Effects of Audio- and Videotape Models on Performance Achievement of Beginning Clarinetists

Author(s): Fraser Linklater

Source: *Journal of Research in Music Education*, Vol. 45, No. 3 (Autumn, 1997), pp. 402-414
Published by: Sage Publications, Inc. on behalf of MENC: The National Association for Music Education
Stable URL: http://www.jstor.org/stable/3345535
Accessed: 21/09/2013 16:48

*The purpose of this study was to investigate the comparative effects of home practice using three different kinds of cassette-tape models on the performance achievement of beginning clarinet students. Subjects were 146 volunteer fifth- and sixth-grade students who were randomly assigned one of three cassette tapes: a videotape, a modeling audiotape, or a nonmodeling audiotape. Information on amounts of student practice, tape use, and parental involvement in student music-making was collected. Performance achievement was assessed at the conclusion of an 8-week experimental treatment period. Two further assessments were conducted to determine retention of performance achievement. All performances were rated by two independent judges, with resulting agreement correlations of 0.84 or higher. Results of analysis of variance indicated that videotape-group students scored significantly higher (0.05) on visual/physical performance criteria than did students in the nonmodeling audiotape group immediately after the treatment and scored higher on tone quality/intonation performance criteria in subsequent, delayed longitudinal assessments.*

**Fraser Linklater,** *Brandon University*

# Effects of Audio- and Videotape Models on Performance Achievement of Beginning Clarinetists

Exemplary musical models are essential for developing musical skills and concepts. There is general agreement by music educators in the present and those of previous decades that this is true (Crane, 1915; Mursell, 1927; Leonhard & House, 1972; Schleuter, 1984). In a 1987 study, Sang concluded that teacher modeling of performance behaviors has positive effects on student achievement in beginning instrumental music classes. However, Kohut (1973) observed that many music teachers lack the skills to provide an exemplary musical model on every instrument they teach. Furthermore, in large mixed-instrument classes, teachers usually do not have the time to demonstrate every instrument in every class, even if they know how to play them all.

---

This article is based on a portion of the author's doctoral dissertation, "A Comprehensive Investigation of the Effects of Audio and Video Tape Models of the Effects of Beginning Clarinet Students," granted in 1994 by the University of Michigan, Ann Arbor. Fraser Linklater is an assistant professor of music education and conducting and directs the Wind Ensemble in the School of Music, Brandon University, Brandon, Manitoba, Canada R7A 6A9. 

Many children, therefore, lack musical models in their school music classes.

Home practice is expected by most music teachers and is generally viewed as necessary to students' improvement (Radocy & Boyle, 1988). Yet at home, too, musical models are usually lacking. Teachers cannot be available during students' home practice sessions, and many parents are unable to guide their children's practice sessions effectively. The result is that many children have no adequate musical models to emulate either at home or at school.

Recognition of this problem has led researchers to explore alternative modeling possibilities. Until this century, musical models had to be provided through live performance. The advent of sound recording offered various sources of aural models, often of the highest artistic level. However, investigators in previous studies examining the effects of aural tape models on musical performance have reported decidedly mixed results. Although researchers in early studies of beginning band classes (Folts, 1973; Puopolo, 1970; Sperti, 1971; Zurcher, 1972) reported some improvement in students' performance skills through the use of recorded aural models, later studies (Anderson, 1979; Hodges, 1974) found no benefit in using recorded models. More recent articles (Dickey, 1992; Kendall, 1990) reiterate support for the use of recorded aural models in instrumental music classes.

The widespread availability of video technology has introduced the possibility of visual as well as aural musical models. Thus, it makes sense to exploit the medium of videotape in the service of music education. Videotape uses the combined visual and aural impact of television and may offer extended possibilities for musical learning.

A further educational potential for videotape lies in family participation. Suzuki Talent Education strongly emphasizes the importance of parental involvement in children's beginning instrumental music studies (Suzuki, 1969). Confirming this importance in an empirical study, Brokaw (1982) found that amount of parental involvement was positively correlated with beginning instrumental students' musical achievement. However, it is also true that parents are often willing to help their children develop musically, but perhaps due to their own lack of formal musical training are unable to do much other than provide encouragement. Through visual modeling, videotape use may provide an effective way for interested parents with limited musical background to help their children learn a musical instrument.

To summarize, it is generally agreed that imitation of appropriate musical models is an effective method of improving music learning. The need for musical models is perhaps most acute during the beginning stages of instrumental study, when playing habits are formed (Froseth, 1977; Holz & Jacobi, 1966). However, from a practical standpoint, many instrumental music teachers lack the expertise to model effectively on all the instruments they teach. Parents, a potential source of guidance, also usually lack the knowledge and skills to be helpful. Tape-recorded aural musical models have been used by a few previous researchers to develop instrumental music achievement with some,

though by no means conclusive, success. By combining aural and visual musical models, the medium of videotape offers further possibilities for enhancing students' music learning and performance achievement.

The purpose of the present study was to investigate the comparative usefulness of audiocassette and videotape models in facilitating beginning clarinet students' performance achievement. Ancillary goals of this study were: (1) to determine the comparative retention of performance skills by students using different kinds of recorded models and (2) to investigate the relationship between different kinds of recorded models and the amount of parental involvement and student practice that occurs.

## METHOD

Students in eight schools from six suburban and rural communities participated in the study. Schools were chosen according to the willingness of the instrumental music teacher to cooperate with the research. The cooperating schools served communities that were all predominately white, residential, and middle-class. Several efforts were made to include in the study schools that represented a wider cultural and socioeconomic diversity within their student populations. However, instrumental music teachers from these schools declined to participate.

Fifth- and sixth-grade beginning instrumental students who elected to play the clarinet served as subjects for the study. Clarinet was chosen for this study because (a) it is a common beginning band instrument, (b) it was believed that clarinet hand position and instrument position would lend themselves to visual modeling, (c) it is commonly played by both male and female students, and (d) it is not often seen or heard on commercial television or radio, making student exposure to clarinet modeling through media sources unlikely.

Students who had previous experience playing the clarinet or who took private clarinet lessons during the first 8 weeks of the study—the experimental treatment period—were not eligible to participate in this investigation. Of 158 eligible students, 146 initially chose to participate in the study. This represented 92% of the potential participants.

The study involved a one-factor, posttest-only research design. The factor was the type of taped clarinet modeling to which a student was exposed. Participating clarinet students were randomly assigned to one of three tape groups using a random numbers table. All students received the same textbook for class and home study. However, as a supplement to this textbook, each participating student also received a cassette tape.

Students in the first experimental group received a videocassette tape that provided both visual and aural clarinet models plus instrumental accompaniments. Students in the second experimental group received an audiocassette tape that provided aural clarinet models plus instrumental accompaniments. Students in the third group received an audiocassette tape without clarinet models, that is, instrumental

accompaniments only. Because this study was concerned with the effects of clarinet modeling, this third group of students functioned as the control group. All three kinds of tapes were designed to allow students not only to listen to the musical materials during home practice sessions, but also to play along with them.

The instrumental accompaniments were performed by an ensemble of professional musicians that included a percussionist, bassist, pianist, and guitarist. The clarinet audio models were performed by a professional clarinetist. The audio portion of the tapes was professionally recorded in a commercial recording studio. Participating students were provided with either standard analog VHS videocassette tapes with normal audio, or standard type I monophonic analog audiocassette tapes without noise reduction. Although the quality of video and audio playback systems available in students' homes obviously varied, it was speculated that most students had access to a reasonable quality of sound reproduction.

Randomization was done separately within each school. This measure assured that an even distribution of the three tape groups was maintained across schools. It also assisted in equalizing differences in teaching and teacher contact time across tape groups.

The study began in September and concluded in April, a period of 32 weeks. The experimental treatment lasted for the first 8 weeks. It consisted of the three groups of randomly assigned beginning clarinet students using their textbook and assigned cassette tape for home practice and study.

At the conclusion of the experimental treatment period (November), all students returned their cassette tapes and textbooks to their instrumental music teachers. The first posttest was also conducted at this time. The study concluded with two further posttests, administered in February and April, respectively. These additional two posttests examined retention of students' performance achievement.

*Introducing the Clarinet* (Froseth, 1977), a beginning textbook that contained numerous photographs of exemplary performance practice, was used. All three groups, therefore, had access to visual modeling, but in different media: photographs only for the modeling-audiotape and nonmodeling-audiotape groups, and television images and photographs for the modeling-videotape group. Printed music for the songs contained on all three types of cassette tapes was stapled onto the inside back cover of each textbook.

The modeling video and audiotapes consisted of two sections. The first section formed a basic instructional sequence, paralleling the first 18 pages of the textbook. The sequence began with the clarinet mouthpiece and barrel joint only, continued with single tones using the entire instrument, and concluded with various articulations in combination with the following five (written) clarinet notes: second line G, F, E, D, and middle C. A narrated instructional script accompanied the sequence.

The second section of the modeling videotape and audiotapes consisted of the 11 songs that were included with the students' textbook.

Some of these songs were repeated on the tape in two or even three different arrangements. Each song arrangement was presented three times on the modeling videotape and audiotapes. First, the melody was performed by clarinet alone. Students were asked to listen to the clarinet performance. Next, the melody was performed by clarinet with an instrumental accompaniment. Students could either listen or play along on their clarinets. Finally, the accompaniment was performed without the clarinet melody. Students were invited to play the missing melody line on their clarinets. Throughout the videotape, exemplary posture, breathing, embouchure, hand position, and instrument position were demonstrated by student models. The models used were boys and girls of middle-school age from a variety of racial and ethnic groups.

The nonmodeling audiotape consisted of instrumental accompaniments for all arrangements of the 11 songs included on the video and audio modeling tapes. No clarinet modeling was included.

Treatment diffusion was one of this study's main threats to internal validity. Students could have exchanged or copied tapes, thereby diffusing the experimental treatments. Providing a tape to all participating students was not only equitable but helped avoid possible resentful demoralization (Cook & Campbell, 1979) by a control group that did not receive any potentially beneficial materials. Parents and students were requested at the outset of the study not to trade or copy tapes. As a further check on treatment diffusion, all cooperating teachers and a random selection of parents were questioned at several intervals regarding this concern. No one reported any incidents of trading or duplicating tapes.

Students' total practice time, length of time using the tape, and amount of parental involvement were recorded in home-practice logs. These practice logs were signed by both parents and students and returned each week to the cooperating teachers for the first 8 weeks of the study—the treatment period. Additionally, a checklist of correct clarinet performance practices concerning posture, breathing, embouchure, hand position, and instrument position was included on the back of each practice log. Parents or other adult helpers were invited to observe students' practice sessions and to record student achievement on this checklist each week.

Performance achievement was measured by the Instrumental Performance Test (IPT), which was designed by the researcher to measure students' overall instrumental performance skills. The first of these tests was administered individually in November at the completion of the experimental treatment period. It consisted of four instrumental études and required approximately 5 minutes to complete.

To help insure content validity, the researcher chose études for the IPT based on the curriculum materials experienced by the participating students. All notes and rhythms contained in the assessment études had previously been studied in school during beginning instrumental classes. The first two études in the IPT were the songs "Twinkle, Twinkle, Little Star" and "Jolly Old St. Nicholas." Both songs were

included on all three types of home-practice tapes. These songs were used in the IPT because they were representative of the range of difficulty of songs found on the tapes.

The third and fourth études were composed by the researcher. Every cooperating teacher was consulted concerning the content of these two études. Each étude was 8 measures in 4/4 time, beginning with easy melodic and rhythmic material and gradually increasing in difficulty. Students were given copies of the third ("self-directed") étude a week prior to the IPT. Students were requested to prepare this third étude on their own without outside help. The final étude was sight-read by the student during the IPT itself.

The first (November) IPT was designed to determine the immediate effect of modeling on performance ability. The same IPT test was administered again after 20 weeks of instruction (February) and again after 32 weeks (April) to determine retention of students' physical and musical performing abilities. None of the cooperating teachers used audio or video modeling tapes of any sort subsequent to the November IPT.

The two later IPTs had exactly the same études as the first. However, the later two tests also included not only the original version of "Twinkle, Twinkle Little Star" and "Jolly Old St. Nicholas," but a transposed version of each song as well. This modification was done to allow a more critical assessment of students' performance abilities at a later stage in their development.

The IPTs were administered as posttests by the researcher in a room free of distractions with only the student and the researcher present. Student performances were videotaped and audiotaped, and the taped performances were rated by two judges, who evaluated the performances independently. The videotaping and audiotaping procedure was the same for all students and songs. Students were allowed to establish their own tempos for all exercises.

Ratings of each taped performance were based on both visual/physical and aural/musical criteria. Visual/physical criteria included embouchure, hand position, instrument position, and posture (Dunlap, 1989; Woods, 1979). Aural/musical criteria included tone quality/intonation, articulation, rhythmic accuracy, and melodic accuracy. The same criteria were applied to all three IPTs. Elements of physical and musical criteria were rated for each study on a 5-point scale, ranging from 1 (low) to 5 (high). A no-response category (rated 0) was also included in the judges' assessment form. Students' final scores on each IPT were determined by averaging the test scores obtained from the two judges. IPT results were used to determine the immediate and long-term effects of modeling media on students' instrumental performance skills.

All student performances for all three IPTs were evaluated by the same two adjudicators. Between them, the two adjudicators had 18 years of experience teaching public school band classes, 13 years of experience teaching clarinet privately, and 55 years of clarinet performance experience. The adjudicators independently rated student

audio- and videocassette test tapes in random order. To control for potential rater bias, adjudicators were not informed about the group to which subjects belonged. Interjudge Pearson product-moment correlations were calculated for each of the three IPTs for all performance criteria. These correlations ranged from 0.84 to 0.96.

## RESULTS

To ensure that randomization resulted in a comparable distribution of qualities among the three tape groups, the distribution of several pertinent variables was statistically analyzed. The following variables were examined: (1) gender; (2) grade level; (3) teachers; (4) students' musical background, as determined by a questionnaire (98% response rate) addressing parents' experience with formal music training and clarinet playing, and students' experience with private music lessons, music in school, and music notation; and (5) students' musical aptitude, as determined by the Intermediate Measures of Music Audiation (Gordon, 1982). No statistically significant differences among the three tape groups were found for any of the above variables.

Of the original 146 subjects who volunteered to participate, 10 did not complete the first IPT assessment (November). Of the remaining 136 subjects, 6 did not complete the second assessment (February), and 12 did not complete the third assessment (April). This left 118 subjects who completed all three assessments. However, the distribution of subjects completing and not completing the study within the three groups was not significantly different, $\chi^2(2, 146) = 1.15$, $p > 0.05$. This suggested that attrition was not related significantly to tape-group membership and would most likely not influence the results of this study.

There was a 71% return rate for home practice logs. There was no significant difference in return rate among the three tape groups ($df = 2$, Kruskal-Wallis chi-square = 3.50, $p = 0.17$). Average weekly amounts of clarinet practice, tape usage, and parental help were derived by averaging the total reported amount for each of these variables for the number of weeks each student returned a practice log. Due to the nonnormal distribution of these three variables, nonparametric statistics were applied. There was no significant difference among the three tape groups for amount of practice ($df = 2$, Kruskal-Wallis chi-square = 0.15, $p = 0.93$), amount of tape usage ($df = 2$, Kruskal-Wallis chi-square = 1.80, $p = 0.41$), or amount of parental help ($df = 2$, Kruskal-Wallis chi-square = 0.44, p = 0.80). A comparison of students' clarinet practice during the first 8 weeks of the study is presented in Table 1.

Examining the checklists on the back of home-practice logs that had been returned to cooperating teachers provided a further way to measure the extent of parental involvement with students' home clarinet practice. It was presumed that parents who completed these checklists may have had more extensive involvement with their child's practice efforts than parents who failed to complete the checklists. Since the checklists were particularly informative concerning the visual/physical

Table 1
*Comparability of Home Practice among the Three Tape Groups* (N = *136)*

| | Average weekly mount of clarinet practice (in minutes) | | Average weekly amount of tape use (in minutes) | | Average weekly amount of parental help (in minutes) | |
|---|---|---|---|---|---|---|
| | Mean | *SD* | Mean | *SD* | Mean | *SD* |
| Modeling video ($n$ = 42) | 122.3 | 55.9 | 42.4 | 35.8 | 50.5 | 50.5 |
| Modeling audio ($n$ = 48) | 115.2 | 65.9 | 51.2 | 45.5 | 43.1 | 33.5 |
| Nonmodeling audio ($n$ = 46) | 110.0 | 66.0 | 38.5 | 34.9 | 41.7 | 38.4 |

aspects of clarinet performance, they provided a further clue as to the benefits, if any, of the visual modeling provided by the modeling videotape. Applying nonparametric statistics, it was found that modeling-videotape parents completed significantly more checklists than did nonmodeling-audiotape parents ($df$ = 1, Mann-Whitney U chi-square = 12.65, $p$ = 0.00) and also had a greater completion rate than the modeling audiotape parents ($df$ = 1, Mann-Whitney $U$ chi-square = 2.66, $p$ = 0.10).

Means and standard deviations for students' November IPT subtest and total test composite scores are presented in Table 2. Possible visual/physical criterion scores and possible aural/musical criterion scores ranged from 8 (low) to 40 (high). Possible tone quality/intonation criterion scores, possible articulation criterion scores, and possible musical literacy criterion scores ranged from 4 (low) to 20 (high). The highest possible score for the total test composite was 120. The test scores used in this analysis were the average of the two judges' assessments.

From Table 2, it can be seen that there were no statistically significant differences among tape groups for five of the six performance mean scores. However, for the final performance measure Tukey HSD (Honestly Significant Differences) multiple comparisons showed that there was a significantly higher score for the modeling-videotape-group students on visual/physical performance criteria (embouchure, hand position, instrument position, and posture) than for the nonmodeling-audiotape-group students ($df$ = 131, mean difference = 2.47, $p$ = 0.02).

Subsequent IPTs revealed that this visual/physical advantage was not retained once students no longer had access to visual models. Instead, the February IPT showed that students who had received the modeling videotape in November scored significantly higher on tone quality/intonation performance criteria than students in the nonmodeling audiotape group ($df$ = 125, mean difference = 2.19, $p$ = 0.02). This tone

Table 2
*Means and Standard Deviations for Students' IPT Scores: November (N = 136)*

| IPT criteria | Modeling videotape group ($n$ = 42) Mean | *SD* | Modeling audiotape group ($n$ = 48) Mean | *SD* | Nonmodeling one-way ANOVA ($n$ = 46) Mean | *SD* | $p$ |
|---|---|---|---|---|---|---|---|
| Total test Composite | 78.88 | 15.66 | 77.60 | 16.01 | 76.05 | 16.78 | 0.71 |
| Aural/Musical | 26.32 | 6.06 | 26.31 | 6.37 | 26.26 | 6.36 | 1.00 |
| Visual/Physical | 31.98 | 4.22 | 30.51 | 4.11 | 29.60 | 4.20 | 0.02* |
| Musical literacy | 12.24 | 4.94 | 12.23 | 4.47 | 12.29 | 5.20 | 1.00 |
| Articulation | 9.76 | 3.52 | 9.67 | 4.35 | 9.45 | 4.37 | 0.99 |
| Tone quality/ Intonation | 8.61 | 2.70 | 8.58 | 3.11 | 8.00 | 2.84 | 0.53 |

quality/intonation superiority on the part of the modeling-videotape-group students was retained at levels near statistical significance ($df$ = 113, mean difference 1.57, $p$ = 0.08) for the April IPT.

The possibility that students' performance achievement was different depending upon gender, grade level, or school attended was also examined. However, two-way analyses of variance (ANOVAs) between tape groups and these three variables did not reveal any significant interactions. This indicated that whatever differences there were in performance achievement across tape groups were similar for both girls and boys, for both fifth- and sixth-graders, and for all participating schools.

## DISCUSSION

In terms of amount of weekly practice, amount of practice with the tape, and amount of parental help, none of the differences among tape groups was statistically significant. It may be that the extremely large standard deviations masked some of the differences among groups. In spite of this, one cannot help noticing some interesting trends. For all three variables, the nonmodeling-audiotape group had the lowest means. Moreover, there is a difference of over 12 minutes of average practice each week between the modeling-videotape and nonmodeling-audiotape groups and a difference of almost 9 minutes of average parental help each week between the modeling-videotape and non-

modeling-audiotape groups. Differences in both cases favored the modeling-videotape group. An examination of the IPT mean scores for the three tape groups also showed that the modeling-videotape group tended to have the highest IPT mean scores, followed by the modeling-audiotape group, with the nonmodeling-audiotape group having the lowest IPT mean scores.

In this age of increasing social fractionalization, parents' relationships with their children are often limited, sometimes harried, and occasionally dysfunctional. Opportunities to build bonds between parent and children through common interests are therefore to be valued. Building on groundwork established by the Suzuki approach to music education, it was hoped that using the modeling tapes might provide one such opportunity for at least some families.

Significant differences among tape groups in the number of completed performance checklists indicate that modeling-videotape parents may have felt more comfortable offering assistance concerning their children's visual/physical performance abilities than did parents in the other two tape groups. Although all participating students had access to visual models through the photographs included in the textbook, differences in the checklist completion rate provide support for the superiority of video modeling over photographs in providing effective guidance to interested parents.

Also worthy of note is the effect of parental help on students' performance achievement. The Pearson product-moment correlation between parental help and students' performance for the modeling videotape group was $r = 0.29$. The Pearson product-moment correlation between parental help and students' performance for the nonmodeling audiotape group was $r = -0.05$. Although not significant at the commonly used alpha levels of 0.05 or 0.10, this difference in correlation suggests that the combination of visual and aural models provided by the modeling videotape may have allowed parents to be more effective helpers.

Some previous research (Folts, 1973; Puopolo, 1970; Sperti, 1971; Zurcher, 1973) has shown audiotape models to be of benefit to beginning music students. Although tape models were helpful in this study, they were not as beneficial as was expected. One possible explanation for this is that an insufficient amount of music was included on the tapes. Based on informal student feedback, many students believed that they had "completed" all their song materials early, in which case they might not have continued to use their assigned tape throughout the entire first part of the study. This premature cessation might have diminished the impact that the tapes had on students' performance achievement. Another possible explanation is that a true control group that did not receive a tape might have provided clearer evidence of the usefulness of taped models. Finally, it may be that the length of the treatment period was insufficient to result in a larger difference in performance achievement.

The relationship between students' musical aptitude and their use of tape models is another issue of interest. Students with higher musical

aptitude used the modeling tapes more extensively than did students with lesser musical aptitude. It may be that higher aptitude students were more easily able to perform with the tapes and to discriminate differences between their performances and the models on the tapes. This points to the possibility that without the requisite musical discrimination skills, students cannot fully benefit from visual or aural musical models. Because this study dealt only with the effects of musical models on students' musical development, no attempt was made to introduce discrimination-skills training in the three types of cassette tapes used. However, this situation suggests that investigation of the effects of media-based aural discrimination training on students' musical awareness and performance self-assessment might be appropriate.

Another area for further research lies in the relationship between visual modeling and music performance with instruments other than clarinet. The greatest modeling advantage in videotape over photographs may lie in the ability of the video medium to show movement. For this reason, it could be that the potential of videotape to provide exemplary musical models is best used with instruments that demand larger motions during performance, namely strings and percussion.

A final issue regarding videotape models concerns today's rapidly changing technology. This study was possible because the huge majority of American families with middle school-age children own tape recorders, television sets, and videocassette recorders (VCRs). However, even if videotape is superseded by other technologies, the modeling concepts underlying this research should remain valid, regardless of technological changes in the medium of delivery. Indeed, should the day arrive when computers and television combine to form one larger interactive technology, the teaching and modeling approaches demonstrated in this study should be further enhanced.

It must be emphasized that the trends concerning performance achievement, amounts of practice time, and parental help are not statistically significant. Still, they do suggest that students with access to media models performed the best overall. These trends also suggest that, for the modeling videotape group students, increased parental involvement promoted increased performance achievement. The implication is that the modeling videotape enabled parents to be more effective in guiding their children's home practice. Providing both visual and aural models of exemplary performance can make a positive difference for both students and parents.

Various writers have emphasized the distinction between statistical significance and practical significance in social science and educational research. Any cost-effective and widely available interventions that help produce increased student performance and effort and increased parental involvement in that effort are likely to be of valuable practical benefit to all concerned. Despite the fact that most differences among tape groups in this study were not statistically significant, potentially positive gains may be indicated for beginning instrumental music educators using audio- and/or videotape models as part of their approach to music teaching and learning.

## REFERENCES

Anderson, J. N. (1979). An investigation of the effect of using tape recorded aural models for home practice on selected sight reading and performance skills of sixth grade clarinet students (Doctoral dissertation, University of Texas, Austin, 1979). *Dissertation Abstracts International, 40,* 6A.

Brokaw, J. P. (1982). The extent to which parental supervision and other selected factors are related to achievement of musical and technical-physical characteristics by beginning instrumental music students (Doctoral dissertation, University of Michigan, Ann Arbor, 1982). *Dissertation Abstracts International, 43,* 10A.

Cook, T. D., & Campbell, D. T. (1979). *Quasi-experimentation: Design and analysis issues for field studies.* Chicago: Rand McNally.

Crane, J. E. (1915). *Music teacher's manual* (7th ed.). Potsdam, NY: Elliot Fay and Sons.

Dickey, M. R. (1992). A review of research on modeling in music teaching and learning. *Bulletin of the Council for Research in Music Education,* no. 113, 27–40.

Dunlap, M. P. (1989). The effects of singing and solmization training on the musical achievement of beginning fifth-grade instrumental students (Doctoral dissertation, University of Michigan, Ann Arbor, 1989). *Dissertation Abstracts International, 51,* 2A.

Folts, M. L. (1973). The relative effect of two procedures, as followed by flute, clarinet, and trumpet students while practicing, on the development of tone quality and on selected performance skills: An experiment in student use of sound-recorded practice material (Doctoral dissertation, New York University, 1973). *Dissertation Abstracts International, 34,* 3A.

Froseth, J. O. (1977). *Introducing the clarinet.* Chicago: G.I.A. Publications, Inc.

Gordon, E. E. (1982). *Intermediate measures of music audiation.* Chicago: G.I.A. Publications, Inc.

Hodges, D. A. (1974). The effects of recorded aural models on the performance achievement in beginning band classes (Doctoral dissertation, University of Texas, Austin, 1974). *Dissertation Abstracts International, 35,* 8A.

Holz, E., & Jacobi, R. (1966). *Teaching band instruments to beginners.* Englewood Cliffs, NJ: Prentice-Hall.

Kendall, M. J. (1990). A review of selected research in elementary instrumental music education with implications for teaching. *Journal of Band Research, 25,* 64–82.

Kohut, D. L. (1973). *Instrumental music pedagogy.* Englewood Cliffs, NJ: Prentice-Hall.

Leonhard, C., & House, R. W. (1972). *Foundations and principles of music education* (2nd ed.). New York: McGraw-Hill.

Mursell, J. L. (1927). *Principles of music education.* New York: The Macmillan Co.

Puopolo, V. (1970). The development and experimental application of self-instructional practice materials for beginning instrumentalists (Doctoral dissertation, Michigan State University, East Lansing, 1970). *Dissertation Abstracts International, 31,* 8A.

Radocy, R. E., & Boyle, J. D. (1988). *Psychological foundations of musical behavior* (2nd ed.). Springfield, IL: Charles C Thomas.

Sang, R. C. (1987). A study of the relationship between instrumental music teachers' modeling skills and pupil performance behaviors. *Bulletin of the Council for Research in Music Education,* no. 91, 155–159.

Schleuter, S. L. (1984). *A sound approach to teaching instrumentalists.* Kent, OH: Kent State University Press.

Sperti, J. (1971). An experimental investigation testing the comparative effec-

tiveness of two different pedagogical methodologies as applied to the teaching of the clarinet (Doctoral dissertation, New York University, 1971). *Dissertation Abstracts International, 32,* 3A.

Suzuki, S. (1969). *Nurtured by love* (W. Suzuki, Trans.). New York: Exposition Press.

Woods, J. R. (1979). A study designed to develop an aural-visual test for measuring instrumental music teachers' abilities to diagnose common wind instrument performance problems (Doctoral dissertation, University of Michigan, Ann Arbor, 1979). *Dissertation Abstracts International, 40,* 2A.

Zurcher, W. (1972). The effect of model-supportive practice on beginning brass instrumentalists (Doctoral dissertation, Teachers College, Columbia University, New York, 1972). *Dissertation Abstracts International, 33,* 5A.

Submitted January 12, 1995; accepted January 31, 1996.