Students' Use of Teacher Feedback During Badminton Instruction.

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Students' use of teacher feedback during badminton instruction

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The Louisiana State University and Agricultural and Mechanical Col., 1992
STUDENTS' USE OF TEACHER FEEDBACK
DURING BADMINTON INSTRUCTION

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in
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by
Nyit Chin Keh
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Abstract

This study examined the relationship between teacher feedback variables, student process variables, and student achievement. Another purpose was to investigate the mediating role of student process variables in student achievement. The subjects were 41 college students enrolled in two beginning badminton classes, and an experienced physical education teacher volunteered to teach both classes. Ten 45 minute instructional sessions took place over a 5 week period. Each class session was videotaped for subsequent coding. Subjects were pretested, posttested, and given a retention test on three badminton skills, the forehand high serve, the forehand overhead clear, and the backhand overhead clear. Student practice was coded to determine the total number of practice trials, the number of correct trials, the number of correct trials after feedback, and the students' use of feedback provided by the teacher. A modified version of Fishman and Tobey teacher feedback observation system was used to code teacher feedback episodes. Analysis of pretest, posttest and retention test scores showed that students made significant improvements for the three skills during the unit and the performance level was maintained after an 11-day period without practice. Teacher feedback behavior patterns were consistent with previous studies, and the occurrence of feedback was not related to achievement. Correct practice
was the best predictor of achievement, but significant relationships were found between students' use of teacher feedback and the number of correct trials. The results suggest that students' use of teacher feedback serves to modify practice which leads to greater learning.
Introduction

Teacher feedback behavior is a clearly defined variable in the teaching learning process, which has been given much attention in research on teaching during the past decade. Researchers interested in teacher effectiveness have studied the relationship of teacher feedback to student achievement in a variety of subject matter areas. In classrooms, feedback is viewed as a key element in the enhancement of learning different subjects (e.g. mathematics and reading). Research findings have demonstrated that specific, nonevaluative, and task relevant feedback which provides the correct answer and how it is derived, is related to achievement (Brophy & Good, 1986; Evertson, Emmer & Brophy, 1980; Good & Grouws, 1977). In physical education, feedback is also considered an essential teacher behavior based on strong intuitive support for the notion that students need information or knowledge regarding the correctness or incorrectness of the movement to be learned. Although actual research findings are inconsistent, researchers and teacher educators typically agree that a major responsibility of physical education teachers is to provide specific and accurate information about a learner's performance (Rink, 1985; Thomas, Lee, & Thomas, 1988; Siedentop, 1991).

The traditional process-product research paradigm (Dunkin & Biddle, 1974) has most often been used to study
teacher feedback in physical education. In this approach, researchers focus on teacher and student process variables that are related to student performance scores at the end of an instructional period. This pragmatic or correlative conception of effectiveness (Shulman, 1986) has resulted in research with inconsistent findings which fail to support the claim that teacher feedback is an effective means of increasing student achievement in physical education. While there is some evidence that more effective teachers provide more feedback (Deknop, 1986; Phillips & Carlisle, 1983; Pieron, 1982), the relationship between teacher feedback and student achievement has, for the most part, been low and nonsignificant (Eghan, 1988; Silverman, Tyson & Morford, 1991). One study by Silverman (1991) found modest positive relationships between teacher feedback and student achievement when the amount of student practice was partialled out.

Recent approaches to the study of teaching and learning have focused on ways individual learners can influence the amount and kind of learning taking place (Doyle, 1977; Wittrock, 1986). The entry characteristics of students--their prior knowledge and experiences--construct a framework from which they perceive teacher feedback and formulate practice patterns during instruction. Students' perceptions of instruction and prior experience in the activity do serve as mediating links between teacher behavior and student
learning. Until researchers interested in teacher feedback consider these mediating variables, the available findings should be viewed cautiously.

One way to study student mediation of teacher feedback is to focus on the short-term effects of instruction. According to Shavelson, Webb, and Burstein (1986), the effects of many teaching activities can be masked when process behaviors are related only to end-of-instruction outcome scores. An important aspect of teaching is missed if individual students' response patterns after teacher feedback are not studied. Analyzing students' abilities to use the information provided by the teacher is requisite to the identification of effective and ineffective components of instructional feedback. The information obtained by studying student response patterns after receiving teacher feedback can help researchers understand more about how and when teacher feedback facilitates learning. For example, because of a lack of prerequisite knowledge and skill, some students may not be able to use the feedback information provided by the teacher. A frame of reference is needed before feedback information is useful to the learner. At least one recent study (Rikard, 1991) has described students' immediate motor skill responses to instructional movement tasks after receiving teacher feedback. Findings indicated that more feedback episodes were given to low skilled students. While receiving teacher feedback early in
practice seemed important to the success of these students, it was unclear whether the feedback itself impacted on success or if it was due to the broader function of teacher monitoring. Although these results provided valuable information about differences in response patterns of varied skill groups to teacher feedback, the study was limited by the use of only 8 students and a 5-day instructional period.

From another perspective, the actual feedback message conveyed by teachers to students may vary considerably from student to student and may be different from what the teacher intended. In most of the observational studies, it is assumed that the observed teaching behaviors recorded by coders are identical to those perceived by students. However, studies in classrooms (Brattesani et al., 1984 Staybrook, Corno, & Winnie, 1978) and in physical education (Martinek, 1988) found that discrepancies between student perceptions and coded behaviors existed and were especially evident for low and high achievers. Since there is little, if any research in physical education on students' interpretations of teacher feedback, this is an important area of investigation. Observation alone probably cannot detect types of feedback that are most useful for learners. While analysis of interview data by Eghan (1988) indicated that students perceived teacher feedback as useful during practice, there was no attempt in this study to match the perceived message with the intended one.
The overall purpose of the present study was to examine the mediating role of perception of students and their use of teacher feedback in student achievement. In an effort to address some of the limitations in the current feedback research, students were asked to recall the feedback statements provided by the teacher, and these were compared to the actual teacher statements. The students' use of the corrective feedback provided by the teacher was determined by analyzing response patterns following feedback episodes. Concentrating on differential student responsiveness to instructional feedback reflects one way to capture directly the effectiveness of the feedback. Specifically, the study was designed to answer the following research questions:

(a) Do students perceive the feedback provided by teachers as it was intended?

(b) To what extent can students make the adjustments suggested by the teacher?

(c) What is the relationship between teacher feedback variables, student process variables, and student achievement?

(d) What is the relationship between student process variables and student achievement?

It was hypothesized that while the total feedback provided to students would not predict achievement, student process variables such as correct trials, correct trials after teacher feedback, and students' use of feedback would
be significant predictors of student achievement.

Methods

Subjects

The subjects were 41 students (male=23, female=18, average age= 21.07) enrolled in two classes of beginning badminton during Fall semester 1991. A student background survey was administered at the beginning of the semester to assure that the students had no prior instruction in badminton and perceived their skill level to be low. All students were considered to be beginners. The teacher for this study was a physical education teacher with 7 years of teaching experience and has taught badminton throughout this time at the high school level.

Skill Testing and Instruction

Pretest and Posttest. Before and after the unit, students were tested on the badminton forehand overhead clear, the backhand overhead clear, and the forehand underhand high serve. Skills tests adapted from Poole (1973) were used to obtain an accuracy score. Reliability of the Poole High Serve Test has been previously established using the test-retest method, r=.81 (Johnson & Nelson, 1986). The technique for each skill was evaluated by trained observers. Each trial during the skills test for each skill was videotaped and evaluated using 10 skill components. The technique score was the number of skill components demonstrated. Interrater agreement for coding
skill technique was .94 figured on 10% of the trials for each skill. Retention tests for accuracy and technique were administered after an 11-day break.

Instructional Unit. Instruction took place during two badminton classes for 10 instructional sessions over a 5 week period. Each class was approximately 45 minutes in length. The teacher was interviewed concerning the goals and procedures of the class but no intervention was used to change the teacher's approach. Each class session was videotaped with one camera following the teacher and one camera each focused on two of the 6 badminton courts. The teacher wore a wireless microphone so that all instruction and feedback could be recorded. Students wore numbered pinafores for subsequent identification. A questionnaire was administered at the end of the instructional unit to elicit students' perception of the usefulness of teacher feedback.

Student Interview and Questionnaire

Students were randomly selected (n=72) and scheduled to be interviewed immediately after each lesson about what the teacher said to them during practice and their perception of the usefulness of the teacher feedback. All interviews were audiotaped and then transcribed verbatim. The feedback statements recalled by the students during the interview and the coded teacher feedback statements from the videotapes were compared. Some of the students selected for interview
(N=10) did not receive a feedback statement on that day and were eliminated. Each subject was interviewed at least once, and several were interviewed two times. Four categories were used to classify the feedback statements for each student in terms of accuracy in recall: no recall, inaccurate recall, partially accurate recall, and completely accurate recall. No recall was coded when the student could not remember the feedback provided. Inaccurate recall was coded when the student reported an inaccurate or incomplete statement. Partially accurate recall was coded when 1 out of 2 statements or 2 out of 3 statements were accurately recalled. Completely accurate recall was coded for a perfect match.

A questionnaire was used at the end of the instructional unit to elicit student perception of the instruction and the usefulness of teacher feedback. Students responded to the question "How helpful is the corrective feedback to your learning of the skills?" by choosing from the responses extremely helpful, very helpful, moderately helpful, not helpful, not helpful at all.

Observation of Teacher Feedback

A modified version of Fishman and Tobey teacher feedback observation system (1978) was used to code feedback episodes. This multidimensional instrument consists of 8 categories and 25 subcategories. Each of the categories is mutually exclusive. The eight categories are Form,
Direction, Time, Teacher Intent, Character, General Referent, Specific Referent, and Quality. Within categories are various subcategories used to identify and code more specific components of feedback statements.

Coding Procedures. Videotapes were used to observe and collect feedback data. Each instance of feedback provided by the teacher was placed into categories of the Feedback Coding System, along with the student number, so that the total number of various kinds of feedback statements provided to students could be related to practice and achievement variables. One coder trained in using the Fishman and Tobey feedback system coded each feedback statement. A second trained observer coded a sample (10% of the total number) of the feedback statements. The average percentage agreement for each category was .87.

Quality of Feedback. The appropriateness of teacher feedback was evaluated by an observer who is an expert in badminton and a trained user of the observational coding system. The coder viewed all teacher feedback episodes for each skill and rated each feedback statement as appropriate or inappropriate based on whether or not the statement matched the error made or the correctness of the movement. A 1 or 0 was assigned to each feedback statement with a 1 representing a appropriate statement. The expert in badminton judged the appropriateness of a sample (10% of the total number) of the feedback statements. Interobserver
agreement was .99.

Collection and Coding of Student Process Data

Students' Use of Teacher Feedback. Selected feedback episodes from the videotapes were used for each student to judge how well the students made the corrections suggested in the feedback statements. For each student, one corrective feedback statement from one lesson for each skill was used. Students' use of teacher feedback was scored by observing the three subsequent trials after a corrective feedback and judging whether or not the student could make the correction in technique. A scoring system of 0-3 was used. A zero was recorded if the correction was not observed in any of the 3 responses. One point was scored if the correction was made in 1 trial out of 3. Two points were given if the correction was made in 2 trials out of 3, and three points were scored if all 3 trials indicated an adjustment. A maximum of 9 points was possible for each student on each skill.

Quality of Practice. Practice trials from each lesson were observed and coded from the videotapes. The total number of practice trials and practice trials using correct technique were recorded for each student and each skill during practice and game play. Each practice trial was categorized as correct or incorrect on the basis of the identified skill components. A trial was coded correct if 7 out of the 10 skill components were performed correctly and
legally. In addition, to get a measure of students' short-term response patterns, samples of 9 practice trials, three trials after each of 3 corrective feedback statements, were selected and judged as correct or incorrect. This procedure allowed the examination of the patterns of responses immediately after feedback statements were provided. Practice trials were coded by two trained observers who were skilled in badminton. Random observer agreement checks (10% of the total number of trials) were calculated for each skill during data analysis. All interobserver agreement checks were .92 or higher.

Classification of Variables for Analysis

Achievement Data. For accuracy and technique residual scores and residual retention scores were calculated for each individual student as measures of student achievement on each of the 3 skills. This was done using a linear regression model in which the pretest was the predictor variable, and the posttest was the criterion variable. Residual scores were selected for analysis because they partial out pretest skill level, are uncorrelated with entry skill, and are not subjected to ceiling effects. Thus, there were four achievement scores calculated: residual accuracy, residual technique, residual retention accuracy, and residual retention technique.

Student Process Data. For each student and each skill, the number of correct practice trials and the total number
of practice trials were summed across the 10 class sessions. For each student and each skill, a short term response score was calculated by summing the number of correct and incorrect trials out of the 9 trials selected after corrective feedback was provided. Scores for the ability to use feedback during practice were summed across lessons for each skill. These four measures (total trials, correct trials, correct trials after feedback, and feedback use) were used as process variables in the subsequent analyses.

Feedback Data. Categories and subcategories of feedback were summed for each student and each skill. These variables were related to the student process variables and the achievement variables.

Data Analysis

Analyses were conducted separately for the three skills since the content of teacher feedback provided during each skill was different. Frequencies of occurrences of the feedback categories and subcategories were summed across the instruction sessions for each skill. Means and standard deviations were calculated for all variables. Dependent t-tests were used to determine differences between pretest and posttest skill accuracy scores and pretest and posttest technique scores. Differences were also determined between the posttest scores and the retention test scores for accuracy and technique. Correlation coefficients were used to assess relations among the teacher feedback sub-
categories, the achievement variables, and the student process variables. Canonical correlations were conducted for each of the three skills and a separate canonical correlation was calculated for the three skills combined. The student process variables were used as one set of variables and the achievement variables were used as the second set of variables. Multiple regression was used to follow up the canonical correlations using the student process and achievement variables found to be significantly related.

Results

Teacher Feedback

A total of 2047 teacher feedback statements for the three skills were recorded during the entire instructional period. Individual students received an average of about 5 feedback statements per lesson. The means, standard deviations, percentage, and range of occurrences of teacher feedback categories and sub-categories are shown in Table 1.

Insert Table 1 about here

The form of the teacher feedback was mostly auditory (60.18%) and auditory-visual (35.75%). The teacher modeled most of the time when he provided a corrective feedback statement. Feedback was primarily directed to a single student (97.37%) immediately after the trial (90.63%).
Students received almost the same amount of prescriptive (46.59%) and evaluative (54.41%) feedback from the teacher. The teacher praised students for motivational reasons to keep them active and interested. While most evaluative feedback was positive and related to outcome, corrective feedback was mostly with general referent to part and specific referent to space and technique. Feedback directed towards the timing and force of the movements involved in performing the skill were not frequent (3.39% and 5.45% respectively).

**Student Interview and Questionnaire Results**

In general, students were able to recall the statements provided by the teacher and perceived the feedback as helpful in making corrections during practice. The student interview and questionnaire data consistently showed that students considered teacher feedback as useful. Using a rating scale of 1-5, fifty percent and forty-three percent of the students selected a 5 and 4 rating, respectively, for the usefulness of teacher feedback. When students' perceived feedback statements and observed teacher feedback statements were matched, only one student out of the 62 interviewed had no recall of the feedback provided. Thirteen of the students (22%) could not recall accurately what teacher had said to them, and 31, or 50 percent, could recall only partially accurate. Seventeen students (28%)
could recall the teacher feedback statements provided to them completely and accurately.

**Student Performance and Correlational Analysis on Pre, Post and Retention Measures**

Comparison of pretest and posttest skill accuracy and technique scores showed significant improvements for each of the three skills. The improvement was reflected by dependent t-tests between achievement pretest and posttest for the high serve, forehand clear, and backhand clear ($t_{40} = 5.80, p < .0001; t_{40} = 5.80, p < .0001; t_{40} = 8.17, p < .0001$). Dependent t-tests between technique pretest and posttest were also significant for the three skills ($t_{40} = 20.30, p < 0.0001; t_{40} = 5.68, p < .0001; t_{40} = 11.54, p < 0.0001$). Retention scores were significantly different from pretest scores but not different from the posttest scores. These means and standard deviations are presented in Table 2.

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Insert Table 2 about here

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On the skill test for accuracy, the pretest, posttest, and retention scores were positively related for all three skills. These coefficients ranged from .27 for pretest accuracy and retention accuracy on the forehand clear to .89 for pretest accuracy and posttest accuracy for the backhand clear. The posttest accuracy and retention accuracy score are highly related for the high serve ($r = .85$) and the
backhand clear (r=.86) and moderately related for the forehand clear (r=.67). All coefficients were significant (p<.05) except the .27 relationship between pretest and retention on the forehand clear. These coefficients are shown in Table 3.

Insert Table 3 about here

Also shown in Table 3 are the correlation coefficients for the pretest, posttest, and retention technique scores for the three skills. As shown, the coefficients for relations between pretest and the posttest are lower for technique, regardless of skill. The rs ranged from .18 to .32 with the latter being the only significant coefficient. The relations between pretest and retention are also rather low and mostly insignificant with rs ranging from -.13 to .33. The relations between posttest and retention technique were high and significant, ranging from .60 for the high serve to .92 for the forehand clear.

**Relationship of Teacher Feedback to Student Process Variables and Achievement Variables**

Pearson product moment coefficients were used to formulate a correlation matrix for determining relations among the teacher feedback categories and sub-categories and various measures of performance. Although significant improvements were found for both accuracy and technique
scores for all three skills, correlations among teacher feedback variables, student process variables, and achievement variables were moderate and many times negative. Furthermore, there were few consistent patterns of relationships across skills. Using residual gain scores for accuracy as an example, the correlation coefficients with the various feedback categories for two skills, the forehand clear and the backhand clear, were low, negative, and nonsignificant. For the high serve, there were significant negative correlations between residual gain for accuracy and the subcategories of prescriptive \((r=-.30)\), space \((r=-.32)\), and technical \((r=-.48)\). For the high serve and the backhand clear, the prescriptive feedback category was negatively related to correct trials after feedback \((rs= -.61 \text{ and } -.35, \text{ respectively})\). There were some positive relationships between the various feedback categories and total trials, but again, the pattern across skills was inconsistent. For the three skills, the relationships between feedback provided for the outcome of the movement and the total number of trials were positive \((rs=.35, .50, \text{ and } .33)\). Also, for the high serve and backhand clear skills, there were positive relationships between feedback provided on part of the movement and the total number of trials \((rs=.50 \text{ and } .45)\). These coefficients are shown in Table 4.
Because most of the relationships between the various feedback categories and the number of correct trials were negative, nine students were selected for further study. Using pretest scores, three high skill, three medium skill, and three low skill students were selected and, frequencies of prescriptive feedback statements were calculated for each group. Findings indicated that the low skill students received more corrective feedback \((n=10)\) than the medium \((n=6)\) and high skill \((n=7)\) groups.

**Relationships Among Student Achievement and Various Student Process Variables**

Pearson product moment correlations were calculated for residual gain accuracy scores, residual gain technique scores, total practice trials, correct trials, correct trials with teacher feedback, and students' use of feedback. Student achievement scores were found to be moderately correlated with the various process variables. These coefficients are shown in Table 5.

For the high serve, residual gain accuracy scores were significantly related to correct trials and correct trials
after teacher feedback (rs=.71 and .31). Residual gain technique scores for the high serve were only related to correct trials (r=.38). For the forehand clear, residual gain accuracy scores were significantly related to feedback use and correct trials (rs=.41 and .37), while residual gain technique scores were significantly related to total trials (r=.35) and correct trials with feedback (r=.43). For the backhand clear, both residual gain accuracy and technique scores were significantly related to feedback use, correct trials, and correct trials after feedback. For feedback use, correct trials, and correct trials after feedback, the significant rs for accuracy were .61, .67, and .64, respectively, and the rs for technique were .51, .33, and .49. The coefficients for the relationships between the process variables and scores on the three skills combined showed a similar trend. The relations between total trials and the residual technique and accuracy scores were not significant. The other coefficients, except the one for correct trials and residual accuracy, were moderate and significant.

The relationships among the various process variables for each of the three skills and the three skills combined are shown in Table 6.
The coefficients of interest were between correct trials and feedback use. These coefficients ranged from .38 (p<.05) for the high serve to .69 (p<.05) for the backhand clear. These coefficients indicated that those students who could use the teacher feedback to make corrections needed during practice had more correct trials throughout the instructional unit. The extremely high positive relationships between feedback use and correct trials after feedback (rs ranging from .91 to .94) should be viewed as having limited usefulness because both variables are measures of short term response patterns after teacher feedback. Feedback use represents how well the students could make the correction suggested by the teacher, and correct trials after feedback represents the number of correct trials the students performed immediately after a feedback statement. Because these two measures were calculated on the same trials (i.e. those immediately after a feedback statement), a high relation would be expected.

For each of the three skills, a canonical correlation was conducted to determine the relationships between student achievement and the various student process variables. A fourth canonical correlation was conducted to examine the combined scores of all three skills. The results of all four canonical correlation analyses were very similar. Only the first canonical function was significant for each analysis. The independent function in each analysis was
defined by total trials, correct trials, correct trials after teacher feedback, and feedback use. The dependent function was defined by residual gain accuracy scores, residual gain technique scores, residual gain retention accuracy scores, and residual retention technique scores.

**High Serve.** The canonical correlation coefficient for the function was .72, $F(9,49)=2.32$, $p < .01$ when analyzing the variables for the high serve. The canonical structures are presented in Table 7. Since the first canonical function was substantially larger than any of the between-set correlations, a firm conclusion about the predicting power of the independent variables can be inferred. In this model, about 25% of the variance was explained by the canonical variables, which indicated that correct trials and correct trials after teacher feedback were contributing more than total trials and feedback use to the linear combination of the independent function. Residual accuracy had the highest weight among the criterion variables, thus it contributed the most to the dependent measures.

**Forehand Clear.** The canonical analysis for the forehand clear yielded a correlation of .70, $F(9,49)=2.88$, $p < .01$ for the function. The canonical structures are presented in Table 7. Correct trials, feedback use, and correct trials after feedback weighted in this order for the independent function. Residual accuracy scores had the largest coefficient for the dependent measure.
**Backhand Clear.** When analyzing the variables for the backhand clear, the canonical correlation for the function was .75, $F(9, 49) = 2.94, p < 0.01$. The canonical structure is presented in Table 7. Correct trials and feedback use contributed most to the independent function while residual accuracy scores weighted highest in the dependent measure function. Residual technique score was not a good achievement measure in the backhand clear as shown by its low coefficient.

**Combined Skills.** When the three skills were combined, the canonical correlation for the function was .74, $F(12, 53) = 2.66, p < 0.01$. The structural canonical coefficients are presented in Table 7. The combined skills model was similar to the three individual skill models. Correct trials, correct trials after feedback, and feedback use correlated very highly with the canonical variable to indicate their predicting power. Residual accuracy and residual retention accuracy contributed the most to the dependent function suggesting that these scores are better achievement measures for badminton skills.

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Insert Table 7 about here

---

Stepwise multiple regression was conducted on the combined skills using correct trials, correct trials after feedback, and feedback use as predictor variables and
residual accuracy scores as the dependent variable. The selection of variables was based on the results of the canonical analysis. Analyses for each of the three skills and the combination of the three skills yielded similar results. The analysis of $R^2$ showed that for the combined skills, nearly half (44%) of the variance in the residual gain score could be attributed to correct practice trials. With correct practice trials in the model, feedback use was not a significant predictor. However, when correct trials were removed from the model, feedback use was a significant predictor and accounted for 25% of the variance in the residual accuracy scores. This could be explained by the positive moderate to high correlations between correct trials and feedback use as shown in Table 6.

Discussion

The purpose of this study was twofold. First, the relationship between feedback variables, student process variables, and student achievement was examined. Second, the mediating role of student process variables in student achievement was investigated. The teacher in this study was a competent teacher with seven years experience, expertise in badminton, a knowledge of skill analysis, and the ability to provide appropriate feedback to students. The instructional sessions were interactive, with the average student receiving about 5 feedback statements during practice in each lesson. This is consistent with
frequencies reported by Silverman (1991) but considerably more than other findings reported by Fishman and Tobey (1978) and Eghan (1988). The teacher in this study often used a "sandwich approach" in providing feedback to the students. Typical patterns of feedback were evaluative, prescriptive, evaluative; evaluative, descriptive, evaluative; or evaluative, corrective, evaluative. This approach appeared to be helpful because it provided students with the error information, reinforcement, and motivation. This approach also resulted in more overall feedback statements. The teacher was concerned about the students learning the correct movement pattern which was reflected in the feedback statements used to correct student performance errors with referent to space. Overall, the patterns of teacher feedback were consistent with previous studies (Fishman & Tobey, 1978; Eghan, 1988; Silverman, 1991).

Students made a significant gain from pretest to posttest, and the level of achievement was maintained over a 11 day period without practice. The relationship between posttest and retention scores was high and significant for all three skills, which suggests that a skill test given immediately at the end of a unit is one way to measure learning. The measurement of learning and the issues involved have been concerns for researchers in motor learning (e.g. Lee & Genevose, 1988) and pedagogy (e.g. Shavelson, et al., 1986) during recent years. It could be
argued that if learning is viewed as a relatively permanent change in performance as a result of practice, a skill test given immediately at the end of a unit cannot be an adequate measure. While results of this study suggest that learning measured immediately after a unit and 11 days later produce similar results, the adequacy of summary scores as measures of how much students learned is still an important issue for researchers.

Although students made significant improvement in all three skills over the instructional unit, frequency of teacher feedback was not related to student achievement. These findings were consistent with previous studies in tennis (Eghan, 1988) and volleyball (Silverman et al., 1991) and were not unexpected. At the conceptual level, it has been argued that the assumption of a direct causal link between frequency of a teacher behavior, such as feedback and student outcomes, is far too simple (Doyle, 1977). Using frequency of a teacher behavior as the process measure in process product research seems to imply that more is better, regardless of the learner and task characteristics. This study provides additional evidence to refute the notion that the number of times a teacher provides feedback to students determines how much will be learned. From the statistical analyses, very few meaningful summary statements can be made about the frequency of teacher feedback and student achievement. The low, negative correlations between
residual gain accuracy scores and the prescriptive, space, and technical subcategories suggest that this teacher gave more corrective and specific feedback to those students who were having trouble making corrections during practice. The positive relationships between a few feedback categories (e.g. outcome and part of the movement) and the total number of trials is interesting and probably indicates that frequent feedback served to keep students on task during practice. For the high serve and the backhand clear, the prescriptive feedback subcategory was negatively related to correct trials, providing further evidence that this teacher gave less corrective feedback to students who were able to perform the correct technique.

Significant relationships were found between student process variables and student residual gain accuracy and technique scores. The canonical analysis revealed that correct trials, correct trials after teacher feedback and feedback use form a subset that is correlated very highly with student achievement. The canonical correlation accounted for more than 25 percent of the variance in the dependent canonical variable for each skill separately and for the three skills combined, reflecting their predicting power. These findings support the call for additional study on the short-term or immediate effects of teacher feedback (Graham, 1987; Rink, 1985; Shavelson, Webb, & Burstein, 1986) and the role of student mediation in feedback
effectiveness. The students' use of teacher feedback served as a mediating link between teacher behavior and student learning in this study. It was the number of times a student was able to use the feedback provided by the teacher rather than the total number of times the student actually received feedback that was related to achievement. Taken together, these relationships draw a picture of a class where students who can use the feedback provided by the teacher make the correction suggested and thus exhibit more correct trials during practice. The higher quality practice or the greater number of correct practice trials is associated with greater learning. Thus, while correct trials may be the best predictor of student achievement, feedback can work to modify the quality of practice for students. From a mediating process viewpoint the role of teacher feedback in student learning can be interpreted in a way that make sense conceptually.

The findings of this study are important and provide insight into the role of teacher feedback in learning motor skills. The appropriate amount and type of feedback vary not only for different skills but also for different students learning the same skill. What appears to be the right amount of feedback to promote learning for one student might inhibit learning for another. Students in this study could not always use the feedback provided by the teacher, even though most could recall what the corrective feedback
statement was. The effective teacher not only needs to learn how to provide appropriate feedback, but must be able to adapt the amount and type of feedback to different students. Magill (in press) presents evidence that has shown differential effects of external feedback for learning motor skills and concludes that "External feedback can be essential, not essential, detrimental, and an enhancement for learning skills." Nearly identical feedback statements offered to two students can have substantially different outcomes. Even if the corrective statement is accurate and consistent with the performance error made, one student may be able to use the information better than the other one. It is possible that a student may never be able to make the correction regardless of the quality and appropriateness of the feedback. Teachers and researchers then must recognize that variation in students' use of feedback is a good starting point for studying student response variables related to achievement in physical education.
Table 1. Descriptive Statistics of Teacher Feedback for Badminton Skills

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Table 2. Descriptive Statistics of Achievement for Badminton Skills

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*HS=High Serve  
*FH=Forehand Clear  
*BH=Backhand Clear
Table 3.  
Correlation Matrix of Pretest, Posttest and Retention Test Measures

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<td>.59*</td>
<td>.53*</td>
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<td>.32*</td>
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* p < .05
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<th>Correct Trials</th>
<th>C Trials After Feedback</th>
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<th>Correct Trials</th>
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* p < .05
Table 5.
Relationship of Student Achievement and Student Process Variables

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* p < .05
Table 6. Correlation Matrix of Pearson Product Moment Coefficient for Three Combined Skills

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*p < .05
### Table 7.
Canonical Structures for Student Achievement and Student Process Variables

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<table>
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\[ r = .7278 \quad r = .8086 \quad r = .7542 \quad r = .7348 \]
\[ p < .0057 \quad p < .0007 \quad p < .0005 \quad p < .0005 \]
\[ F = 2.3286 \quad F = 2.8835 \quad F = 2.9405 \quad F = 2.9393 \]
References


Appendix A

Extended Review of the Literature
Instructional Effects of Teacher Feedback in Physical Education

Information provided to learners about their performance, often called feedback or knowledge of results (KR) has long been considered a critical learning variable. Bilodeau and Bilodeau (1961) define information feedback as the stimuli represented during and after a subject's response and indicate that verbal feedback is the strongest, most important variable controlling performance and learning (Bilodeau, 1969). Adams (1971), in his closed-loop theory, claimed that the learner must make use of KR in order to learn. Several years later, Schmidt (1975) proposed the schema theory of motor learning in which he included KR as a variable critical for the learning of motor skill to occur. The importance of the role given to verbal feedback led to the acceptance of a link between teacher feedback and student learning in various school subjects. For decades, feedback had been studied extensively in classroom settings, in motor learning laboratories, and in the gymnasium. While researchers have made some progress toward understanding the nature and significance of feedback provided by teachers, there are still some unanswered questions.

The purpose of this review is to examine the major research thrusts in feedback, describe the current status of research on teacher feedback, and present an outline of
Suggestions for future investigations of teacher feedback effects on motor skill learning during instruction. The first section of the paper will present definitions and different views of feedback derived from three areas: motor learning KR studies conducted in the laboratory, teacher effectiveness studies conducted in the classroom, and teacher feedback research conducted in the gymnasium. In the second section, an historical overview is presented with the early influence of motor learning emphasized. The third section will address the concerns for conflicting and contrasting results from these studies about feedback and the possible causes of these equivocal findings. Efforts are made to explore factors which produce these perplexing findings. The last part of the review will present some recommendations for future directions in the study of teacher feedback as a learning variable. The goal is to examine the literature and formulate suggestions for future research which might be helpful in educating teachers to become effective providers of feedback. Finally, alternative approaches to studying the relation of teacher feedback and student achievement will be presented.

Definitional Problems and Views of Feedback

Research on teaching in physical education has been influenced by two main research models: motor learning research conducted in laboratories and research on teaching
in classrooms. While the focus of this paper is on teacher feedback, researchers and authors of textbooks in teaching and learning are inconsistent with the terminology used to describe the information provided to a learner after a movement response. Feedback in the motor learning literature is also known as knowledge of results (KR), knowledge of performance (KP), and augmented feedback. Feedback in the effective teaching literature is at times described in terms of its character and can be positive, negative, or neutral. These definitional concerns are important and will be discussed briefly.

Two primary categories of information feedback are available to learners during motor skill acquisition: intrinsic and extrinsic feedback. Intrinsic feedback is the information provided by various sensory receptors (e.g. vision, proprioception, audition, force, touch, and smell). Intrinsic feedback involves information inherent in the movement response itself (consequence of a tennis serve) and/or in the environment (e.g. crowd noise in a sport competition). Extrinsic feedback, on the other hand, is sometimes defined as augmented feedback. Augmented extrinsic feedback is further classified into three categories as knowledge of performance (KP), knowledge of results (KR), and augmented sensory feedback, depending on the functional nature of the information. KR pertains to the response outcome in relation to some environmental goal.
KP is information about the learner's own movement pattern and form (Gentile, 1972) and is sometimes referred to as kinetic or kinematic feedback (Newell & Walter, 1981). Augmented sensory feedback is provided by an external device to supplement sensory feedback which is already available to the learner (Magill, in press). Intrinsic feedback usually occurs both during and after a movement response (concurrently and terminally) while KR and KP are presented after a movement response (terminally) and augmented sensory feedback is provided during the movement response (concurrently). However, it is possible to provide concurrent KP and terminal augmented sensory feedback to a learner. Historically, researchers interested in motor learning have focused on KR, which is, after years of research, recognized as one of the most important variables in skill learning (Newell, 1981). In physical education studies, feedback is referred to as a teaching behavior dependent upon the motor response of one or more students and intended to provide information related to the acquisition or performance of a motor skill (Fishman & Anderson, 1971). Siedentop (1991) defined feedback as information generated about a response that is used to modify the next response.

Researchers interested in teaching sometimes categorize feedback according to the character of the statement (e.g., positive or corrective). Traditionally, corrective feedback
is provided to correct a learner's performance error and has been used most frequently during skill instruction. According to Placek and Locke (1986), the use of positive feedback is not extensive, particularly in secondary schools. Siedentop (1991) recommends a balance between positive and corrective feedback application in skill instruction where teachers use a positive feedback approach when the performance is correct. This view of feedback as a means of reinforcement to the learner is viewed as contributing to a more pleasant and healthy learning climate. Feedback in classroom research is also known as praise and criticism. Teacher praise is a designation used to describe a positive reaction to a correct response or desired behavior. It goes beyond a simple statement about correctness of answers and serves to control the classroom or to maintain a positive classroom climate (Brophy, 1981). Likewise, criticism refers to negative teacher responses to student behavior which is inappropriate or answers which are incorrect. It connotes expressions of disapproval, disgust, or rejection.

In this paper, teacher feedback is referred to the two forms of augmented extrinsic feedback, KP and KR, which are presented to an individual or a group of individuals concurrently or terminally during motor skill acquisition. The focus is on how teacher feedback is used as a source of information for motor skill learning.
Teacher Feedback from a Historical Perspective

The early research-based conclusions on the teachers' role as a source of feedback were drawn primarily from motor learning laboratory research. The description of feedback studies by Nixon and Locke, in the Second Handbook of Research on Teaching (1972), is similar in nature to a review of motor learning studies conducted in the laboratory. The research summarized at that time focused on the use of KP and KR with open and closed skills. The suggestions presented for teachers were formulated after a review of research designed to identify feedback processes as critical events in motor skill learning. Thus, in the early 70's, researchers interested in a body of knowledge about teaching motor skills could not be distinguished from those interested in a body of knowledge about learning motor skills (Gentile, 1972).

With the development of systematic observation instruments in the 1970's, research on teaching physical education in general and research on teacher feedback in particular moved away from methods of inquiry used in motor learning and toward field-based models. The activities of researchers focused on observing and analyzing the feedback behaviors of teachers and identifying the patterns of feedback statements which might relate to student achievement. Dunkin and Biddle (1974), in their book The Study of Teaching, clarified research on teaching by
classifying variables into presage, process, product, and context. It was suggested by Dunkin and Biddle that the strongest strategy documenting teacher effectiveness is the process-product design. Thus, during the 80's, many process-product studies were conducted in physical education where teacher process variables, such as the frequency of teacher feedback, were correlated with student product or outcome measures. While there has been some interest during the last decade on studying the cognitive processes underlying teacher behavior (e.g. Housner & Griffey, 1985), there are no published studies which include teacher feedback as a variable.

The next section of the review will present an overview of the major research topics on which principles of feedback have been based. Views of feedback will be described briefly as derived from research in motor learning laboratories, in classrooms, and in the gymnasium.

Motor Learning KR Studies

Researchers on feedback in motor learning have been using the KR paradigms to gain understanding for the functions of feedback information in learning (Schmidt, 1988). In motor learning, feedback is referred to as information provided to an individual after the completion of a response that is related to either the outcome of the response or the performance characteristics that produce
that outcome (Magill, in press). Traditionally, laboratory-based KR research has focused on the manipulation of KR effect on performance and transfer of learning. Topics such as KR function, temporal locus of KR (KR delay, post-KR delay, intertrial interval), KR frequency effects (absolute and relative frequency of KR), and KR precision effects have resulted in a rich knowledge base for understanding the role of KR and how it operates in motor skill learning. In general, the findings indicate that KR functions in three ways: reinforcement, error correction, and motivation (Adams, 1971; Newell, 1976; Salmoni, Schmidt, & Walter, 1984). KR, as reinforcement, provides the learner with information that will increase the probability of the next response being correctly performed (Thorndike, 1927). In error correction, KR provides the learner with meaningful information to serve as guidance to correct errors (Salmoni, Schmidt, & Walter, 1984). The motivational role of KR (Locke, Cartledge, & Koeppel, 1968) acts as an incentive to stimulate the learner to try harder and assist the learner in monitoring the achievement of performance goals.

How often should KR be given for optimal learning is the issue examined under the absolute and relative KR frequency studies. Findings from studies on absolute and relative frequency of KR presentation during skill acquisition suggests that 100% frequency is not necessary for optimal learning. Findings from the study by Winstein
and Schmidt (1990) indicated that the 50% KR frequency group performed better than the 100% KR group on a no-KR retention test.

Precision of KR refers to the nature of the information contained in the KR statement. A study by Magill and Wood (1986) indicates that the most accurate performance in the transfer test is a function of the most precise KR condition provided during the acquisition. In general, the increase in precision of KR leads to an increase in learning (Salmoni et al., 1984).

**Feedback Research Conducted in Classrooms**

In classroom studies, feedback is viewed as a major teaching function which involves the teacher's response or reaction to students' questions and the correction of student errors (Good & Grouws, 1977; Medley, 1979; Rosenshine & Stevens, 1986). The importance of feedback as a key element in the enhancement of learning different subjects (e.g., mathematics and reading) is based on the belief that providing specific information to students about their performance and mastery of learning objectives is essential. Effective feedback includes information about correct and incorrect performance and gives suggestions for improving performance as well as encouragement of subsequent effort. Studies conducted in classrooms (Hughes, 1973; Good & Grouws, 1979) show that appropriate teacher praise
following correct student responses or re-explanations of material following incorrect responses helped to facilitate student learning. It is interesting to note, however, that more effective teachers praised their student less than their less effective colleagues. In other studies (Good & Grouws, 1977; Rosenshine, 1979), findings demonstrated that teachers who offer immediate and academically oriented feedback to student responses are able to elicit higher student achievement in classroom learning. In a meta-analytic review focused on timing of feedback, Kulik and Kulik (1988) found that immediate feedback was superior to delayed feedback in tasks that seemed to require greater cognitive demands. Other researchers (Brophy & Good, 1986; Evertson, Emmer, & Brophy, 1980; Good & Grouws, 1977) found that more effective teachers used significantly more performance feedback and less behavior feedback. Taken together, these findings suggest that specific, nonevaluative, and task relevant feedback which provides the correct answer and how it is derived is related to achievement. In classroom process-product-research, these are some of the components that have distinguished effective and ineffective teachers.

In a recent review of the instructional effects of feedback in various subject matter content (Bangert-Drowns et al., 1991), feedback effects were found to vary with control for presearch availability, type of feedback, use of
pretests, and type of instruction. This review provides some evidence to explain why feedback has insignificant or detrimental effects on achievement in some studies.

**Feedback Research Conducted in the Gymnasium**

Teacher feedback studies in physical education have generally used one of several approaches depending on the research questions and the problems to be solved. Many researchers have developed multidimensional observation systems to describe feedback in regards to form, direction, time, content, cue relevancy, and general or specific referent (Arena, 1979; Cheffers & Mancini, 1978; Fishman, 1974; Fishman & Tobey, 1978; Oliver, 1983; Pieron & Devillers, 1980; Pieron & Delmelle, 1981). These descriptive-analytic studies have provided the field with rich descriptions of teacher behavior and student behavior in the gymnasium and an understanding of the nature and significance of feedback patterns. The effort of presenting a clear picture of what's going on in the gymnasium by these researchers has provided much insight into the teaching of physical education. Fishman (1974) developed a system for recording how teachers provided augmented feedback to students in physical education classes. Tobey (1974) used a modified version of this system to code the videotapes of 81 physical education classes from the Data Bank Project (Anderson & Barrette, 1978). The first completed study
describing teacher feedback patterns in physical education was reported by Fishman and Tobey (1978). This study provides answers to the following questions: How often do teachers give feedback? To what extent is the feedback individualized? What is the intent of the feedback? How specific is the feedback? To what aspects of the movement does it refer? How is the feedback timed in relation to the students' performance of the movement? Does the feedback tend to be positive, negative, or neutral?

The findings basically indicate that the teachers' use of feedback is not extensive (an average of one per minute). Teachers tend to use positive evaluative statements which are general in nature or corrective statements which are specific and negative. Overall, much of the feedback statements are negative and general. The specific referent is usually spatial. The form used by teachers is predominately auditory and directed mostly toward individual students. This pattern of providing feedback was believed to be due to practical limitations. That is, the teacher chose the less difficult approach which is general and auditory.

Feedback has been used as a process variable to compare more and less effective teachers in teacher effectiveness studies. The general findings indicate that more effective teachers provided slightly more feedback, and the types of feedback are positive, specific, and
performance related (Deknop, 1986). On the contrary, less effective teachers provided more general, evaluative, and affective feedback (Faucette & Patterson, 1990). In studies using experimental teaching units, findings regarding the relationship of feedback and student achievement are inconsistent (Pieron, 1982; Salter & Graham, 1985). The researchers attribute the results to a host of methodological problems, including short periods of duration and incompetence of the teachers in those studies (Yerg, 1981b; Graham et al., 1983). Reasons for the conflicting results will be discussed in detail in a later section of this review.

**Perceived Power of the Data**

Based on the motor learning KR lab-based and physical education field-based studies, as well as classroom research, generally accepted principles of feedback have been adopted by many physical educators. Various authors (Rink, 1985; Siedentop, 1991; Thomas et al., 1988) have included feedback/KR principles in their physical education methodology books to propose the important role feedback plays in the teaching and learning of motor skills. For example, Rink (1985), in her textbook, stated that "one of the most significant functions teacher behavior serves during activity is to provide feedback to learners on their performance" (p.241). Thomas et al., (1988) concluded that
"a teacher's main responsibility is to provide KP (are there aspects of the movement that can be improved?)" (p. 52). Based on the frequency effects research in motor learning, they also recommended that "the ideal level for providing feedback is on about 50% of the practice trials" (p. 61). More specifically, Siedentop (1991) recommends a rate of 4.0 feedbacks per minute and a ratio of four positive to every one corrective feedback for learning physical education skills. Teacher feedback is considered an essential teacher behavior because of the strong support for the notion that students need information or knowledge regarding the correctness or incorrectness of the movement to learn and improve. Siedentop (1991) indicated that positive and specific corrective feedback regarding various aspects of skill performance is important for motor skill acquisition. He suggested from 50 to 70 percent of feedback statements should contain specific information. In regards to precision (amount of information), the learners learn more quickly with more precise information in feedback. Evidence supports the notion that feedback information that is specific and precise can enhance the learning of motor skills (Siedentop, 1991).

By the same token, teacher educators also promote teacher feedback as an effective teaching behavior with student teachers. Using a group of 15 PE student teachers, Rolider, Siedentop, and Houten (1984) demonstrated that it
was possible to train preservice teachers to increase their level of verbal enthusiastic behavior, including hustling, providing specific positive feedback, and using of positive prompting. The results from this study also showed a clear relationship between teacher feedback behaviors and student performance in a physical education setting. The view that developing skill feedback behavior in prospective teachers is important for skill instruction lead to a whole line of studies on teacher feedback intervention. The goal was to change the behavior of inservice and preservice teachers regarding the type and quality of feedback delivered to students. Teachers were trained and offered strategies to increase their feedback behavior during skill instruction. Student teachers were trained to modify their feedback behavior by increasing the rate of appropriate levels of positive feedback to students (Hawkins, Wiegand & Landin, 1985; Landin, Hawkins, & Wiegand, 1986; Landin, Herbert, & Cutton, 1989). Cusimano (1987) and Van der Mars (1988) also used a planned intervention to increase the amount of specific positive feedback student teachers gave to students regarding their skill performance. Findings indicated that the intervention was effective in promoting criterion levels in approximately 50% of the cases across all categories of feedback. These studies used behavior analysis techniques to evaluate and modify what occurred in physical education lessons. Giving data-based feedback to the teachers proved
to be an effective strategy for changing teacher behavior and promoting increases in rates of responding (Grant et al., 1991). It was shown that teacher behavior can be changed, and many teachers are willing to improve their instructional skills if given accurate and meaningful feedback.

Problems Inherent in Teacher Feedback Research

It is obvious that researchers in physical education pedagogy, as well as motor learning researchers, have traditionally viewed feedback as essential for learning. Table A1 summarizes the evidence for the claim that teacher feedback is an effective means of increasing student achievement in physical education. Overall, these studies were designed to support the view that some type of feedback is necessary in order for learning to occur, and the frequency and quality of feedback determine the rate and the amount of learning. Fifteen studies were included in the summary where ten characteristics for each study were identified and presented. Eight of these studies were designed to examine the relationships between teacher feedback and student achievement. Among these, three studies (Eghan, 1988; Silverman et al., 1991; Salter & Graham, 1985) found that feedback was not related to achievement while Yerg (1981b) reported that feedback negatively affected final performance. Pease (1987) did not
find significant difference between feedback group and non feedback group in assessing the effect of teacher feedback on student achievement in a novel motor task. When comparing more and less effective teachers, more effective teachers were found in most cases to provide more feedback (Deknop, 1986; Faucette & Patterson, 1990; Phillips & Carlisle, 1983). In contrast, one study (Graham et al., 1983) reported that more effective teacher provided slightly less feedback to students. However, the difference was not significant. Generally, more effective teachers tend to give more specific performance feedback which is positive. In the two feedback studies on high- and low-skilled students (Keh et al., 1989; Rikard, 1991), both studies found that low-skilled students consistently received more corrective feedback while their counterparts received less feedback which was evaluative. A conclusion of the review of the teacher feedback studies presented in Table 1 is that while there is some evidence that teacher feedback has modest effects on student achievement, there are many inconsistent findings. Given the traditional view of the essential role of feedback in learning, it is interesting to speculate on reasons for the disappointing findings.

Researchers and theorists in motor learning are beginning to wonder whether feedback is as essential for motor skill learning as once believed (Magill, 1991; Salmoni et al., 1984). Beginning in 1984, Salmoni, Schmidt, and
Walter published a critical review of literature on the role of verbal feedback in skill learning. These authors concluded that the generally accepted principles of feedback are only applicable to practice situations and not appropriate when considering the effects of long-term learning. Magill (1991) presented an argument to reconsider the traditional view about the role of verbal feedback in skill learning and proposes that investigations should consider the interaction of verbal and visual feedback as visual information can make verbal feedback redundant. Magill (In press) also presents evidence that has shown differential effects of external feedback for learning motor skills. "External feedback can be essential, not essential, detrimental, and an enhancement for learning skills" (p. 13). The extent of how essential teacher feedback is for skill acquisition offers an answer to explain the inconsistency in some of the teacher feedback studies. Evidence showed that the amount and quality of teacher feedback is not essential for beginners in learning tennis and volleyball skills (Eghan, 1988; Silverman, 1991). However, this phenomena may be due to the characteristics of the skills taught or the interaction of teacher feedback with other teaching variables, such as verbal instruction, teacher demonstration, and amount and condition of practice. Future research is needed to examine the interaction of these instructional variables to increase understanding.
about the instructional effect of teacher feedback in physical education.

The remainder of this paper will discuss important theoretical and practical issues raised by the teacher feedback studies and offer suggestions for new directions for research.

Methodological issue

Feedback studies in physical education have, for the most part, utilized a field-based approach, and many have employed the experimental teaching units (ETU) approach. The ETU studies used extremely short period of time, often not long enough to obtain a reliable sample of behavior. While the time period varied widely for the 15 studies listed in Table A1, five collected feedback data during only one class period. Only three studies were conducted over periods of more than 8 weeks. The problem of unequal numbers of practice trials for students is a serious one for research on teaching in general and especially when attempting to study how teacher feedback affects achievement. Differences in student opportunity to learn can complicate the study of any instructional effects in a naturalistic setting. Another difficulty inherent in field-based research is controlling for student ability level. While several of the studies used a novel task, and 4 included skill level as a variable, the issue was not
addressed in the remaining studies. Finally, the timing of feedback is difficult, if not impossible, to control. Some students may receive feedback at the beginning of the practice session while others proceed in a trial-and-error fashion until the end of the class period. The problem gets worse of course with larger classes.

Developing and using valid and reliable measurement systems is a critical issue in studying teacher feedback. Most of the studies used one of several different observation systems available which yields frequency counts on teacher feedback behavior. This makes comparisons across studies difficult if not impossible. More important is the notion that frequency counts may be inadequate to identify the qualitative aspects of the feedback behavior in the teaching process. Perhaps researchers should examine the content of feedback statements in addition to the amount of feedback. Factors such as accuracy and relevancy of the feedback statement could be included as a subcategory of the observation instrument used to collect feedback data.

Another methodological issue is the concern for the measurement of student learning. The frequency and quality of teacher feedback may have no effect on achievement in feedback studies if the final test used is not a valid sample of the content of the class. Further, it is difficult to compare findings if different criteria are used for achievement. For example, analysis of filmed
performance (Yerg, 1981a), judges' rating of performance (Pieron, 1982), number of hits on a novel task (Pease, 1987), and accuracy scores on criterion task (Eghan, 1988) have been used, just to mention a few. Obviously, measurement of outcome is an important issue associated with the appropriateness and correctness of teacher feedback. Although total feedback was not related to achievement, Silverman and his colleagues (1991) found that feedback directed to the outcome was related to the accuracy scores in volleyball skills. In another study (Landin & Cutton, 1989), bandwidth knowledge of performance was found significantly better than KR in improving the technique scores in tennis backhand groundstrokes.

**Complexity of the Learning Environment**

The use of teacher feedback in the teaching process is a complex issue, and the way feedback has been evaluated in the studies reported here may be insufficient to yield achievement gains. Yerg's classic feedback studies (1981b; 1982) revealed contrasting results. The study of beginning teachers teaching the cartwheel did not find differences between more effective and less effective teachers in either the amount and type of feedback they provided to students. The second study by Yerg and Twardy (1982) on learning balance beam skills indicated that more effective teachers spent more time on task presentation and gave more feedback.
Results of this study also indicated that practice seemed to be ineffective due to a lack of feedback to guide successive practice attempts. When comparing the data in these two studies, Yerg (1983) supported the complexity issue in relation to the teacher's understanding of the skill and the ability of the learners to profit from the feedback. Yerg and Twardy (1982) concluded, "that teachers must understand the learners, the tasks, and the learning process in order to balance practice and feedback in facilitating learning" (P. 68). To study teacher feedback effectiveness, the context in which instruction occurs, the task or skill being taught, and the background of students and the teachers must be clearly delineated in order to produce more generalizable findings. Many skills in physical education are different in nature, and some are more difficult for learners and teachers (e.g. cartwheel).

Use of Frequency Counts. Most studies reported frequencies of feedback statements which had been figured after placing feedback statements in coding categories. The feedback data were then correlated with achievement gains or more and less effective teachers were compared in terms of frequency. There are many variables other than teacher feedback that are important in the teaching process, and it may be unrealistic to expect large effects from only one factor. Recently, researchers have suggested approaching studies from multiple perspectives (Graham, 1989). While
studies on feedback have failed to provide a clear cut prescription about selecting and sequencing feedback to improve learning motor skills, they have provided a greater understanding of the interrelatedness of learners, tasks, and the learning process in physical education. Researchers (Graham & Heimerer, 1981; Graham, Soares, & Harrington, 1983) have argued that successful teaching requires an orchestration of teaching behaviors, and a single behavior (e.g. feedback) is rarely powerful enough to discriminate more and less effective teachers.

**Nature of the Task.** Because physical education encompasses a great variety of activities and skills, factors affecting the delivery of feedback must be considered in research. Simple and complex skills need different kinds of feedback. Some simple tasks are self-learned, and teacher feedback may not be necessary. What about open and closed skills? Studies had shown that these different skills require different types and modes of feedback. For instance, KR is better than KP for learning tennis forehand ground stroke (Cooper & Rothstein, 1981), and KP is better for training in a closed skill like the tennis serve (Wallace, 1979). Landin & Cutton (1989) found that a combination of bandwidth knowledge of performance and KR were significantly better than KR in raising the scores on mechanical evaluations of backhand groundstroke in tennis. The nature of the task must determine the type of
feedback teachers use to aid student learning (Magill, in press). This issue has not be addressed adequately in the research completed to date.

Teacher Variation. Teacher variation in the delivery of feedback is another factor important to consider. Studies on the pygmalion effect (Martinek, 1981, 1983; Martinek & Karper, 1982, 1984) indicated that teachers give more praise and make more contact with the high-skilled learners as they perceive the high-skilled could conceptualize better the feedback than the low-skilled. This consequently affects students' performance and learning. Similarly, in physical education and sport setting, instructors are found to give more evaluative feedback to the high-skilled and more corrective feedback to the low-skilled learners (Keh, Lee, & Magill, 1989; Rejeski, Narracott, & Hutslar, 1979). Low-skilled students received far more feedback than the high-skilled because of the teachers' perception that students need more corrective feedback to learn the skill (Keh et al., 1989; Eghan, 1988). Theoretically, low-skilled students need evaluative as well as corrective feedback to be motivated in learning a new skill. However, too much feedback often overloads the beginners with information and thus, interfer with their learning process. Therefore teachers have to be knowledgable about feedback/KR principles and be careful to provide feedback according to a student's response and not
their perceived competence or need of the students.

The complex nature of providing optimal amounts and types of feedback to students is also a critical issue contemplated by motor learning scholars. Magill (1986b), for example, presented the following questions concerning the complexity of the feedback issue: What type of feedback is appropriate? If corrective feedback is to be given, what errors should the student be told to correct? How often? How soon after a practice trial should the student begin the next practice trial? Is teacher feedback more beneficial in some contexts or for some age groups and some skill level groups? To be able to answer these questions will ensure an effective teaching-learning interaction.

Teacher Knowledge and the Quality of Feedback Statement

Teachers with limited backgrounds in the skill being taught may fail to recognize and correct student errors (Siedentop, Herkowitz, & Rink, 1984). From this point of view, the effectiveness of teacher feedback may vary according to the teacher's knowledge about the skill. Perhaps studying expert teachers will provide a more complete picture of how feedback influences student outcomes in physical education (Shulman, 1986b). Researchers interested in the beneficial effects of teacher behavior should describe the substantive subject specific content of instruction rather than generic teaching acts. Only one of
the studies in Table A1 reported the level of teacher knowledge. The expert tennis teacher in Eghan's study (1988) was a highly recommended certified tennis instructor with over 8 years of successful teaching and coaching experience and was capable of giving a high percentage of appropriate feedback. The appropriateness of feedback was verified with a panel of judges. Evidence is available to indicate that coaches are more capable of diagnosing performance errors and providing accurate feedback to learners than physical education teachers (Imwold & Hoffman, 1983; Pieron & Goncalves, 1987; Rupert & Bushner 1989). This might suggest that coaches have more subject matter knowledge and are more capable of providing accurate descriptive and prescriptive feedback (Landin et al., 1989). When comparing teaching behaviors of physical education specialists and nonspecialists, it was found that specialists placed higher value on more effective teaching behaviors, such as providing feedback, while the nonspecialists spent more time in monitoring, attending, and silently observing (Faucette & Patterson, 1990). Siedentop (1989) asserts that expertise is specific to subject matter and context, and he contends that in physical education teaching, the lack of subject matter competence is the most serious deficit likely to impede the development of expertise.

Recent evidence from research on teacher education suggests that teachers with subject matter knowledge are
more effective in providing feedback which is content related. According to Rink (1985), effective feedback must be content specific and cue relevant for motor skill refinement. Two studies which identified high content knowledge and low content knowledge teachers (Lynn et al., 1990; Solmon et al., 1991) unequivocally reported that the high content knowledge teachers exhibited similar feedback behaviors. The high content knowledge teachers were more interactive with students and provided specific and skill related feedback for error correction during skill practice. While a description of feedback patterns was not a major goal of these studies, findings support the notion that the effectiveness of teacher feedback is related to knowledge of the skill or activity.

It has been established that teachers spend a great deal of time observing pupils and reacting to students' performance (Anderson & Barrette, 1978). Most teacher educators would insist that while watching the students, teachers should provide some kind of skill related feedback to assist them in improving their skill level. However, the teachers' ability to observe, evaluate, and interpret the students' performance depends on the accuracy of their analytical judgements. The complexity of the skill analysis process requires a knowledge of the critical elements and common errors in sport skills (Hoffman, 1977). Recent research in motor learning suggests that the accuracy of
feedback is critical for motor skill learning and that incorrect feedback can be detrimental. Buekers et al., (in press) report that students actually use incorrect feedback to guide their learning. These findings lend further support to the idea that the quality of teacher feedback may be more important than the frequency and help explain some of the modest effects reported in Table A1. Some studies (Gangstead & Beveridge, 1988; Hoffman, 1977) found that even experienced teachers lack competency in skill analysis. Taken together, these studies provide valuable pieces of information that can help explain why the effectiveness studies in teacher feedback constantly produce conflicting findings. It is possible that the feedback statements in some of the studies were not accurate and therefore, did not result in student learning and improvement.

**Student Mediation of Instruction**

A recent approach to the study of teaching effects has focused on how teaching and learning are mediated by students. The concept, student mediation, refers to the active role of the learner in motor skill achievement and means that individual responses of students will influence the amount and kind of learning taking place. For example, several students may listen to the same feedback statement but the understanding will be unique for each student depending on background, motivation, and skill level. Two
of the studies listed in Table A1 (Eghan, 1988; Keh et al., 1989) studied how teacher feedback is mediated by students. Eghan (1988) used the stimulated recall interview to find out whether the teacher feedback was perceived by the students as helpful to them to correct error on subsequent practice trials in learning tennis skills. Analysis of interview data indicated that students perceived teacher feedback as useful and the error correction information helped them to correct errors and improve their tennis performance. Martinek (1988) studied how high and low expectancy students perceived three types of teacher feedback directed to them. Students were interviewed to determine whether their perceptions of the teachers' feedback were consistent with coded dyadic interaction and how they attributed causes of the perceived feedback statements. Results showed differences between observed and perceived teacher praise, corrective skill feedback and corrective behavior feedback for both groups. Low expectancy students tended to attribute corrective behavior feedback to personal causes while high expectancy students attribute the same behavior to teacher characteristics. Locke (1977), in describing cutting edge research on instruction in physical education, included teacher clarity in the gymnasium as a priority area of inquiry. Students' successful development and learning of motor skills depends on their ability to perceive information the way the teacher
intended. Students' perceptions of instructional cues and the intended cognitive process (response) do serve as mediating links between teacher behavior and student learning (Doyle, 1978), and if students' perception is incorrect, they are not going to be successful. The result may be a lack of interest or disruptive behavior. Winnie and Marx (1982) suggest that children's success in acquiring intended classroom knowledge largely depends upon their ability to perceive information correctly and process the information in accordance with the way the teacher intended them to process it. Researchers interested in teacher feedback effects must recognize the need to study various student variables, especially the mediating variables of attention, interest, and understanding. For example, researchers can use these research questions to study feedback: "How do students perceive the feedback they receive during instruction?" "Do the students understand the feedback provided?" "How much of the feedback message does the student retain?" These questions will answer some concerns about clarity in teacher instruction and more clearly reflect the complexities of teaching and learning motor skills.

A Focus on Immediate Effects of Teacher Feedback

Investigation of the short-term effects of instruction is one way to study student mediation and might help
researchers understand how and when teacher feedback facilitates learning (Shulman, 1986a). The process-product studies in Table A1 used student achievement as the product measure and correlated this with some observable teacher behavior or student behavior. The student outcomes or achievement at the end of the instructional period is used to infer student learning and teacher effectiveness. While end-of-instruction scores can indicate whether learning occurred or not, these scores do not tell much about how or why learning occur during instruction. In addition, some problems from the theoretical perspective inherent in using student end-of-instruction outcome to measure the instructional effectiveness are likely to misrepresent the true picture of learning and teaching processes (Rink, 1985). Perhaps a more immediate measure will tell us more about the factors that promote and constrain student learning. Shavelson, Webb, and Burstein (1986) address this problem and call for consideration of the short-term or immediate effects of instruction. Graham's (1987) study on movement tasks and student performance during a volleyball unit provided evidence that a close study of subject matter and its interactions with the process and outcomes of instruction provide a clearer picture and better understanding of how and why learning occurs.
Implications for Future Study

The complexity of teacher-student behavior in the gymnasium and the limited capacity of any single paradigm to account for this complexity is the rationale given by Graham (1989) to support the need for multiple perspective analyses of teacher-student behavior. Thus, to give more meaning to the observable phenomena in a classroom or gymnasium (e.g. teacher providing feedback), several new perspectives on the study of teaching have been introduced by Shulman (1986a).

In the past, studies on teacher feedback have been conducted using different designs and paradigms (mostly process-product research). These studies often sought to answer questions regarding frequency, type, and mode of feedback presentation related to student learning. Each of the studies made a unique contribution toward revealing how this important variable helps students learn. However, in most studies, the length and complexity of instructional treatments confounded the identification of specific aspects of instruction (e.g. feedback) that may have contributed to student progress. It is essential to study how teacher feedback affects immediate responses of students as well as its impact on the long-term measure. Concern about the knowledge base and expertise of the teacher being studied is not to be taken lightly (Shulman, 1986a). The study of how teachers provide feedback and how to be a positive interactor is insufficient, we must also study the content
knowledge they incorporate into the feedback episodes during practice. Doyle's (1977) concept of student mediation in teacher effectiveness research must be taken into consideration when studying teacher feedback. When we take into account the perspective of the student, we add an indispensable dimension to the study (Shulman, 1986a). Studies on perceptions of students show evidence that they are able to perceive differences in teacher expectations regarding their perceived skill level, and the way they perceive instructional cues affects their behavior and learning (Martinek, 1988).

Considering the complex nature of teaching and learning, employing a multiple-approach in teacher effectiveness research will hopefully be more beneficial (Graham, 1989). A comprehensive understanding of teaching should include explanations of both thought and action in teachers as well as in students (Shulman, 1986a). It is important that researchers recognize that physical education classes are complex social settings (Brophy & Good, 1986) where teachers deal with multiple agendas and react to numerous unexpected events. Descriptions of how expert teachers organize a class and present information to students are needed. Analysis of teachers' goals, expectations, beliefs, and intentions are also important. Researchers can only interpret the behaviors of teachers after understanding what the teachers' goals and intentions
are. Teaching must be studied and described as the complex task that it is.

In summary, this review supports the need for further examination of the role of teacher feedback in learning motor skills. Among research issues that still need to be addressed are the following:

1. How does teacher feedback affect the immediate responses of students, and what is the impact of these responses on outcome measure?

2. How does a teacher use content knowledge to plan feedback statements systematically and use skill analysis and analytical judgement to provide correct feedback?

3. How do students perceive teacher feedback? A related question is - does perceived competence, motivation level, background, and skill level affect how one perceives the usefulness of teacher feedback?

4. How do students use teacher feedback statement, and what is the impact of student's ability to use teacher feedback on student achievement?

5. How does feedback interact with other teaching variables such as verbal instruction, teacher demonstration, number and condition of practice trials?
Additional References


### Table A1.
Summary of Teacher Feedback Studies

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Task</strong></td>
<td>Cartwheel</td>
<td>Handstand rollover</td>
<td>Balance beam skill</td>
</tr>
<tr>
<td><strong>Teacher Characteristics</strong></td>
<td>Undergraduate PE majors</td>
<td>PE student teachers</td>
<td>Preservice PE teacher</td>
</tr>
<tr>
<td><strong>Number of teachers</strong></td>
<td>40</td>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td><strong>Student Characteristics</strong></td>
<td>Grades 3 - 6</td>
<td>Freshman PE majors</td>
<td>Grades 4 - 6</td>
</tr>
<tr>
<td><strong>Number of students</strong></td>
<td>3 per class</td>
<td>4 per class</td>
<td>4 per class</td>
</tr>
<tr>
<td></td>
<td>A total of 120</td>
<td>A total of 40</td>
<td>A total of 128</td>
</tr>
<tr>
<td><strong>Number of lessons</strong></td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Length of lessons</strong></td>
<td>20 minutes</td>
<td>9 minutes</td>
<td>15 minutes</td>
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<tr>
<td><strong>Analysis system</strong></td>
<td>TBOS</td>
<td>OBEL/ULg</td>
<td>TBOS</td>
</tr>
<tr>
<td><strong>Outcome measure</strong></td>
<td># of cartwheel performed</td>
<td>Judges' ratings of performance</td>
<td>Rating of 5 points scales on components</td>
</tr>
<tr>
<td><strong>Results</strong></td>
<td>Feedback negatively affect final performance</td>
<td>Feedback is significantly related to student learning</td>
<td>Feedback positively affected outcome</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------</td>
<td>---------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Task</td>
<td>Novel golf task</td>
<td>Volleyball skills</td>
<td>Novel golf task</td>
</tr>
<tr>
<td>Teacher Characteristics</td>
<td>PE specialists</td>
<td>Experienced PE teachers</td>
<td>PE graduate students</td>
</tr>
<tr>
<td>Number of teachers</td>
<td>11</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Student Characteristics</td>
<td>Grades 4 - 5</td>
<td>Grades 5 - 8</td>
<td>Grades 3 - 6</td>
</tr>
<tr>
<td>Number of students</td>
<td>14-30 per class A total of 297</td>
<td>8 per class A total of 144</td>
<td>10 per class A total 244</td>
</tr>
<tr>
<td>Number of lessons</td>
<td>1</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Length of lessons</td>
<td>20 minutes</td>
<td>30 minutes</td>
<td>20 minutes</td>
</tr>
<tr>
<td>Analysis system</td>
<td>FDCS</td>
<td>PETAIBAT</td>
<td>BAT</td>
</tr>
<tr>
<td>Outcome measure</td>
<td>Number of stroke</td>
<td>Standard skills test</td>
<td>Number of stroke</td>
</tr>
<tr>
<td>Results</td>
<td>No significant difference between more or less effective teachers</td>
<td>Total performance feedback and positive performance feedback was significant for more effective teacher</td>
<td>Feedback was not significant for criterion skill measure but significant for cognitive measure</td>
</tr>
<tr>
<td>---------------------------</td>
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</tr>
<tr>
<td>Task</td>
<td>Tennis skills</td>
<td>Olympic handball</td>
<td>Standard board jump</td>
</tr>
<tr>
<td>Teacher characteristics</td>
<td>Tennis specialists</td>
<td>PE teachers</td>
<td>PE specialists</td>
</tr>
<tr>
<td>Number of teachers</td>
<td>8</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Student characteristics</td>
<td>University freshmen</td>
<td>12-17 years old students</td>
<td>K - 6 students</td>
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<td>Number of students</td>
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<td>8 per class</td>
<td>25 per class</td>
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<td></td>
<td>A total of 48</td>
<td>A total of 24</td>
<td>A total of 50</td>
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<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Length of lessons</td>
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<td>2 hours</td>
<td>1 1/2 hours</td>
</tr>
<tr>
<td>Analysis system</td>
<td>IFTB</td>
<td>ALT-PE</td>
<td>OSCD-PE</td>
</tr>
<tr>
<td>Outcome measure</td>
<td>Skills test scores</td>
<td>Skills test scores</td>
<td>Number of jumps</td>
</tr>
<tr>
<td>Results</td>
<td>More effective teachers gave 35% of the time to specific feedback Less effective teachers gave 30%</td>
<td>Significant correlation of .55 btw teacher's feedback and student gains</td>
<td>Specific feedback increased scores significantly for 1st and 2nd grades only</td>
</tr>
<tr>
<td>---------------------------</td>
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</tr>
<tr>
<td>Task</td>
<td>Novel badminton skill</td>
<td>Tennis skills</td>
<td>Badminton skills</td>
</tr>
<tr>
<td>Teacher characteristics</td>
<td>Preservice PE teachers</td>
<td>Expert tennis teachers</td>
<td>PE graduate students</td>
</tr>
<tr>
<td>Number of teachers</td>
<td>10</td>
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<td>1</td>
</tr>
<tr>
<td>Student Characteristics</td>
<td>Grade 5 students</td>
<td>University undergraduates</td>
<td>Female education majors</td>
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<tr>
<td>Number of students</td>
<td>12 per class</td>
<td>24-28 per class</td>
<td>10 per class</td>
</tr>
<tr>
<td></td>
<td>A total of 120</td>
<td>A total of 52</td>
<td>A total of 20</td>
</tr>
<tr>
<td>Number of lessons</td>
<td>1</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Length of lessons</td>
<td>10</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Analysis system</td>
<td>ALT-PE</td>
<td>Modified Fishman &amp; Tobey System</td>
<td>Modified Fishman &amp; Tobey System</td>
</tr>
<tr>
<td>Outcome measure</td>
<td>Number of hits</td>
<td>Skills test scores</td>
<td>Skills test scores</td>
</tr>
<tr>
<td>Results</td>
<td>No significant difference between feedback group and no feedback group</td>
<td>Achievement gain and frequency of feedback was not related</td>
<td>Low-skilled received more corrective and high-skilled more evaluative FB</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------------------</td>
<td>---------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Task</td>
<td>Different team games and individualized activities</td>
<td>Striking skills</td>
<td>Volleyball skills</td>
</tr>
<tr>
<td>Teacher characteristics</td>
<td>PE specialists and classroom teachers</td>
<td>PE Specialists (10-13 yrs experience)</td>
<td>PE teachers (1-8 yrs experience)</td>
</tr>
<tr>
<td>Number of teachers</td>
<td>11</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Student characteristics</td>
<td>Grades 4 - 5</td>
<td>Grade 4</td>
<td>Grades 6 - 8</td>
</tr>
<tr>
<td>Number of students</td>
<td>27-32 per class</td>
<td>4 per class</td>
<td>28 per class</td>
</tr>
<tr>
<td></td>
<td>A total of 330</td>
<td>A total of 8</td>
<td>A total of 202</td>
</tr>
<tr>
<td>Number of lessons</td>
<td>4</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Length of lessons</td>
<td>40 minutes</td>
<td>40 minutes</td>
<td>30 minutes</td>
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<tr>
<td>Analysis system</td>
<td>TOS</td>
<td>Rink's coding system</td>
<td>Modified Fishman &amp; Tobey coding system</td>
</tr>
<tr>
<td>Results</td>
<td>Specialists had significantly higher percentage of feedback &amp; reward behavior</td>
<td>Low-skilled received more feedback-specific and corrective. High-skilled received less feedback-specific and evaluative</td>
<td>Total feedback did not correlate with achievement. Students received relatively few feedback</td>
</tr>
</tbody>
</table>
Appendix B

Questionnaire
Student Background Questionnaire

1. Name: ___________________________ 2. SS#: ___________________________
3. Age: ____________________________ 4. Sex: ___________________________
7. Reason(s) for taking this class: __________________________
   __________________________
   __________________________
8. What do you expect to get out of this class? __________________________
   __________________________
   __________________________
9. Other activity classes taken in the past: __________________________
   __________________________
   __________________________
10. Experience in sports including badminton: __________________________
    __________________________
    __________________________
11. How motivated are you in learning this sport skills? ______
    __________________________
    __________________________
12. What is your perceived competence in badminton skills? ______
    __________________________
    __________________________

Direction: Please answer these questions to your best knowledge
Badminton Final Questionnaire
(Frequencies of Responses are in Parenthesis)

1. How motivated are you in learning the badminton skills?
   5 Extremely motivated (10)
   4 Very motivated (20)
   3 Moderately motivated (11)
   2 Not motivated (0)
   1 Not motivated at all (0)

2. What helped you the most in learning the badminton skills?
   1 Teacher individual error correction (23)
   2 Teacher group instruction (4)
   3 Teacher demonstration (9)
   4 Teacher praise (4)
   5 Partner help (1)

3. How helpful is teacher corrective feedback to your learning of the skills?
   5 Extremely helpful (21)
   4 Very helpful (16)
   3 Moderately helpful (4)
   2 Not helpful (0)
   1 Not helpful at all (0)

4. How helpful is teacher group instruction to your learning of the skills?
   5 Extremely helpful (6)
   4 Very helpful (24)
   3 Moderately helpful (11)
   2 Not helpful (0)
   1 Not helpful at all (0)

5. How helpful is teacher group demonstration to your learning of the skills?
   5 Extremely helpful (13)
   4 Very helpful (20)
   3 Moderately helpful (8)
   2 Not helpful (0)
   1 Not helpful at all (0)

6. How helpful is teacher praise to your learning of the skills?
   5 Extremely helpful (14)
   4 Very helpful (19)
   3 Moderately helpful (6)
   4 Not helpful (2)
   5 Not helpful at all (0)
7. How helpful is your partner help to your learning of the skills?
   5 Extremely helpful (7)
   4 Very helpful (11)
   3 Moderately helpful (17)
   2 Not helpful (5)
   1 Not helpful at all (1)

8. How good would you rate your performance on badminton high serve?
   5 Really well (12)
   4 Good (22)
   3 OK (6)
   2 Not good (1)
   1 Not good at all (0)

9. How good would you rate your performance on badminton forehand clear?
   5 Really well (10)
   4 Good (26)
   3 OK (5)
   2 Not good (0)
   1 Not good at all (0)

10. How good would you rate your performance on badminton backhand clear?
   5 Really well (2)
   4 Good (23)
   3 OK (12)
   2 Not good (4)
   1 Not good at all (0)

11. How good would you rate your overall performance or success on the 3 badminton skills now?
    5 Really well (9)
    4 Good (26)
    3 OK (6)
    2 Not good (0)
    1 Not good at all (0)

12. What is the most important reason for why you rated your performance the way you did?
    1 My ability (20)
    2 My effort (16)
    3 My teacher (The learning environment) (4)
    4 My luck (1)
    5 The task (Too easy or too difficult) (0)

13. How well do you expect to perform in badminton or other sports in the future?
    5 Really well (15)
    4 Good (24)
14. What do you think is your instructor's expectation of your performance?
5 Extremely high (10)
4 High (27)
3 OK (4)
2 Not high (0)
1 Not high at all (0)

15. What is your own expectation of your performance?
5 Extremely high (12)
4 High (26)
3 OK (3)
2 Not high (0)
1 Not high enough (0)

16. What are the 5 most difficult components of the badminton high serve? Rank them from 1-5, 5 being most difficult.
   ( )Points foot to target, 90° with racquet foot (2)
   ( )Turn body sideways (5)
   ( )Bring racquet back to waist height (1)
   ( )Drop birdie in front and in line with racquet foot (7)
   ( )Bring racquet forward in a pendulum swing (1)
   ( )Rotate body to face net (1)
   ( )Shift weight to front leg (1)
   ( )Make contact in front and below waist (4)
   ( )Snap wrist at the time of contact (17)
   ( )Follow through with racquet high (2)

17. What are the 5 most difficult components of the badminton forehand clear? Rank them from 1-5, 5 being most difficult.
   ( )Turn body sideways (6)
   ( )Place weight on back foot (2)
   ( )Bring racquet back at scratch back position (8)
   ( )Point non-racquet arm to birdie for balance (7)
   ( )Keep eye on birdie (5)
   ( )Contact birdie at highest point (6)
   ( )Snap wrist at the time of contact (3)
   ( )Shift weight to front foot (2)
   ( )Rotate body and shoulder (2)
   ( )Follow through high (0)

18. What are the 5 most difficult components of the badminton backhand clear? Rank them from 1-5, 5 being most difficult.
   ( )Turn body sideways (5)
( ) Place weight on back foot (0)
( ) Bent elbow (5)
( ) Keep wrist loose and racquet down (3)
( ) Keep eye on birdie (6)
( ) Point elbow to birdie (2)
( ) Contact birdie at highest point (8)
( ) Snap wrist at the time of contact (7)
( ) Shift weight to racquet foot (1)
( ) Follow through short in front (4)

19. How helpful is the drill to your learning of the badminton skills?
5 Extremely helpful (19)
4 Very helpful (17)
3 Moderately helpful (5)
2 Not helpful (0)
1 Not helpful at all (0)

20. How often are you successful or are able to do what your teacher wants you to do?
5 All the time (4)
4 All the time after the teacher corrects me (13)
3 Most of the time (19)
2 Most of the time after the teacher corrects me (4)
1 Sometimes after the teacher corrects me (1)
Appendix C

Instructional Sequence
### Instructional Sequence

<table>
<thead>
<tr>
<th>Date</th>
<th>Lesson</th>
<th>Lesson Content and Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 27, Tu</td>
<td></td>
<td>Course outline, consent form, student background questionnaire, student self-perceived profile</td>
</tr>
<tr>
<td>Aug 29, Th</td>
<td></td>
<td>Demonstration of badminton games, explanation of skills test</td>
</tr>
<tr>
<td>Sept 3, Tu</td>
<td></td>
<td>Pretest on high serve, forehand overhead clear, backhand overhead clear</td>
</tr>
<tr>
<td>Sept 5, Th</td>
<td>1</td>
<td>High serve, grip, rules, court</td>
</tr>
<tr>
<td>Sept 10, Tu</td>
<td>2</td>
<td>High serve, rules, return serve</td>
</tr>
<tr>
<td>Sept 12, Th</td>
<td>3</td>
<td>High serve, return serve, ready position</td>
</tr>
<tr>
<td>Sept 17, Tu</td>
<td>4</td>
<td>Forehand overhead clear, footwork</td>
</tr>
<tr>
<td>Sept 19, Th</td>
<td>5</td>
<td>Forehand overhead clear, underhand return</td>
</tr>
<tr>
<td>Sept 24, Tu</td>
<td>6</td>
<td>Forehand overhead clear, strategy: cross court/down the line, game</td>
</tr>
<tr>
<td>Sept 26, Th</td>
<td>7</td>
<td>Backhand overhead clear, footwork</td>
</tr>
<tr>
<td>Oct 1, Tu</td>
<td>8</td>
<td>Backhand overhead clear, underhand return</td>
</tr>
<tr>
<td>Oct 3, Th</td>
<td>9</td>
<td>Backhand overhead clear, strategy: cross court/down the line, game play</td>
</tr>
<tr>
<td>Oct 8, Tu</td>
<td>10</td>
<td>Review on the three skills, game play</td>
</tr>
<tr>
<td>Oct 10, Th</td>
<td></td>
<td>Posttest on high serve, forehand overhead clear, backhand overhead clear</td>
</tr>
<tr>
<td>Date</td>
<td>Lesson</td>
<td>Lesson Content and Skill</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Oct 15, Tu</td>
<td></td>
<td>Lecture on history, rule, and strategy</td>
</tr>
<tr>
<td>Oct 17, Th</td>
<td></td>
<td>Written test, final questionnaire</td>
</tr>
<tr>
<td>Oct 22, Tu</td>
<td></td>
<td>Retention test on high serve, forehand overhead clear, back hand overhead clear</td>
</tr>
<tr>
<td>Oct 24, Th</td>
<td></td>
<td>Transfer test - forehand overhead dropshot</td>
</tr>
</tbody>
</table>
Appendix D
Skills Test
Badminton Skills Test

1. **Forehand High Serve**

A cord is stretched across the court 8 feet from the baseline and parallel to the net, at a height of 8 feet from the floor. Floor markings are shown in Appendix E, Figure E1. The subject stands by the X in the service area and serves 10 times to the diagonally opposite court, 5 from the right service court and 5 from the left service court. No score is given for any trial which fails to go over the 8-foot cord or which fails to land in the appropriate service court. Any shuttlecock landing on a line dividing two scoring areas receives the score of the higher area. The score for the entire test is the sum of ten trials. The trial is repeated if the serve is illegal, either foot fault or shuttlecock, is contact above the waist.

The reliability coefficients computed on two different groups of freshman and sophomore women at the University of Iowa and a larger group of 332 players were .62 and .68. When corrected by the Spearman-Brown formula, the coefficient was .77 and .81. The validity computed on the subjects at the University of Iowa was .54 when correlated with subjective ratings made by three judges during play.

2. **Forehand and Backhand Overhead Clear**

A cord is stretched across the court 8 feet from the baseline and parallel to the net, at a height of 8 feet from the floor. Floor markings are shown in Appendix E, Figure E2
and Figure E3. The feeder (player with considerable experience) stands on the same side of the net as the targeted area. The serve must be good, and the shuttlecock is served high to the X on the appropriate court. The subject stands on the X and moves to the X or nearby area in the right serve court to return the shuttlecock for forehand clear. Likewise, the subject stands on the X and moves to the X or nearby area in the left service court to return the backhand clear. The subject should not return the serve if it is not good. Five trials are targeted to cross court and 5 to down the line. No score is given for any trial failing to go over the cord or failing to land in the appropriate court area. The trial is repeated if the stroke is "carried" or "slung".

The reliability computed on the two groups of subjects from University of Iowa was .96. For the 59 subjects from Illinois State Normal University, it was .70. At Iowa, with criterion of tournament rankings the validity was .60; at Normal University, with the criterion of subjective ratings, it was .50.
Appendix E

Badminton Court Layout
Figure E1.
Badminton High Serve Skill Test

8' high rope
8' from the baseline
Figure E2.
Badminton Forehand Overhead Clear Skill Test

8' high rope
8' from the baseline
Figure E3.

Badminton Backhand Overhead Clear Skill Test
Appendix F

Criteria of Badminton Skills Rating
Table Fl.
Criteria for Badminton High Serve

Skill Components

Stance for ready position
1. Both feet shoulder width apart
2. Non-racquet foot points to target
3. Body weight on rear foot

Body position
4. Non-racquet shoulder points to the net
5. Racquet backswing at waist height with wrist cocked
6. Birdie is held by the base at chest height

Serve execution
7. Drop birdie slightly in front of the non-racquet foot to the racquet foot side
8. Bring racquet forward in a pendulum swing to contact birdie below waist
9. Shift body weight to front foot and rotate body to face net
10. Snap wrist at contact point and follow through over the opposite shoulder
Table F2.
Criteria for Badminton Forehand Overhead Clear

<table>
<thead>
<tr>
<th>Skill Component</th>
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</thead>
<tbody>
<tr>
<td><strong>Stance</strong></td>
</tr>
<tr>
<td>1. Feet apart, non-racquet foot points to target</td>
</tr>
<tr>
<td>2. Weight on racquet foot</td>
</tr>
<tr>
<td><strong>Body Position</strong></td>
</tr>
<tr>
<td>3. Non-racquet shoulder points to the net</td>
</tr>
<tr>
<td>4. Racquet up and cocked behind head in a back scratching position</td>
</tr>
<tr>
<td>5. Non-racquet arm is raised for balance</td>
</tr>
<tr>
<td><strong>Stroke Execution</strong></td>
</tr>
<tr>
<td>6. Get behind the birdie</td>
</tr>
<tr>
<td>7. Shoulder and hips rotate to face birdie</td>
</tr>
<tr>
<td>8. Extend arm to contact birdie at highest point above racquet shoulder</td>
</tr>
<tr>
<td>9. Transfer weight to non-racquet foot</td>
</tr>
<tr>
<td>10. Snap wrist at contact point and follow through with racquet head down to the opposite side of the body</td>
</tr>
</tbody>
</table>
Table F3.  
Criteria for Badminton Backhand Overhead Clear

Skill Components

**Stance**
1. Feet apart, racquet foot points to the net post
2. Body weight on non-racquet foot

**Body Position**
3. Racquet shoulder points to the net
4. Racquet bends at non-racquet shoulder & elbow points at coming birdie

**Stroke Execution**
5. Get behind the birdie
6. Shoulder and trunk rotate into the shot
7. Extend elbow and contact birdie high & in front of the body
8. Snap wrist at contact point.
9. Transfer body weight to fore foot
10. Follow through with racquet head up & pointing to target
Appendix G

Student Interview Schedule
<table>
<thead>
<tr>
<th>Date</th>
<th>Lesson</th>
<th>Section</th>
<th>Student #</th>
</tr>
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<tbody>
<tr>
<td>Sept 5, Th</td>
<td>1</td>
<td>1</td>
<td>3, 5, 10, 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3, 5, 10, 11</td>
</tr>
<tr>
<td>Sept 10, Tu</td>
<td>2</td>
<td>1</td>
<td>1, 2, 14, 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1, 2, 13, 14</td>
</tr>
<tr>
<td>Sept 12, Th</td>
<td>3</td>
<td>1</td>
<td>6, 8, 9, 10</td>
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<td>6, 7, 9, 12</td>
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<td>Sept 17, Tu</td>
<td>4</td>
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<td>16, 17, 19, 20</td>
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<td>16, 17, 19, 20</td>
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<td>Sept 19, Th</td>
<td>5</td>
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<td>7, 12, 13, 21</td>
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<td>21, 22, 23, 24</td>
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<tr>
<td>Sept 24, Tu</td>
<td>6</td>
<td>1</td>
<td>1, 2, 3, 4</td>
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<tr>
<td></td>
<td></td>
<td>2</td>
<td>5, 10, 15, 18</td>
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<tr>
<td>Sept 26, Th</td>
<td>7</td>
<td>1</td>
<td>11, 14, 15, 18</td>
</tr>
<tr>
<td></td>
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<td>2</td>
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</tr>
<tr>
<td>Oct 1, Tu</td>
<td>8</td>
<td>1</td>
<td>8, 9, 10, 19</td>
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<td>6, 7, 10, 11</td>
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<tr>
<td>Oct 3, Th</td>
<td>9</td>
<td>1</td>
<td>7, 16, 17, 20</td>
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<td></td>
<td></td>
<td>2</td>
<td>9, 17, 19, 22</td>
</tr>
</tbody>
</table>
Student Interview Questions

1. What was the most difficult part of the skill you practiced today?

2. What were some of the errors you made while you were practicing today?

3. What did the teacher say or do to you individually that helped you to correct those error(s)?

4. How did that help you to correct those error(s)? Could you do what he wanted you to do? How often? (all the time, most of the time, sometimes or other response). How would you rate your success on a scale of 5, 5 being most successful, and 1 the least? Why did you rate yourself the way you did?

5. What helped you the most to improve the skill while you are practicing? (If student gave answers related to teacher feedback, ask what else?)

6. Did the teacher praise and encourage you? What did he say? Why do you think he praised or encouraged you?

7. If you were the teacher, what would you do to help the students to learn this particular skill while they were practicing?
Appendix H

Teacher Interview Transcripts
Teacher Interview Transcripts

1. Could you please talk about your qualification and teaching experience in physical education, especially in badminton?

   Ans: I have a B.M. in Sports Science, a Post Graduate Certificate in Education (Physical Education and General Science) and a M. Sc. in Human Movement Science. Now a second year Ph.D. student in Motor Behavior. Altogether I have 7 years teaching experience. I have taught badminton throughout this time, 6 weeks each year, age-range 11-18. This is my third semester teaching beginning badminton in LSU.

2. What are your instructional goals and the objectives you set for this badminton course?

   Ans: These are some of the goals for the course: (1) That all students could serve, play forehand-backhand clears, dropshots and smashes. (2) That they knew the basic strategy of singles and doubles play. (3) That they knew enough rules to play a formal game and teach their friends these rules. (4) That their knowledge of technique was sound enough, so that despite still having skill problems, they could work with their knowledge and "frame-of-reference" how to progress.

3. What kind of expectation do you have for your students in these badminton classes?

   Ans: I expect them to have fun, learn a basic game, and
improve over and above the beginners level.

4. What thoughts do you give to prepare your lesson plans for the skills you teach?
   Ans: I plan the organization, warm-up, the lesson theme, and the design drills to best develop this theme.

5. Do you have any systematic feedback plan regarding to feedback provision to students during the lesson?
   Ans: I prefer to react to each individual as how I feel they will best benefit from a choice of various forms of feedback, rather than using a preconceived approach that may be inappropriate. But of course as an instructor, one must know the sport and the skills for sport well enough to provide the appropriate feedback in the simplest possible form. I like to give them cues and tell them what form I'm looking for.

6. What would you consider appropriate when providing a certain type of feedback to a particular student?
   Ans: To minimize verbal information and maximize kinesthetic awareness of the relationship between the feedback and movement itself, so that (if any) self analysis does not disrupt during the movement but may be used appropriately between movements. Also, it depends upon the skill level. For beginners, overload is the problem. For more advanced players, they may be able to make quite subtle changes to their playing action with technical information.
7. When you were providing feedback to students, what aspects of the skills were you more concerned about?

Ans: That they grasped the general idea of the whole skill, e.g. what it looked like, what it achieved, or could achieve, how it related to the game. After these goals, I would then concern myself with more detailed actions.

8. I notice you praised the students very often during practice, what effects do you think that might have on student learning of the skills?

Ans: Motivation is important for performance and learning. I hope to keep the students active, attentive, and interested by offering praise as often as necessary.

9. Could you please share with me your knowledge about teacher feedback and student learning motor skills?

Ans: I did my dissertation on different teaching styles and their effectiveness. Basically, I feel from this research that for beginners, it is best to minimize verbal feedback and let them observe and model skills rather than "blasting" them with detail. Over time, cues and detail can be added to the basic feel of the movement pattern. I try to use as many forms of feedback as possible, eg. visual, tactile, kinesthetic, auditory, guidance (self or teacher led), and analogies.

10. Would you do anything differently from other classes if you were not videotaped for the study?

Ans: In general the same, but I would have spent more time
letting them play and discover in game-play rather than constrain their activity by so many drills. Without a microphone, I may well have been less formal.
Appendix I

Teacher Feedback Coding System
**Table II.**
**Teacher Feedback Coding System**

**Definition of Feedback Categories and Subcategories in the Teacher Feedback Coding System**

**Methodology**

1. **Form**: The category identifying the way feedback is provided.
   b. Auditory + visual: Verbal and modeled feedback.
   c. Auditory + tactile: Verbal and physical guided feedback.

2. **Direction**: The category identifying to whom the feedback is provided.
   a. Individual: Directed to one student.
   b. Group: Directed to more than one student.
   c. Class: Directed to the entire class.

3. **Time**: The category identifying when feedback is provided.
   a. Concurrent: Provided during the motor skill performance.
   b. Terminal: Provided immediately after the motor skill performance.
   c. Summary: Provided after a sequence of motor skill performance (at the completion of two or more trials).

**Substance**

4. **Intent**: The category identifying the purpose of feedback.
   a. Prescriptive: To provide instruction for the subsequent motor performance.
   b. Descriptive: To provide an account of the preceding motor performance.
   c. Evaluative: To provide an appraisal of the motor performance.

5. **Character**: Identifies the positive or negative tone of the feedback.
   b. Negative: Criticizes the motor performance.
   c. Neutral: Neither praises nor criticizes.

6. **General Referent**: Identify the quantity of the movement mentioned in feedback.
   a. Whole movement: Information on more than one component of the motor performance. For example, "Cock your wrist and swing with a pendulum action".
Table II. (Continued)

<table>
<thead>
<tr>
<th>Part movement: Information on one component of the motor performance. For example, &quot;Cock your wrist&quot;.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome movement: Information on the result of the motor performance. For example, &quot;Good serve. It landed in the back court.&quot;</td>
</tr>
</tbody>
</table>

7. **Specific referent**: Identifies the quality of the movement mentioned in feedback.
   a. **Force**: Information on the strength or power in the motor performance.
   b. **Rate**: Information on the time or duration of a movement involved in the motor performance.
   c. **Space**: Information on the direction, level or magnitude of movement involved in the motor performance.
   d. **Technical**: Information on the technique of the motor performance with no reference to rate, force and space.
   e. **Nonspecific**: Information with no reference to rate, force, space, and technique.

8. **Quality**: Identifies the usefulness of feedback.
   a. **Appropriate**: Information which is related to the error(s) or success in the performance.
   b. **Inappropriate**: Information which is not related to the error(s) or success in the performance.
## Teacher Feedback Coding Sheet

**Skill:** __________________________  **Date:** __________________________

<table>
<thead>
<tr>
<th>student #</th>
<th>feedback cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

**auditory**
**aud-tactile**
**aud-visual**

**single**
**group**
**class**

**concurrent**
**terminal**
**summary**

**evaluative**
**descriptive**
**prescriptive**

**positive**
**negative**
**neutral**

**whole**
**part**
**outcome**

**rate**
**force**
**space**
**technique**
**non-specific**

**appropriate**
**inappropriate**

**teacher moves**
**observes**
**gives add. fbk**
Appendix J

Teacher Feedback Lists
<table>
<thead>
<tr>
<th>Priority</th>
<th>Feedback Statement</th>
<th>Specific Referent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Point front foot to target</td>
<td>Spatial</td>
</tr>
<tr>
<td>2</td>
<td>Body weight on rear foot</td>
<td>Force</td>
</tr>
<tr>
<td>3</td>
<td>Point shoulder to the net</td>
<td>Spatial</td>
</tr>
<tr>
<td>4</td>
<td>Racquet back at waist high with wrist cocked</td>
<td>Spatial/Technique</td>
</tr>
<tr>
<td>5</td>
<td>Hold birdie by the base at chest high</td>
<td>Spatial</td>
</tr>
<tr>
<td>6</td>
<td>Drop birdie slightly in front of front foot</td>
<td>Spatial</td>
</tr>
<tr>
<td>7</td>
<td>Bring racquet forward in a pendulum swing</td>
<td>Spatial/Technique</td>
</tr>
<tr>
<td>8</td>
<td>Shift body weight to front foot and rotate body to face net</td>
<td>Force/Spatial</td>
</tr>
<tr>
<td>9</td>
<td>Contact birdie below waist</td>
<td>Spatial</td>
</tr>
<tr>
<td>10</td>
<td>Snap wrist at contact and follow through over the opposite shoulder</td>
<td>Force/Spatial</td>
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### Table J2: Primary List of Teacher Feedback Statements for Forehand Clear

<table>
<thead>
<tr>
<th>Priority</th>
<th>Feedback Statement</th>
<th>Specific Referent</th>
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<tbody>
<tr>
<td>1</td>
<td>Racquet up</td>
<td>Spatial</td>
</tr>
<tr>
<td>2</td>
<td>Turn side on</td>
<td>Spatial</td>
</tr>
<tr>
<td>3</td>
<td>Point non-racquet foot to target</td>
<td>Spatial</td>
</tr>
<tr>
<td>4</td>
<td>Bend your knees</td>
<td>Technical</td>
</tr>
<tr>
<td>5</td>
<td>Scratch your back with racquet</td>
<td>Technical</td>
</tr>
<tr>
<td>6</td>
<td>Point left arm to birdie</td>
<td>Spatial</td>
</tr>
<tr>
<td>7</td>
<td>Extend you racquet arm</td>
<td>Technical</td>
</tr>
<tr>
<td>8</td>
<td>Hit birdie high above your head</td>
<td>Spatial</td>
</tr>
<tr>
<td>9</td>
<td>Move through the birdie and finish tall</td>
<td>Technical</td>
</tr>
<tr>
<td>10</td>
<td>Follow through across the opposite side of the body</td>
<td>Spatial</td>
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Table J3.
Primary List of Teacher Feedback Statements for Backhand Overhead Clear

<table>
<thead>
<tr>
<th>Priority</th>
<th>Feedback Statement</th>
<th>Specific Referent</th>
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<tr>
<td>1</td>
<td>Turn side on</td>
<td>Spatial</td>
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<td>2</td>
<td>Point racquet foot to the net post</td>
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<tr>
<td>3</td>
<td>Point racquet shoulder to the net</td>
<td>Spatial</td>
</tr>
<tr>
<td>4</td>
<td>Bend arm and racquet at non-racquet shoulder</td>
<td>Spatial</td>
</tr>
<tr>
<td>5</td>
<td>Point elbow to birdie</td>
<td>Spatial</td>
</tr>
<tr>
<td>6</td>
<td>Place weight on back foot</td>
<td>Force</td>
</tr>
<tr>
<td>7</td>
<td>Move weight to front foot</td>
<td>Force</td>
</tr>
<tr>
<td>8</td>
<td>Extend arm and make contact in front of the body</td>
<td>Spatial</td>
</tr>
<tr>
<td>9</td>
<td>Snap wrist at point of contact</td>
<td>Technique</td>
</tr>
<tr>
<td>10</td>
<td>Follow through high up with racquet head towards target</td>
<td>Spatial</td>
</tr>
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</table>
Table J4.
Secondary List of Teacher Feedback Statements for High Serve

**Ready Position**
- Point front foot to target
- Check your back leg
- Bend your knee
- Front foot toes up
- Feet not too far apart
- Back foot about 90° with front foot
- Start with your racquet back
- Racquet back
- Turn to side
- Cock your wrist

**Serve Execution**
- Bend elbow and hold birdie close to chest
- Hold your birdie in front and to the side
- Hold birdie close to chest then drop out in front by racquet side
- Hold your racquet a little in front
- Drop birdie to side
- Drop the birdie, don't toss
- Dropping the birdie right
- Keep your eyes on the birdie
- Let the birdie drop lower
- Let the birdie drop then play through
- Pull racquet down and whip through
- Pull racquet down in a big pendulum swing
- Slowly pull down and snap
- Racquet head down
- Hit it slowly
- Slow down your swing
- Don't swing sideways
- Contact birdie lower
- Hit birdie a little in front of your body
- Hit towards target
- Snap that wrist
- Snap at last second
- Let your wrist loose then let it go through
- Turn body facing net
- Turn shoulder
- Let your body come through
- Move weight to your front toes
- Move your weight to front foot
- Feel your weight through the birdie
- Let more weight go through your body
- Bend your knees and move weight through
- Back heel up
- Back leg bend towards target
Table J4. (Continued)

Finish on toes down
Heel to toes action
Follow through with racquet towards target
Follow through high over your opposite shoulder
Control your racquet face
Push your racquet higher
Point your racquet face up then turn
Finish tall facing net
Table J5.
Secondary List of Teacher Feedback Statements for Forehand Clear

**Foot Work**
- move your feet
- move your feet and get to the birdie
- get to the birdie earlier
- get behind the birdie
- skip back
- get back to the center
- use your legs

**Ready Position**
- get yourself ready
- racquet up
- on your toes
- turn side on
- point left foot (non-racquet) to target
- bend your knees
- left arm up
- racquet up and elbow points to front
- bring racquet back
- bend your elbow
- scratch your back

**Stroke Execution**
- hit the birdie high
- extend your arm and hit high
- hit high above your head
- push it high
- hit high in front of your body
- let the wrist get loose
- right through the birdie
- release through the birdie
- control the pace of your racquet
- direct racquet face down the line
- direct racquet face cross court
Table J6.
Secondary List of Teacher Feedback Statements for Backhand Clear

**Ready Position**
- turn side on
- turn your body side on
- move and turn your body
- turn your body more
- get your racquet back earlier
- racquet up and back earlier
- have your racquet back as soon as you hit one
- point your elbow to the birdie
- elbow points high
- loosen your wrist
- keep wrist loose
- let your wrist get loose all the time
- let racquet drop down with loose wrist
- bend your knees
- bend your knees more

**Stroke Execution**
- let your wrist loose, extend and snap
- bend your elbow down and swing up
- point your elbow and let the back of your hand move towards birdie
- arm swing higher
- don't swing across your body
- swing from 6 to 12 o'clock
- remember clock face movement
- don't swing sideways
- start with a pendulum swing along your body
- swing with racquet head down at 6 o'clock
- pull the racquet up and through
- move racquet in a long arc
- snap your wrist
- swing up and snap
- swing racquet face up
- hit high
- hit slightly in front of your body
- hit higher and earlier
- contact birdie out in front
- contact birdie high up
- hit with a dangling arm and loose wrist
- extend arm and hit through
- extend your arm and hit high
- hit high above your head
- don't hit too close to your body
- don't hit behind your body
Table J6. (Continued)

- bend your knees and move through
- move your weight from back to front foot
- move weight to front foot
- uncoil your body and hit high
- bend your knees and stretch
- move your weight through
- bend knees and shift weight to straight legs
- stretch and move weight through
- control your racquet face for direction
### Table J7.
Examples of Feedback Statements Using "Sandwich Approach"

1. "Good."
   "Hold your birdie in front, in line with your pendulum swing."
   "Let the birdie drop."
   "Good, racquet follow through to target."
   "Terrific."

2. "Nice."
   "You are starting with your weight in front, keep your weight more on back foot and move through."
   "Terrific, bend your knee and move weight through."
   "Beautiful."

3. "Steve, you're swinging the racquet sideways. Pendulum swing down close to the side of your body."
   "Lovely, pull your racquet through."
   "Lovely, you have the pendulum swing."

4. "Good shot. You have your racquet back a little late, as soon as the birdie is served, have your racquet ready to hit."
   "Good job."

5. "Turn your body side on, get your body ready earlier."
   "Good, move your weight to front foot."

6. "You hit behind your head, you really want to make contact here."
   "Good."

7. "Terrific stroke."
   "When you get back, bend your knee and extend through your birdie."
   "Good lad, finish tall when you extend."

8. "Hit more in front of your body, Sean."
   "Good, Sean."
Appendix K

Recalled and Coded Teacher Feedback Statements
Recalled and Coded Feedback Statements for the Three Skills

Lesson 1, Section 1

#5 : "Hold my hand back and keep still."

T : "Racquet back then move through."

#10 : "Dropping the birdie to the right spot."

T : "Drop your birdie more to side, to your racquet."

#11 : "My stance."

T : "Point your foot facing you partner."

#3 : "Remind me to point my foot."

*No corrective feedback was given.

Lesson 1, Section 2

#5 : "Change my grip."

T : "Move your weight through."

: "Move your finger right here."

: "Make your pendulum swing higher and push through."

#3 : "Hold the racquet back and push it through the net and over the net."

T : "Hold racquet closer to body."

: "Push your arm up."

: "Birdie closer and pushing through and up."

#10 : "Where to point your foot."

T : "Good."

#11 : "Where to drop the birdie and where to make contact."

T : "Ready position."

: "Point your racquet front up."
Lesson 2, Section 1

#2 : "Say out loud and hit."
T : "Get into good position."
   : "Drop front, hit toward target."

#15 : "Show me hold to hold the birdie."
T : "Hold birdie close to chest."

#1 : "Show me how to move and place birdie."
   : "Push weight toward front foot."
   : "Bend elbow and hold birdie here."
   : "Watch birdie, snap."

#14 : "Today the teacher didn't come talk to me but last class he came to help me with my serve, like shifting my weight to front foot and judging the distance of the birdie with my racquet."
*No corrective feedback was given.

Lesson 2, Section 2

#14 : "Timing of forward swing, hit too far or too close."
T : "Drop birdies close to the side."
   : "Slow down and hit."
T : "Good weight transfer."
#1 : "Swift weight."
T : "Let your body come through."
   : "Wait longer to snap your wrist."
   : "Feel your weight come through then drop birdie."
   : "Move weight and hit it last minute."

#13 : "Hit birdie low down."
T : "Hit birdie front."
:"Whip through."
:"Drop birdie front."
:"Cock wrist."
:"Let the birdie drop."
:"Work on your drop, bring birdie closer."

#2 : "Back swing still in ready position; Shift weight."

T : "Toe-heel action."
:"Point to target."
:"Cock wrist, racquet back in ready position."

**Lesson 3, Section 1**

#9 : "Slow down, going through each one I try to hit.

T : "Good, you make contact. Racquet back here, drop
the birdie here, racquet head down instead of
swing side."
:"No rush, slow down, do it very very slow. good,
drop birdie there, and hit."

#8 : "Keep back foot still; Swing your racquet like a
pendulum."

T : "Pendulum swing and up."

#6 : "Show me the right swing."

*No corrective feedback was given*

#10 : "He demonstrated where I should hit the birdie."

T : "Hold birdie high."
:"Stand straight up, move weight through birdie."
Lesson 3, Section 2

#9  "Not to be stiff, relax more."

T  "Loose your wrist, lift your toes, front toe points to target."

:"Turn your body to different direction."

:"You follow through sideways, follow through here."

:"Let's get the birdie here this time."

#7  "Concentrate on one spot, make sure your racquet ends up where it supposed to be."

T  "Point your racquet to your target and follow through."

#6  "He show me how to hold the racquet right, what angle to stand and how to put more force to it."

T  "You drop birdie too far."

:"Your racquet swing sideways, swing it upwards."

:"Pull pendulum swing through, you pull too fast, swing slowly."

:"Have your racquet cocked at waist height."

#12  "Demonstrate the toe-heel action."

*No corrective feedback was given.

Lesson 4, Section 1

#16  "The 3-step back, follow through, he showed us how to hit the birdie."

*No corrective feedback was given.

#17  "He told me and showed me how to hit the birdie more front."
"You're hitting the birdie behind you. Hit the birdie here, up front."

"Turn to the side and get the racquet ready."

"You stroke well, good action. But you're not turning your side on. Now really turn your body side on and come through."

"Keep pointing at the birdie and moving my weight."

"Hit a little higher."

"Turn a little side on and give yourself a little more power to the birdie."

Lesson 4, Section 2

"He reminded me to get back to the middle of the court, and to keep my hands up too and get behind the birdie."

"Turn side on and get your left arm up."

"He showed me how to position my body and how to move so I could move back quicker to be able to get to the birdie when it got to the back court, and the position to put your racquet in front so you could be in the position to hit the birdie."

"Extend your arm, hit it here, you're hitting the birdie here."

"Racquet up."

"Give me an idea of pointing, swing back and turn."

"Hit a little more in front."

"He showed me proper foot work and getting around
better so I could be ready for it."

T : "Good shot. See this position, from there to there, put the birdie back behind the court."

Lesson 5, Section 1

#7: "He told me to wait for the birdie to get right in front of me instead of letting it go behind."

T : "You're still facing the net, turn side on, that'll give you more power."

: "You're hitting here, get behind the birdie."

#12: "He made me swing a lot slower and aim my foot so that when I dropped my arm back, my shoulders would turn so that getting me not to stand straight and watch the birdie."

T : "You're too quick. I want you to bend and hit."

: "You can turn a little side on."

: "A little more side on."

#13: "He told me to turn my feet to the direction of my opponent or to the direction I want to hit. He said I need to put my hand all the way back and scratch my back like that."

T : "Nice movement from side on to follow through."

: "Bring your racquet back all the way."

#21: "He showed me how my wrist should be and to turn sideways."

T : "Keep your wrist loose."

: "Follow through to the side of your body."
Lesson 5, Section 2

#21: "He told me to take it easy, loosen my wrist up, and not to hit it quite as hard as I was hitting it. He showed me how to put my fingers on the grip and swing a little softer."

T: "Racquet up."
"Racquet up all the time."

#22: "He pointed out that I was letting the birdie get too far behind me and to really attack it."

T: "Hit it up there and out in front of your body."
:"Racquet ready."
:"Racquet up all the time."

#23: "He told me to take a couple steps back and judge the birdie."

T: "I want you to hit high in front."

#24: "He helped me with the foot work and that helped me and the racquet swing."

T: "I want you to hit it there, high."

Lesson 6, Section 1

#1: "He didn't correct me. He just praised me on other things."

T: "Good form, just the direction."
:"A little more in front of your body."
:"Good shot, you really hit it side on and high above."
:"Terrific, you used your leg."
"He told me to hit it from the side with straight arm, turn my body."

"Good Steve, you have your racquet up and hit it high above."
"Bend a little more and hit higher."
"Get a little behind the birdie."
"A little behind your body."

"He advised me to back up and stay behind the birdie a little bit so that I could look at it better and stay in control of it."

"That's terrific stroke, the face of the racquet was coming towards me."
"Nice shot, but a little bend arm. I want you to hit as high above your head as possible."
"A little low, it's a smash."

"He reminded me to bend my knees, get underneath the birdie more."

"A little more in front of your body."
"Good stroke, get ready on your toes."

Lesson 7, Section 1

"It was the aiming, the elbow thing, and he showed me like put it like in the right spot and it worked and now I can play professional badminton."

*No corrective feedback was given.

"He went over the correct style of the swing. Hit from the 6 o'clock to the 12 o'clock direction."
T: "Good. You're hitting from 6 to 12 o'clock, hitting a pendulum swing along your body rather than out here."

"Lovely Mark. Hit from here to there."

#15: "He showed me how to hold my elbow up."

T: "Nice Sean. Your racquet is down here, I want you move your racquet up here and hit birdie up here."

"There you go, the timing is important, good."

#18: "He just told me to keep my eye on the birdie and be sure that I'm watching it all the time so that I know where it's going to fall in relation to my body."

*No corrective feedback was given.

Lesson 7, Section 2

#1: "He just showed me how to hold the racquet and to put my weight into my swing."

T: "Move your finger here, loosen wrist and move racquet from here to here."

"You still hold it like that. You should feel like that."

"You got it. Hit the birdie in front of your body for direction."

"You went back to your old stroke."

#2: "He came to me, he watched me do it, then he showed me the motion, keeping the elbow up and moving
through from 6 o'clock to 12 o'clock, went through it a few times, and he watched me do it."

T : "Good, lovely. Your racquet is well in line with your body, that's exactly. You want to contact the birdie high and front like the forehand clear."

#13 : "He told me to hit the birdie over my head and it went across better."

T : "Good stroke. You're bending your leg and stretch, good."

#14 : "He fixed my grip right on my racquet, he showed me how to hold it right and showed me where to hit the birdie overhand."

T : "Move your fingers here, get your wrist real heavy, move racquet from there to there."

: "That's an underarm stroke.

: "Good. Like forehand clear, hit slightly in front of your body."

: "As you can see the birdie drop behind you, you have to get behind it and hit there."

Lesson 8, Section 1

#8 : "He just pointed out what I was doing wrong, I didn't put my weight on my back foot right and he showed me the proper stance to stand."

T : "Good shot. That's your best one yet. Move your weight from back to front foot and move it into the
swing."

#9 :"Um, basically he showed, I just watched him when he showed the group once or twice and I tried to just keep practicing to do it right."

T :"Good, just your timing, you let the birdie drop too low."

#10 :"He demonstrated and showed me how actually to hit the birdie. You know, the loose wrist, point the racquet straight down to the ground, so I can get more power and control."

*No corrective feedback was given.

#19 :"He showed me how to put my weight on the back foot and how to hold my racquet correctly."

T :"Good, bend your knee and shift weight."

:"Good, hit a little higher."

Lesson 8, Section 2

#6 :"He just showed me which way to hold my racquet for the backhand clear."

T :"Good, have your racquet back earlier."

:"Can you let that wrist get real heavy?"

#7 :"He just informed us how we were supposed to move in and out of the court."

*No corrective feedback was given.

#10 :"Well, he came over and he showed me what form I should have, how to swing and follow-through, like to move a little earlier and have my elbow up."
T: "Check you racquet position, swing from there to there."

#11: "He showed me how to hold the racquet right, the way I hold my thumb on the racquet... I pointed my thumb up."

T: "Move your thumb to the back bevel, that will allow you to snap your wrist like that."
"Lovely, now hit the birdie here, same stroke."
"Love it, simply move your thumb to that position."

Lesson 9, Section 1

#7: "He told me not to hit it behind my head, keep the birdie in front of my head when I hit it so it would go further."

T: "You hit it too behind and close to you, hit further front."
:"You hit behind your head, you really want to make contact here."

#13: "He showed me the right footwork to do the cross court, getting over to the corner and moving to the birdie to hit in the form of the backhand. I started picking up the skill and did much better."

T: "That's almost not a cross court, you really have to move, turn your body and control your racquet face."

#17: "He told me how to correct my position with my
backhand, he said get my racquet back and push my weight forward, it will go further, but I never did get that."

T : "Feel this, move your racquet from there to there."

"Racquet back from ready position."

"Focus on moving your weight."

#22 : "He basically told me to bring my racquet into the ready position earlier, instead of waiting for the birdie to come to me and to be ready for it."

T : "Good, you want to turn your body more and hit it towards here."

"Racquet back earlier."

Lesson 9, Section 2

#9 : "He watched me and he told me how to stand and where to go and how to turn my body and put my feet and everything so I can get back to hitting, because I was rushing to my hit, I wasn't doing it right."

T : "Racquet up and back as soon as you hit one."

"Terrific, because you prepare early."

#17 : "He told me to set up, get my arm ready in a ready position to be able to contact the birdie and move back in time and strike it at the highest point whenever in a ready position and that will give more distance and accuracy."

T : "Good, hit a little high and in front of your
body."
"Racquet back."

#19 :"He told me that the birdie would go further if I have a flexible wrist and snap it. He showed me how to do that and asked me to feel about it."

T :"Racquet back earlier."
"Hit it with the back of your arm here."
"Good, hit from here to here with dangling wrist."

#2 :"He actually came over and pointed out the fact that I was letting the birdie go a little too far and over on top of my head instead of like getting on top of the racquet."

*No corrective feedback was given.*
Appendix L

Descriptive Statistics of Teacher Feedback for
Badminton Skills
Table LI.
Descriptive Statistics of Teacher Feedback for High Serve

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HS* = High Serve  
FH* = Forehand Clear  
BH* = Backhand Clear
Appendix N

Achievement Scores and Quality of Practice with Feedback

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Appendix O

Students' Use of Teacher Feedback
Table 01.
Students' Use of Teacher Feedback for Badminton Skills

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<td>7</td>
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</tbody>
</table>

*Scores for students' use of teacher feedback:
0 - 0 out of 3 trials
1 - 1 out of 3 trials
2 - 2 out of 3 trials
3 - 3 out of 3 trials

**The maximum score for each student is 9
Appendix P

Students' Ability to Recall Teacher Feedback
Table P1. Students' Ability to Recall Teacher Feedback for Badminton Skills

<table>
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<tr>
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<th>BH Clear</th>
<th>%</th>
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<td>3</td>
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<td>27.42</td>
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</tbody>
</table>
Vita

Nyit Chin Keh was born on June 29, 1951, in Mersing, Johor, Malaysia. She attended elementary and junior high school in Mersing. In December 1969, she graduated from Methodist Girls' Senior High School in Malacca. After graduating from Mohdmad Khalid Teacher Training College with a Teaching Certificate, she taught elementary school in Malaysia for 8 years.

Keh came to the United States in 1980. She graduated from Louisiana State University at Baton Rouge with a Bachelor of Science in 1985. She began her graduate program in the Fall of 1985 and completed her Master of Science in the Fall of 1987. Keh began her doctoral program in the Spring of 1988. She has been a teaching and research assistant for the Department of Kinesiology throughout her 6 year graduate program at LSU. Keh will return to Taiwan with her husband, Hank Jwo, after completing all requirements for the doctor of philosophy degree in August, 1992.
Candidate: Nyit Chin Keh

Major Field: Kinesiology

Title of Dissertation: Students' Use of Teacher Feedback During Badminton Instruction

Approved:

[Signatures]

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination: April 16, 1992