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**An Examination of Teaching Behaviors and Learning Activities Using Direct Instruction Model in Physical Education Class Settings at High School and College levels**

Howard Z. Zeng, Michael Hipscher, and Raymond W. Leung

Brooklyn College, the City University of New York; U.S.A.

Research in teaching effectiveness has advanced remarkably with respect to how teaching behaviors were related to students’ learning outcomes in physical education (PE) settings over the last decades (Graham & Heimerer, 1981; Keating, Kulinna, & Silverman, 1999; Martin & Kulinna, 2004; 2005). Previous studies focused on how teacher behaviors were associated with direct instruction resulting in the development of the direct instruction model (DIM) in PE (Good & Grouws, 1977; Graber, 2001; Rosenshine, 1976; Rosenshine, 1979; Sweeting & Rink, 1999). According to pedagogical theorists, in order to have an effective lesson, well pre-planed and positive teaching behaviors, such as informing, questioning, feedback, and praising should be exhibited throughout a teaching session (Faucette & Patterson, 1990; Graham & Heimerer, 1981; Rink, 2003). Moreover, researchers in PE have focused on academic learning time physical education (ALT-PE) or motor activity engaged time as a means of assessing effective teaching (Godbout, Brunelle & Tousignant, 1983; McKenzie, Clark & McKenzie, 1984; Parker, 1989; Placek & Randall, 1986; Shute, Dodds, Placek, Rife & Silverman, 1982).

Recently, researchers have used different systematic observation systems to observe, measure, describe and compare the differences and similarities of teaching behaviors exhibited by instructors at the K-12 levels (Faucette & Patterson, 1990; Hagood, Lynn & Trliffe, 2007; Keating et al., 1999; Martin & Kulinna, 2005; Mitcell & Castelli, 2003). Previous studies showed that using the DIM in PE classes improved teaching effectiveness as well as students’ learning engagement (Anderson, Evertson, & Brophy, 1979; Graber, 2001; Rosenshine & Stevens, 1986; Sweeting & Rink 1999). Specifically, general instructional behaviors (e.g., informing/directing/explaining) and management (e.g., structuring and organizing) behaviors were negatively related to motor engaged activities of the students; general instructional behaviors, however, were positively associated with sitting and standing behaviors of the students (Martin & Kulinna, 2005). Yet, most of these studies were conducted at elementary and middle school levels. To the knowledge of the investigators, teaching behaviors and learning activities at the high school and college levels have not been well documented. Hence, the following questions remain unknown: What are the features of teaching behaviors (TB) and learning activities (LA) in high school and college PE class settings? Are there any significant differences between TB and LA in PE class settings at high school and college levels? The purposes of this study were to address the above two questions using the Direct Instruction Behavior Analysis (DIBA, Zakrajsek & Tannehill, 1989) system in the high school and college PE class settings.

**Methods**

**Participants**

Participants were 30 PE instructors and their students from an urban city located in the East Coast of the United States; wherein 15 were high school instructors (HIs) and 15 were college instructors (CIs). After obtaining the permissions to conduct this study from the Institutional Review Board of the university and the administrators of the high schools, the informed consent and the cover letters were delivered to the participants. The research design and the videotaping procedures were explained to the participants. All participants signed the informed consent.

The following 60 PE skill/activities classes taught by the participants (two lessons per instructor) were videotaped and analyzed: volleyball (12 classes), basketball (10 classes), yoga (6 classes), track and field (4 classes), gymnastics (4 classes), soccer (4 classes), tennis (4 classes), dance (4 classes), weight lifting/fitness (2 classes), softball (2 classes), lacrosse (2 classes), swimming (2 classes), aerobics (2 classes), and body conditioning (2 classes). It was important to point out that among the 60 lessons, 30 of them were team sport (which is 50% of the total lessons) and the rest of 30 lessons were individual sports or activities; but all 60 lessons involved in at least 5 minutes fitness exercises.
Instrumentation

A systematic observation instrument, direct instruction behavior analysis (DIBA, Zakrajsek & Tannehill, 1989) instrument was utilized to collect data. The DIBA instrument was composed of 13 behavioral categories that reflected the features of TB and LA in which eight categories were used to determine TB of the instructors and five categories were used to determine LA of the students:

1. Teaching Information (I). Teacher tells, explains, demonstrates, reviews, or summarizes.
2. Teacher Observing (O). Teacher silently observes, watches, or monitors student performance.
3. Teacher Structuring (S). Teacher stresses objectives and important points, directs performance, or signals transitions.
4. Teacher Questioning (Q). Teacher asks questions that are intended to evoke a verbal or motor response.
5. Teacher Praise/Encouragement (P). Teacher praises, commends, accepts, or encourages student performance or attempts.
6. Teacher Feedback (F). Teacher gives feedback that is immediate, specific, task relevant (can include correct or incorrect responses).
7. Teacher Controlling (C). Teacher uses disciplinary comments or actions to criticize or to justify authority.
8. None of the Above (N). Teaching behaviors are not related to the instructional process (teaching and learning).
9. Motor Engaged (M). Student is actively engaged in an appropriate motor task/activity.
10. Cognitive Engaged (CE). Student listens to or reads about subject matter and gains information.
11. Response Preparing (R). Student gets ready to respond to a learning task.
12. Gets Equipment/Relocates (GR). Student is following teacher’s direction or information to get the equipment or move to a different location.
13. Waits for a Turn (W). Student is waiting in a line for his or her turn to practice a task. (pp. 244-245; Zakrajsek & Tannehill, 1989).

It was noted that there was a “Comments” section on the ‘DIBA Recording Sheet’, which allowed the recorder to write down his/her comments/notes about the lesson. These comments/notes were very important because the qualitative information would remedy a defect for a quantitative instrument. As a result, the DIBA instrument would enable the investigators to obtain not only quantitative data but also qualitative information. Zakrajsek and Tannehill (1989) indicated that the DIBA system was an instructional model that was based upon a combination of common teaching behaviors and was synthesized from teaching and learning processes. Moreover, the DIBA system characterizes those behaviors identified by the researchers of the direct instruction model and is specifically illustrated from the field of teaching physical education. The DIBA system is believed to be an ideal systematic observation instrument that “was designed to collect data on teacher and student behaviors that can be used in analyzing teaching performance with the direction instruction teaching model.” (Zakrajsek & Tannehill, 1989, p. 243).

Data Collection and Analyses

Each participant was videotaped two lessons during his/her regular teaching schedule, and the entire lesson was recorded; therefore, a total of 60 lessons were caught on tapes. Two digital video camcorders (Sony DCR TRV 350 NTSC, Japan) were utilized to perform the videotaping tasks. Classes were videotaped from the moment when the teachers officially started the lesson until the teachers dismissed the class. During each videotaping session, the camcorder was placed in a non-obtrusive location to minimize the reactive effects. Interval and event recording techniques were employed for data collection and the following two types of data were obtained: (a) percentage data, that reflected the percentage of times the participants spent on the pre-defined behaviors/activities; and (b) rate per minute (RPM) data, which reflected the occurrence frequency on the pre-defined behaviors/activities.

Two judges were selected and trained for coding the 13 behavioral categories. Prior to the actual coding, the judges completed two 60 minutes practice sessions in pre-coding training so that they were familiarized with the coding process.
The results in terms of the mean RPM scores over the 13 behavioral categories were summarized as follows: (a) for the HIs: Informing 28.8%; Structuring 25.4%; Observing 17.0%; providing Feedback 9.2%; Questioning 3.2%; Praise/encouragement 1.9%; Controlling .3% only; and None of the Above 14.1%. In contrast, the CIs spent their time on the eight teaching behaviors were: Informing 28.8%; Structuring 25.4%; Observing 11.4%; providing Feedback 9.2%; Questioning 3.2%; Praise/encouragement 1.9%; Controlling .3% only; and None of the Above 14.1%. In contrast, the CIs spent their time on the five learning activities were: Motor Engaged 56.2%; Cognitive Engaged 20.7%; Response-preparing 6.8%; Get-equipment/Relocation 6.4%; and Waiting for a Turn 9.7% in a lesson.

Secondly, on average, the high school students (HSs) spent their time on the five learning activities were: Motor Engaged 5.215 ± 2.612 (HSs), Cognitive Engaged 3.596 ± 1.758 (HSs), Response-preparing .278 ± .205 (HSs), Get-equipment/Relocation .665 ± .469 (HSs), and Waiting for a Turn .963 ± .915 (HSs), and .383 ± .304(CSs). The descriptive statistics for participants of the two levels in percentage and RPM scores using the DIBA system are displayed in Table 1.

Table 1. Descriptive statistics for high school and college instructors (n = 30) in percentage and rate per minute (RPM) scores using the DIBA system

<table>
<thead>
<tr>
<th>Variables</th>
<th>College Settings</th>
<th>High School Settings</th>
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<tbody>
<tr>
<td></td>
<td>Percentage</td>
<td>RPM</td>
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<tr>
<td></td>
<td>%</td>
<td>M  SD</td>
</tr>
<tr>
<td>T B:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informing</td>
<td>25.500</td>
<td>2.617 1.014</td>
</tr>
<tr>
<td>Observing</td>
<td>11.400</td>
<td>1.149 1.126</td>
</tr>
<tr>
<td>Structuring</td>
<td>36.000</td>
<td>2.624 1.504</td>
</tr>
<tr>
<td>Questioning</td>
<td>5.500</td>
<td>.529 .362</td>
</tr>
<tr>
<td>Praise/Enc</td>
<td>300</td>
<td>.248 .164</td>
</tr>
<tr>
<td>Feedback</td>
<td>12.900</td>
<td>.946 .601</td>
</tr>
<tr>
<td>Controlling</td>
<td>.000</td>
<td>.000 .000</td>
</tr>
<tr>
<td>None-Above</td>
<td>3.300</td>
<td>.362 .295</td>
</tr>
<tr>
<td>L A:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor-Enga</td>
<td>46.900</td>
<td>3.596 1.758</td>
</tr>
<tr>
<td>Cogn-Enga</td>
<td>31.200</td>
<td>2.755 1.084</td>
</tr>
<tr>
<td>Resp-prepare</td>
<td>6.800</td>
<td>.205 .205</td>
</tr>
<tr>
<td>Equip/Relo</td>
<td>13.500</td>
<td>.791 .311</td>
</tr>
<tr>
<td>Wait a Turn</td>
<td>2.900</td>
<td>.383 .304</td>
</tr>
</tbody>
</table>

Note: TB = Teaching Behaviors; LA = Learning Activities. Praise/Enc = Praise/Encouragement, None-Above = None of the Above, Motor-Enga = Motor-Engaged, Cogn-Enga = Cognitive-Engaged, Resp-prepare = Respond-preparing, Equip/Relo = Get Equipment/Relocation, and Wait a Turn = Waiting for a Turn.
Furthermore, the independent group MANOVA using the RPM data revealed that a significant difference was found for the mean vector between the high school and college levels [Wilks’ $\Lambda = .405$; $F (1, 58) = 55.000; p < .000$]. The stepwise discriminant function analysis (DFA) discovered that Function one (TB vs. LA) was significantly different ($\Lambda = .405; \lambda = 50.572; p < .000$); and the DFA further identified the following four categories that distinguished the differences between the TB and LA when using the DIBA system collecting data: (a) Informing, $r = .407 (3.349$ vs. $2.617)$, HSs $>$ CSs; (b) None-Above, $r = .776 (1.284$ vs. $362)$, HSs $>$ CSs; (c) Motor Engaged, $r = .322 (5.215$ vs. $3.596)$, HSs $>$ CSs; and (d) Wait for a Turn, $r = 1.462 (.963$ vs. $.383)$, HSs $>$ CSs. Unexpectedly, all four behavioral categories (two TB and two LA) identified by the DFA were high school scores greater the college scores. The differences between TB scores and LA scores for the high school and college instructors and their students are presented in Table 2.

Table 2. Discriminant function analysis to determine which variables are more important in the 11 behaviors from the ASUOI for the participants in dual roles of teacher and coach (N = 9)

<table>
<thead>
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<tbody>
<tr>
<td>Informing</td>
<td>.493</td>
<td>.000</td>
<td>.407</td>
<td>.715</td>
<td>.175</td>
</tr>
<tr>
<td>None-Above</td>
<td>.566</td>
<td>.001</td>
<td>.776</td>
<td>.767</td>
<td>.392</td>
</tr>
<tr>
<td>Motor-Engaged</td>
<td>.520</td>
<td>.000</td>
<td>.322</td>
<td>.717</td>
<td>.305</td>
</tr>
<tr>
<td>Wait a Turn</td>
<td>.623</td>
<td>.000</td>
<td>1.462</td>
<td>.997</td>
<td>.357</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td>-4.254</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: TB = Teaching Behaviors; LA = Learning Activities. Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions Variables ordered by absolute size of correlation within function.

Discussion

The purpose of this study was to examine and compare the differences of the teaching behaviors and learning activities in physical education (PE) class settings between high school and college levels. The current findings shown that the percentage data were consistent with the RPM data, and these data reflected the features of TB and LA in terms of using the DIBA system collecting data in PE class settings at high school and college levels. With respect to the teaching behaviors, the current findings were consistent with the findings from Faucette and Patterson (1990) in Questioning and Feedback, but were inconsistent in Informing, Structuring, and Praise/Encouragement teaching behaviors. The CIs in the current study exhibited more Questioning and Feedback teaching behaviors than those of the HSs; and the CIs in the current study exhibited less Informing, Structuring, and Rewarding teaching behaviors than those of the HSs. In particular, the RPM scores in the current study for the CIs and HSs on the Questioning behaviors were .53 vs. .37, on the Feedback behaviors were .95 vs. .69, and on the Praise/Encouragement behaviors were .25 vs. .14, which illustrated that the CIS employed a lot more Questioning, Feedback and Praise/Encouragement TB than those of the HIS during they were teaching. Secondly, on the Informing and Non-Above behaviors, the RPM scores for the CIs and HSs were .26 vs. .33 and .36 vs. 1.30 respectively; which illustrated that the HIS utilized much more Informing and Non-Above behaviors than those of the HIS during they were teaching.

With regard to the activity levels of the students, the findings of the current study were inconsistent with the findings from Faucette and Patterson (1990), whereby they reported that the rates of activity levels of the students were 35.0% and 16.5% taught by specialists and non-specialists respectively. The percentage and the RPM of activity levels of the students found in the current study were a great deal higher than the Faucette and Patterson’s (1990) finding, with 47% of class time or 3.59 RPM vs. 56% of class time or 5.22 RPM for the CSs and HSs respectively.

In contrast to the findings from the study of Martin and Kulina (2005), in which they reported that middle and high school students spent over 60% of class time on non-motor-engaged activities. Surprisingly, students in the current investigation spent over 55% of class time engaged on motor-related activities. Reasons for explaining this difference might be attributed to the following factors: (a) the features of the activities or sports: seventy-five percent of the lessons in the current investigation involved in fitness exercises and more than 50% of the lessons are classified into individual activities or sports. Obviously, activities such as running, swimming, yoga, and aerobic fitness exercises are quite conducive to continuous movement resulting in higher motor engaged time; and (b) the impact of the Healthy People 2010 objectives for school physical education (United States Department of Health and Human Services [USDHHS],
2000): Due to the Healthy People 2010 objectives promoted by the USDHHS, both college and high schools have emphasized the importance of providing moderate to vigorous physical activity in physical education/skill class settings. Moreover, providing 50% or more of class time in physical activity along with maximizing student opportunities for good practice have become an essential criterion for determine whether a lesson is effective and successful (Rink, 2003).

Based upon the qualitative information collected and summarized from the “Comments/Notes” of the DIBA, the investigators would like to further analyze and discuss the findings that described previously. First, the CIs scored higher on Cognitive Engaged and Feedback than the HIs. This finding reflected that the goals of college and high school PE are different. In order to reach the goals, college PE courses involved not only physical skills/techniques but also theoretical instructions (i.e., basketball skills and theories). In addition, the CIs need to have thorough understanding of the content knowledge in what they are teaching, and the capability to stimulate students’ cognitive learning and provide valuable feedback for the students as well.

Findings revealed that HIs scored higher on Motor Engaged and Wait for a Turn than the CIs. According to the “Comments/Notes”, this finding demonstrated that the HIs appear to be the practitioners who know how to maximize students’ activity learning time; they have the skills to motivate their students to participate in the activities they offer. The goals of high school PE classes that were more focused on providing physical activities/exercises and having fun may also contribute to this finding. Moreover, the HIs scored higher in Waiting for a Turn variable than the CIs. This reflected the current issue of ‘class oversize’ in the urban high schools settings, and this might be the reason that explained why the HSs had much higher waiting time than the CSs.

In addition, the reasons for the similar scores among the participants on Questioning, Observing, Structuring, Preparing, and Get Equipment/Relocation might be explained as follow. Questioning is the favorite teaching behavior used by all instructors for motivation and checking students’ understanding. A similar amount of behaviors showed in the Questioning category was the PE class instructional pattern implying that no matter you are HIs or CIs, you have to use certain amount of the Questioning to make teaching work. Observing teaching behaviors occurred during students’ learning. This behavior is critical, because by observing what the students were doing teachers know what is going on in the classroom and help to make decisions on whether the students need more demonstration, feedback, or further instruction. All participants showed a similar pattern using the Observing category. Preparing and Get Equipment/Relocation students’ activities are really dependent on how a teacher manages her/his lesson that is highly related to the manner she/he applies the Structuring teaching behaviors. The reasons for why the participants scored similarly in this category might be due to the fact that, in the profession of teaching physical education, some common instructional patterns you have to follow no matter you are high school or college instructors.

In conclusions, HIs appear to utilize more Informing and None-Above behaviors than those of CIs. HSs appear to gain activities learning time than those of CSs in the PE class settings. However, HSs spend more time on Wait for a Turn than those of CSs. The participants from the two levels use other eight variables on the DIBA in a similar manner. Findings of this study suggest that the HIs should reduce student waiting time during a PE lesson whereas the CIs should increase Motor Engaged activities for their students. Lastly, the percentage and the RPM data of this investigation provided information and insight regarding the features of teaching behaviors and learning activities for the high school and college levels. These data may help establish a guideline for high school and college PE instructors who want to improve and modify their teaching strategies.

References


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