	.02	.0%
23	D3 SR	.02	.0%
24	D4 OT	.01	.0%
25	D3 TA	-.01	.0%

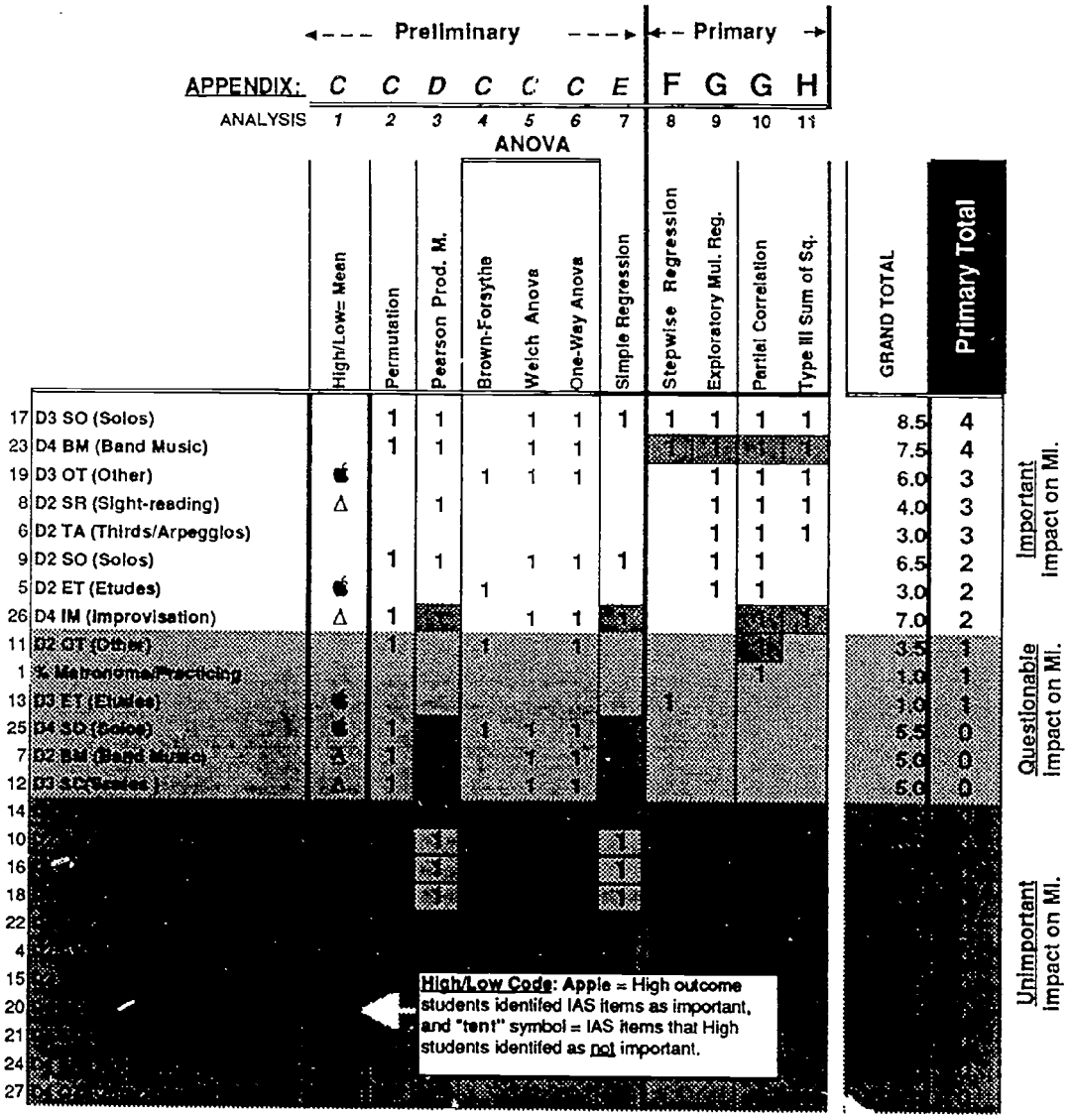
Type III Sum of Squares

		MAT3 Subtests								MAT4 Subtests										TESTS					
		MAT3 ST1	Tonal Memory	MAT3 ST2	Melody Recog.	MAT3 ST3	Pitch Recognition	MAT3 ST4	Instrument Recog.	MAT4 ST1	Musical Style-Composer	MAT4 ST2	Musical Style-Texture	MAT4 ST3	Auditory-Visual Recog.	MAT4 ST4	Chord Recognition	MAT4 ST5	Cadence Recog.	Total	MAT3		MAT4		GT	
	Practicing	t	p	t	p	t	p	t	p	t	p	t	p	t	p	t	p	t	p		t	p	t	p	t	p
1	Scales (SC)	-.35	.73	.82	.42	1.01	.31	-.61	.54	-.61	.54	1.11	.27	-1.33	.18	-.52	.60	1.27	.20		.56	.58	-.05	.96	.25	.80
2	Etudes (ET)	.04	.96	3.22	.00	2.40	.02	.57	.57	.99	.32	1.93	.05	1.98	.05	1.46	.15	2.62	.01	4	2.59	.01	2.72	.01	2.97	.00
3	Thirds/Arpeggios (TA)	-.17	.86	2.43	.02	2.01	.05	.63	.53	2.16	.03	1.08	.28	2.78	.01	2.50	.01	2.20	.03	6	2.02	.04	3.28	.00	3.03	.00
4	Band Music (BM)	-.48	.63	.84	.40	-.14	.89	-.39	.70	-1.83	.07	-.36	.72	-1.03	.30	1.34	.18	.63	.53		.06	.95	-.77	.44	-.44	.66
5	Sight-reading (SR)	-.12	.90	1.80	.07	.94	.35	-.21	.83	.12	.91	.24	.81	1.31	.19	1.53	.13	2.72	.01	1	1.11	.27	1.57	.12	1.52	.13
6	Solos (SO)	.72	.47	3.12	.00	2.34	.02	1.13	.26	1.83	.07	2.08	.04	2.59	.01	1.58	.12	3.34	.00	5	2.86	.00	3.52	.00	3.61	.00
7	Improvisation (IM)	-.19	.85	1.00	.32	.59	.56	-1.34	.18	-.54	.59	-.64	.52	.07	.95	-.83	.41	1.08	.28		.35	.73	-.36	.72	-.04	.97
8	Other (OT)	.18	.86	1.82	.07	2.15	.03	-.08	.93	1.44	.15	-.15	.88	.19	.85	-2.17	.03	.56	.57	2	1.78	.08	.27	.79	1.06	.29
	Private lessons																									
9	Scales (SC)	-.10	.92	.08	.94	-.51	.61	-.71	.48	-2.8	.00	.85	.40	-1.12	.26	.30	.77	.74	.46	-1	-.37	.71	-.94	.35	-.77	.44
10	Etudes (ET)	-.27	.79	1.40	.16	1.47	.14	.24	.81	.62	.54	.63	.53	.11	.92	.01	.99	1.28	.20		1.22	.22	.82	.41	1.11	.27
11	Thirds/Arpeggios (TA)	-1.47	.14	1.58	.12	.21	.83	-.46	.64	.73	.46	.34	.73	.65	.52	.67	.51	.33	.75		.19	.85	.83	.41	.61	.54
12	Band Music (BM)	-.67	.50	.63	.53	.27	.79	-.70	.48	-.37	.71	-1.46	.15	.18	.86	.35	.72	.23	.82		.02	.98	-.48	.63	-.29	.77
13	Sight-reading (SR)	.32	.75	-.23	.82	.50	.62	-.11	.91	-.89	.37	-.39	.69	-.95	.35	.19	.85	.89	.38		.21	.84	-.52	.60	-.22	.83
14	Solos (SO)	.57	.57	1.90	.06	1.40	.16	.88	.38	.92	.36	1.08	.28	.70	.49	.39	.70	1.79	.08		1.81	.07	1.49	.14	1.82	.07
15	Improvisation (IM)	.93	.35	.90	.37	-.82	.42	.32	.75	-1.46	.14	-1.34	.18	-.88	.38	.20	.84	1.69	.09		.40	.69	-.86	.39	-.34	.74
16	Other (OT)	.69	.49	1.64	.10	1.49	.14	.58	.56	1.13	.26	-.21	.83	.34	.73	-2.1	.03	.21	.84	-1	1.72	.09	.08	.94	.90	.37
	Student's Perceptions																									
17	Scales (SC)	.45	.65	1.57	.12	.73	.47	.96	.34	-.20	.84	-.04	.97	-.60	.55	.49	.63	1.24	.22		1.30	.20	.15	.88	.73	.47
18	Etudes (ET)	.32	.75	.49	.63	-.28	.78	-.22	.83	.39	.70	2.40	.02	.74	.46	-.08	.94	-1.14	.26	1	.14	.89	.86	.39	.60	.55
19	Thirds/Arpeggios (TA)	.71	.48	-.25	.80	-.50	.62	-.20	.84	.95	.35	-.55	.58	.22	.82	2.33	.02	.25	.81	1	-.13	.90	.83	.41	.44	.66
20	Band Music (BM)	-2.0	.05	-.89	.38	-1.7	.10	-.46	.65	-2.4	.02	-2.1	.04	-2.3	.01	.68	.50	.01	.99	-4	-1.8	.08	-2.1	.03	-2.2	.03
21	Sight-reading (SR)	-.38	.71	-.32	.75	-.43	.67	-.43	.67	-.44	.66	.12	.90	.76	.45	-.35	.73	.37	.71		-.53	.60	.11	.91	-.19	.85
22	Solos (SO)	-.19	.85	1.26	.21	2.36	.02	.47	.64	.18	.86	.72	.47	.45	.65	1.67	.10	1.16	.25	1	1.55	.12	1.10	.27	1.43	.15
23	Improvisation (IM)	-1.47	.15	-1.9	.06	-1.49	.14	-1.8	.07	-2.7	.01	-.15	.88	-.03	.98	-1.31	.19	-1.15	.25	-2	-2.3	.02	-1.7	.09	-2.3	.03
24	Other (OT)	-.30	.77	-.54	.59	.58	.56	-.30	.76	1.73	.09	-.86	.39	-.90	.37	-2.1	.04	-2.2	.03	-2	-.14	.89	-.91	.36	-.62	.53

Box/Light Shaded=ps.05; Box/non-shaded = ps.10; Dark Shaded = Significant at either .05 to .10 level plus a "negative" Beta score form Model Coefficient

The Type III sums of squares statistic was ". . . designed to remove the effect of all the other effects in the model before testing the effect in question. Consequently, they can be thought of as being constructed from a sequential model where each effect in turn plays the role of the last effect being entered into the model. Because of this, observed cell frequencies do not play a part in forming the hypotheses being tested". (Abacus Concepts, Inc. SuperANOVA, p. 192).

SUMMARY ANALYSIS



CODE: Significant p≤.05 = 1; marginal signficance = 0.5; shade = negative impact (slope/trend-line).

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