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TEACHING PHYSICAL EDUCATION:
STUDIES ON STUDENT AND
TEACHER BEHAVIOUR

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This research provided descriptive data on student and teacher behaviour over a series of related physical education lessons and also examined the effect of feedback to teachers on the quantity and quality of student behaviour during these lessons. In Study One eight teachers were observed teaching their classes in their school’s gymnasium within the regular school timetable. A modified version of the Academic Learning Time - Physical Education observation system (Siedentop, Tousignant and Parker, 1982) was used to take repeated measures of the behaviour of the teacher and the behaviour of two randomly selected high, average and low achieving students in each class across all lessons.

Study One showed that the teachers allocated less than half of the available lesson time for student participation with the learning tasks. Over all classes less than 20.0% of student time was spent in Motor-on-Task behaviour with a range from 11.2% to 29.2%. The three student achievement groups within each class spent similar amounts of time in Motor-on-Task behaviour and performed similar numbers of learning trials, but differed in the proportion of successful learning trials experienced. The high achievers always performed with the greatest percentage of success on the learning trials and the average achievers performed with more success than the low achievers. Across all classes, Cognitive
behaviour was the most prevalent student behaviour.

In Study Two a multiple baseline design across teachers was used to evaluate the effects of feedback to teachers of behavioural data gathered in baseline lessons. Two teachers received such feedback while a third teacher served as a control. Both teachers who received feedback increased the amount of time students spent in Motor-on-Task behaviour (+15%). While this increase provided the students with more learning trials only one of the two teachers was able to increase the percentage of success of all student achievement groups when performing the learning trials. The high achievers performed with the highest percentage of success in classes taught by both teachers. Increases in Motor-on-Task behaviour did not occur at the expense of any one other student behaviour. There was considerable variance within each intervention class for all behaviours. There were no substantial differences in student behaviour between the three classes taught by the teacher who did not receive feedback. The study showed that while there were considerable differences in how physical education lessons were implemented, the two teachers were able to respond to feedback and to modify their lessons so that the amount of student participation was increased.
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CHAPTER ONE

INTRODUCTION

Over the last decade studies have been undertaken that describe events taking place during physical education lessons. A major focus of much of the recent research has been directed at identifying variables that characterize effective teaching. Although many of the aspects of the teaching-learning process remain uncharted, a more accurate and purposeful understanding of instructional effectiveness is beginning to emerge (Locke, 1982; Pieron, 1983; Silverman, 1983; Siedentop, Mand and Taggart, 1986; Yerg, 1986; Harrison, 1987).

Efforts to describe and analyse physical education lessons have followed classroom research on teaching which has used systematic observation to study student and teacher behaviour as they occur in the natural setting (Good, 1981; Brophy, 1979; Doyle and Carter, 1984; Rosenshine and Berliner, 1978). Encouraging similar research in the area of physical education, Siedentop (1982) and Locke (1983) have suggested that if teaching is defined primarily in terms of its impact on students then it is important to observe what is happening to the students in the learning environment as one essential component in evaluating teaching strategies. It is student behaviour which ultimately determines the final performance of
learning tasks (Yerg, 1982), therefore student in-class behaviours are critical factors that may enhance or inhibit student learning (Yerg, 1986).

Through the use of applied behaviour analysis methodology a research base is being established from which it becomes possible to describe and evaluate the effectiveness of instructional processes in physical education (Siedentop and Taggart 1984). Although this information is valued, Graham and Heimener (1981), Locke (1982), Schultz and Goodman (1982), Rink (1983) and Schempp (1987) have all recommended that the results from such observation studies be interpreted with caution because the learning environment is a complex setting in which many factors operate simultaneously. To make generalizations about the importance of results and relationships in specific studies could be misleading. Templin (1983), Locke (1983), Pieron (1986) and Schempp (1987) support this view and note that no single research method will explain all the dynamics of the teaching - learning process in physical education. Nevertheless, descriptive observational studies can provide useful data on teaching and learning.

Recognising the limitations of some classroom research, Doyle (1979) and Garrison and MacMillan (1984) advocated the need for systematic descriptions which would explore and clarify the influence of the teacher and the learning environment on student behaviour. Tousignant (1982) noted that such information was also absent from physical education research and suggested that knowledge about the sequencing of
events and structuring of the learning tasks would enrich our understanding about the contextual factors in which the learning occurs in physical education. Despite different methodologies all investigations have a common purpose. This is to attempt to specify what is effective teaching in physical education and what is associated with greater learning gains.

In reviews of classroom instructional research Rosenshine and Berliner (1978), Smyth (1980), Stallings (1980), Waxman and Walberg (1982) and Anderson (1981) have acknowledged the importance of "academic engaged time" as a key variable in predicting student achievement. This suggests that there is a strong positive relationship between achievement and student engaged time in the classroom. Reviews of classroom research have identified some teaching behaviours that seem to be associated with achievement. However, the overall conclusion from such reviews (Garrison and MacMillan, 1984) is that so far there is no clear explanation as to what comprises effective teaching behaviours, nor is it possible to identify behaviours that are consistently important within subject areas across teachers.

Active Learning Time.

Several observation systems have been developed specifically for observing student behaviour in physical education. These have been based on observation instruments used in the analysis of student behaviour in the classroom.
The Active Learning Time - Physical Education (ALT-PE) observation system developed by Siedentop, Birdwell and Metzler (1979) and later revised by Siedentop, Tousignant and Parker (1982) provides a systematic approach from which individual student behaviour, in particular student participation patterns during physical education lessons can be analyzed. Anderson (1983) describes the system as valuable because it focuses on the most crucial element in the educational setting, the learner. Student activity serves as a link between teacher behaviour and student performance. Information about the relationship between engagement and achievement for individual students or groups of students may have important implications for teacher educators and physical education teachers.

Since the adoption of the academic learning time variable into research on teaching physical education a number of descriptive, correlational and experimental studies have been completed. Dodds, Rife and Metzler (1982) reviewed the research and noted that:

The viability of ALT-PE will depend on how well we can produce careful replications and creative new designs, conceptualised to refine this time-on-task variable so it reflects more and more of the subtleties and complexities of the educational environment. (p.45)

While the relationship between the amount of time students spend actively engaged with learning tasks (i.e. motor-on-task behaviour) and subsequent levels of achievement in physical
education has yet to be demonstrated empirically, the concept is theoretically sound (Siedentop and Taggart, 1984). Nevertheless, while academic learning time is being claimed as a viable predictor of student achievement in physical education, Griffey (1983) warns that it is possible for more time than is necessary to be spent practicing tasks. Silverman (1985) suggests that the number of trials as well as the level of difficulty may be just as important in predicting achievement as the amount of time students spend engaged in skill practice. Although there is some controversy within the research in physical education on such issues there is considerable interest in academic learning time as a major factor in learning. Doyle (1979) suggested that student behaviour and responses to the learning tasks can be considered as the mediating variable which help understand how teaching works and learning occurs. Siedentop (1983a) supported this and stated:

Certain kinds of on going process evaluations provide a better measure of student learning because they are less contaminated than are typical achievement measures. What is needed is a measure that provides on a day-to-day basis direct evidence of the degree to which the student is learning.(p.26)

In the past, determining the appropriate criterion measure has been one important problem that has limited the type of study undertaken on the teaching of physical education. The studies in physical education that have attempted to relate amount of student motor-on-task behaviour to learning gains
(e.g. Yerg, 1983; Pieron, 1982; Graham, Soares and Harrington, 1983; Phillips and Carlisle, 1983; Silverman, 1983; Howe, 1985; Paese, 1986) have generally been in agreement in recognizing academic learning time as a useful criterion variable for assessing teacher effectiveness and student learning. However, there is also a case for examining more specific components of on-task activities.

Repeated Measures.

The use of class means to represent student behaviour across a period of time in research may well mask information relevant to teacher effectiveness as well as disguise information about the performance of individual students or groups of students within the class (Silverman, 1985). It is probable that the variability of within class events will need to be identified if more generalizable relationships between student behaviour and learning outcomes are to be established. In order to provide a more valid and reliable interpretation of what occurs during the teaching of physical education Shute, Dodds, Placek, Rife and Silverman (1982), Lombardo and Cheffers (1983), Pieron (1983), De Knop (1983), Phillips and Carlisle (1983), and Metzler (1986) have all taken repeated measures of either student or teacher behaviour, rather than relying on observations from single occasions. The most significant finding from studies taking repeated measures across time was that the students of the more effective teachers consistently spend more of their lesson time
practising motor skills. Although the time spent practising the tasks and the number of trials varied between studies, student motor-on-task time was emphasised as an important process variable. However, there was no common pattern of teacher behaviour across these studies so that it has not been possible to clearly relate specific teacher behaviour to specific student outcomes in physical education (Pieron and Graham, 1984). Nevertheless, some instructional strategies may allow for more successful student participation than others (Metzler, 1986).

Research On Changing Teacher Behaviour In The Natural Setting.

Systematic analysis of the daily events occurring in the normal physical education learning environment is needed. In addition, there is a need to evaluate interventions designed to change teacher behaviour and to improve student responses. Future instructional strategies could be developed through accurate and reliable observation of selected students in natural educational environments. While there is some evidence from behaviour analysis studies about the behaviours of teachers who are claimed to be more effective, there is still an absence of programmes directed at developing and increasing effective teaching skills (Siedentop, 1986). From their training teachers do not necessarily acquire the skills identified with effective teaching and produce high rates of on-task time for their student during physical education lessons. However, what teachers do in the instructional
setting can be changed (Olsen, 1983; Siedentop, 1981; Borys, 1986; Dunbar and O'Sullivan, 1986; Siedentop, 1986).

It would seem appropriate, therefore, to evaluate ways in which teachers could increase the amount of lesson time in which students are engaged in appropriate motor activity. Increasing this learning time could enhance the learning of motor skills during the physical education lesson. There is a notable gap in our knowledge about improving academic learning time. Unless information in this area is forthcoming it may be reasonable to expect physical education to receive less emphasis in the school curriculum in the future (Razor 1983).

One direction for research in physical education teaching, therefore, is to understand the impact of each teacher's performance on student behaviour during physical education lessons. While it is difficult to determine what levels of participation are desirable to produce student learning, it would seem important to identify ways to increase both the quantity and quality of participation and hence the quality of learning experiences for students.

The Present Research.

The studies presented in this dissertation were designed to provide data on student and teacher behaviour during a series of related lessons taught by different teachers to their respective classes. Study One described the behaviour of teachers and students across a series of related physical education lessons. Study Two examined the effect of an
intervention which provided specific feedback to teachers on the quantity and quality of student behaviour across a series of related lessons.

From the limited number of studies available on research in teaching physical education, several generalizations can be made. First, the results have produced data that closely resemble data from classroom studies of student behaviour. Secondly, teacher's behaviour and interaction patterns indicate that a predominantly direct teaching style is used and that this does not fluctuate significantly. Thirdly, student engaged time, rather than teacher behaviour is the more powerful predictor in determining student achievement gains in physical education.

To be effective, therefore, it would seem the teachers should aim for an increase in both the quantity and quality of student participation during the lessons. The last, but most surprising generalisation noted from the research in physical education so far is that many students are reported to be actively engaged in performing learning tasks for less than one quarter of the available lesson time.

To date, few studies on the teaching of physical education have been done in New Zealand. Clearly, such investigations are needed and present a valuable opportunity for examining the effectiveness of current instructional strategies and practices in the teaching of physical education. The present studies, therefore, examined student time-on-task, the student rate of success in practice trials and the behaviour of teachers during physical education lessons.
Introduction

Physical education usually takes place in an area larger than a classroom and involves children in highly mobile activities. This context calls for different teacher managerial and instructional skills from those most common in the classroom. In the regular classroom setting observational studies have proved useful for identifying what occurs during instruction and for investigating relationships between teacher and student behaviour. However, it is only over the last decade that research has begun to objectively observe and analyse events taking place during physical education lessons. From the early 1970’s, behaviour observation strategies have played a significant role in providing objective, reliable data in physical education research (Siedentop and Taggart, 1984). Also, there has been increasing emphasis on observation of teacher and student behaviours during regular physical education lessons in natural settings, and efforts to evaluate the impact of different teaching strategies on student activity and learning (Siedentop, 1983a).

Clearly, no single research strategy will explain all the dynamics of the teaching-learning process in classroom (Berliner, 1976; Koehler, 1978; Ballard, 1983a) or physical
education teaching (Templin, 1983; Anderson, 1983; Schempp, 1987). Nevertheless, despite specific setting-activity interaction which may limit the generalization of findings from individual studies (Cheffers, 1977; Locke, 1979; Bailey, 1981; Shute, et al., 1982), observational studies have begun to describe some of the dimensions of effective teaching in physical education.

Influences from Research on Classroom Teaching.

Rosenshine and Furst's (1971) review of 50 classroom studies had a significant impact on teaching effectiveness research. In these studies process criteria involved evaluations of teacher classroom behaviour while product criteria were primarily related to increases in the student knowledge of subject matter. Although inconsistencies in some of the data proved controversial the review had an important impact on the future direction of research on teaching in identifying five teacher variables that seemed closely associated with student learning. These variables were:

1. clarity of presentation,
2. enthusiasm of the teacher,
3. variety of related activities during a lesson,
4. task-orientated and businesslike behaviours in the classroom,
5. amount of content covered by the students.
In a follow-up review Rosenshine (1976) concluded that possibly the major factor in student achievement was opportunity to learn, and that important teacher behaviours were therefore those that resulted in the most time for student engagement with the subject matter. This hypothesis was later supported by Fisher (1978), Brophy (1976) and Everston et al. (1980) who showed that learning in mathematics and reading was more likely to be accelerated if the students were provided with sufficient examples and sufficient opportunities to practice and to receive meaningful feedback. Opportunity to respond is presented by Greenwood, Delquadri and Hall (1984) as the major variable influencing academic performance, and their evidence suggests that some school environments provided remarkably low levels of opportunity for students to engage in academic activities.

In a comprehensive review of 289 teacher effectiveness studies Medley (1977) examined relationships among teaching strategies, student achievement and positive student attitude to learning. This review concluded that the more effective teachers were skilled managers ensuring maximum time on learning tasks and maintaining a strong subject matter focus. The same qualities were evident in teachers identified as being the most effective in the Beginning Teacher Evaluation Study (Brophy 1976). In this study it was also noted that achieving in school was a major contributor to self-concept and attitudes about school among students. Most teacher effectiveness studies have been conducted in the primary and
intermediate school, but Stallings (1980), Good (1982) and Everston (1978) have reported similar findings from the few studies conducted at high school level.

Although some practices identified with optimum learning have thus been identified, Doyle (1981) has cautioned that the classroom is a complex setting with multiple dimensions, many of which operate simultaneously. This complexity presents problems for the validity of data collection and analysis procedures. The observation strategies used in teacher effectiveness research, for example, may tend to fragment the teaching processes into discrete and narrowly defined variables, and it is possible that some qualitative aspects of classroom interactions may not be adequately identified by such procedures. Care is therefore needed in generalising about the results and specific variables implicated in teaching research. However, available data suggest that student time engaged with the relevant subject matter, and teacher behaviours that optimize that time, are important factors in learning. Greenwood et al. (1984), Doyle (1979) and Tousignant (1982) reported that the particulars of the instructional setting (tasks, grouping, teacher behaviour) exerted a powerful influence on what students did. These setting variables may be more strongly related to children's failure to learn than variables such as learning disabilities or socio-cultural differences.
Overview of Research on Physical Education Teaching.

The findings from classroom research have had a direct influence on studies of physical education teaching. Research on teacher effectiveness in physical education became focused on observing teachers actually at work in schools (e.g. Fishman and Anderson, 1971; Goldberger, 1974). Locke (1977) and Nixon and Jewett (1980) recommended that future research in physical education should involve only studies that involved observation of instructional activity, claiming that this was the only way for valid information about the process of effectively teaching physical education to be accumulated. Darst (1977); Schempp (1987) and Wuest et. al. (1982) however, cautioned that the observational instrumentation used to analyse lessons would examine only a part of the teacher-learner process and must, therefore, be interpreted with care. As in classroom studies, there are probably many factors which influence teacher and student behaviour. Siedentop (1983a), for example, has noted an absence of data about the learning "atmosphere" in a physical education setting, but speculated that efficient management, a strong academic focus, and a positive instructional climate would probably be related to effective teaching in physical education to the same extent that these factors are implicated in other teaching areas. This would be particularly true if student achievement were found to be controlled through the teachers' management of the instructional ecology.
Although studies in natural settings are favoured by some researchers, a range of studies of physical education have been conducted in experimental or contrived settings, and have provided some interesting data on teacher effectiveness (e.g. Pieron, 1981; Olsen, 1983; Dodds, Rife and Metzler, 1982; Pieron and Graham, 1984). The first such study was reported by Yerg (1977) who examined the relationship between teacher behaviours and student achievement in learning to perform a cartwheel. Achievement, determined by a pretest-posttest measure, improved significantly following instruction, but it was shown the pupil entry skills accounted for 75% of the variability of the final performance. The teacher behaviour variables task presentation, providing an opportunity for learning, and task related feedback accounted for a non-significant two percent of the total variance in pupil attainment. This study raises some interesting questions about what influences learning in specific motor skills. In this case previous learning seemed more important than the teacher behaviours that were measured.

Grant and Martens (1982) compared effective and less effective student teachers when teaching physical education, and reported only one significant finding. The main difference between the two groups was that the more effective student teachers allocated approximately three times as much on-task activity for the whole class as the least effective teachers. This time allocation difference was largely attributable to better organizational and managerial skills on
the part of the effective teachers. Paese (1986) found that first year physical education specialist student teachers produced a higher rate of student activity time and less management and instruction time with their classes than final year specialist student teachers. While the reasons for the differences could not be specified, it was suggested that the influence of cooperating teachers on the final year student teachers during teaching practice may have influenced their methods of instruction. Housner and Griffey (1985) also suggest that student teachers focus on keeping the learners busy rather than on facilitating motor skill acquisition. Nevertheless the results did raise the issue of what impact teaching methods courses have on what transpires when the student teachers are involved in teaching practice in schools. In a similar study which compared the academic learning time of students in physical education classes taught by specialist and non-specialty teachers, Placek and Randell (1986) found that the rates of student participation with the learning tasks were similar for both groups. However, the specialist teachers were observed as providing more appropriate learning activities for the students.

McLeish, Howe and Jackson (1981) determined teacher effectiveness by having experienced teacher educators independently rank 104 videotaped lessons into best average and poor lessons. They then identified two major factors that determined the main differences in the effectiveness of the physical education teachers. First, the best lessons were
highest in their proportion of learning time, and second, the better lessons were low in the proportion of waiting time. Those lessons classified as poor displayed the opposite characteristics. The other most notable finding in this study was that a knowledge focus (i.e. presenting information about the task) did not discriminate between the levels of teaching effectiveness. Hence opportunity to perform is more critical than opportunity to be a passive recipient of information.

Examining the effectiveness of teaching a motor task in a controlled micro-teaching setting Pieron (1981) also found that the time students spent in receiving information did not distinguish between groups with high and low learning gains. However in this study it was shown that brief explicit instructions allowed for more practice time than implicit instructions. What did differentiate between high and low learning gains in this study was the amount of time students spent practising the task during the time allocated for practice, and the number of trials the learners performed during this time. Once again it is evident that the efficient management of the available time during the instructional process appears crucial if the ratio of activity to inactivity in the subject matter is to be optimised. In a similar project Pieron (1983) used learning outcomes to differentiate between the more effective and less effective teachers instructing a series of gymnastic lessons. Although different observational gathering and statistical analysis methods were used the findings replicated Pieron's (1981) earlier study
with the added information that the more successful students tended to get more individual and specific feedback than less successful students. Bischoff (1982) observed similar patterns of student behaviour in coeducational volleyball classes.

De Knop (1983) evaluated differences between more effective and less effective tennis teachers defined in terms of pupil achievement on skill and technique. Analysing data with multiple regression techniques identified time spent on-task, specific feedback, successful organisation to ensure a high rate of practice time, and positive teacher motivation as variables accounting for the greatest contribution to effective teaching.

Using teachers during in-service training in an experimental teaching unit Graham, Soares and Harrington (1983) examined the utilization of different process variables between more effective and less effective teachers when teaching a novel motor skill to 11-year-old students. Teacher effectiveness was determined by evaluating child pretest and post-test performance on the motor skill. The teachers who produced the largest learning gains were those who involved the learners with the subject matter for significantly longer periods of the available time than did the less effective teachers. In this study there was no significant difference between either the amount or type of feedback provided by the teachers classified as more or less effective. This outcome is in contrast with Pieron's (1983) finding that feedback was
a significant variable in learning gains. Possibly feedback can be a functional variable only when there are sufficient opportunities to perform and receive feedback. The difference in findings regarding feedback supports the notion that successful teaching requires the orchestration of teaching behaviours that may not be equally effective in different settings or circumstances. In this regard it should be noted that the importance of practice variables in all areas of instruction is challenged by Yerg's (1983) replication of her earlier (1977) study of a psychomotor activity when she again found that student entry behaviour was the most predictor of outcomes. It would seem that for some, possibly advanced motor skills, teacher variables are less important than prior learning. This could also simply show that proper pre-testing could show practice is not needed if students have the behaviours well established at entry. It is also possible that these research findings reflect differential responsiveness on the part of teachers to completed and uncompleted performances. There is clearly a need for more data on such teaching process issues (Yerg, 1986).

Salter and Graham (1985) claim that conducting process-product research in the natural school setting and experimental setting is a challenging task, and is an effective means by which to examine selected teacher and student behaviours as they relate to learning. Phillips and Carlisle (1983) compared effective and less effective groups of junior high school teachers. Teacher effectiveness was
determined by student pretest–posttest achievement on a five-item volleyball skills test. Specific teaching behaviours discriminating effective from less effective teachers were:

1. analysing students needs,
2. utilising less time for management activities,
3. providing more engaged skill learning time at an appropriate level,
4. using a flexible approach to instruction.

The correlation between student achievement and engaged skilled learning time was .80, and between student achievement and success during engaged time .70 suggesting that these teaching variables were strong indicators of student achievement gain. Metzler (1983) and Salter and Graham (1985) compared the effects of different teaching methods on student learning. Neither study reported any significant differences in the student learning between the groups of students taught by different instructional methods. Rink, Werner, Hohn, Ward and Timmermans (1986) described the effects of three teachers on psychomotor, cognitive and affective outcomes over a 15 lesson volleyball unit. All teachers were considered to be strong managers and task orientated in their approach. Each class was recorded as improving in skill performance, understanding and maintaining positive feelings about participating. Although the student process behaviours varied within each class it was not possible to claim that generic behaviours (e.g. student participation) were predictors of achievement gains. However, it was suggested that qualitative
measures need to be incorporated in order to fully understand and offer a more detailed account of the true differences between teacher effects on student achievement.

To date the teacher effectiveness studies in physical education support the suggestion made by McLeish, Howe and Jackson (1980) that engaged skill learning time is the single most important criterion identifying an effective physical education teacher. Student in-class behaviours are critical factors for enhancing or inhibiting learning. Hence, maximising the amount of time that students are engaged directly in the performance of a motor skill while ensuring they experience a high rate of success should become a priority goal in physical education instruction.

Studies showing the importance of engaged skill learning time tend to support claims made by Cruickshank (1976), who reported two main conclusions about teacher effects that he saw as significant for both policy and research. The first was that few teacher behaviours were generic and that the relative effectiveness of different teacher behaviours is related to subject matter, class level and characteristics of the students. The second finding was that student opportunity to be engaged with the subject matter was one variable that appeared to frequently discriminate between the more effective and less effective teachers. This variable has played a significant role in recent studies in physical education instruction. Both subject matter (task variables) and opportunities to perform are contextual variables, which focus
attention on the importance of ecological features of physical education environments, rather than on teacher and student characteristics which are less open to manipulation.

Acknowledging the research and developments in studying the teaching of physical education, Siedentop, Mand and Taggart (1986) identified eight strategies that are confirmed by research to be associated with effective teaching regardless of the instructional method used. These strategies are:

1. devote a large percentage of lesson time to the learning content,
2. utilize effective organizational and management routines,
3. ensure the students are allocated a high percentage of the lesson time for participation,
4. keep the students actively involved with the learning content for a high percentage of the lesson,
5. match the learning content to the students' abilities,
6. provide the students with realistic expectations,
7. ensure the momentum of the lesson is maintained,
8. hold the students accountable for learning.

It is the appropriate combination of these strategies in relation to the lesson content and the characteristics of the class that will produce the best student learning gains.
The Concept of 'Academic Learning Time' and its Role in Research on Teaching Physical Education.

Siedentop and Taggart (1984) and Yerg (1986) identify a significant problem confronted by research on teaching physical education. This is the lack of agreement on selection of student outcome measures. Except for some physical fitness outcomes there are no standardised measures of physical education. In addition, there are few tests for skill performance, especially for team games and dual activities in which many different actions, including skills other than physical education skills, contribute to one outcome, effective team participation (e.g. cooperative behaviour). As a result there has been a growing acceptance of a concept that has become known as Academic-Learning-Time Physical Education, or ALT-PE (Siedentop, Tousignant and Parker, 1982). Siedentop and Taggart (1984) describe ALT-PE as "a proxy variable for achievement....." involving "a complex 'time-on-task' variable that incorporates judgements about the quality of the students' interaction with a learning task" (p. 109).

Rife, Shute and Dodds (1985) support the claim that ALT-PE provides accurate estimates of time spent on learning as well as an indirect measure of learning as it occurs that stands in place of outcome measures which are difficult to determine. The concept is based on research showing that the amount of time actively engaged in the prescribed physical task is a
major determinant of learning in physical education. Although accepting this notion, Yerg (1986) argues that it is also important to identify other variables that have an impact on student learning as time-on-task can be altered positively or negatively by the instructional process.

It is unreasonable to expect students to be on-task for all of the lesson time. Griffey (1983) has even suggested that possibly more time on-task than is necessary for effective learning may be involved in some lessons, and that the correlation between on-task time and student learning appears not to be a linear function but possibly assumes an inverted U relationship. It would clearly be simplistic to expect that a given amount of time on-task would have a fixed effect on learning across all students and subject matter.

Nevertheless, time engaged in learning has been a widely used variable in recent educational research. Yet the significance of academic learning time will most certainly not be effectively assessed unless the component variables are examined (Smyth, 1980). These components have been described as:

(1) allocated time - the amount of time the teacher allocates for instruction and practice in a particular subject matter,

(2) engaged time - that portion of allocated time that the student is actually involved with the subject matter,
(3) academic learning time - the percentage of engaged time that students are involved with materials or actions that are appropriate to their level of skill resulting in a high success rate and low error rate.

The use of the ALT-PE concept has influenced the study of teaching effectiveness in physical education by changing the initial focus from teacher behaviour to student behaviour. Student behaviour can then be related to those teacher organisational and instructional strategies that affect the time available for student engagement in active learning. Figure 1 presents a hypothetical picture of how student engaged time relates to the total physical education lesson time. Referring to the erosion of lesson time as the "funnelling effect", Metzler and Young (1984) suggest that lesson time slips away in small proportions with the upper limit made available for student learning often being only a small proportion of the total lesson time.

Figure 1 suggests that student engaged time can involve less than half of the total physical education lesson time. Studies to date clearly show that there is a constant decrease in the percentage values from available allocated lesson time, 100%, down to student engaged time, which can be around 27% (e.g. Costello and Laubach, 1978; Godbout et al., 1983; Pieron, 1983). Interestingly, this compares with initial findings reported by Greenwood, Delquadri and Hall (1984) which showed that of the 75% of the school day devoted to instruction in academic subjects only 25% of that available
FIGURE 1: Distribution of student time during physical education lessons. The figure shows the hypothetical proportion of total lesson time available for physical education content, the proportion allocated to physical activity and the proportion utilized as student engaged time.
time involved students being engaged in responding to academic work. In the physical education research Carlisle (1981) found that student achievement was unrelated to varying allocated lesson time but that student achievement was positively correlated (.79) with motor engaged time. Phillip and Carlisle (1983); Metzler (1983) and Placeck and Randell (1986) noted that the variables total lesson time and student engaged time could be relatively independent of one another. It can be argued, then, that proportion of allocated lesson time utilised as engaged time reflects the quality and nature of instruction. As Rosenshine and Berliner (1978) suggest, "Although it still matters whether a teacher is critical or indirect or enthusiastic it is much more relevant to the issue of student achievement to know if the student has been engaged in mastering academic skills." (p.4).

The case for using motor-on-task behaviour (i.e. academic learning time) in conjunction with success rate when performing the learning tasks as a proxy indirect measure for student achievement is well documented. Nevertheless there is a clear need for more data on the issue of student motor-on-task behaviour as a predictor variable for student achievement in physical education. Locke (1982), for example, suggests that there remains a need to show what learning actually resulted from a physical education lesson. Skill outcomes may be influenced by many factors beyond the teacher's control, as the studies by Yerg (1977; 1983), cited above, showed. Pieron and Graham (1984) emphasize the
importance of considering the number of practice trials performed while the student is engaged with the learning activity. For individual students there is likely to be complex interactions among lesson variables, the complexity of the motor skill being taught, physical maturation and prior training in the skills.

Nevertheless, Siedentop (1983a) among others (Metzler, 1983; Templin, 1983; Anderson, 1983; Silverman, 1985; Placek and Randall, 1986) supports active learning time as a legitimate criterion variable for assessing teacher effectiveness and student learning, and sees identifying the factors that maximise student engaged time as having significance for teacher training in physical education. Since many of these factors can be seen to be "antecedent' events to student engagement (e.g. lesson planning), then they may be more readily manipulated, and require less intrusion within a lesson, than will consequent variables such as providing individual feedback (Glynn, 1985). Understanding the antecedent event concept may therefore have important implications for teacher training.

Student Engaged Time in Physical Education Lessons.

The first extensive study to describe how students spend their time during physical education lessons was reported by Costello and Laubach (1978). The behaviour of 193 randomly selected students in twenty different classes was classified according to the Behaviour of Students in Physical Education
(BESTPED) observation system. Individual student behaviour was coded according to function, mode, content and time. Costello and Laubach (1978) found that only 29.2% of student time during a lesson was spent in movement related activities while for 63.2% of the time the students were involved in non-movement related activities (e.g. waiting, receiving information, organisation). This compares with the findings from classroom research reported by Greenwood et al. (1984) that passive attention to the teacher occupied the majority of instruction time in classroom teaching — in their studies this was about 48% of the available instructional time. Costello and Laubach (1978) reported that while subject matter was a strong variable in affecting the time spent on-task, class size was not a factor in affecting the amount of participation. Whaley (1980) also reported that on-task time changed for different physical education curriculum content. Put another way, time spent on-task varied as a function of the task selected, not group size.

Observing the actions of selected individual students in separate studies incorporating over 50 lessons Metzler (1981), Godbout, Brunelle and Tousignant (1983), Grant (1983), Paese (1986) and Placek and Randall (1986) all found that on average just over half the lesson time on physical education was allocated for student participation in on-task movement activities. These studies also showed that only a few students were actively involved with the subject matter for more than 30% of the total lesson time, although this varied
considerably between content areas. Receiving information and waiting utilized over half of the students' time. The average time spent in motor activity was around 27%. In analysing the movement activity in 16 classes taught by student teachers, Grant and Martens (1982) noted that for 45% of the time the class was kept in non-active behaviour. For the remainder of the time there was always some on-task motor activity occurring but this very seldom involved the whole class. Siedentop (1983) suggests that many teachers are unaware of the low motor-on-task rates that occur as they focus on the nature of the group activity without regard for the involvement of the individual.

After comparing student behaviour between primary and secondary school students Godbout et al. (1983) found that secondary school students were allocated more lesson time (72.4% compared with 57.7%) for physical activity. Regardless, both groups were engaged in motor responses for approximately one fifth (20%) of the lesson time but considerable variance was reported. Yet all students were recorded as having a high rate of success. Silverman, Dodds, Placek, Shute and Rife (1984) compared academic learning time rates between different student groups and content areas. All students were given relatively equal opportunities to be involved in the learning activities. It was concluded that neither sex nor skill level was a significant variable accounting for differences in motor-on-task behaviour. The content of lessons (movement education, manipulative skills
and games) was the most influential variable on the amount of student participation that occurred in the lessons.

Student behaviour during practical classes at university level has also been observed. Having observed 106 students during four 15-minute swimming lessons Silverman (1983) found that Waiting behaviour, Cognitive involvement and Motor Engaged behaviour each accounted for approximately 25% of all the available lesson time, the remaining time being spent mainly in Organization and Management behaviour. McKenzie, Clark and McKenzie (1984) observed six subjects for 30 out of 52 fencing lessons held for university students. Although different methods of instruction were used throughout the course the on-task time averaged 52% for the sessions observed. This amount of motor-on-task time is markedly higher than that reported in other studies. The researchers suggested that the nature of the activity, the system of instructor feedback being used, the organization ability of the instructor and the interest of the learners since the course was an elective, would all have contributed to the unusually high percentage of motor activity. Class size could be another factor implicated in maintaining the high level of motor activity.

In a study comparing the amount of motor response between university students and Grade 1 to 12 classes Metzler (1981) noted that the university students accrued more than twice (29.1%) as much involvement as the school students (13.2%) in archery, racketball and tennis lessons. The university
Instructors also allocated more of the lesson time for practising the motor activities, i.e. 88.4% compared to 71.2% for the school classes.

While most physical education classes are heterogeneous, this does not assume students of different skill levels have the same amount of motor-on-task behaviour or success rate. After studying the behaviour of high, average and low skill ability students at the primary school level, Silverman, Dodds, Placek, Shute and Rife (1984) reported that no significant differences occurred between the groups for motor-on-task behaviour. After observing three teachers teach a 15 lesson volleyball unit (for 12-14 year olds) Rink et al. (1986) reported that there was a average of 39.2%, 29.2% and 27.2% for motor-on-task behaviour for each of the three classes. Within each class there was minimal difference for motor-on-task behaviour between the high, average and low achievers. While all students were reported as making achievement gains it appears that increases in performance were influenced by the skill level of the students at the beginning of the instructional unit. Contrary to this Pieron (1982) found that in secondary school gymnastic and volleyball classes, those students classified as high achievers were more involved and more successful with the learning tasks than the students classified as being low achievers. Wuest, Mancini, van der Mars and Terrillion (1986) compared the academic learning time of high, average and low skilled university level volleyball players during 18 practice sessions. While
all players were allocated similar amounts of time for skill practice, the high skilled players experienced more success and greater amounts of participation (32.7%) than the average skilled (25.8%) and low skilled (23.4%) players. Approximately one fifth (20%) of the practice time was spent in non-instructional activities (e.g. warm up, management). Silverman (1985) examined the relationship between motor and cognitive engagement with the number and success rate of the learning trials. It was found that engaged time was not significantly related to achievement. Rather the appropriateness of the task performance and the number of trials performed were better overall predictors of achievement than either motor or cognitive behaviours. While the results varied between different student skill levels, it was suggested that the number and quality of practice trials may be a more meaningful criterion measure of achievement than time-on-task.

Tousignant and Siedentop (1983) employed what they called ethnographic research techniques to intensively study four secondary school classes. A detailed narrative account of each of the 127 lessons was combined with quantitative techniques of data collection. Adopting some components of the ALT-PE system with an analysis of task accomplishments led to the identification of four sub-categories. These categories were students engaged with the task as stated by the teacher, students engaged in a modified task, in deviant off-task behaviours and as competent bystanders. Continual
analysis over a period of time revealed also that the students' on-task behaviour altered depending on the characteristics surrounding the activity (e.g. explicitness of the task, the difficulty level of the task) and the type of teacher feedback used.

After an intensive study investigating three variables associated with active learning time (i.e. allocated time, engaged time and success rate) Godbout, Brunnelle and Tousignant (1983) made several observations about the concept of learning time. They concluded that:

(1) active learning time has been assumed to be the mediating link between teacher behaviour and student achievement,
(2) class on-task levels can remain relatively stable over time, whereas individuals show great variations in many behaviours,
(3) students spend considerable portions of the lesson time waiting to get involved,
(4) engaged time-on-task varies for different content areas,
(5) because of the variations in lesson time, class size and lesson content, casual relationships cannot clearly be established,
(6) it is possible to increase the portion of lesson time the students are directly engaged with the learning content, thereby enhancing the opportunity to learn.

Another conclusion is that these studies demonstrate that individual engaged time varies more according to instructional ecology than according to individual differences between
students. Hence low student achievement in physical education could be remedied with more attention to quality of instruction and efficient management of the learning environment.

**Studies of Teacher Behaviour in Physical Education.**

As teachers are accountable for what happens in the learning environment it is understandable that teacher behaviour has been the focus for many studies in recent years. Goldberger (1974) argued that there was a need to study what the teachers do while teaching physical education. Regardless of the teachers' intent, it is their actual behaviour which the learners perceive and to which they must react. Although studying teacher behaviour in isolation has obvious limitations, Ornstein and Levine (1981), Siedentop (1983a), Yerg (1986) and Harrison (1987) believe that such studies can provide a detailed picture of what teachers actually do during a lesson. However, it is also evident from the research that what teachers do prior to a lesson in terms of planning, organization and task selection can also be critical for student performance (Twardy and Yerg, 1987).

In the first intensive study of teacher behaviour in physical education, Anderson (1978) observed 20 primary and 20 secondary school physical education classes and reported marked diversity and variability in teaching strategies between teachers. Overall the teachers spent 76.6% of the lesson time preparing for, guiding and observing the motor
activities of the students. The duration and frequency data clearly indicated that the physical education lesson involved frequent changes in both teacher and pupil behaviour. Lombardo and Cheffers, (1982), Olsen (1982), Rushall and Richards (1981) and Gusthart (1985) observing different groups of teachers over a period of time noted that although variability in instructional strategies was low for each teacher, no teacher instructed in a consistent fashion. This may reflect the demand in physical education lessons for different activities within a given lesson. These studies, then, would suggest that teachers do not adhere to consistent strategies across lessons. Differing research outcomes in this area may reflect differences in lesson content, student groups, or even teacher training background among the teachers studied.

The results from many of the teacher behaviour studies in physical education were reviewed by Siedentop (1983a), who classified teacher behaviour into three broad categories: (1) managing the students, transitions within the lesson and moving equipment accounted for approximately 15 to 20 percent of the lesson time. (2) instructional behaviour and communicating about the subject matter in its many forms accounted for about 30% of the lesson time. Although many styles of teaching are advocated in physical education, teacher-directed styles were reported in the majority of the lesson observed.
(3) the teacher monitoring or observing the students typically counted for from 20 to 45 percent of the teacher's time. Although this needs further investigation it has been suggested that teachers who are active supervisors tend to keep the students on-task for longer periods of time.

Addressing the International Symposium on Research in School Physical Education, Pieron (1982) reported that, overall, studies have shown that there is very little positive verbal interaction between the teacher and student during physical education lessons. Also, evidence suggested that physical education teaching involved very little teacher praise, acceptance of student feelings and ideas, and teacher questioning. Pieron (1982) concluded that the best way to describe the learning climate in physical education was as mildly reprimanding and corrective, and neither strongly positive nor negative. Pieron also reported that there was very little difference in the behaviour of male and female teachers.

Dodds (1983) investigated relationships between teacher and student behaviours and showed that teachers used knowledge presentations to stop and start the lesson. This suggests that the teachers interrupted the flow of the activity to present the majority of information. Siedentop, Mand and Taggart (1986) suggest that once a lesson gets started the momentum should be maintained. Teachers should wait for the appropriate moment to interrupt the on-going activity. The
teachers in Dodds’ (1983) study continually interacted with different groups or individuals primarily to provide feedback, correct mistakes, encourage and praise good efforts thus avoiding interrupting an entire class. However the dominant teacher behaviour was giving instruction and this often occurred at the expense of student participation. A similar result of continual and diversified interaction was reported by Lirette, Pare and Caron (1986) after observing 23 teachers teach a total of 81 physical education lessons. Overall, the teachers provided instructions for over one-third (36.4%) of the lesson time, observed the students for one fifth (22.8%) of the time and spent almost a quarter (23.5%) of the time in management related tasks.

McKenzie, Clark and McKenzie’s (1984) study of 28 fencing lessons and showed that different instructional strategies involved different teacher behaviours. For example, giving knowledge related information was the dominant teacher behaviour (43.9%) in lessons that involved direct verbal instruction on fencing. This resulted in a low percentage of student participation in physical activity in these lessons. The highest rates of student participation and teacher-student interaction were achieved by the teaching strategies of teacher-paced drilling, machine-paced drilling, and student-paced drilling. These findings support Brophy’s (1979) claim that the most efficient instruction involves the teacher working with the whole class, establishing clear goals to the students, ensuring that there is sufficient time allocated for
continuous involvement in the learning tasks, the performance of the students is monitored and feedback is immediate and specific. Contrary to this neither Phillips and Carlisle (1983), Graham, Soares and Harrington (1983) or Rink et al (1986) support that clarity or time spent giving instructions to an entire class are indicators of physical education teacher effectiveness. It would seem that effectiveness of this instructional variable may be shown in lessons that have a definite predetermined structure.

After an intensive study of the task structure in 127 secondary school physical education lessons taught by four teachers, Tousignant and Siedentop (1983) found that how the tasks were presented and the type of accountability system used strongly influenced the quality of student behaviour. Accountability refers to the level of performance and involvement teachers expect of students during each lesson, and the emphasis placed on monitoring student performance of the prescribed physical responses. Teacher monitoring provided information on the correctness of student performance which could then be used in feedback to students. The students learned to discriminate among various cues which informed them about task requirements and how close their performance came to correct responding. In general it was claimed that teachers underestimate the value of accountability. Good (1981) has also claimed that it was reasonable to suggest that even if explicit teacher expectations do not immediately influence student achievement,
regular feedback on accuracy of performance may serve to sustain student achievement behaviours.

With a university class, Metzler (1986) compared the effects of two different teaching methods on student behaviour over 20 instructional lessons. Higher rates of academic learning time were obtained in the class taught using Mastery Learning and a Personalized System for instruction (41.6%) while there was considerably less appropriate participation (27.2%) in the class taught by the Traditional method. Although differences in achievement were not determined, it was suggested that the processes of Mastery and Personalized Instruction are capable of producing greater learning gains than more traditional methods.

Twardy and Yerg (1987) suggest that there is a significant relationship between teacher planning and inclass teacher and learner behaviour. However, there is clearly no consensus about how teachers should behave while teaching a lesson and it is apparent that no one teaching strategy is going to apply uniformly across settings and subject areas in physical education. Nevertheless, student engagement in the specified task seems to have emerged as a useful indicator of student learning and teacher effectiveness. Teacher behaviours resulting in an increase in engaged time are potentially of considerable importance. Also, the quality of feedback teachers provide to students (e.g. de Knop, 1983; Pieron, 1982; Yerg and Twardy, 1982) most probably influences skill acquisition and practice. After studying learning gains in
tennis classes de Knop (1986) reported that the students claimed that specific feedback from the teacher was the important characteristic of good teaching. However, Yerg and Twardy (1982) suggested that it is possible that the more complex the task the less effect feedback has on achievement, or the more difficult it becomes to provide accurate feedback to individuals.

A Behaviour Analysis Perspective on Physical Education Research.

Several questions can be raised from the research reviewed in this paper. In the main the studies have involved extensive descriptive reports of observed student and teacher behaviour in a wide range of classes and physical education lessons. Given the research emphasis on behaviour observation data, repeated measures and research in natural settings it is relevant to comment on these studies from the perspective of applied behaviour analysis. This field has long advocated the use of direct observation, and repeated measurement (Baer, Wolf and Risley 1968; Bijou, Petersen and Ault, 1968). The perspective of applied behaviour analysis would suggest that the physical education research to date lacks the contribution of smaller-scale intensive studies which explore functional relationships between student behaviour and teacher behaviour. Such studies, by means of intensive repeated measurement both within and across successive lessons, allow for observational data to be gathered on the effects of experimental application...
of particular variables. For example, variables such as provision and arrangement of specific equipment, or different types of teacher modelling of skilled performance (e.g. live or video modelling) can be examined most effectively by taking repeated measures over time. The impact of a particular variable can be examined by comparing observations of student and teacher behaviour under conditions where that variable is operative and under conditions where it is not. Given the strong finding from existing descriptive studies that student behaviour appears related to instructional-ecological factors, the time seems right for undertaking a functional analysis of these factors.

One important question arising from the studies reviewed is whether the stress being placed on direct instruction, and the dominance of the teacher giving instruction might be counter productive. While it is clear that a high level of teacher structure (Siedentop, 1983) results in high rates of student engaged time, such emphasis on teacher control over the learning interaction may reduce opportunities for student initiation of activity. Student initiation of behaviour is an important requirement for the occurrence of strategies such as Incidental Teaching (Hart and Risley, 1968, 1974, 1975, 1980; Charles, Glynn and McNaughton, 1984). Incidental teaching is a procedure known to enhance generalization of behaviour beyond the confines of the original learning context. This is partly because the characteristics of Incidental Teaching provide for "loose training" rather than a "tight", highly
controlled training. Stokes and Baer (1977) have emphasised the importance of the link between loose training and generalization of behaviour change. "Efficient" learning in the training context, as measured by high rates of student-engaged time under teacher control may result in performance that is highly setting specific. Teachers may be so engrossed in maintaining high rates of student engagement by direct control that they allow minimal opportunity for student initiation and have minimal time to respond to such initiations when they do occur (Glynn, 1985). Although Tousignant (1982) has examined some of the effects of different teacher interactions and expectations, these issues must remain open until more intensive research studies are conducted in physical education.

A related question, also requiring experimental attention in physical education, concerns other aspects of teacher behaviour. On the basis of research on adult-infant interaction in children's learning to talk, and of research on children's learning expressive writing, it has been argued that a responsive-interacting adult may have a more powerful effect on learning than a controlling-supervising one (Glynn, 1985). Also the work of Graves (1983) and Vargas (1978) has guided research into children's communicative and expressive writing by emphasising the responsive rather than the corrective role of "audience" in this process, to the point that writing may be conceptualised as a reciprocal social process. The research reviewed in this paper, while
frequently referring to relationships between student behaviour and teacher behaviour, appears to cast the teacher in the dominant controlling-supervisory role. Given the range of different equipment and tasks which might be utilised in a physical education lesson, it remains an open question also whether student choice of activity and equipment with the teacher responding to (rather than directing) might also result in high levels of student engaged time, but with the added prospects of better generalization of skill.

Another question arising from the studies reviewed is that of the amount and type of feedback provided to students in physical education lessons. In the main, these studies have discussed feedback in the context of individual lessons, often studied in isolation. While within-lesson feedback on performance is important, even more important from the viewpoint of applied behaviour analysis is cumulative feedback over time. If students are to improve their levels of performance on any skill they need access to information about their own behaviour as it changes over time. One major contribution of applied behaviour analysis to the learning of academic skills has been through devising simple performance feedback procedures (eg. graphs and charts), which allow children to see how their performance has changed over a series of lessons, and how far it still has to go to reach some desired goal (Van Houten, 1980). In the area of performance on written tasks by secondary school students, for example. Scriven and Glynn (1983) report major gains in rate
of work completed, and improvement of already high levels of accuracy, from the use of a simple cumulative feedback chart for individual performance. There appear to be important opportunities for examining the effects of cumulative feedback within the context of physical education lessons which have not been fully exploited. Access to cumulative feedback on one's own performance would appear to be an essential component of any programme which aims to have learners take responsibility for and take control of their own learning.

A further question arising from this review concerns the need to explore further the variability in student engaged time across individual students (e.g. Schutz and Goodman, 1982). Given the finding that differences in levels of engaged time may relate closely to teacher behaviours, and ecological characteristics of lessons, there are important implications for assisting poor performers in physical education. First, it follows that something can be done (e.g. by means of altering lessons plans, altering equipment task requirements, teacher responsiveness to initiations, or type of feedback) for poor performing students. Secondly, given the growing acceptance of student engaged time as a suitable outcome measure in physical education, it is likely that just as students requiring remedial assistance in academic skills learning have benefited from increased, (not reduced) opportunities to perform appropriate academic tasks, so too will students requiring remedial assistance in physical education skills benefit from increased (and not reduced) opportunities to perform.
Conclusion.

Given that opportunity to perform is a fundamental principle of learning the most salient issue to have emerged is the relatively small proportion of lesson time students spend actually performing the required motor tasks. In the absence of any clearly articulated model in the literature reviewed of the processes involved in teaching physical education, the majority of research studies to date have been (appropriately) descriptive with an increase in correlational and experimental designs being used. The time has now arrived for a more detailed explanation of the process of teaching physical education in order to identify functional relationships between instructional behaviours, strategies and the students' response. The observational and research design methodology from applied behaviour analysis has a great deal to contribute towards this goal.
INTRODUCTION

In recent years research on teaching physical education has focused on systematic observations designed to identify instructional processes and their effects. Such research has involved the use of behaviour analysis strategies and this has provided a relatively new direction for physical education research. Locke (1977) and Graham (1981) for example, have strongly supported studies which gather data through direct or indirect observation of instructional activity as of primary importance in research on teaching. This indicates an emphasis on observational methodology as a basis for gathering data that will help evaluate the impact of instruction on student achievement. As Anderson (1978) has suggested, the essential character of physical education teaching is not to be found in curriculum guides but in the day-to-day activities of classes. A number of teacher educators (e.g. Locke, 1982; Graham and Heimener, 1981; Anderson 1980; Siedentop, 1983b; Yerg, 1986) all support the need for increased research focusing on the teaching and learning environment. Such a focus should provide a framework of empirical research and may lead towards a more valid theory of teaching.
This research, however, still requires further development of observation methodologies and research designs appropriate to the area of study (Howe, 1985; Pieron, 1986). In a review of trends in recent studies of teaching and learning in physical education Siedentop and Taggart (1984) state:

It is interesting to note that, conceptually and methodologically, these early research studies in physical education and sport were very much "state of the art" efforts; that is, even though they were pioneer efforts within their fields, they appear to be as sound conceptually and methodologically as J.A.B.A. studies of the same era. What this seems to indicate is that behaviour analysis research strategies disseminate quickly, and that even in fields where the applications are quite new, the methodologies can be quite current. (p.105)

Pieron and Graham (1984) believes that such research has provided sport pedagogy with invaluable descriptive data which has moved the field beyond recording subjective impressions and can lead to a better understanding of the teaching act. In an extensive review of this new area of research which is using behaviour analysis in physical education and sports, Martin (1984) has identified three areas in which progress has been noted over the last few years.

(1) The development of reliable observation systems for monitoring the behaviour of teachers and students as it occurs in the physical education setting.

(2) The increased acceptance of "behavioural teaching skills" as important components for undergraduate preparation programmes.

(3) The increased acceptance of behaviour change strategies to decrease behavioural difficulties in physical education
environments and increase the frequency of behaviours associated with achievement in these teaching environments.

Systematic observation of behaviour in the natural setting will provide access to pertinent information about the teaching-learning process in physical education. It is, however, important to acknowledge that observation procedures will be influenced by theoretical and conceptual frameworks being developed within the field. In contrast to the progress reported on research methodology, Siedentop and Taggart (1984) have identified an important concept in physical education on which there has been no progress of any consequence. The issue of concern here is the notion of accountability. Accountability refers to teacher behaviour being related to, and even responsible for, student performance gains. The reasons for the lack of data relating teacher behaviour to student outcomes include:

1. The frequent movement and pace of change in physical education lessons creates problems of measurement,
2. Relevant responses in physical education classes do not leave permanent products so that heavy reliance must be placed on direct observation,
3. There is little agreement on what constitutes important outcomes measures in physical education. These issues were discussed more fully in Chapter 2.
Although such difficulties exist, applied behaviour analysis is beginning to make a valuable contribution to our understanding of the teaching-learning process in physical education, particularly in providing a descriptive and methodological base upon which future research could be based (Olsen, 1983). As valid and reliable outcome measures of student achievement in physical education are difficult to ascertain (Siedentop and Taggart, 1984) studying the involvement of the learner (i.e. the student) during a single and series of lessons has merit (Locke, 1982). This direction has been strongly influenced by classroom studies using student behaviour as the dependent variable (eg. Rosenshine and Berliner, 1978; Good and Beckerman, 1978; Fisher, 1978) and resulted in the development of an observation system designed specifically for evaluating student engagement within the physical education lesson.

THE ACADEMIC LEARNING TIME - PHYSICAL EDUCATION OBSERVATION SYSTEM.

Development of the System.

Influenced by the reports from classroom research, Metzler (1979) developed what is known as Version 1 of the Academic Learning Time – Physical Education (ALT_PE) observation system. The primary purpose of the system is to determine the amount of time students spend working directly on meaningful
learning tasks. This implies that monitoring student behaviour is one legitimate criterion variable for assessing learning (Siedentop, 1983a). The system incorporated several features found in classroom observation instruments. These include:

1. the individual student was the unit of observation.
2. the number of target students would remain low. With controversy surrounding the use of class means as a unit of analysis (Earls, 1982; Brophy, 1979) the detailed analysis of a few students within the class is gaining momentum (Hopkins, 1982; Pieron, 1982; Silverman; 1983; Silverman, 1985).
3. academic learning time would be measured using a time based interval recording procedure. Time itself is not the variable. How the time expended practicing to the learning tasks is the most important criteria (Locke, 1982).
4. the use of priority coding procedure (i.e. one observation category takes precedence over another) on the basis of theoretical importance.
5. the system allowed for determining that portion of the lesson time allocated for learning, and, the amount and appropriateness of individual student on-task behaviour during that allocated time.

Using Version 1 of the ALT-PE system the observer was required to make decisions about four levels of behaviour, each level having its own specified categories. The system
comprised of 28 separately defined behaviours. A decision hierarchy was established within each level as only one category could be coded from each level per observation interval. The four levels were:

1. setting Level which described the general instructional strategy of the observed moment,

2. content Level described the focus of instructional content during the observation interval. The categories were divided into two sections; General Content which described the non-academic focus and Physical Education Content which reflected on instructional nature of the relevant activity being observed,

3. Learner Moves level described the student behaviour only when a Physical Education content category had been coded on the Content Level,

4. Level of Difficulty described the manner in which a student completed an observed motor performance.

After ALT-PE had been used in several studies (e.g. Birdwell, 1980; Whaley, 1980; Rate, 1980) it was reported that having to make four decisions during the time interval caused some difficulties and also provided information that was not focusing on what the learners were doing. Analyzing student response opportunities was the intention of the system. Although changes were needed, programmatic research relies partly on experimenting with methodology and improving observation instrumentation (Rife, Shute and Dodds, 1985).
Following the American Association for Health, Physical Education, Recreation and Dance convention in Boston considerable interest was shown in the concept of academic learning time—physical education as it seemed to have potential as a new direction in research on teaching physical education (Metzler, 1981). Accepting that changes were necessary, Siedentop, Tousignant and Parker (1982) revised the ALT-PE observation system but still kept the focus on what the learners themselves were doing. The most notable change was to streamline the system to a two level system involving first, the class as a group and second, individual students who were selected as target subjects. The first level required a decision on the context of the whole class. This provided a clearer picture of what setting the students were in regardless of what the teacher was doing. This level contains 13 separate categories which can be classified as either General, Knowledge, or Motor settings. The second level is determined by observing the learning involvement of the individual student within the setting. There are eight categories with each being classified as a "not motor engaged" behaviour (e.g. waiting) or "motor engaged" (e.g. on-task) behaviour. The observer is also required to make a decision about the level of difficulty of the performance required of the student.

As a result of the changes, ALT-PE Version II became more sensitive to individual student behaviour regardless of the class setting, but at the same time the revised system lost
information about the teachers instructional moves (Rife, Shute and Dodds, 1985). However, Whaley (1980) did devise a teacher behaviour system to use in conjunction with the ALT-PE system. This also proved to be very complex as the observer was required to make three decisions per interval i.e. one about the class, one about the behaviour of the target subject and one about the teacher behaviour. Although considerable refinement to the initial ALT-PE system has occurred there is still a need for more specificity, particularly as regards student behaviour during the time made available for responding to the learning tasks (Siedentop, 1983b).

Overview of ALT-PE Research.

Since Metzler’s (1979) initial foray into the gymnasium with the ALT-PE observations system the research has expanded into three areas of descriptive, intervention and correlation studies. Reliable descriptive records now exist from a variety of instructional settings across different class levels. As student behaviour can be accurately observed Siedentop and Taggart (1984) claim that there has been a growing acceptance of the notion of active learning time as a proxy variable for achievement in physical education. This is reflected in the increasing use of the system (see Table 1) across different populations and settings. Refined sampling techniques, improved observation protocols and a variety of data analysis procedures has increased the credibility of such research (Dodds 1983).
TABLE 1

A list of descriptive, intervention and process-product studies using the ALT-PE observation system.

### ALT-PE DESCRIPTIVE STUDIES

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Level</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metzler</td>
<td>1979</td>
<td>Primary and Secondary</td>
<td>Multiple</td>
</tr>
<tr>
<td>Rate</td>
<td>1980</td>
<td>University (Coaching)</td>
<td>Football</td>
</tr>
<tr>
<td>Aufderleide</td>
<td>1980</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>McLeish, Howe and</td>
<td>1981</td>
<td>Primary</td>
<td>Movement Education</td>
</tr>
<tr>
<td>Jackson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shute et al</td>
<td>1982</td>
<td>Primary</td>
<td>Movement Education</td>
</tr>
<tr>
<td>Beamer</td>
<td>1982</td>
<td>Primary (Inservice)</td>
<td>Multiple</td>
</tr>
<tr>
<td>Aufderleide,</td>
<td>1982</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>McKenzie and Knowles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dodds</td>
<td>1983</td>
<td>University</td>
<td>Lacrosse</td>
</tr>
<tr>
<td>Godbout, Brunnelle,</td>
<td>1983</td>
<td>Primary and Secondary</td>
<td>Multiple</td>
</tr>
<tr>
<td>and Tousignant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mancini et al</td>
<td>1983</td>
<td>Secondary</td>
<td>Multiple</td>
</tr>
<tr>
<td>Silverman et al</td>
<td>1984</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>McKenzie, Clark,</td>
<td>1984</td>
<td>University</td>
<td>Fencing</td>
</tr>
<tr>
<td>and McKenzie</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rife, Shute &amp; Dodds</td>
<td>1985</td>
<td>University</td>
<td>Badminton, Volleyball</td>
</tr>
<tr>
<td>De Paepe</td>
<td>1985</td>
<td>Primary</td>
<td>Balance</td>
</tr>
<tr>
<td>Placek and Randall</td>
<td>1986</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>Metzler</td>
<td>1986</td>
<td>University</td>
<td>Tennis</td>
</tr>
<tr>
<td>Wuest, Mancini,</td>
<td>1986</td>
<td>University (Coaching)</td>
<td>Volleyball</td>
</tr>
<tr>
<td>van der Mars and</td>
<td></td>
<td></td>
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<tr>
<td>Terrillion</td>
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<td></td>
<td></td>
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<tr>
<td>McKenzie</td>
<td>1986</td>
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<td>Volleyball</td>
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</tbody>
</table>

### ALT-PE INTERVENTION STUDIES

<table>
<thead>
<tr>
<th>Author</th>
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<th>Level</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birdwell</td>
<td>1980</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>Whaley</td>
<td>1980</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>Metzler</td>
<td>1981</td>
<td>University</td>
<td>Archery</td>
</tr>
<tr>
<td>Ratcliffe</td>
<td>1986</td>
<td>Primary</td>
<td>Multiple</td>
</tr>
<tr>
<td>Twardy and Yerg</td>
<td>1987</td>
<td>Secondary</td>
<td>Volleyball</td>
</tr>
</tbody>
</table>

### ALT-PE PROCESS-PRODUCT STUDIES

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Level</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young and Metzler</td>
<td>1982</td>
<td>Primary</td>
<td>Hockey, Golf</td>
</tr>
<tr>
<td>Metzler</td>
<td>1983</td>
<td>Primary</td>
<td>Striking</td>
</tr>
<tr>
<td>Silverman</td>
<td>1985</td>
<td>University</td>
<td>Swimming</td>
</tr>
<tr>
<td>Paese</td>
<td>1986</td>
<td>Primary</td>
<td>Novel task</td>
</tr>
</tbody>
</table>
The main findings from the studies using either version of the ALT-PE observation system include:

1. Student engaged rates are affected by the organization of the activities themselves (e.g. individual activity, team efforts).

2. Student engaged rates are affected by the different instructional strategies.

3. Rates of engagement vary across individual students.

4. Student engaged rates vary between curriculum content areas (e.g. gymnastics, volleyball).

5. Baseline rates for student engagement are generally low even though the percentage of lesson time allocated for activity is high.

6. The correlations between high student engaged rates and student achievement in experimental settings are positive but not conclusive.

Continued replication and diversification of ALT-PE is encouraged. Rife and Dodds (1983) claim that the strength of this research field is growing and state:

"What we are learning about ALT shows great promise of contributing significantly to the scientific bases of pedagogical practices and to our storehouses of descriptions about the naturally occurring teaching and learning events in the play areas where we teach." (p.2)

The Need To Refine The ALT-PE Observation System.

Although the ALT-PE system is subject to the limitations of all interval recording techniques it remains one of the most valuable observation procedures available at present for
use in analyzing physical education lessons (Anderson, 1983). Nevertheless, Siedentop (1983b) has suggested that some changes are required in order to increase the specificity of the system. For example, the behaviour of the student during the lesson time allocated for task accomplishment has recently been identified as being one of four possibilities (Tousignant and Siedentop, 1983). These were; engaged with the stated task, involved in a modified version of the stated task, the student deliberately avoids participating and becomes a "bystander" and the student helps other students perform the task. This suggests that the motor engaged category of the observation system needs expansion as students often have time to respond but do not respond or do so with varying degrees of accuracy and commitment (Tousignant, 1982).

The results of the motor-on-task time measurement also need clarification as not all rates of engagement are equivalent because some skills are learned faster than others. In many cases constant repetition will not necessarily yield higher achievement. A further issue is that the optimal amount of engaged time may not be the same as the maximum amount of available time (Griffey, 1983). By identifying the quality along with the quantity of motor response the potential of the system as a more purposeful research tool could be increased (Howe, 1985). Also, discrete trials of many motor activities can be recorded. Parker and O'Sullivan (1983) suggest that a more sophisticated analysis of student behaviour could provide a ratio of appropriate responses to the number of opportunities the student has to respond.
Not all students utilize the lesson time available for acquisition of motor skills in the same way (Tousginant and Brunelle, 1982). Observing high and low performers in physical education classes Martinek and Karper (1983) and Pieron (1982) reported that considerable differences existed between the quantity and the quality of performers for the two groups in relation to task accomplishment. While data from the ALT-PE observation system are currently able to identify how the lesson time is distributed, additional detail about how students utilize the time made available for the acquisition of motor skills needs to be included to allow for a more functional analysis of the results (Alexander, 1983).

The teacher's role can also be observed in order to determine whether or not there are common patterns of identifiable behaviour related to classes where a higher or lower rate of appropriate motor behaviour is observed. It is understandable that while no one single variable would explain all student behaviour, the identification of an array of variables may help to describe some of the differences between the more effective and less effective teachers (Pieron, 1982).

As the observation system is further refined to focus more specifically on coding student behaviour in terms of the objectives of the lesson, the credibility of research findings will be further enhanced (Siedentop, 1983b). Future ALT-PE research will continue to hold great ecological validity in everyday teaching of physical education because it focuses on an important aspect of learning, whether the student is
engaged in appropriate learning behaviour (Metzler, 1983). Although some reservations have been raised the continued development of this area of research is strongly supported by Anderson (1983) when noting:

Without question, our teachers are most influenced by their analysis of student behaviour and by their subsequent efforts to improve those student behaviour profiles. Other targets of analysis have proved to be far less potent. (p. 56)

THE MODIFIED ACADEMIC LEARNING TIME - PHYSICAL EDUCATION OBSERVATION SYSTEM.

A modified ALT-PE observation system was developed for the present research. The revised system was designed to provide additional and more detailed information about what the individual student actually does during a physical education lesson. This revision of the ALT-PE system includes three separate dimensions each with a set of predetermined categories (see Table 2). Each of the three dimensions and the respective categories are discussed separately.
**TABLE 2**

Dimensions and categories included in the modified ALT-PE observation system.

<table>
<thead>
<tr>
<th>CONTEXT</th>
<th>STUDENT BEHAVIOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>NOT MOTOR ENGAGED</td>
</tr>
<tr>
<td>Know</td>
<td>Cognitive</td>
</tr>
<tr>
<td>WU</td>
<td>Organisation</td>
</tr>
<tr>
<td>ISP</td>
<td>Waiting</td>
</tr>
<tr>
<td>GSP</td>
<td>Bystanding</td>
</tr>
<tr>
<td>GP</td>
<td>Off Task</td>
</tr>
<tr>
<td>Management</td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td></td>
</tr>
<tr>
<td>Warm-up</td>
<td></td>
</tr>
<tr>
<td>Individual Skill Practice</td>
<td></td>
</tr>
<tr>
<td>Group Skill Practice</td>
<td></td>
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<tr>
<td>Game Playing</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>TEACHER BEHAVIOUR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>Preparatory Instruction</td>
</tr>
<tr>
<td>CI</td>
<td>Concurrent Instruction</td>
</tr>
<tr>
<td>MD</td>
<td>Modelling-Demonstration</td>
</tr>
<tr>
<td>TP</td>
<td>Teacher Participation</td>
</tr>
<tr>
<td>OB</td>
<td>Observation</td>
</tr>
<tr>
<td>MA</td>
<td>Management</td>
</tr>
<tr>
<td>OF</td>
<td>Officiating</td>
</tr>
<tr>
<td>RC</td>
<td>Recording</td>
</tr>
<tr>
<td>SM</td>
<td>Social Matter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>MOTOR ENGAGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>WU Warm Up</td>
<td></td>
</tr>
<tr>
<td>M Motor-On-Task</td>
<td></td>
</tr>
<tr>
<td>MM Motor Modified</td>
<td></td>
</tr>
<tr>
<td>I Interim</td>
<td></td>
</tr>
<tr>
<td>S Supporting</td>
<td></td>
</tr>
<tr>
<td>IP Indirect</td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td></td>
</tr>
</tbody>
</table>
CONTEXT DIMENSION

This dimension is designed to describe the context of the lesson within which the student behaviour is occurring. The instructional setting for the majority of the class is classified into one of six categories. The Management category relates to all class management and organizational activities. The Knowledge category includes that part of the lesson time when the teacher is providing information to the class and no form of physical activity is intended. Warm-up identifies that part of the lesson used for fitness and/or general conditioning related activities. The remaining three categories (Individual Skill Practice, Group Skill Practice and Game Playing) differentiate between different forms of instructional settings used by the teacher for providing the student with an opportunity to be actively involved with the prescribed motor activity.

Definitions For Context Categories.

MAN - MANAGERIAL AND ORGANISATION TASKS
Definition: Time devoted to managerial and/or organizational activities related to either instructional activities or class business. It is a time which does not allow for participation or direct involvement with the learning matter even though it may be essential task relating to the functioning of the lesson.
Examples:— getting out or putting away equipment
   — taking attendance, giving out notices
   — moving from one space to another for activity,
   — regrouping for instruction
   — getting the class into groups or teams
   — class waiting for teacher

KNOW — KNOWLEDGE CONTENT

Definition: Time devoted to transmitting information about the activity, discussing tactics and rules, providing instructions while the class are inactive.

Examples:— listening to the teacher (or a student) give information
   — watching a demonstration
   — receiving instructions about the task to be performed
   — reading a task sheet or workbook, watching a video

W.U. — WARM-UP

Definition: Time devoted to activities that will help contribute to or change the current physical state of the individual through activities that precede the lesson proper to prepare the students for what is to follow. This may include general fitness work. If the activities are directly related to the skills to be learned code under Skill Practice.
Examples: - stretching before a class
           - performing strength activities with a partner
           - exercising to music or performing own exercises

I.S.P. - INDIVIDUAL SKILL PRACTICE
Definition: Time devoted to the development, refinement, and/or extension of skills. This will occur as an individual activity. The skill can occur in an applied setting. (i.e. a setting which simulates the game in which the skill is generally used). Information and instructions will often accompany this practice.
Examples: - exploring ways of moving along a beam
           - practicing pitching and batting by self
           - practicing setting a volleyball against the wall

G.S.P. - GROUP SKILL PRACTICE
Definition: Time devoted to the refinement, extension and application of a skill (combination of skills) in a group activity. The activity can be either a specific skill practice or a task in the form of a group challenge.
Examples: - a group setting for practicing a volleyball dig
           - serving a ball and attempting to dig the ball the serve
           - working in paris for skill practice such as 1 v 1 over the net
G.P. – GAME PLAYING

Definition: Time devoted to the application of skills in a structured or informal game and/or competitive setting. The game may be a concluding activity, used as a teaching strategy about rules, strategies or skills application in relation to the objective of the lesson.

Examples:– a minor or modified game
– playing of a sport such as softball, netball

STUDENT BEHAVIOUR DIMENSION.

Here a slight modification has been made to earlier ALT-PE systems (Rife, Shute and Dodds, 1985) to allow for a clearer specification of student behaviours, particularly during that portion of the lesson allocated for learning tasks (Tousignant and Siedentop, 1983). Although several behaviours may occur simultaneously for a very short duration of time (e.g. 2 seconds) a hierarchical decision is established to allow one behaviour category precedence over another during the observation time interval. The hierarchy is organized in order of the contribution each behaviour makes to the accomplishment of a prescribed task. When more than one behaviour occurs during an observation interval then the behaviour predetermined as the most important for task accomplishment is recorded.
The principle concern of the observation system is to focus on the skill learning behaviours of the student. A system using a priority coding may mean that important information is not recorded (Templin, 1983; Anderson, 1983). Nevertheless, it is inevitable that some information may be lost in order to ensure reliable and accurate observation data using human observers. In the present system the occurrence of a category predetermined as more important than other behaviours that also occur during the observation interval is recorded. Thus, information is provided on the frequency of those student behaviours most closely associated with skill learning although, sampling of less important behaviour categories is clearly affected.

An additional modification to the observation system requires the observer to count and record the number of successful and not-successful trials performed during the Motor-On-Task category. As more than one learning trial may be performed during an observation interval counting and classifying the trials provides additional detail about student involvement with the learning tasks.
Definitions For Student Behaviour Categories.

C - COGNITIVE
Definition: The student is appropriately attending to a task for the purpose of gaining information about the lesson activity. This information can be obtained by either listening, watching, reading or discussing.
Examples:- listening to the teacher describe a task
- watching a demonstration by either teacher or student
- umpiring a game
- sharing in a group discussion to devise an activity

O - ORGANISATION
Definition: The student is engaged in a non-instructional event of an ongoing activity or is involved in an organisation task which is a part of the lesson.
Examples:- setting out, getting out and/or putting away equipment
- getting into teams or groups
- moving from one setting to another for a defined purpose that is not a part of the task
- taking the roll, name is called, if name not called code "W" Waiting.
W - WAITING

Definition: The student is not currently involved in any specified task. This is often the result of the way the activity and organization is structured. This will not include times when the student chooses to be inactive. (If the later occurs code "B" Bystanding).

Examples:- waiting while the teacher takes the roll
- waiting for an opportunity to be involved such as being a member of a relay team, eliminated from a game.
- waiting for an instruction to begin an activity
- waiting for partner to retrieve ball, serve the ball in a game

B - BYSTANDING

Definition: The student deliberately chooses NOT TO BE engaged with the on-going lesson activity or participate in the required task.

Examples:- moving back and forth in a line to avoid having a turn
- getting into a group and deliberately avoiding involvement in on-task activity.
- stopping to observe other class members perform, talk to a friend.
X - OFF TASK

Definition: The student is engaged in a task that is not a part of the stated task or an accepted part of the pre or post on-task activity. This category will also include unacceptable social behaviour. This behaviour must last for the duration of the time interval otherwise code other prominent behaviour.

Examples:— deliberately disrupting other students in the lesson
— inattentive during the giving of instructions i.e. involved in other behaviour.

WU - WARM-UP

Definition: The student is directly engaged in motor activity that is related to fitness and general exercising and not a direct part of the skill learning goals of the lesson. (If this is incorporated with the skill learning then code "M" Motor-on-task.)

M - MOTOR ON-TASK

Definition: The student is directly engaged in performing the motor skill or activity as prescribed by the teacher. A motor response or learning trial must occur during the interval for "M" to be coded. Count and record the number of trials performed. Classify the trials performed as either being Successful or Not Successful.
Successful – using the correct technique, experiencing frequent success, few errors, performing the task appropriately as stated by the teacher. Not Successful – using incorrect technique, obvious difficulty at performing, student unable to perform task appropriately as stated by the teacher.

**MM – MOTOR MODIFIED**

Definition: The student is engaged with the subject matter but makes considerable changes to the conditions of the task. The modification can either increase or decrease the difficulty level and conditions of the task, or change the nature of the task. If the student is able to determine the nature of the task then this would not apply.

Examples:– the task is to practice digging the volleyball but the student practices serving  
– the task is to run around the gym but the student decides to walk

**S – SUPPORTING**

Definition: The student is engaged in the subject matter for the purpose of assisting others learn or perform the prescribed activity.

Examples:– throwing a ball for partner to set or dig  
– collecting the balls and giving them to the teacher who is initiating other students in on-task behaviour
I - INTERIM

Definition: Any non-instructional activity that is a natural part of the practice activity.

Examples:— retrieving a ball, if this occurred while working in pairs or a group other students would be code as "W" Waiting behaviour.
— changing sides of the court.

ID - INDIRECT ON-TASK PARTICIPATION

Definition: The student is directly involved in the prescribed activity as a participant but is not able to perform a trial or the required skill because of the nature of the setting and/or the task.

Examples:— playing a game but not touching the ball
— being in a group activity but not getting to perform the motor task.

TEACHER BEHAVIOUR DIMENSION.

A modification of the teacher behaviour system developed by Whaley (1980) was used in the present revision of the ALT-PE system. Nine categories form three behaviour sub groups; (1) managing the class, (2) providing task related information to the class or individual student prior to performing the motor activity, and (3) observing the class, obtaining
or providing information while the class or individual students are involved with the activity. A priority coding system is also utilized when more than one behaviour occurs during a given observation interval.

Definition Of Teacher Behaviour Categories.

PI - PREPARATORY INSTRUCTION
Definition: Providing information about the general nature of the activity, giving directions about the activity to be performed and discussing events relating to the functioning of the class. Applies only when the individual, group or class are in the Knowledge Context category.
Examples:— reviewing what happened at the previous lesson
— instructing about a new event
— defining the rules of the game
— giving an expectation of what is required
— asking the student(s) a question and listening to the response
— an instruction to start an activity

CI - CONCURRENT INSTRUCTION
Definition: The teacher provides verbal instruction to the students while they are performing an activity. This includes encouraging, "hustling", modifying and providing instruction for a new activity.
Examples:
- counting a timing pattern for task
- generally encouraging a greater effort
- providing information that will help to change and/or improve the performance
- stressing a key point during practice time
- an instruction/signal to stop activity

MD - MODELLING
Definition: The teacher uses a demonstration to teach a skill behaviour for one or many students while they are inactive. If verbal instruction accompanies a demonstration code "MD" modelling behaviour.
Examples:
- a student does a lay-up while the teacher points out the appropriate movement pattern.
- a student throws the volleyball while the teacher sets the ball and identifies the correct hand position.

TP - TEACHER PARTICIPATION
Definition: The teacher is actively engaged in the activity as a member or leader of the group while the class or group are actively on task. This could be in the form of a demonstration/model for the class to follow. If teacher talk accompanies this still code "TP" Teacher Participation.
Examples:
- leading warm-up routine
- making up the number in a team, a member of a group for a task
- moving through a dance sequence
OB - OBSERVING
Definition: The teacher silently observes or monitors the student(s) during any aspect of the lesson. This behaviour must occur for the duration of the interval.
Examples:— standing on the perimeter of the class and watching the activity
— watching a group practice a routine or skill

MA - MANAGEMENT
Definition: The teacher is engaged in activities (including giving directions) that are directly related to the managerial and organizational aspects of the lesson. Both verbal and non-verbal behaviour will often be incorporated with this category.
Examples:— taking the roll
— setting out or changing equipment, organizing balls while class warm-up
— organizing the class into groups and directing the students where to go for a task

OF - OFFICIATING
Definition: The teacher is obviously refereeing/umpiring or controlling the flow of a game. Any behaviour which implies making judgements, applying regulations or rules, or monitoring for the purpose of controlling a
game setting should be coded as officiating. If the teacher instructs the group then code Concurrent Instruction.

Examples:— umpiring a small group game
— controlling a game of volleyball

RG — RECORDING
Definition: The teacher is recording information or conducting a test about the students performance for the purpose of developing a record of the performance level.
Examples:— counting the number of successful hits before recording results

SM — SOCIAL MATTER
Definition: The teacher responds to undesirable behaviour or disruptive element, interacts with a social problem, reacts to off-task behaviour.
Examples:— asking a student to sit out for a short time

OBSERVATION PROCEDURES
The modified ALT-PE observation system was designed to sample the behaviour of individual students and of the teacher for the duration of a physical education lesson conducted on-site in the natural setting. The system uses interval time sampling procedures to assess the proportion of time for different instructional contexts, for different behaviours of
the targeted students, and the time spent by teachers in different behaviours. Event recording is used to obtain information about the number of trials of the prescribed task performed and the amount of success experienced by the targeted students in executing the skill during these trials. An example of a modified ALT-PE observation coding sheet is shown in Appendix A.

Observation involved a five second interval for observing the individual student or teacher, followed by a 10 second interval for coding and recording what was observed according to the category system, making anecdotal notes and for then locating the next subject. A portable electronic timer emitted an auditory signal through an earphone to indicate observation and recording intervals, and allowed concurrent, but independent, observations by more than one observer.

Time sampling describes the distribution of behaviour over time (Baer and Fowler, 1984). Repeated measures of the same behaviours across time yields accurate estimations of the occurrence of those behaviours during a specified period (Lombardo, 1982; Thompson, Holmberg and Baer, 1974; Test and Heward, 1985).

In the present study two independent observers each monitored three different students, one of whom was a higher achiever, one average and one a lower achiever for the class. The target students were selected from student names grouped by the teacher into high, average and low skilled based on their perceived performance in the skills to be taught. The
observers also recorded teacher behaviour after every three student observations. That is, each of the three students was observed for an interval then the teacher was observed. Thus the behaviour for each student and the teacher was sampled once for every minute the lesson was in progress.

The procedure required the observers to make a decision at the beginning of the observation interval about which Context category best described the function of the majority of the class. For the duration of the same interval the observers also had to observe their respective students (or observe the teacher in a teacher interval). At the conclusion of the interval the category which best described the behaviour of that subject as determined by the coding convention was recorded and then the next subject located. This observation pattern continued throughout the lesson with each subject being observed for the same number of intervals within the lesson. If the student was observed as being in the Motor-on-Task (M) behaviour category the number of trials performed were also counted and each trial recorded as being either successful or not successful. Recording that an motor-on-task behaviour occurred and also counting the number and appropriateness of each motor-on-task trial has merit when considering if on-task behaviour during the lesson contributes to the learning of the prescribed skills (Salter and Graham, 1985). An example of the completed recording sheet for one behaviour sample from each subject observed by one observer is shown in Figure 2.
FIGURE 2: An example of one completed minute of the modified ALT-PE observation recording sheet showing one observation for each target subject.
The example in Figure 2 shows that in the first observation interval the High achiever was in a (C) Cognitive behaviour in the Knowledge context, during the second observation interval the Average achiever was (W) Waiting in the Group Skill Practice context, during the third observation interval the Lower achiever was in (M) Motor-on-Task behaviour in the Group Skill Practice context and performed two successful trials and the next observation interval the teacher was (OB) Observing the class who were in the Group Skill Practice context. The observer then continued the observation process by observing the High achiever again. The same pattern continued for the duration of the lesson.

OBSERVER RELIABILITY

In behaviour analysis the quality of the research data is largely dependent on the reliability and accuracy with which observers code and record the observed behaviour occurring in the natural setting (Peterson, Homer and Wonderlick, 1982). The relationship between instrument validity and observer reliability is important (Hartman, 1977). Validity refers to the suitability of the instrument to accurately identify and measure the behaviours appropriate to the question being investigated. Reliability, on the other hand, refers to the level of agreement between observers when independently recording responses at the same time in the same setting (Siedentop and Olsen, 1978). A high degree of interobserver
agreement does not guarantee the accuracy (and therefore the validity) of recorded information (Harrop, 1979).

A number of factors can influence the reliability of the observers and the accuracy of data collected. Procedures suggested under each of the following areas were followed in the present research studies.

Complexity Of The Observation System.

Two components of the observation protocol may influence interobserver agreement. These are the number of behaviour categories and the observation interval size. The more behaviour categories included in the system the more complex the decision making process becomes and the more fatiguing it is for the observers. This implies that the behaviours under study must be clearly and unambiguously defined otherwise a high degree of observer agreement will not likely be obtained (Hawkins and Fobry, 1979; Kazdin, 1977). To cope with larger numbers of categories observers must be especially well trained in these definitions (Kent and Foster, 1977). It is possible that an inverse linear relationship exists between observer agreement levels and the complexity of the observation system particularly when the number of categories is considered (Moore, 1978). The number of behaviour categories required should be determined by the goals of the project.
Although there are no data to conclusively support the argument that agreement level is influenced by interval size, the use of short time intervals for observing is encouraged (Repp et al., 1976; Bijou et al., 1968; Siedentop and Olsen, 1978; Johnston and Pennypacker 1980; Springer et al., 1981). This also ensures a higher correspondence between the actual and recorded frequency of occurrence of behaviour. In the present study a five second observe and ten second record observation pattern was used.

Awareness of Reliability Checks.

If the observers are aware of when reliability is likely to occur interobserver agreement is likely to be higher at this time (Craighead, Mertactoris and Bellack, 1974). Hence reliability checks need to be unobtrusive. While unobtrusiveness may help avoid bias on a particular occasion this does not imply that the observers should not be aware of results of the reliability check. However, it is usually recommended that the experimenter, rather than the observer, should compute the interobserver agreement level (Kazdin, 1977; Boykin and Nelson; 1981). In the present study the observers were not aware when a reliability check was taken.
Observer Bias.

Observer bias occurs when the observer is either affected by or affects the information about the subjects under study. This may result from a limited observer training programme if the experiences are not varied and the observer attempts to predict the occurrence of behaviour (Kazdin, 1977). Likewise, if the observer is expecting a predetermined rate of occurrence a clear observer bias is often obtained (O'Leary et.al., 1975). For similar reasons the observers should not have advance knowledge of details of the experimental design since this could establish expectancies about the frequency of behaviour occurrence. This stresses the importance of accuracy in the use of behaviour definitions and intra-observer reliability during observer training (Sulzar-Azariff and Mayer, 1977; Boykin and Nelson, 1981; Cunningham and Tharp, 1981). In the present study the observers were not made aware of the nature of the study.

Observer Drift.

Once accuracy is achieved at observing and recording behaviour it is assumed that observers continue to apply the same definition of behaviour and maintain the initial level of reliability. However, observers may change in how they apply the definitions of specified behaviour over time (Siedentop and Olsen, 1978) particularly when a targeted behaviour markedly increases or decreases in frequency definition so that high levels of agreement would be maintained while accuracy declined. Pairing observers with independent observers may help control drift (Lipiski and Nelson, 1974).
Assessing Observer Reliability.

In behaviour analysis the terms interobserver agreement and observer reliability have been used interchangeably (Ballard 1981). Baer (1977a) defined observer reliability as being:

The percentage of agreement for how often two observers watching one subject and equipped with the same definitions of behaviour see it occurring or not occurring in the same standard time.

Interobserver agreement levels in the present study were determined by interval by interval comparisons. The calculation then involved dividing the total number of agreements by the sum of the total number of agreements and disagreements and then multiplying the results by 100 as shown by the formula

\[
\frac{\text{number of agreements}}{\text{number of agreements} + \text{number of disagreements}} \times 100
\]

Although it is accepted that obtaining the agreement of an individual occurrence of behaviour is fundamental to accurate measurement, it has been reported that by using different formulae with the same data to calculate observer agreement levels different results may be produced (Hopkins and Herman, 1977; Birkimer and Brown, 1979; Hawkins and Fabry, 1979; Harrop, 1979). The simple percentage of agreement can be misleading as this may be a function of the method rather than a function of the data (Repp et al., 1976).
In the present study an agreement was counted each time both the observers recorded that a specific target behaviour occurred. To be counted as an agreement observers must have recorded the same information for all aspects of that observation (e.g. shown in Figure 2, recording (C) Cognitive in the Knowledge Context for the High Achievers during that interval). There is, therefore, a check on the coding and recording of all behaviour used in the observation system. There are three aspects of concern when calculating interval by interval reliability. They are:

1. the percentage agreement is directly affected by differences in frequency of behaviour especially when a very low rate or very high rate of behaviour is reported,

2. whether or not the agreement of non-occurrences of behaviour (for high rate behaviour) or the agreement of occurrences of behaviour should be reported (for low rate behaviour),

3. the percentage agreement does not of itself necessarily indicate the quality of agreement because the number of agreements by chance are not considered.

When collecting data with the Modified ALT-PE observation system eleven student and nine teacher behaviour categories are the focus of attention and all occur at different rates. As many of the behaviours occur at a moderate rate the use of interval by interval agreement is acceptable (Baer, 1977b; Kelly, 1977,; Metzler, 1983). The use of more complex
statistical procedures are unnecessary when determining the level of interobserver agreement for such data (Carver, 1978; Birkimer and Brown, 1979; Ballard, 1986). Correlation coefficients, for example may remove the focus of the research too far from the raw data which is the focus of behaviour analysis (Hartman, 1977; Baer, 1977a; Ballard, 1983b).

Observer Accuracy.

Observer agreement does not necessarily imply accuracy of the recorded data. Accurate data using the Modified ALT-PE observation system occurs when a behaviour category that represents the observed behaviour according to the definitions is recorded. To reduce possible confounding events the observers were subjected to a detailed training and retraining programme to ensure accuracy in the use of behaviour definitions and observation protocol. The training programme required the observers to study the definitions of each category included in the modified ALT-PE observation system, observe lessons in a variety of physical education settings and view a videotape training programme. Retraining was conducted using the videotape training programme during the observations of the physical education classes included in the study.

The reduction of potentially confounding influences such as observer drift (Kazdin, 1977) and observer bias (Boykin and Nelson, 1981) was achieved through a systematic retraining programme and followed the procedures previously discussed.
The accurate and objective measurement of the observed behaviour is essential in behaviour analysis in order to ensure the validity of the results (Sulzer, Azaroff and Mayer, 1977). The procedures used in the present study were designed to provide accurate and reliable data.
CHAPTER FOUR

METHODS AND PROCEDURES FOR STUDY ONE

Statement of the Problem.

The aim of this study was to use the modified ALT-PE observation system described in the preceding chapter to analyse the behaviours of the teachers and students in several separate instructional settings during a series of related physical educational lessons. The study was designed to describe the behaviour of students during a series of lessons. Teacher behaviour and the allocation of time for learning were also observed across the series of lessons.

METHOD

Participant Selection and Ethical Procedures.

The teachers and students who participated in this study were from four secondary schools in Dunedin. The procedures to be used in the project were approved by the Ethics and Research Committee in the Department of Education at the University of Otago. Approval to conduct the study was also obtained from the school Principal, the Head of the Physical Education Department in the school and the teacher's of the classes to be observed. The eight classes included in the
study were selected on three criteria. First, the suitability of the school timetable in relation to the availability of observers; secondly, the time of the year the physical education content to be observed was scheduled in the school programme in relation to the time available for the project, and thirdly, the willingness of the teacher of those classes to allow the class to be observed. At the completion of the study all data obtained from the observation of the instructional unit was made available to the teacher.

Participants.
Teachers. Eight teachers (three women and five men) each teaching a different third form class (aged 13 and 14 years) were observed. All teachers held Physical Education teaching qualifications and had taught for at least three years. Each class was part of the teacher's scheduled teaching programme for the year. The observed lessons were taught during the winter and early spring term. The number and composition of the students in each class was determined by the organizational schedule at the beginning of the school year. The demographics of each class included in the study are presented in Table 3.

Students. In each class six students were randomly selected to be participants. The participants were selected from three different teacher perceived skill groups, classified by the teacher as being either high achievers, average achievers, or low achievers within their class for physical education
skills. The teachers were not provided with guidelines on how to select the students. The skill level was determined according to the respective class standard. From each of the three skill groups two students were randomly chosen by the researcher to be participants for the study. If the class was co-educational then one boy and girl was selected at each skill level. The teacher was not informed as to which students were chosen. Prior to grouping the students according to their skill level the teachers were asked to eliminate from the sample those students who were known to be irregular attenders of physical education and those students who were likely to be absent from future classes for other reasons. The teachers indicated that all their students had excellent attendance records so none were eliminated.

The eight separate classes provided a total sample of 48 student participants, 16 in each of the higher skilled, average skilled and lower skilled groups. These students and their teacher were observed for the duration of their respective instructional units.

Setting.

All lessons were taught in the school standard size gymnasium. Only the class being observed was timetabled for the gymnasium during the period of observation. Even though each class had a different number of participants (see Table 3) there was an abundance of space to conduct the lessons. To ensure some degree of resource standardization, the researcher
TABLE 3
Description of the eight classes observed in study one.

<table>
<thead>
<tr>
<th>CLASS NUMBER</th>
<th>TEACHER SEX</th>
<th>NUMBER IN CLASS</th>
<th>CLASS COMPOSITION</th>
<th>NUMBER OF LESSONS OBSERVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>26</td>
<td>Co-educational</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>24</td>
<td>Co-educational</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>32</td>
<td>Male</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Male</td>
<td>33</td>
<td>Male</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>24</td>
<td>Female</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Male</td>
<td>29</td>
<td>Male</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Female</td>
<td>28</td>
<td>Female</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Male</td>
<td>29</td>
<td>Male</td>
<td>4</td>
</tr>
</tbody>
</table>

n= 41
ensured that the teacher had a sufficient ratio of equipment to student available to enable a high degree of participation by every class member if so desired. For this study a minimum ratio of one volleyball for every two students in the class was available.

The number of lessons taught to each class for the purpose of the study was determined by each schools physical education curriculum plan. This varied between and within schools (see Table 4). The average time the class spent in the instructional setting and being involved in the lesson proper was 45 minutes. The beginning of the instructional component of the lesson was determined by the teacher either initiating a class response or utilizing a pre-established routine to have the class involved on entering the gymnasium. All lessons were considered to be finished after the teacher gave a final instruction or command. This was usually a management related task. However, as shown in Table 4 the range of lesson time within and between classes varied considerably. This occurred for a number of different reasons including scheduled length of school lessons, the time of day that the lesson was scheduled, interruption of non-timetabled or scheduled events and lack of efficient pre-lesson management strategy.
TABLE 4

Length of lesson time in minutes for all lessons observed.

<table>
<thead>
<tr>
<th>CLASS</th>
<th>LESSON NUMBER</th>
<th>MEAN</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48 52 54 56 44 49</td>
<td>50.5</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>42 50 49 60 50 49</td>
<td>50.0</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>41 34 32 38 37 40</td>
<td>37.0</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>43 35 38 35 44 --</td>
<td>39.0</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>56 57 50 55 -- --</td>
<td>54.5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>43 33 45 32 45 --</td>
<td>39.6</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>47 45 50 48 47 --</td>
<td>49.4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>42 47 53 39 -- --</td>
<td>40.7</td>
<td>14</td>
</tr>
</tbody>
</table>

Overall Mean 45.0
The Instructional Unit

The eight teachers included in the study independently agreed to plan and teach an instructional unit in physical education with a set of common instructional goals (See Appendix B). The goals were determined by the teachers and agreed upon after the researcher held a discussion with each teacher. The unit of instruction was aimed at introducing the students to some of the basic skills used in the game of volleyball. Although not mandatory, the teaching of volleyball skills is a common section of the secondary school physical education curriculum at all class levels. In addition, this would have been the first formalized instruction in volleyball related skills as this activity is not a regular part of the primary or intermediate school curriculum.

Although the instructional goals for the unit were agreed to by the participating teachers, each teacher was required to plan and implement their own series of lessons in an attempt to meet the stated objectives. This was necessary because the range of skill level within each class was different, the number of students in the class differed (See Table 3), the composition of the class differed, the number of lessons in the unit varied (see Table 3), the amount of time scheduled for the lessons varied (see Table 4), the method of instruction for each lesson was determined by the teacher and the organization of the lesson content would determine how and when the planned learning tasks were introduced into the lesson for either some or all of the class.
OBSERVATION PROCEDURES

Observer Training

As any attempt to measure behaviour involves the danger of introducing sources of variability beyond those that already exist, an extensive observer training programme is essential. Two observers, in addition to the researcher were trained to use the modified ALT-PE observation system. Both observers were senior students studying physical education at the University of Otago. The training programme was arranged to suit the availability of the observers and to avoid the necessity of learning the observation system over a short period of time. Prior to observing the lessons in the study a systematic training procedure was used to familiarize the observers with the observation system, the data collecting process and to establish a high degree of observation accuracy and interobserver agreement.

The observers were provided with a complete set of definitions and examples for each behaviour category included in the system. Each definition and the special features (e.g. priority coding) of the system were explained in detail with examples of each being identified on a videotape of a typical physical education lesson. The observers were expected to study the system in some detail before meeting again. When the observers were conversant with the purpose and structure
of the system a physical education class was observed. This allowed the observers to independently identify the context and behaviour categories in the natural setting. This also highlighted to the observers that many events could occur simultaneously during a lesson therefore the need to fully understand the behaviour definitions and observation protocol. Several physical education lessons were then observed for the purpose of applying the functions of the system e.g. time intervals for observation, coding procedures, priority, event recording of task performance, rotation of selected participants.

Each observer was required to practice using the system in a variety of instructional settings and with several videotaped lessons but requested to observe only one student and the teacher on a rotation basis at first. The length of observation for each practice session varied. The results were always discussed with the researcher. When the two observers observed the same lesson segment the results were always compared and the results discussed. The same procedure was then used except each observer was asked to observe the same three students on a rotation basis. Observing the teacher was eventually included in this section of the training programme.

To conclude the training programme, each observer independently observed a specially prepared training videotape for the purpose of establishing a minimum interobserver agreement level of 80 percent. This figure was suggested as
being the minimum acceptable level when using interval recording technique with the ALT-PE observation system (Siedentop 1983a). Observing two additional but separate volleyball classes in a natural setting (study content) was also required. This allowed the observers to identify any anomalies which may have affected the observation procedures that were not evident when observing the final videotape.

Interobserver Agreement

As all data were collected using interval time sampling methodology the level of interobserver agreement was determined on an interval by interval basis. An interval agreement required two independent observers to agree on the context of the class as determined at the beginning of the observation interval, and the behaviour of the target participant during the same interval as determined by the behavioural categories in the modified ALT-PE observation system. The percentage of agreement was determined by the formula

\[
\frac{\text{Number of Agreements}}{\text{Number of Agreements} + \text{Number of Disagreements}} \times 100
\]

At the completion of the training programme and prior to observing the lessons included in the study the level of agreement was determined using a specially prepared 34 minute training videotape of a lesson using similar instructional content and setting to the lessons included in the study. The
training programme required the observers to code the behaviour of two students and the teacher on a rotational basis. Each subject was coded 45 times for a total of 135 observation intervals. This procedure was used to establish the initial level of interobserver agreement.

Maintaining observer reliability throughout a study is important to ensure that the recorded behaviour accurately represents the teacher and student performance (Siedentop 1983a). During the observation of the 41 lessons included in the present study interobserver agreement checks were taken on a random basis. Some checks were made between the researcher and either of the two independent observers as well as between the two independent observers on separate occasions. All interobserver agreement checks were initiated by the researcher. Prior warning was not given to the observers as to which lessons or at which time the checks would be conducted.

At least one interobserver agreement check was made within each of the eight instructional units. A total of 11 checks were made each for a ten minute period (i.e. 40 observation intervals) but not at a set time during the lesson. Overall a total of 880 intervals (2 x 11 x 40) were used to provide reliability checks. The levels of interobserver agreement are presented in the results section.
The Observation Process

All lessons were observed and analyzed using the modified ALT-PE observation system discussed in Chapter 3. A record student and teacher behaviour as determined by the modified ALT-PE system was obtained using an interval time sampling procedure and the number of skill trials performed by the student participants by event recording. A five second observation interval for observing was followed by a ten second interval for recording the appropriate behaviour categories, making anecdotal notes and then locating the next participant. In order to maintain a consistent observing and recording interval time each observer received an audio cue by earphone from the same portable signalling device.

Each observer was always required to make two decisions on categories for each observation interval. First, the Context category (i.e. instructional setting which best described the majority of the class) was determined. Second, the target participant was observed and their behaviour coded. At the end of the five second interval the observer had ten seconds to record the context and behaviour categories which best described the observation, note any point of specific interest (e.g. new task, no expectation, task too difficult) and locate the next subject. The same pattern continued for the duration of the lesson time.
RESEARCH PROCEDURES

Visiting the Class Prior to Data Collection

Prior to observing the instructional unit all classes were visited and observed on more than one occasion so the observers could become familiar with the learning environment. This also provided the researcher with an opportunity to discuss any concerns the teacher may have had relating to the previously agreed arrangements in relation to the instructional unit that was to be observed. During this time the researcher was also able to select and identify the participants for the study. In order to minimize observer intrusion and distraction during the study it was necessary for the observers to become familiar with the teaching environment, class routines and students in the class before the first lessons in the instructional units were taught. This also helped to:

(1) eliminate subject reactivity to the observers during the observation sessions which followed,
(2) give the observers a feeling for the atmosphere that prevailed within the class,
(3) allow the observers to learn to recognize the participants for the study.
Observing the Lessons

Two trained observers each observed three separate students (a high achiever, average achiever, and low achiever) and the teacher on a rotation basis for the duration of the lesson. For identification purposes all students in the class were asked to wear a coloured elastic sports wrist band. The six participants being observed each wore the same colour. This was a different colour to the other four coloured wrist bands worn by the remainder of the class. All students were asked to wear the same colour wrist band for each lesson. The teachers agreed to let the children wear the wrist bands. In spite of this the teacher was not aware of which students were selected to participate in the study as each coloured group had between four and six students. The students were not told the specific purpose for wearing a wrist band.

The observation and recording of the target participants began when the behaviour of the teacher or class indicated that the lesson had commenced. This varied between the eight classes and sometimes within classes. Variations were dependent on the time of the day that the lesson was scheduled, the length of the class, other factors associated with events in the school (e.g. school cross country) and the different routines previously established by the teacher (e.g. students begin own warm-up when they arrive in the gym, students sit and wait for teacher). See Table 4 for lesson time. The proposed format for each lesson was always obtained from the teacher during a brief pre-lesson discussion. The
observers stopped recording data when the teacher indicated that the lesson had ended.

In order to ensure an accurate and reliable data was collected the procedures discussed in Chapter 3 were incorporated in the observation procedures. Random reliability checks were made against an independent observer and between the observers themselves. The level of interobserver reliability was always calculated by the researcher.

Minimizing Subject Reactivity

The modified ALT-PE observation system was designed to sample the behaviour of one or more students and the teacher for the duration of the physical education lesson. Because the system is designed for using on-site in the natural setting it is crucial that any possible subject reactivity to the observers is minimized. While it cannot be claimed that the observers presence had no effect on what transpired in the lesson being observed, the apparent effect in this study was minimized by:

(1) visiting the school to meet with teachers and observe the classes prior to collecting any data.

(2) ensuring the observers were located in such a position within the learning environment so that they were in an inconspicuous as possible.

(3) requesting that no interaction occur between the teacher and the observers during the lesson, natural teacher behaviour was encouraged.
(4) asking each teacher not to make any changes to the already established class routine and style of teaching.
(5) requesting the observers to deliberately avoid acknowledging the students presence if their attention was being sought.
(6) not disclosing the specific details of the observation schedule to the teachers until the completion of the instructional unit.
(7) in structuring the observers not to communicate with each other while the lessons were in progress.
(8) ensuring that the observers were always present in their location before the students arrived at the gymnasium.

Data Analysis

All data for Study One is presented using means and standard deviations as descriptive summary statistics for student behaviour, teacher behaviour and the context of the class. Also, responses were graphed to allow visual evaluation. Although interpretation of results presented for visual analysis can be made more difficult by excessive variability, it is an appropriate analytical form for reporting data obtained using repeated measures in a single subject research design (Carver, 1978; Parsonson and Baer, 1978; Ballard 1986; Smith 1981). Visual inference obtained from time series data can be subjective and interpretation may differ between individuals (Wampold and Furlong 1981). The value of visual analysis, however, is that the reader is presented with the raw data from the study, with a minimum of statistical processing.
CHAPTER FIVE

RESULTS

OBSERVER RELIABILITY

At the completion of the observer training programme and prior to the study, the level of interobserver agreement was determined against a training videotape. The results presented in Table 5 show that all levels of observer agreement were greater than 85% for the 135 observation intervals on the training tape.

Interobserver agreement checks were also made throughout the study. As indicated in Table 6 at least one agreement check was made from each class. The percentage of agreement ranged from 76.6% in Class 6 to 93.0% in Class 8. The mean interobserver agreement level was 87 percent.
TABLE 5

Interval by interval percentage of observer agreement with the training videotape.

<table>
<thead>
<tr>
<th>OBSERVER</th>
<th>PERCENTAGE AGREEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer 1</td>
<td>87.4%</td>
</tr>
<tr>
<td>Observer 2</td>
<td>89.8%</td>
</tr>
<tr>
<td>Researcher</td>
<td>95.2%</td>
</tr>
<tr>
<td>Observer 1 v Observer 2</td>
<td>85.8%</td>
</tr>
</tbody>
</table>
TABLE 6

Interval by interval percentage of interobserver agreement taken during data collection.

<table>
<thead>
<tr>
<th>CLASS NUMBER</th>
<th>LESSON NUMBER</th>
<th>AGREEMENT CHECK BETWEEN</th>
<th>PERCENTAGE AGREEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>Observer 1 and Researcher</td>
<td>89.2%</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Observer 1 and Observer 2</td>
<td>92.6%</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Observer 2 and Researcher</td>
<td>87.5%</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Observer 1 and Observer 2</td>
<td>87.5%</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Observer 1 and Observer 2</td>
<td>93.0%</td>
</tr>
</tbody>
</table>
RESULTS OF STUDY ONE.

STUDENT BEHAVIOUR

Overall Patterns Of Student Behaviour.

An analysis of the overall mean values for student behaviour during the 41 physical education lessons is presented in Table 7. Table 7 indicates that the students were actively engaged in physical activity prescribed by the teacher for approximately one third (30.3%) of the lesson time. However, not all physical activity was directly related to the learning of skills. Those physical activities provided at the beginning of the lesson and classified by the teacher as Warm-Up (Wu) exercises occurred for one tenth (10.7%) of all lesson time. Motor-on- Task (M) behaviour requiring direct involvement with the learning tasks related to the instructional objectives of the lesson and accounted for one fifth (19.7%) of all lesson time.

When comparing the total amount of Motor-on-Task behaviour and Warm-Up behaviour within classes marked differences are evident. From Table 7 it can be seen that all the students in Class 2 spent a higher percentage of the lesson time involved in Warm-Up behaviour than participating in the prescribed Motor-on-Task behaviour. The students in Classes 1 and 7 spent equivalent amounts of time in both behaviours. In contrast all students in Classes 4, 5, 6 and 8 spent approximately three
TABLE 7

Proportion of lesson time spent in each modified ALT-PE student behaviour category in each class (means and standard deviations).

<table>
<thead>
<tr>
<th>Category</th>
<th>1</th>
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times as much of the lesson time actively engaged in Motor-on-Task behaviour than Warm-Up behaviour.

In conjunction with the time spent in performing skill related tasks the students were also recorded as being Indirectly Involved (I.D) with the learning activities (eg. a team member but not performing any skill related activity) for 7.9% of the time. A further 3.4% of the time was spent Supporting (S) other students perform the prescribed learning tasks (eg. throwing the ball for their partner to set). Those actions classified as Interim (I) behaviour (eg. retrieving a ball, changing location during the activity) utilized 3.3% of the lesson time.

Five categories were used to describe what the students were doing when they were not involved in physical activity. Of these, Cognitive behaviour (C) was recorded as occurring for over one quarter (28.0%) of all lesson time. This behaviour included such events as receiving instructions and information from the teacher, sharing in a group discussion and watching a demonstration performed by either the teacher or student. A further 9.7% of student time was spent in Organisation (O) behaviour (eg. putting up the net) as directed by the teacher. The students deliberately avoided taking part in the prescribed activity (Bystanding behaviour) for 3.3% of the lesson time but this behaviour was not reported as occurring in all classes. The results indicate that the students averaged 14.0% of each lesson Waiting (W) to be involved in some aspect of the class activity. This
category incorporated all behaviour that identified the student as not being able to be involved in any lesson activity, either active or passive. Off Task (X) behaviour occurred for less than one percent of the time and was not recorded as occurring in all classes.

The means and standard deviations reported for each behaviour category presented in Table 7 show that no consistent or stable pattern of student behaviour existed either within or between classes during an instructional unit with the same goals.

From Table 7 it can be seen that individual students do not spend a high percentage of the lesson time actively performing skill learning behaviours. In seven of the eight classes more time was spent in Cognitive related behaviour than any other behaviour. In the other class, that is Class 7, the dominant behaviour was Waiting. In both cases the dominant student behaviour was passive rather than active.

A Comparison of Student Behaviours Within and Between Classes.

Six students in each class (i.e. two high achievers, two average achievers and two lower achievers) were observed for the duration of the instructional units. The behaviour of these three sub-groups in the most frequently occurring behaviour categories identified in Table 7 are examined separately in this section.
Motor-on-Task Behaviour. The students spent one-fifth (19.7%) of all lesson time in Motor-on-Task behaviour. The results for the high, average and low achieving students in each class are presented in Table 8. With the exception of Class 3, the high achievers in all other classes spent more time performing the learning tasks (Motor-on-Task behaviour) than either the average or low achievement groups. In Class 3 the low achievers were recorded as having the most Motor-on-Task behaviour.

From Table 8 it can be seen that although the amount of direct participation in skill learning behaviour is similar within all classes for the three achievement groups, there is a substantial difference between classes. For example, Table 7 shows that the students in all achievement groups in Classes 5 and 8 were recorded as having twice as much Motor-on-Task behaviour (average 27.4% and 25.4% respectively) than their counterparts in Classes 2 and 7 (average 12.7% and 11.6% respectively).

From the standard deviations presented in Table 8 it is evident that marked variability existed within the three achievement groups in each class. Although no common pattern of participation is evident between classes, those students who spent the least amount of lesson time in Motor-on-Task behaviour generally had the smallest levels of variability. This suggests that their amount of active participation during any lesson was consistently very low. Regardless of the achievement group, all the students in Class 5 had a higher
TABLE 8

Proportion of lesson time spent in motor-on-task behaviour for high, average and low achievement groups in each class (means and standard deviations).

<table>
<thead>
<tr>
<th>ACHIEVEMENT GROUP</th>
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<td>26.7</td>
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</table>
percentage of Motor-on-Task behaviour during their lessons than all other students. It is interesting to note that the students in this class also displayed the largest standard deviations which suggests that there was a substantial difference in how much Motor-on-Task behaviour occurred between individual students during each lesson.

**Indirect Participation.** The results for the mean percentage of Indirect Participation behaviour during the physical education lessons by the three achievement groups are presented in Table 9. From Table 9 it can be seen that a considerable difference existed between the classes. With the exception of Class 1 the high achievers spent less time Indirectly Participating than the other two achievement groups.

Except for Class 8, where a five percent range existed between the achievement groups, the students within the other seven classes all spent similar amounts of time (around 7.5%) Indirectly Participating in the learning tasks during the lesson. It was noted in the anecdotal records made during the observations that the majority of Indirect Participation behaviour occurred during the playing of games. It is possible that the high achievers dominated the activity during game playing. The standard deviations reported in Table 9 indicate that in some classes (eg. Classes 1, 5 and 7) marked variability occurred between lessons while in others (eg. Class 8) there was only a small difference between lessons. In
TABLE 9

Proportion of lesson time spent in indirect participation behaviour for the high, average and low achievement groups in each class (means and standard deviations).

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many cases the standard deviation is greater than the mean suggesting that this behaviour did not occur in every lesson.

**Cognitive Behaviour.** As previously identified in Table 7 Cognitive behaviour was the single most prevalent behaviour across the 41 lessons. Cognitive behaviour almost always involved the students listening to the teacher. Table 10 presents the data on the Cognitive behaviour category for the three achievement groups. While the within class differences between the three achievement groups are small, the high achievers spent slightly more time in Cognitive behaviour than the other two achievement groups.

The difference between classes for the Cognitive behaviour category is substantial. This ranged from an average of approximately 20% in Class 7 to an average of 30% in Classes 3 and 5. The variability as identified by the standard deviations suggests that a marked and irregular pattern of Cognitive behaviour occurred between lessons in each class.

**Organization Behaviour.** While organization behaviour occurred across all classes for 10% of the total time, the high achievers were less involved than the average or low achievers in this category six classes. Table 11 shows that the students in some classes (eg. Classes 6 and 7) spent almost twice as much time as the students in other classes (eg. Classes 1 and 5) involved in Organization behaviour.
TABLE 10

Proportion of lesson time spent in cognitive behaviour for the high, average and low achievement groups in each class (means and standard deviations).

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TABLE 11

Proportion of lesson time spent in organization behaviour for the high, average and low achievement groups in each class (means and standard deviations).

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</tr>
<tr>
<td></td>
<td>5.3</td>
<td>4.4</td>
<td>3.5</td>
<td>2.3</td>
<td>2.1</td>
<td>2.8</td>
<td>4.8</td>
<td>3.0</td>
<td></td>
</tr>
</tbody>
</table>
The variability for each achievement group in a given class differed considerably. For example, in Class 5 all three achievement groups were involved in Organization behaviour for a similar amount of time during each lesson. However in Classes 1, 2, 7 and 8 the percentage of time utilized for Organization behaviour varied between lessons within the class for the three achievement groups.

Waiting Behaviour. Table 12 presents data on the Waiting behaviour category for the three achievement groups. It can be seen that there was only a minimal within class difference in how much time the three achievement groups spent in behaviour categorized as Waiting. The largest variation between the achievement groups occurred in Class 7 where the time spent Waiting ranged from 18.6% for the high achievers to 25.4% for the low achievers.

Regardless of the achievement level, the variability reported for many of the students suggests that the amount of lesson time spent Waiting was not consistent across lessons or within classes. The results indicate that several students spent approximately one quarter of the lesson time in one or more lessons waiting to be involved in the prescribed activity. In contrast to this, other students only spent approximately one tenth of the lesson time in Waiting behaviour.
TABLE 12

Proportion of lesson time spent in waiting behaviour for the high, average and low achievement groups in each class (means and standard deviations).

<table>
<thead>
<tr>
<th>ACHIEVEMENT GROUP</th>
<th>CLASS NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>( \bar{x} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td></td>
<td>12.4</td>
<td>18.6</td>
<td>9.9</td>
<td>14.9</td>
<td>8.1</td>
<td>14.9</td>
<td>18.6</td>
<td>8.5</td>
<td>13.2</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>1.7</td>
<td>4.3</td>
<td>5.7</td>
<td>10.1</td>
<td>2.6</td>
<td>3.0</td>
<td>4.7</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>12.1</td>
<td>16.5</td>
<td>11.9</td>
<td>16.9</td>
<td>9.7</td>
<td>17.7</td>
<td>22.7</td>
<td>7.7</td>
<td>14.4</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>4.2</td>
<td>3.1</td>
<td>3.1</td>
<td>9.7</td>
<td>3.9</td>
<td>9.6</td>
<td>5.7</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>15.3</td>
<td>15.3</td>
<td>12.3</td>
<td>15.2</td>
<td>8.7</td>
<td>13.2</td>
<td>25.4</td>
<td>11.8</td>
<td>14.7</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>9.4</td>
<td>4.6</td>
<td>2.8</td>
<td>5.9</td>
<td>1.8</td>
<td>5.1</td>
<td>5.6</td>
<td>4.2</td>
<td></td>
</tr>
</tbody>
</table>
Summary. The results for the three achievement groups are similar within a given lesson for each behaviour category. When comparing the descriptive statistics with the anecdotal records it was concluded that the students experienced physical education lessons taught as a whole class. That is, all the students experienced the same activities at the same pace for the same length of time regardless of their entry skill level.

Lesson by Lesson Variability Within and Between Classes.

As previously noted, only small differences occurred between the three achievement groups for each behaviour category within a class. However, the standard deviations indicate that considerable variability existed for most behaviours between the lessons within each class. It is, therefore, appropriate to examine each class on a lesson by lesson basis. Figure 3 provides a graphic comparison for Motor-on-Task behaviour, Cognitive behaviour, Waiting behaviour and Indirect Participation behaviour across the lessons in each class. Examining the data on a lesson by lesson basis reveals that the behaviour which contributes the most towards learning, that is Motor-on-Task behaviour, was recorded as being the most frequent behaviour in only four out of the 41 lessons observed. Two of these lessons occurred in Class 8. The pattern for most classes shows that as the instructional unit progressed the amount of student Motor-on-Task behaviour generally decreased. The exception to this occurred in Class 8.
FIGURE 3: Percentage of occurrence for cognitive, motor-on-task, waiting and indirect participation student behaviour across lessons in all classes.
where an increase in Motor-on-Task behaviour was noted. In Classes 2 and 7 the level of Motor-on-Task behaviour was minimal in all lessons.

Although Indirect Participation behaviour was reported as occurring for less than ten percent of the total class time, Figure 3 shows that marked differences existed between lessons in most classes. With the exception of Class 8, this behaviour did not occur in all lessons. In Classes 1, 2, 5, 6 and 7 there was a marked increase in the occurrence of Indirect Participation during the last lessons of the class. This was a result of playing games in large groups. Indirect Participation was insignificant in Classes 3 and 4.

From Figure 3 it can be seen that Cognitive behaviour occurred more frequently than any other behaviour in 29 out of the 41 lessons. In Class 2 Cognitive behaviour was the most prevalent behaviour in every lesson. The time spent in Cognitive behaviour between lessons in each class is marked. The variability is illustrated by the fact that in Classes 1, 5, 6 and 8 Cognitive behaviour was most prevalent during the first lessons, in Classes 3, 4 and 7 during the middle lessons and in Class 2 the last lesson of the instructional unit.

Figure 3 shows that lesson by lesson occurrence of Waiting behaviour also varied considerably within each class. Although a non-productive behaviour, Waiting was the most prevalent behaviour for three lessons in Class 7. The amount of Waiting in Classes 1 and 4 increased as the instructional unit progressed. The opposite pattern was recorded as occurring in
Classes 7 and 8. In Classes 1, 2, 4, 6 and 7 the students spent more time in a Waiting behaviour than in Motor-on-Task behaviour during one or more lessons. From Figure 3 it can be seen that the classes that had the least amount of Waiting behaviour, that is Classes 5 and 8, also had the highest percentage of lesson time in Motor-on-Task behaviour. However, it is not argued that this implies a cause and effect relationship.

Overall, Figure 3 shows that the behaviour trends on a lesson by lesson basis within a class are inconsistent, suggesting that one behaviour is not fully dependent on, nor consistently influenced by another single behaviour. The patterns of student behaviour during a series of related physical education lessons are not stable and appear to be unique to a lesson rather than following a pattern a series of lessons.

Number of Learning Trials.

When a student was coded as being in the Motor-on-Task behaviour category the number of learning trials were counted and recorded. Table 13 shows that overall the high achievers had more practice trials (23 trials) than either the average (19 trials) or low (17 trials) achievement groups during the observational intervals. Both the average and low achievement groups performed a similar total number of learning trials.
TABLE 13

Number of learning trials performed by the high, average and low student achievement groups in each class (means, range and standard deviations).

<table>
<thead>
<tr>
<th>Class</th>
<th>HIGH ACHIEVERS</th>
<th>AVERAGE ACHIEVERS</th>
<th>LOW ACHIEVERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Trials per Lesson</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>148</td>
<td>24.8</td>
<td>110</td>
</tr>
<tr>
<td>2</td>
<td>88</td>
<td>14.8</td>
<td>74</td>
</tr>
<tr>
<td>3</td>
<td>136</td>
<td>22.6</td>
<td>134</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
<td>24.0</td>
<td>98</td>
</tr>
<tr>
<td>5</td>
<td>141</td>
<td>35.4</td>
<td>122</td>
</tr>
<tr>
<td>6</td>
<td>102</td>
<td>17.0</td>
<td>100</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>16.0</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>108</td>
<td>27.0</td>
<td>92</td>
</tr>
</tbody>
</table>

Mean | 22.7 | 19.6 | 18.2 |
Range| 16.0 - 35.4 | 12.4 - 30.4 | 10.0 - 33.4 |
SD   | 6.8  | 5.5  | 7.6  |
Examining the data on a class by class basis shows a substantially different pattern from that identified by the overall result. For example, Table 13 shows that in Classes 3, 5 and 7, the high achievers did not have more practice trials than the other achievement groups in the class. Although the high achievers in Classes 1, 2, 4, 6 and 8 performed more learning trial than the other groups, these differences were negligible. All the students in Class 5 averaged more learning trials during each lesson than any other class. The least number of practice trials performed during each lesson is reported as occurring in Classes 2 and 7. From Table 13 it can be seen that the most notable difference in the amount of practice the students experienced occurred between the eight classes, not within the classes.

However, the number of trials alone is insufficient to determine the appropriateness of the performance within trials. The quality of the performance must also be examined, and this is presented next by reporting the rate of success with the learning trials.

Rate of Success With the Learning Trials.

All learning trials performed during the observation interval were not only counted but also classified as being either successful or not successful in terms of producing an effective (correct) practice of the assigned skills. The ratio of successful to not-successful trials are presented in Table 14 and shows that the high achievers obtained substantially
more success than the other students during the time spent participating in the Motor-on-Task behaviour. Overall, the high achievers performed six successful trials to every one unsuccessful trial while the average and lower achievers were recorded as having a 2:1 and 1:1 ratio of successful to not-successful trials respectively.

From Table 14 it can be seen that the ratio of successful to not-successful trials varied considerably both between and within classes. Although the high achievers had the greater percentage of successful trials in every class, there was also a substantial difference between classes. The range varied from a 12:1 ratio of success to not-success for high achievers in Class 3 to a smaller 4:1 ratio for high achievers in Class 5, 7 and 8.

The ratio of success to not-success for the average achievers varied between approximately a 4:1 ratio in Classes 1 and 4 to approximately a 1:1 ratio in Classes 5, 7 and 8. The low achievers had the least amount of success in every class. Again there was a marked contrast between classes. In Classes 1, 2, and 4 the low achievers had only slightly more successful than not-successful trials. In Classes 2, 5, 6, 7, and 8 the low achievers performed more not-successful than successful trials.

Figure 4 provides a graphic comparison between the percentage of success for the three achievement groups across the lessons in each class. Examining the percentage of success on a lesson by lesson basis suggests that using cumulative
TABLE 14

Percentage of successful learning trials performed by the high, average and low achievement groups in each class (mean and range).

<table>
<thead>
<tr>
<th>Class Number</th>
<th>HIGH ACHIEVERS</th>
<th>AVERAGE ACHIEVERS</th>
<th>LOW ACHIEVERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>92</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>85</td>
<td>71</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>93</td>
<td>74</td>
<td>72</td>
</tr>
<tr>
<td>4</td>
<td>88</td>
<td>82</td>
<td>61</td>
</tr>
<tr>
<td>5</td>
<td>77</td>
<td>55</td>
<td>34</td>
</tr>
<tr>
<td>6</td>
<td>89</td>
<td>63</td>
<td>45</td>
</tr>
<tr>
<td>7</td>
<td>80</td>
<td>53</td>
<td>34</td>
</tr>
<tr>
<td>8</td>
<td>78</td>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>Mean</td>
<td>86</td>
<td>66</td>
<td>55</td>
</tr>
<tr>
<td>Range</td>
<td>77-92</td>
<td>53-82</td>
<td>34-72</td>
</tr>
</tbody>
</table>

Ratio of Successful to Not Successful Trials

<table>
<thead>
<tr>
<th></th>
<th>HIGH ACHIEVERS</th>
<th>AVERAGE ACHIEVERS</th>
<th>LOW ACHIEVERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:1</td>
<td>2:1</td>
<td>1:1</td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 4: Percentage of success when performing the learning trials for the high, average and low student achievement groups across all lessons within each class.
data to make judgements about the overall success rate for each achievement group is misleading. The lesson by lesson data reveals that success is not exclusively a student achievement group variable. In some circumstances, for example in lessons 1 and 2 in Classes 1 and 3, lesson 6 in Class 2, lessons 3 and 5 in Class 7, the low achievers performed the learning tasks with a similar rate of success as the high and average achievement groups. However, a relatively consistent pattern is evident. The low achievers in Classes 2, 4, 5, 6 and 8 consistently had the lowest percentage of success while the high achievers in all classes consistently performed the learning trials with a higher percentage of success than either of the other two groups. It should be noted, however, that there is considerable between lesson variability for the three achievement groups in all classes.

In summary Table 14 and Figure 4 shows that only on a few occasions did the low achievers in any class obtain very much success when performing the learning tasks. In most lessons the average achievers performed with more success than the low achievers but this varied between lessons for all classes. Regardless of the class, the high achievers consistently had a greater rate of success, and therefore a better chance of learning the skills than the other students in the class.
At the beginning of each observation interval the Context category that described the nature of the setting in which the student behaviour occurred was recorded. From this data the allocation of lesson time for the different settings and the pattern of how this time was used could be examined.

The overall results presented in Table 15 show that less than half of all the lesson time (45.8%) was allocated for student participation with the learning activities. Allocated time consisted of; Individual Skill Practice (2.2%), Group Skill Practice (31.8%), and Game Playing (11.8%). The variability reported for each class shown in Table 15 indicates that there was a substantial difference in the way each teacher allocated the time in each lesson within a class for the skill learning activities.

Table 15 shows that practicing the skills in a Group context was the most extensively used setting in all classes except for Class 7. The overall time allocated for group activities ranged from 19.9% in Class 7 to 41.4% in Classes 4. The standard deviations indicate that the distribution and use of the Group Skill Practice setting varied considerably within most classes.
TABLE 15

PROPORTION OF LESSON TIME SPENT IN EACH MODIFIED ALT-PE CLASS CONTEXT CATEGORY FOR ALL CLASSES (MEANS) AND STANDARD DEVIATIONS.

<table>
<thead>
<tr>
<th>CLASS NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-MOTOR CONTENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAN. X</td>
<td>13.4</td>
<td>18.5</td>
<td>13.3</td>
<td>11.8</td>
<td>8.9</td>
<td>13.7</td>
<td>17.6</td>
<td>12.9</td>
<td>13.8</td>
</tr>
<tr>
<td>SD</td>
<td>6.8</td>
<td>7.2</td>
<td>2.5</td>
<td>1.7</td>
<td>2.3</td>
<td>4.7</td>
<td>3.5</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>KNOW. X</td>
<td>29.3</td>
<td>29.2</td>
<td>31.0</td>
<td>33.4</td>
<td>28.3</td>
<td>26.7</td>
<td>18.6</td>
<td>23.8</td>
<td>27.6</td>
</tr>
<tr>
<td>SD</td>
<td>7.9</td>
<td>6.8</td>
<td>4.5</td>
<td>5.8</td>
<td>6.2</td>
<td>6.7</td>
<td>7.7</td>
<td>3.8</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL PERCENTAGE OF LESSON TIME ALLOCATED FOR NON-MOTOR CONTENT 41.1

GENERAL EXERCISE

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARM- X</td>
<td>15.5</td>
<td>19.4</td>
<td>13.7</td>
<td>7.0</td>
<td>10.4</td>
<td>9.1</td>
<td>15.1</td>
<td>8.4</td>
<td>12.4</td>
</tr>
<tr>
<td>SD</td>
<td>4.8</td>
<td>6.9</td>
<td>5.1</td>
<td>2.0</td>
<td>0.9</td>
<td>3.8</td>
<td>6.7</td>
<td>3.4</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL PERCENTAGE OF LESSON TIME ALLOCATED FOR GENERAL EXERCISE 12.4

ALLOCATED FOR SKILL PRACTICE

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>IND. X</td>
<td>8.4</td>
<td>-</td>
<td>2.5</td>
<td>3.1</td>
<td>-</td>
<td>-</td>
<td>4.5</td>
<td>-</td>
<td>2.2</td>
</tr>
<tr>
<td>SK.PR. SD</td>
<td>7.0</td>
<td>-</td>
<td>2.8</td>
<td>4.4</td>
<td>-</td>
<td>-</td>
<td>7.0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>GROUP X</td>
<td>15.4</td>
<td>17.5</td>
<td>32.6</td>
<td>41.3</td>
<td>41.4</td>
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<td>19.9</td>
<td>34.7</td>
<td>31.8</td>
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<tr>
<td>SK.PR. SD</td>
<td>14.7</td>
<td>15.3</td>
<td>7.3</td>
<td>5.5</td>
<td>17.8</td>
<td>17.2</td>
<td>12.3</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>GAME X</td>
<td>7.9</td>
<td>5.2</td>
<td>6.5</td>
<td>3.1</td>
<td>10.6</td>
<td>17.9</td>
<td>23.5</td>
<td>19.8</td>
<td>11.8</td>
</tr>
<tr>
<td>SD</td>
<td>19.5</td>
<td>12.7</td>
<td>10.7</td>
<td>7.1</td>
<td>21.1</td>
<td>20.1</td>
<td>23.8</td>
<td>3.3</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL PERCENTAGE OF LESSON TIME ALLOCATED FOR SKILL PRACTICE 45.8
While Game Playing was recorded as occurring in all classes the use of this context varied from an average of 3.1% in Class 4 to 23.5% in Class 7. However, the variability is marked suggesting that in some lessons there was a considerable portion of the lesson time allocated for Game Playing while in other lessons there was none. Each teacher appeared to have a different view on using game playing to teach the students new motor skills.

Individual Skill Practice was not greatly utilized and only occurred in four classes. With the exception of Class 1 which allocated 8.4% of the time for Individual Skill Practice this setting was used for less than five percent of the class time in the other three classes.

From Table 15 it can be seen that each teacher allocated different portions of lesson time for Warm-Up. This context was always allocated at the beginning of the lesson and was recorded as occurring in all the lessons. The activities performed in this setting were not directly related to the goals of the lesson. In Class 2 one fifth of all lesson time was allocated for the students to perform exercises in the Warm-Up setting. This was considerably more than in most classes. The least amount of time was recorded in Class 4 (7.0%). With the exception of Class 5 who were consistently allocated 10.0% of each lesson to the Warm-Up setting, the standard deviations indicate that a notable within class difference was evident.
Table 15 shows that non-motor lesson context (that is Management and Knowledge categories) occurred for an overall average of 41.4% of the total lesson time. Of this time, 13.8% was used in the Management setting. Some classes, for example Classes 2 and 7, were recorded as spending twice as much time as other classes in the Management setting. The remaining 27.6% of the overall lesson time was allocated to the Knowledge setting where the students were inactive and involved in the cognitive process. With the exception of Classes 7 and 8 approximately one third of the lesson time was allocated for Knowledge related behaviours such as receiving instructions and watching a demonstration.

The allocation of time within classes across all context categories varied substantially. For example Table 15 shows that, regardless of the setting, in Class 2 only one third (32%) of the lesson time was allocated for skill learning while in Class 8 just over half (55%) of the time was allocated for students to participate in the learning activities. The patterns of distribution of lesson time seem applicable only to a given class and even this is inconsistent.

Relationship Between Allocated Time and Motor-on-Task Behaviour.

It has already been established that 45.8% of the overall lesson time was allocated for the students to participate in the skill learning activities (see Table 15). It was shown in
Table 7 that 20.9% of the lesson time was spent by the individual student in Motor-on-Task behaviour. Figure 5 graphically compares the amount of time allocated for skill practice and the portion of that time that the students were actively involved in skill practice (Motor-on-Task skill behaviour) within each class.

From Figure 5 it can be seen that in some classes, for example Classes 3 and 5, the students were engaged with the skill learning tasks for approximately half of the allocated time. In other classes, for example Classes 6 and 7, an even smaller portion of the allocated time was used in skill practice. These results clearly illustrate that allocating more time for practice does not necessarily increase the percentage of Motor-on-Task behaviour during the lessons. For example, Figure 5 shows that the teachers in Classes 4 and 7 allocated similar amounts of time for participation, but the students in Class 4 had approximately twice as much practice than the students in Class 7. From Figure 5 it can be seen that the "funnelling effect" referred to in Figure 1 is evident across all classes.

Figure 6 illustrates that the amount of lesson time allocated for physical activity and the amount of Motor-on-Task behaviour varies on a lesson by lesson basis within each class. Repeated measures of both variables show that no class was recorded as having a consistent amount of time allocated for participation regardless of how many lessons were taught in the instructional unit. Similar variability is noted for
FIGURE 5: Relationship between the mean percentage of lesson time allocated for physical activity and the percentage of student motor-on-task behaviour within each class.
FIGURE 6: Relationship between the percentage of lesson time allocated for physical activity and observed motor-on-task behaviour within each lesson in each class.
Motor-on-Task behaviour. Examples of extremes between the two variables occurred in Class 1, lesson 6 and Classes 6 and 7, lesson 5. Similar times for both variables were recorded for the first lesson in Classes 1, 2, 3 and 4 and the second lesson in Class 3.

Overall, Figure 6 shows that there is no consistent or predictable pattern for either variable. In general, the amount of time allocated for participation gradually increased across the lessons in the class while the amount of Motor-on-Task behaviour tended to decrease. The greatest difference between the two variables almost exclusively occurred during the last lesson in the instructional unit for each class. One reason for this as identified in the anecdotal notes made in conjunction with the interval observation was the extensive use of game playing in the last lesson. It was noted that the nature of the organization associated with the game (e.g. large groups, inadequate skill level of most students to perform in game conditions) rather than the game itself was the factor that minimized direct participation during this time.

Lesson Momentum.

The percentage of lesson time allocated for the students to be actively involved in the learning partially depends on how the lesson is structured. This will also effect the momentum of the lesson. Momentum refers to the degree to which the teacher is able to keep the lesson free from events that limit the opportunity for the students to be actively involved
Examples of the effect of the lesson structure on the time allocated for physical activity and momentum within a lesson are shown in Figure 7. The three examples shown in Figure 7 represent a class with the most, average and least amount of overall lesson time allocated for student participation for each lesson during the instructional unit.

The stop–start nature of the pattern of allocated time shown in Figure 7 indicates that the nature of instruction varied considerably between classes. It was observed that when a new task or task variation was initiated by the teacher the class was stopped from participating before the instruction was given. As illustrated in Figure 7, this method of instructing often interrupted the momentum of the lesson. It was noted in the anecdotal records that on many occasions the class was required to relocate themselves to another area of the gymnasium, the instructions for the activity were often provided more than once and the new tasks were nearly always different in nature from the preceding tasks, thus requiring the teacher to reorganize the students. It appears from the graphic display in Figure 6 that such events eroded considerable portions of the lesson time from being available for skill practice. Overall, from Figures 5, 6 and 7 it does not appear that any of the classes consistently provided the students with a high percentage of ongoing lesson time in which they could be actively involved with the learning tasks.
FIGURE 7: Examples of the distribution of lesson time allocated for motor-on-task behaviour in each lesson for the three classes with low (class 2), average (class 4) and high (class 8) allocated time.
Relationship between Allocated Time, Motor-on-Task Behaviour, Number of Trials and Success Rate with the Learning Trials.

The descriptive data of the results of Allocated Time, Motor-on-Task behaviour, number of learning trials performed and the percentage of success when performing the learning trials for each class are graphically presented in Figure 8. It is shown in Figure 8 that the pattern of Allocated time and Motor-on-Task behaviour is not consistent between classes. More time Allocated for practice does not necessarily mean more student involvement in the learning tasks. Thus, the findings indicate that Allocated time is not an appropriate variable by itself to use in determining the amount of active learning time that occurs during a physical education lesson.

There was no relationship between the percentage of Motor-on-Task behaviour and the number of learning trials performed by each achievement group. Figure 8 shows that although there is only a small within class difference between the three achievement groups for both percentage of Motor-on-Task behaviour and the number of learning trials there is a marked difference between the eight classes on both variables. While the students in Class 5 had the highest percentage of Motor-on-Task (27.4%) behaviour and performed the most trials (35) per lesson, the students in Class 7 were recorded as averaging 11.7% Motor-on-Task behaviour and 10 trials per lesson. A corresponding pattern did not exist for the other classes. It should be noted that the number of learning trials performed is influenced by the nature of the learning activities.
FIGURE 8: Relationship between allocated time, motor-on-task behaviour, number of learning trials and success rate with the learning trials for all students and for high, average and low achievers.
It is further shown in Figure 8 that the relationship between the number of learning trials performed and the contribution of the performance to student learning varies for each achievement group. While all the students in a class had a similar opportunity to be involved and perform a similar number of trials, the high achievers had a substantially higher percentage of success than the other two achievement groups. In seven of the classes the average achievers had considerably more success than the low achievers.

However, the data presented in Figure 8 does show that the number of trials performed is not necessarily related to the success rate experienced by the student. For example, the students in Class 5 had the most time allocated for practice, the highest percentage of Motor-on-Task behaviour, performed the most learning trials but still had the lowest rate of success with each achievement group.

While all the variables are of some importance and are partially influenced by each other, it appears that the success rate is the most discriminating factor to consider when analyzing the relation between student behaviour and learning. Although the percentage of Motor-on-Task behaviour will have some influence on how many learning trials are performed, it is the amount of success experienced when performing the learning trials that will ultimately determine the accomplishment of the skills.
The overall pattern of teacher behaviour is presented in Table 16. This Table shows that the teachers were recorded as performing four main functions: Preparatory Instruction, Concurrent Instruction, Observing and Management. Table 16 shows that the way in which these and the other five behaviours were used varied markedly for the eight teachers in the study.

The teachers presented spoken information to the students either preceding, during or after the activity for approximately two thirds of the total lesson time. This consisted of 25.7% in Preparatory Instruction, 28.8% in Concurrent Instruction and 7.0% in Modelling. When a Modelling behaviour was used it was often accompanied with a verbal message. Although the use of Preparatory Instruction (i.e. provision of information preceding an activity) varied within each class the overall difference between Classes 1, 2, 5, 6 and 8 was minimal. Concurrent Instruction on the other hand varied substantially within and between each class. This varied between a relatively consistent use in Class 2 (26.9%) to a much higher and irregular use (38.3%) in Class 5.

Information was also provided to the students through Modelling behaviour for 7.0% of the time. Although this may have been accompanied by a verbal explanation the intentions
TABLE 16

Proportion of lesson time spent in each modified ALT-PE teacher behaviour category for each teacher (means and standard deviations).

<table>
<thead>
<tr>
<th>CLASS NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparatory</td>
<td>X</td>
<td>24.8</td>
<td>25.9</td>
<td>25.8</td>
<td>29.5</td>
<td>26.9</td>
<td>25.4</td>
<td>20.4</td>
</tr>
<tr>
<td>Instruction</td>
<td>SD</td>
<td>7.8</td>
<td>5.4</td>
<td>4.4</td>
<td>5.6</td>
<td>5.7</td>
<td>3.1</td>
<td>6.6</td>
</tr>
<tr>
<td>Concurrent</td>
<td>X</td>
<td>29.5</td>
<td>26.9</td>
<td>36.4</td>
<td>33.1</td>
<td>38.3</td>
<td>19.4</td>
<td>19.8</td>
</tr>
<tr>
<td>Instruction</td>
<td>SD</td>
<td>5.4</td>
<td>3.2</td>
<td>7.0</td>
<td>5.2</td>
<td>14.4</td>
<td>10.9</td>
<td>6.3</td>
</tr>
<tr>
<td>Modelling-</td>
<td>X</td>
<td>7.0</td>
<td>7.1</td>
<td>10.2</td>
<td>5.4</td>
<td>5.7</td>
<td>10.2</td>
<td>7.3</td>
</tr>
<tr>
<td>Demonstration</td>
<td>SD</td>
<td>5.3</td>
<td>6.1</td>
<td>5.4</td>
<td>3.6</td>
<td>3.6</td>
<td>4.6</td>
<td>3.8</td>
</tr>
<tr>
<td>Teacher</td>
<td>X</td>
<td>3.8</td>
<td>0.6</td>
<td>10.7</td>
<td>0.5</td>
<td>6.3</td>
<td>4.9</td>
<td>3.8</td>
</tr>
<tr>
<td>Participation</td>
<td>SD</td>
<td>4.4</td>
<td>1.0</td>
<td>5.1</td>
<td>1.1</td>
<td>4.7</td>
<td>4.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Social Matter</td>
<td>X</td>
<td>0.9</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
<td>1.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Social Matter</td>
<td>SD</td>
<td>1.5</td>
<td>-</td>
<td>-</td>
<td>0.9</td>
<td>-</td>
<td>2.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Observing</td>
<td>X</td>
<td>16.4</td>
<td>14.1</td>
<td>4.4</td>
<td>11.5</td>
<td>12.2</td>
<td>19.1</td>
<td>21.0</td>
</tr>
<tr>
<td>SD</td>
<td></td>
<td>11.7</td>
<td>7.6</td>
<td>3.0</td>
<td>5.8</td>
<td>4.1</td>
<td>8.1</td>
<td>8.5</td>
</tr>
<tr>
<td>Management</td>
<td>X</td>
<td>16.7</td>
<td>24.9</td>
<td>12.7</td>
<td>19.2</td>
<td>9.9</td>
<td>19.2</td>
<td>27.8</td>
</tr>
<tr>
<td>SD</td>
<td></td>
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<td>7.8</td>
<td>4.0</td>
<td>4.9</td>
<td>1.9</td>
<td>9.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Officiating</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>Officiating</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>1.8</td>
<td>-</td>
</tr>
<tr>
<td>Recording</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Recording</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
of the teacher was to provide a demonstration of the required
movement or to illustrate a specific teaching point.

Management behaviour occurred for 19.0% of all lesson
time. Although there was a variety of management tasks
performed (eg. putting up a net, organizing teams, relocating
students) the results indicate that overall the teachers spent
one fifth of the time in activities that did not directly
contribute to student learning. However the difference between
classes ranged from 9.9% (SD 1.9) in Class 5 to a much greater
24.9% (SD 7.8) in Class 2.

The teachers observed the students during lessons for
14.2% of the time but there was a marked difference in how
this behaviour was used. The teacher in Class 3 consistently
spent very little time (4.4%) observing the students while the
teachers in Classes 1, 6, 7 and 8 averaged between 16.0% and
20.0 percent.

During the time allocated for practice the teachers would
sometimes join with the students and participate in the
activity. Although Teacher Participation occurred for only
3.8% of the time, the standard deviations suggest that this
behaviour was used by the teachers for different times during
the lessons.

Only one teacher (Teacher 6) was coded as Officiating.
This occurred when the students were involved in game playing
and learning how to score. No teacher was observed as
Recording Information about the students performance during
the lessons. This indicates that no observable in-class
evaluation was conducted. Dealing with a Social Matter was insignificant and only recorded as occurring in four classes for less than one percent of the time.
CHAPTER SIX

DISCUSSION

The results from Study One represent the behaviour of 48 students across a series of lessons in eight different classes each taught by a different teacher. Each series of lessons had the same instructional goals. Repeated measures of the behaviour of the same students and teachers across a series of lessons provided a more meaningful base than data collected from single lesson observations because repeated measures can assess variability over time (Sidman, 1960). One limitation of the majority of studies on teaching physical education to date is that data has been obtained from the observation of single lessons. While the overall results within the present study are similar to those previously reported from single observations, a lesson by lesson analysis reveals additional information about student and teacher behaviour during the teaching-learning process in physical education.

Student Behaviour.

The present results show that just being in an organized physical education lesson does not guarantee a high degree of physical activity across all classes. The 48 students observed in this study spent less than one third of the lesson time actively engaged in prescribed physical activity. The
amount of engaged time varied between the lessons in each of
the eight classes. While there was only a small difference
between the high, average and low achievers in each class, the
high achievers were recorded overall as having the highest
Motor-on-Task behaviour.

Overall, only one fifth of the total lesson time was used
in Motor-on-Task behaviour related to skill learning. While
this overall result is similar to that reported in other
studies (e.g. McLeish, Howe and Jackson, 1981; Pieron, 1983;
Costelle and Lauback, 1978; Silverman, Dodds, Placek, Shute
and Rife, 1984; Godbout, Brunelle and Tousignant, 1983; Paese,
1986) the present study showed that differences were evident
between the lessons in each class as well as between classes.
It should be noted that this variability evident in the
present study is not shown in the other research which have
relied on observations from single lessons in different
content areas. In contrast, data for the present study are
taken from a series of lessons in eight different classes all
with common instructional goals.

One explanation for what seems a limited amount of student
Motor-on- Task behaviour (20.9%) in the present study may be
the fact that less than half of the total available lesson
time (45%) was allocated for skill practice. While a high
engagement rate in the learning task may not be sufficient by
itself to produce learning (Dodds, Rife and Metzler, 1982) it
would seem important first to provide students with sufficient
opportunity to be actively engaged with the learning tasks (De
In the present study, the majority of the time allocated for motor skill activity was spent in group activities (31.8%) and game playing (11.8%). The largest discrepancy between allocated time and the percentage of Motor-on-Task behaviour in all classes occurred during the lessons in which large group activities and game playing were included. In these activities the majority of the students in the class were not able to be directly involved in performing the motor tasks. It was during this time that the majority of Indirect Participation (7.8%) and Supporting behaviour (3.4%) was recorded. The high achievers had the least amount of Indirect Participation, suggesting that they were more involved during these activities. Group activities and game playing are an important part of the learning process and have a great deal to offer students. However, teachers should be aware that the structure of the activities within the group and game setting may severely limit the opportunity for many of the students to actually perform the motor skills and therefore gain maximum value from participating in that part of the lesson (Placek and Randell, 1986; Earls, 1983).

An example of an assignment that can limit skill practice occurs when the student is in a Supporting behaviour assisting another student to perform the learning task. This occurred in all classes for small but varying portions of the lesson time. In some cases the observed student acted only in a supportive role during the learning task and never had the opportunity to practise the skill themselves.
Congruent with most studies on student behaviour the present findings indicate that the majority of physical education lesson time was spent in non-motor behaviour rather than on the planned physical activity. Although there was a marked difference between lessons, in each of the classes Cognitive behaviour was the most prevalent behaviour in 37 out of the 41 lessons observed. While it may be the intention of teachers to provide a high percentage of lesson time for physical activity, involvement in cognitive related behaviours with the class inactive seems to be consistently more prevalent than physical activity in physical education lessons (Grant, 1982; Shute et al., 1982; Annarino, 1984; Siedentop, 1983a). Despite this common result, research to date has not been able to identify a strong relationship between receiving information and skill achievement (Yerg, 1981; McLeish et al., 1981; Silverman, 1983). The lack of evidence to either support or refute that an identifiable relation exists between these two variables has been disappointing (Phillips and Carlisle, 1983). It is therefore reasonable to suggest that some of this time could be better used by having students practicing the skills.

As it is necessary for teachers to impart information to students, some cognitive behaviour must occur in physical education lessons. Although teacher effectiveness research studies to date have not clearly identified cognitive involvement as a variable that discriminates between more and less effective teachers (McLeish, Howe and Jackson, 1981;
Pieron, 1982; Yerg and Twardy, 1982; Graham and Heimener, 1981) the importance of providing the students with information, in particular feedback, about the performance should not be dismissed (de Knop, 1986). However, receiving instructions and feedback at the expense of practice opportunities may be less effective for enhancing skill improvement and may even have long term negative implications for skill learning if it detracts from practice time (Salter and Graham 1985) or from opportunities to respond.

The present data showed that remaining student behaviour time was primarily spent in either organizational activities or waiting to be involved in some aspect of the lesson. Overall, the percentage of time spent in Organization and Waiting behaviour for most classes in the present study was considerably less than results reported in most other student behaviour studies in physical education. For example, many studies report that at least one fifth of the lesson time is spent waiting. While the results for most classes in the present study are relatively low (e.g. around 14.8%) by comparison to some data, it should be remembered that the nature of the lesson content does influence student behaviour (Pieron, 1982).

The percentage of lesson time spent in Waiting behaviour and Organization behaviour has been cited in teacher effectiveness research as being a difference between classes taught by less and more effective teachers, with less effective teachers having their students spend more time in
Waiting and Organizing behaviours. Waiting and organizing time contributes to a lower percentage of time being spent in skill learning activities in lessons taught by the less effective teachers. The results in the present study show a corresponding pattern (although teacher effectiveness was not considered). The students in the two classes in which the most Waiting, Bystanding and Organization behaviour was recorded had the least amount of Motor-on-Task behaviour. In the two classes in which the greatest amount of Motor-on-Task behaviour occurred the lowest Waiting, Bystanding and Organization times were recorded. These latter two classes also had the least variability for Waiting and Organization behaviour, indicating that the lesson time was used more consistently. The amount of lesson time spent in Waiting and Organization behaviour partially reflects how effectively the teacher maintains the momentum of the lesson by using established routines and by structuring the learning tasks to ensure minimum disruption to student participation (Siedentop, Mand and Taggart, 1986).

While Modifying and Bystanding behaviour were not prevalent in the present results, the frequent occurrence and characteristics of these behaviours justifies identifying them separately when observing student behaviour in physical education lessons.
Variability in Student Behaviour.

The pattern across lessons in each class indicated that student behaviour was not consistent either within or between classes, suggesting that each lesson had its own unique qualities. The behaviours appeared to be specific to each lesson rather than to the class, supporting evidence that classes do not behave in predictable ways (Rushall and Richards, 1981). For example, spending more time in Motor-on-Task behaviour did not necessarily mean less time in Waiting behaviour in the same lesson. The instability of many patterns of behaviour between lessons is attributable to the uniqueness of the lesson events and not necessarily to the quality of student or teacher (Rink, 1983).

There was a noticeable increase in the amount of lesson time allocated for physical activity as the instructional units progressed from first to last lesson in each class. However, the pattern of Motor-on-Task behaviour across lessons within each class either decreased or remained relatively constant. Examining Motor-on-Task behaviour on a class by class basis showed the "funnelling effect" (see Chapter 2) as occurring to varying degrees in all classes.

The distribution of student behaviour across time was also inconsistent across the lessons in each class. The sequence of lesson events seems to have a strong influence on student behaviour, supporting the argument that behaviour is strongly
related to prior and subsequent events within a lesson (Olsen 1983). Therefore, identifying the pattern of the instructional content might help explain the variance between physical education lessons. The instructional patterns identified in the lesson momentum graphs (Figure 7) showed that the structure of each lesson in terms of how the lesson time was allocated for on-task behaviour was different. The influences of this on student behaviour during each lesson appears to be marked. In addition, the teachers often focused on the activity and disrupted the learning activities of the whole class without regard for the behaviour of the individual student.

Although student behaviour might not need to be consistent across lessons, it would seem that teachers should arrange the learning environment so that the students are engaged for an optimal amount of time in behaviours that result in learning (Medley and Crooks, 1980). It can be concluded that the Motor-on-Task behaviour of many of the students in the present study was limited by the constraints of teacher organization patterns within each lesson.

Performance With the Learning Trials.

While the percentage of Motor-on-Task behaviour varied between and within the eight classes, the lessons in which Motor-on-Task behaviour was more prevalent did not necessarily mean that the students obtained more practice (i.e. performed more learning trials). The results showed that allocating
more time for practice will not automatically increase time involved with the task or increase the number of trials performed and therefore improve learning. The present results agree with Pieron (1983) and Ratcliffe (1986) in suggesting that there is a need to investigate not only the amount of activity time but also the quality of student engagement with the learning tasks during this time. Although the number of practice trials has been used to differentiate between more and less effective teachers (Pieron, 1981) the present study suggests that it may in fact be student success rate which is most important for student learning (Pieron, 1983).

In the present study there was approximately equivalent opportunity to participate provided for each of the three achievement groups in each class. As a result there was virtually no disparity in the number of trials of particular skills performed by the three achievement groups in each class. However, there was a notable difference in the ratio of successful to not successful trials performed between the three achievement groups in each class. This was particularly noticeable between the high and low achievers. The results of the present study are congruent with the findings of Pieron (1983) and Wuest, Mancini, van der Mars and Terrillion (1986) who also noted that the high achievers had greater success with the learning trials than did other students.

It has been suggested that students should have a success rate of approximately 80 percent or greater when involved with learning tasks (Siedentop, 1983a). In the present study the
high achievers and some of the average achievers were observed as having met this optimal success rate throughout the entire instructional unit. The remaining average achievers and some of the low achievers had only moderate success (60% to 75% success) while participating in the learning tasks. Predictably, the remaining low achievers had minimal success (less than 60% success) while performing the learning tasks during the instructional unit. After examining the relationship between Motor-on-Task behaviour, the number of learning trials performed and student achievement Silverman (1985) and Graham (1983) found that practising at an appropriate level of success produced learning gains in skill performance while practising at an inappropriate level of success was negatively related to achievement. It would seem, therefore, that when practising tasks the ratio of successful performances is more positively related to achievement than is motor-on-task time.

From the data of the present study it can be inferred that approximately half of the students did not meet levels of success during the instructional unit that might enhance their learning of the skills being taught. Three factors that may have contributed to the discrepancy between achievement groups in this study are suggested. First, a whole class practice situation was used for the duration of the majority of the lessons in all classes and this disadvantaged some students. This would seem to suggest the need for more flexible teaching strategies to be used by the teacher to cater for all
students. Secondly, when group activities were used the students of similar skill level tended to work together. This appeared to minimize the success rate particularly for the low achiever unless the tasks were performed in very controlled situations. Thirdly, as a result of the teacher changing the focus of the ongoing activity many of the tasks were often presented in isolation of each other. This instructional mode detracts from the momentum of the lesson (Siedentop, Mand and Taggart, 1986) and limits the opportunity for the students to persevere with one skill in a variety of ways for a reasonable period of the lesson time. This occurred in the present study. Such perseverance may be especially important for low achieving students, whereas high achievers may get reasonable and successful practice from a few trials.

The results of the present study support the belief that observing both the quantity and quality of student motor-on-task behaviour provides worthwhile data on student learning (Berliner, 1982; Yerg, 1981; Siedentop, 1983b; Paese, 1985; Pieron, 1981). It is possible to have the students engaged in the learning tasks for a high portion of the allocated time but for the teacher to be unaware of the quality of their performance.

In addition, it was evident in the present study that none of the students were expected to obtain a predetermined performance level, nor was there any formal evaluation conducted by teachers at either the conclusion of a task or at the end of the instructional unit. If students behave
according to what they are held accountable for then in physical education it is apparent that accountability is not always based on the successful practice of motor skills (Tousignant and Siedentop, 1983). The only accountability apparent in the present study was that the students should participate and should not disrupt the lessons. Although the goals of the lessons were always stated, there was no evidence of an evaluation procedure for determining the rate or quality of student learning. This reflects the findings of Imwold, Rider and Johnson (1982) after studying the use of evaluation in school physical education.

If learning is viewed as a process rather than an outcome (Smyth 1980) then teachers must develop effective managerial and instructional systems (Tousignant and Siedentop, 1983; Placek and Randall, 1986) to optimize participation and task engagement throughout the lesson. In particular the amount of time the students are directly engaged with the performance of the motor skills while experiencing a reasonable high rate of success must be maximized (Phillips and Carlisle, 1983; McLeish, Howe and Jackson, 1981; Pieron, 1981; Silverman, 1985; Metzler, 1986). While not all increments in time-on-task yield improvements in student achievement, research increasingly suggests that successful skill practice is of great importance (Locke, 1982). From this perspective it can be stated that in the present study many of the students were behaving in a ways that did not optimize learning.
Teacher Behaviour.

The results of the present study showed that teacher behaviour was neither stable across lessons nor similar between the eight different teachers. This supports the conclusion by Rushall and Richards (1981) that physical education teachers generally do not instruct in a consistent way. In contrast to this Lombardo (1982) showed that only minimal variations occurred in teacher-student interaction patterns over successive days in physical education classes. Other studies suggest that individual teachers do develop consistent patterns of instruction but that their patterns are specific to selected parts of a lesson and many not be continually used in all lessons (Nygard, 1975; Cheffers and Mancini, 1978; Olsen, 1982).

The teachers in the present study were recorded as spending one-third of their time providing the students with content related information while the class were inactive. This information was presented in the form of either Preparatory Instruction (accounting for 25.7% of the class time) or Modelling (accounting for 7.0% of the class time). The benefits of involving the students with so much cognitive involvement in relation to achievement gains in the motor skills is questioned. It is then reasonable to suggest that the instructional patterns of the teachers need to be modified to provide more time for student participation. It is possible to give directions and interact with the students concurrently while keeping the momentum of the lesson free
from events that reduce the rate of student participation. This procedure can help produce a more task oriented atmosphere (Siedentop, 1983a). Teachers do have the potential to vary and modify their behaviour (Lombardo, 1982; Siedentop, 1986; Dunbar and O'Sullivan, 1986). While the type of pre-lesson decisions will influence and determine the upper limits for active learning time, well-planned lessons can result in increased learning opportunities (Metzler and Young, 1984).

The teachers in the present study were highly interactive with the students as a group and taught the classes as a whole for much of the lesson. However, providing a great deal of skill related interaction with the class group does not guarantee a high rate of individual student successful skill practice (McEwen and Graham, 1982). It is not yet clear which teacher behaviours or multiple constellations of teacher behaviours can produce high levels of successful motor-on-task behaviour and the best learning gains (Dodds, Rife and Metzler, 1982).

To develop a strong subject matter focus teachers must be skilled managers. As in many other studies (e.g. Anderson, 1978; Linette, Pariire and Coron, 1986) the teachers in the present research were recorded as using approximately one fifth of the lesson time for management related matters. The effect of teacher management behaviour on student motor-on-task behaviour can not be generalized. For example, although Classes 5 and 8 were recorded as having the most and similar amounts of Motor-on-Task behaviour, the teacher of Class 5
consistently used ten percent of the lesson time in management tasks where as the teacher of Class 8 was inconsistent between lessons and overall spent 21.6% of the time in management behaviour. The teacher in Class 8 often performed management tasks while the students were involved in motor-on-task behaviour. Physical education teachers have been reported as remaining within their pre-lesson plans in spite of different student needs within the class (Lombardo and Cheffers, 1983). If this is common it may also account for the difficulty many teachers experience in effectively managing and organizing the class activities spontaneously in order to respond to individual student needs. The outcome of poor managerial skills often results in fewer opportunities for students to participate in the learning tasks (Brophy and Evertson, 1976; McDonald, 1976; Locke, 1977).

Data gathered in the present study indicated that the teachers spent only very short periods of time performing the same function and were frequently changing from one mode of behaviour to another. This appeared to vary depending on the demands of the learning environment and nature of the tasks being performed. In determining the effectiveness of teaching behaviour on student learning it should be remembered that a given behaviour might produce positive effects under one set of conditions while negative effects are produced in other circumstances (Ornstein, 1985). Therefore the appropriateness of the teacher's behaviour should be judged in relation to what the students do during the lessons. It is student
behaviour during the physical education lessons which ultimately affects their level of achievement on the prescribed motor tasks (Yerg, 1981).

Summary.

The data from the 41 lessons observed in the present study showed similar patterns to those evident in other research on student and teacher behaviour in physical education. The present results showed that much of the lesson time available was not used effectively by the teachers to ensure that the students had the optimal opportunity to practice and successfully perform the motor skills being taught. A feature of the present study was the use of repeated measures to examine individual student behaviour across a series of physical education lessons with a common goal. This strategy showed that first, there was a marked difference in the amount of Motor-on-Task behaviour between the eight classes and within the lessons in each class, and second, that there was a noticeable difference in the accuracy of the performance of the motor tasks between the high, average and low achievers within each class. While all the students in a given class had a similar amount of involvement with the learning tasks, the high achievers always had a much higher rate of success than either of the other two achievement groups. This would appear to accentuate the difference in skill level between the achievement groups. This relates to the earlier reason that for some classes the high achievers (i.e. those who enter with
the most skill) get more opportunities to successfully practise skills, while the majority of students (the moderate and low achievers) get a higher percentage of inappropriate opportunities to practise skills with success.

If keeping students involved in appropriate learning behaviour is an important characteristic of teaching effectiveness in physical education then the efficiency of many current instructional strategies is questionable. The findings from the present study suggest that there are important challenges for teachers and teacher educators in devising ways to increase the amount of learning behaviour, and specifically, accurate practice that occurs during instructional units in physical education.
CHAPTER SEVEN

STUDY TWO.

Introduction.

The data from the first study of teachers showed that only about half of the available lesson time was allocated for student participation; that many of the students were engaged with the learning tasks for only approximately twenty percent of the lesson time; and that the average and lower achievers in particular had only limited successful participation in the assigned skill practice.

Time-on-task engaged in activities at an appropriate level of difficulty, and experiencing reasonable success in practicing a skill are factors that may determine learning in physical education (Lawson, 1983; Siedentop, Mand and Taggart, 1986). It is important, then, that teaching strategies for physical education lessons attempt to enhance opportunities for successful practice by students. Earls (1983) suggested that teachers may improve their effectiveness by evaluating the effects of their actions on the quality of student response. Focusing on teacher response is given greater credence considering teacher behaviour does change across time and vary between lessons (Pieron, 1982; Rink, 1983; Gusthart, 1985).
Teaching skills can be learned and modified. Behaviour analysis techniques, for example, have been used to specify and to modify teacher skills (Siedentop, 1986). Other research (eg. Borys, 1986) however, has suggested that training to help teachers change their teaching strategies should not be to prescriptive. It is unlikely that teachers will allow experimental research to proceed in their setting unless the proposed changes are satisfying to them (Siedentop, 1982). Dodds (1983) supports this view and claims there is no simple or single situation for teachers who want to produce higher levels of active learning time. Excessively tight specification may mean that the strategies do not suit an individual teacher and so will not be maintained beyond the intervention training. From this perspective it is important that teachers chose features of their own teaching skills and organization of the learning environment that they wish to change (Anderson, 1983; Metzler, 1983; Placek, 1983). Such changes need to be monitored and analyzed so the variables to which the change may be attributable can be identified (Siedentop, 1981). However, researchers who have endeavoured to increase the amount of active learning time in physical education have reported mixed success (Placek and Randall, 1986; Harrison, 1987).
Statement of the Problem.

The second study evaluated one approach to modifying teaching skills. This approach involved observing the teacher during physical education lessons and providing the teacher with systematic information on their behaviour and on student behaviour. The teacher was then free to devise his or her own strategies for improving aspects of the lesson.

The aim of the second study was to assess teacher response to feedback about their teaching and to evaluate the effect of this feedback on teacher and student behaviour while teaching physical education lessons. This involved providing teachers with detailed feedback on student and teacher performance using data from observations of a series of lessons previously taught by that teacher. Specifically, the study set out to:

(1) Assess the effect of providing teachers with feedback about their teaching performance and patterns of student behaviour on the amount and success rate of motor-on-task behaviour over a series of related physical education lessons.

(2) Examine the effects of teacher feedback intervention on the organization of the content of the physical education lessons.

(3) Identify what differences exist in teacher and student behaviour between instructional units taught prior to and following teacher feedback intervention.
METHOD

Participants.

Teachers Three teachers included in the first study were invited to participate in Study Two of the research. The teachers had not received any feedback about the results of their teaching during the first study. The same procedures as those used in the first study were used for obtaining teacher approval for class visits prior to data collection and for initial observing of lessons in order to minimize student and teacher reactivity.

Students. All teachers taught classes that were scheduled routinely as a part of the school programme. The number of students in each class was determined at the beginning of the school year. In each class six students comprising two high achievers, two average achievers and two low achievers were randomly selected to be observed for the study. The procedures for selecting the participants were the same as those used in Study One of the research.

Setting

All instruction and observation took place in the natural setting of the school gymnasium to ensure ecological validity for the study (Tousignant, 1982). Each teacher had access to a minimum ratio of one volleyball for every two students in the class. The number of lessons to be taught to each class was determined by the school’s overall physical education
curriculum plan. No additional constraints were imposed by the study on timing, scheduling or location of classes.

The Instructional Unit

All lessons observed were taught during the winter term. Each teacher was asked independently to plan and teach two consecutive instructional units to two separate third form classes. The instructional units had the same goals as used in Study One of the research (see Appendix B). The aim of the instructional unit was to teach three basic volleyball skills at the introductory level, the dig, the set and the serve. All teachers independently planned and implemented a series of lessons designed to meet the stated objectives. The teacher’s determined their own methods of instruction and lesson organization.

PROCEDURES

Observation Procedures.

The observer training procedures, methods of determining interobserver agreement and the observation procedures themselves were the same as those reported for the first study of the present research thesis (see Chapter 4). Teacher and student behaviour was observed on a rotational basis during each lesson using the modified ALT-PE observation system. The same observation procedures were applied during baseline and intervention stage. The present intervention research was
undertaken in conditions under which the behaviours of interest normally occur (Sidman, 1960).

Research Design.

The overall research strategy involved, first, collecting observations of teacher and student behaviour during an instructional unit. Data from these observations were then used as an intervention strategy which provided the teachers with precise and detailed information about what happened during the series of lessons in the instructional unit. Further observations were then collected over a series of lessons comprising a second instructional unit. These observations were used to assess how the teachers had changed their behaviour, how they organized the instructional setting and whether student performance in these lessons was different from that during lessons in the previous unit.

The elements of a within subject design provided the experimental basis for the study. These elements are repeated measures within subjects, a baseline phase (determining the natural frequency of the behaviour against which subsequent change might be evaluated) and an intervention phase (introducing a predetermined event to change the frequency of the measured behaviour). Repeated measures were taken prior to and following the change being introduced. A multiple baseline across persons (in the present case teachers) was used in the present study. Intervention was introduced for one teacher while baseline measures continued for classes taught by a second and third teacher. Intervention was later
introduced to the second teacher. The third teacher was not involved with the intervention and so data from his classes provided control comparison data. Three classes were taught successively by each of the teachers and each class involved a different group of students. It is important to note that while the intervention focused on teacher behaviour the assessment of teacher change involves both teacher and student behaviour. The specific research design used in this study is described in Figure 9.

Data from the instructional unit described as Study One in the present research served as the initial baseline for the present study, Study Two. Teacher feedback intervention with Teacher 1 preceded the teaching of Class 2, the first class to be taught in Study Two of the research. During intervention with Teacher 1, baseline measurements continued for Teacher 2 and Teacher 3. At the completion of Class 2, and before Class 3, teacher feedback intervention was applied with Teacher 2. Baseline measurements continued through Class 3 with the third teacher. Observations of Class 3 provided follow up data for Teacher 1. No feedback was provided for Teacher 1 during this phase. In this design no intervention was applied to Teacher 3 who therefore served as a control across the entire period of the study. Assurances were obtained from the teachers that they would not discuss their involvement with any other teachers.
FIGURE 9: Multiple baseline across teachers research design for examining the effects of teacher feedback intervention on teacher and student behaviour.
Two issues that must be addressed in within subject experimental designs are internal validity and external validity or generalization of the results. The internal validity for the present study is established by a multiple baseline design that uses data from three teachers who were each observed teaching the same instructional unit in the same environments to three separate classes. While the students for each instructional unit were different, the classes were of similar skill level, size and the same age group. Having different students clearly complicates the interpretation of differences in student behaviour across classes. However, there was no way to avoid this problem where the aim was to undertake an ecologically valid study of a series of lessons while preserving the normal school organization and teaching sequences in physical education. The school organization was such that teachers introduced the same teaching unit successively to different classes of students.

The generalization of findings from within subject studies rests on replication. Using a clearly explicated and logical research design and utilizing reliable measuring devices both enhances the internal validity of the present study and supports future replication of the study by independent researchers.
Intervention Procedures.
The intervention consisted of the following:

1. Obtaining informed consent from each of the three teachers to allow the researcher to observe several lessons and to meet with them to provide feedback.

2. Each teacher was invited to visit the researcher at his office for a personal conference which provided feedback about the teaching observed while teaching the instructional unit to the previous class. This occurred one week before teaching the first lesson in the intervention instructional unit.

3. Observation data from the lessons of the baseline class were graphed and presented visually for discussion with the teacher. The researcher provided a brief explanation of the main findings. After presenting an overview of the data the teachers were invited to question the findings and share ideas on how the instructional strategies and lesson organization could be changed to enhance the level and appropriateness of student participation. In presenting the data the researcher directed specific attention to:

- The momentum of the lesson as indicated by the relation identified between the context variables. For example, how often physical activity was stopped to give information and how much lesson time was used up by teacher talk before skill practice began.
- The number and quality of learning trials the individual students performed in each separate task during each lesson. Some of the reasons why differences between students occurred were also discussed. For example, the pairing of low achievers with other low achievers produced many unsuccessful trials, while in the Game setting the high achievers dominated a game thus limiting the opportunities for the low achievers to practice.

- The variety of learning tasks used for teaching and refining the skill performance.

- The teacher's role during that part of the lesson time when the students were practicing motor skills. Teachers might spend this time observing, providing, feedback, giving new instructions for some or all of the class while the students were participating.

During the discussion the researcher acted as a consultant to the teacher and assisted the teacher to make decisions about appropriate changes. If the teacher asked the researcher's advice then two alternatives were always provided to ensure that the teacher still had to make the final decision.

4. A series of probe questions was asked to satisfy the researcher that the teacher had a clear understanding of what the intention of the intervention was and what some of the possible alternatives were for achieving a greater degree of student participation during the next series of
lessons that were observed. Examples of the questions asked:
- How could concurrent instructions be used to maintain the momentum of the lesson?
- Is it feasible to have different groups of students working at different tasks of an appropriate level of difficulty at the same time?
- What percentage of the lesson time do you believe should be allocated for students to participate in the skill learning activities and how can this be achieved? Do some students need more time to learn the same skills?
- What can you do to ensure that all the students in the class are successfully on-task for a higher percentage of lesson time than in the previous instructional unit?

5. During the intervention phase, any questions asked by the teacher were answered by the researcher using data from the lesson observations.

6. At the completion of the research observations all teachers were separately given feedback about their behaviour and student behaviour. Each teacher was interviewed to obtain their comments on the value of the intervention strategy.

Data Analysis.
All data for Study Two is presented using means and standard deviations as descriptive summary statistics for Student behaviour, Teacher behaviour and Class Context. Absolute values could not be used since there were variations
with regard to the duration of each lesson. Therefore the frequency of occurrence for each category is shown as a percentage of class time. Responses were graphed to allow visual inspection.

Although interpretation of results presented for visual analysis can be made more difficult by excessive variability, it is an appropriate analytical form for reporting data obtained using repeated measures in a single subject research design (Carver, 1978; Ballard, 1986; Smith, 1981). Visual inference from time series data can be subjective and interpretation may differ between individuals (Wampold and Furlong, 1981). However, the value of visual analysis is that the reader is presented with the raw data from the study or a close approximation to the raw data in the form of response rates from each lesson and average rates for each class.
The observers used in Study One were employed to collect the observational data for Study Two. At the completion of a retraining programme and prior to observing the lessons in Study Two, interobserver agreement was determined on an interval by interval basis. Percentage of agreements between observers were obtained for the Context level and for the behaviour of the target participants. To count as an agreement the same Context category as well as the same Student behaviour category had to be recorded by both observers during the five second observation interval. When data collection began, at least one interobserver agreement check was made in each of the six classes taught in the study. A total of six checks were made, each for a ten minute period (i.e. 40 intervals) but not at a set time during the lesson. Overall, interobserver agreement was checked for a total of 480 intervals (2 x 6 x 40) throughout the study. The interobserver agreement results are presented in Table 17. The data show that all levels of interobserver agreement after re-training and during the study were greater than 86 percent with a mean interobserver agreement of 90 percent (range 86.4% to 93.6%).
TABLE 17
Interval by interval percentage of interobserver agreement (study two).

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<tr>
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<th>PERCENTAGE AGREEMENT</th>
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</thead>
<tbody>
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<td><strong>Pre-Study Check</strong></td>
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<tr>
<td>Researcher and Observer 1</td>
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<tr>
<td>Researcher and Observer 2</td>
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<tr>
<td>Observer 1 and Observer 2</td>
<td>93.6%</td>
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<td><strong>In-Study Check</strong></td>
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<td>Teacher, Class, Lesson</td>
<td></td>
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<tr>
<td>T1 C2 L2</td>
<td>Observer 1 and Observer 2 92.4%</td>
</tr>
<tr>
<td>T1 C3 L1</td>
<td>Researcher and Observer 2 89.6%</td>
</tr>
<tr>
<td>T2 C2 L3</td>
<td>Researcher and Observer 1 93.6%</td>
</tr>
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<td>Observer 1 and Observer 2 90.4%</td>
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<td>T3 C2 L1</td>
<td>Observer 1 and Observer 2 86.4%</td>
</tr>
<tr>
<td>T3 C3 L2</td>
<td>Researcher and Observer 2 89.6%</td>
</tr>
</tbody>
</table>
RESULTS OF STUDY TWO.

The three teachers in the current study each taught the same instructional unit on volleyball to three separate third form classes. The first of the three classes was taught during Study One. Intervention in the form of feedback on teacher and student performance was provided to two of the three teachers. Throughout this chapter the teacher who had received feedback after teaching the instructional unit to one class is referred to as Teacher 1. The teacher who received feedback after teaching the instructional unit to two classes is referred to as Teacher 2. The teacher who taught the instructional unit to three classes and who did not receive any feedback is referred to as Teacher 3. For student data the percentage of occurrence for each student behaviour category is presented initially as a composite result for the three student achievement groups.

Overview of Main Outcomes for Study Two.

Overall, the results of Study Two showed that during baseline conditions the students in the three separate classes taught by their respective teachers displayed similar amounts of Motor-on-Task behaviour. Following intervention for Teacher 1 and Teacher 2 respectively, there was a noticeable increase in the amount of student Motor-on-Task behaviour across all lessons. This was accompanied by an increase in the number of learning trials performed by all the students in
these classes. However, an overall improvement in the percentage of success with which the students performed the learning trials occurred only for the students taught by Teacher 2 following feedback intervention.

The baselines for Teacher 1 and 2 and the on-going observations of Teacher 3 across the entire study showed relatively consistent patterns of teacher and student behaviour. As the changes in student behaviour occurred only at the time of teacher feedback intervention, some justification is claimed for identifying the change as a result of the intervention. The results are now presented separately for Student behaviour, Class Context and Teacher behaviour.

STUDENT BEHAVIOUR

Introduction.

The overall effects of intervention are shown in Table 18. It can be seen from Table 18 that following teacher feedback intervention for Teacher 1 and Teacher 2 there was an average 14% and 15% increase respectively over baseline measures in the percentage of student Motor-on-Task behaviour. For Teacher 3, who did not receive teacher feedback intervention, Table 18 shows that average Motor-on-Task levels for his students varied by only 5% across the three classes. Although there was a slight reduction in the amount of Motor-on-Task behaviour in the follow-up phase for Teacher 1 (Class 3) the
follow-up level for Teacher 1 was still greater than that observed during baseline.

The lesson by lesson data of the predominant student behaviour categories are presented graphically in Figure 10 and Figure 11 respectively. Categories of Off-Task, Bystanding, Warm-Up and Motor Modified are not included in these figures because they occurred at extremely low rates. Figure 10 shows that the amount of student Motor-on-Task behaviour increased in each of the classes taught Teacher 1 and Teacher 2 following teacher feedback intervention. Figure 10 also shows that, following intervention, there was less variability in Motor-on-Task behaviour between the lessons in each class for Teacher 1 and Teacher 2. There was no common pattern of change for the other student behaviour categories. Figure 11 shows that there was a reduction in Waiting behaviour for the students in the classes taught by Teacher 1 following intervention while no change in this behaviour was recorded for the students in the class taught by Teacher 2 following feedback intervention.

Table 18 and Figures 10 and 11 indicate that the percentage of occurrence for all student behaviour categories for classes taught by Teacher 3 (the control teacher) remained relatively consistent across the three different classes although there were some within class differences in the lesson by lesson pattern.

Figure 12 presents the number of trials performed per lesson by the three achievement groups within each class.
These data show that overall, the students in the classes after Teacher 1 and Teacher 2 received intervention feedback performed more learning trials compared with the students in the baseline classes for those teachers. From Figure 12 it can be seen that students in classes taught by Teacher 3, who did not receive intervention feedback, show a more consistent pattern across the three classes and across each lesson.

Figure 13 shows, that although the number of learning trials increased for classes taught by Teacher 1 and Teacher 2 following intervention, this increase was not reflected in a consistent improvement in the proportion of trials completed successfully. From Figure 13 it can be seen that for Teacher 1 following teacher feedback intervention there was a slight decrease in success rate of students compared with the success rate of the baseline students for all three achievement groups in the baseline class taught by Teacher 1. In the case of Teacher 2, after teacher feedback intervention students performed the learning trials with more success than had the baseline students. Figure 13 shows that the rates of success varied between achievement groups across the three classes for Teacher 3.
TABLE 18

Proportion of lesson time spent in each modified ALT-PE student behaviour category by all students during the baseline, intervention and follow-up phase for teacher 1 and 2 across all classes for teacher 3 (means and standard deviation).

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<tr>
<th></th>
<th></th>
<th>BASELINE</th>
<th></th>
<th>INTERVENTION</th>
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<th>FOLLOW-UP</th>
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<td>CLASS 2</td>
<td>CLASS 3</td>
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<td></td>
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<td>(\bar{x})</td>
<td>(SD)</td>
<td>(\bar{x})</td>
<td>(SD)</td>
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<tr>
<td>Not Motor-Engaged</td>
<td></td>
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<td>16.0</td>
<td>23.3</td>
<td>4.0</td>
<td>32.2</td>
<td>4.1</td>
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<td>9.3</td>
<td>2.0</td>
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<td>4.1</td>
<td>1.5</td>
<td>8.6</td>
<td>3.7</td>
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<td>0.6</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Motor Engaged</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warm Up</td>
<td>7.0</td>
<td>1.7</td>
<td>7.9</td>
<td>3.0</td>
<td>7.6</td>
<td>1.8</td>
</tr>
<tr>
<td>Motor-on-Task</td>
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<td>6.8</td>
<td>25.9</td>
<td>4.6</td>
<td>20.9</td>
<td>1.8</td>
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<tr>
<td>Motor Modified</td>
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<td>1.6</td>
<td>1.5</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Supporting</td>
<td>2.9</td>
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<td>6.3</td>
<td>3.2</td>
<td>9.4</td>
<td>2.5</td>
</tr>
<tr>
<td>Interim</td>
<td>4.2</td>
<td>2.1</td>
<td>3.1</td>
<td>2.1</td>
<td>4.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Indirect Participation</td>
<td>3.3</td>
<td>3.8</td>
<td>1.8</td>
<td>1.9</td>
<td>4.0</td>
<td>2.6</td>
</tr>
</tbody>
</table>
FIGURE 10: Percentage of occurrence for motor-on-task, indirect participation, support and interim student behaviour for each lesson in the baseline, intervention and follow-up phase for teacher 1 and 2 and across classes for teacher 3.
FIGURE 11: Percentage of occurrence for cognitive, organization and waiting student behaviour for each lesson across all classes in the baseline, intervention and follow-up phase for teacher 1 and 2 and across classes for teacher 3.
FIGURE 12: Number of learning trials performed by the high, average and low student achievement groups in each lesson during the baseline, intervention and follow-up phase for teacher 1 and 2 and across classes for teacher 3.
FIGURE 13: Percentage of success on skill learning trials in each lesson for the high, average and low student achievement groups during baseline, intervention and follow-up phase for teacher 1 and 2 and across classes for teacher 3.
Changes in Student Behaviour Within and Between Classes.

Mean percentage data and variability for each student behaviour category are presented in Table 18. Table 18 shows the most notable change following teacher feedback intervention involved an increase in Motor-on-Task behaviour in the classes taught by Teacher 1 and 2. As indicated by the standard deviations in Table 18 the between lesson variability for Motor-on-Task behaviour was also lower in these post-intervention classes than in the baseline classes. For the three classes taught by Teacher 3, the control teacher, the mean percentage of Motor-on-Task behaviour did not vary by more than 5% across classes.

Table 18 shows that following teacher feedback intervention there was a reduction in the amount of Warm-Up behaviour for the students in the classes taught by Teacher 1. No Warm-Up behaviour was recorded for the students in the post-intervention class taught by Teacher 2. The students in each of the three classes taught by Teacher 3 spent the same amount of time in Warm-Up behaviour.

From Table 18 it can be seen that following intervention for Teacher 1 and 2 and in the follow-up phase for Teacher 1 there was an increase in student Interim behaviour. Because of the characteristics of Interim behaviour (e.g. retrieving a ball after a practice trial) it is reasonable to expect that an increase in this behaviour would accompany an increase in Motor-on-Task behaviour. Students in successive classes taught by Teacher 3 did not differ in the amount of Interim behaviour.
Table 18 and Figure 10 shows that there was a reduction in the amount of Indirect Participation behaviour experienced by the students in the post-intervention class taught by Teacher 2 and for the students in the follow-up class taught by Teacher 1. This suggests that fewer large group activities were used in lessons taught to classes following intervention. In contrast, a slight increase in Indirect Participation across the three classes was noted for Teacher 3. Supporting behaviour was slightly reduced for the students of Teacher 1 after teacher feedback intervention, remained constant across the three classes for Teacher 2, but increased considerably over the three classes for Teacher 3. Only very small amounts of Modified Motor behaviour were recorded as occurring in any of the classes taught by the three teachers.

The two other most notable changes to occur following feedback intervention were a decrease in the amount of Cognitive and Waiting behaviour. Table 18 shows that overall there was a 7% reduction in Cognitive and Waiting behaviour for the students of Teacher 1 and a 6% reduction in the amount of Cognitive behaviour for the students of Teacher 2. Across the three classes taught by Teacher 3 a 5% between class difference was recorded in the amount of time that was spent in Cognitive behaviour while the amount of time spent in Waiting behaviour varied between 7 and 15 percent.

Table 18 shows that the students in the classes taught by Teacher 1 spent considerably less time in Waiting behaviour in the post-intervention classes than students in the baseline
class. This change was not observed in the intervention class taught by Teacher 2. However, there was a notable difference in the amount of time spent in Waiting behaviour between the three classes taught by Teacher 3, the control teacher.

Similar amounts of time were recorded for the students' behaviour in the category Organization behaviour across the classes taught by Teacher 1 and 3 while a slight increase occurred across the three lessons for Teacher 2. Overall, the students in each class averaged approximately 10% of the observed lesson time in Organization behaviour. Bystanding behaviour occurred for less than 1% in each class. The standard deviations indicate that this behaviour did not occur in every lesson in each class. No Off-Task behaviour was recorded as occurring in any of the nine classes observed in this study.

Following teacher feedback intervention the only notable change to occur for any student behaviour was an increase in Motor-on-Task behaviour for students in the post-intervention classes.

Trends in Student Behaviour Within and Between Classes.

As reported in the results section for Study 1 of the present research, examining the occurrence of student behaviour on a lesson by lesson basis helps to identify the degree of behaviour variability within each class. Such a detailed description of student behaviour helps illustrate the effect of teacher feedback intervention over a series of
related but different lessons taught by the same teacher.

Figure 10 shows the lesson by lesson data for Motor-on-Task behaviour, Supporting behaviour, Interim behaviour and Indirect Participation behaviour. Figure 11 shows the lesson by lesson occurrence of Cognitive behaviour, Organization behaviour and Waiting behaviour. The results for classes taught by each teacher are discussed separately.

**Students Taught By Teacher 1.** The first class taught by Teacher 1 was taught under baseline conditions. The second class was taught after the teacher was provided with feedback about the baseline class. The third class served as the follow-up phase. From Figure 10 it can be seen that during baseline there was considerable variability for all behaviours. Figure 10 shows that for Teacher 1 the most notable change to occur in student behaviour following teacher feedback intervention was the substantial increase in Motor-on-Task behaviour among students in the class taught following intervention. This increase was maintained but at a slightly lower level during the follow-up phase. The only common between class pattern of student behaviour evident in Figure 10 for classes taught by Teacher 1 was that the greatest amount of Motor-on-Task behaviour always occurred in the first lesson for each class.

Figure 10 shows that there was a little change overall in the frequency of occurrence of Supporting behaviour for Teacher 1's students. No change occurred in Indirect
Participation behaviour in the intervention class but this behaviour did not occur in Class 3, the follow-up phase for Teacher 1. Figure 10 shows that the percentage of Indirect Participation behaviour varied considerably between lessons in the first two classes taken by Teacher 1 with the greatest amount being recorded during the lessons in which the least amount of Motor-on-Task behaviour occurred. Interim behaviour was stable across Teacher 1's three classes.

Figure 11 shows that a lower level of Waiting behaviour and Cognitive behaviour occurred for the students in Teacher 1's intervention class compared with that of the baseline class. However, an increase in both behaviours were recorded for the students in the class observed during the follow-up phase. There were only small differences in organization behaviour for Teacher 1's students in the baseline, intervention and follow-up phases.

Students Taught By Teacher 2. The first two classes taught by Teacher 2 were taught under baseline conditions. The third class was taught after providing the teacher with feedback about the two baseline classes. There was no follow-up phase. From Figure 10 it is evident that for the students in the class following teacher feedback intervention for Teacher 2 there was a higher level of Motor-on-Task behaviour than for the baseline classes. The rate and consistency of occurrence for this behaviour was considerably higher than in either of the two baseline classes taught by Teacher 2. Figure 10 shows
that Supporting behaviour and Interim behaviour, and Figure 11 shows that Waiting behaviour and Organization behaviour were relatively stable across classes taught by Teacher 2. The pattern for Cognitive behaviour, Indirect Participation and Motor-on-Task behaviour varied substantially between the two baseline classes. As reported for Teacher 1, the lessons in which the students had the least amount of Motor-on-Task behaviour were those in which the highest occurrence of Indirect Participation behaviour was recorded.

From Figure 10 it can be seen that following teacher feedback intervention for Teacher 2 there was a lower level of Indirect Participation behaviour than for classes taught prior to intervention. Figure 11 shows that a decrease in Cognitive behaviour was also reported for the students in this class. The patterns of occurrence for the other student behaviour categories were not noticeably different to that reported in the baseline classes for Teacher 2.

Students Taught By Teacher 3. All of the classes taught by Teacher 3 were taught under baseline conditions. That is, they served as a control to assess the degree of consistency in student and teacher behaviour across three different classes. The overall results for each class presented in Table 18 suggest that only relatively small differences occurred between the three classes for each student behaviour category. However, the lesson by lesson data in Figures 10 and 11 for Teacher 3 show that considerable within class
variability existed for most student behaviours. While there were only small between class differences for Teacher 3 (Table 18) there were noticeable differences in how students behaved on a lesson by lesson basis (Figures 10 and 11). Nevertheless, Figure 10 shows that none of the students taught by Teacher 3 showed Motor-on-Task behaviour at the consistently high levels shown by the post-intervention classes for Teacher 1 and Teacher 2.

Summary of Student Behaviour Within and Between Classes. It is apparent that immediately following teacher feedback intervention there was a marked increase in the amount of Motor-on-Task behaviour for the students in the classes taught by Teacher 1 (+14%) and Teacher 2 (+15%) and that this change was maintained for the students in the follow-up phase in the case of Teacher 1. No marked changes in Motor-on-Task behaviour were observed in the three classes taught by Teacher 3 who served as a control. The increase in Motor-on-Task behaviour for Teacher 1 and 2 did not occur consistently at the expense of any one other student behaviour. Rather, small changes in several different behaviours were recorded in different lessons within each class.

Figures 10 and 11 show that only Interim behaviour was reasonably consistent across all three classes taught by each teacher. The occurrence of the other student behaviours varied within and between classes, but remained at a fairly low rate. Although the class means (Table 18) indicate the
overall pattern of student behaviour, the within class variability as illustrated by a lesson by lesson analysis (Figures 10 and 11) reveals a more informative and accurate picture of how student behaviour varied across a series of related lessons.

Number of Learning Trials.

The number of specific learning trials performed when Motor-on-Task behaviour occurred were also counted and recorded. These results are presented separately for the high achievers, average achievers and low achievers for all classes in Figure 12. Figure 12 shows that only in two classes (Teacher 1 - Class 2 and Teacher 3 - Class 3) did the high achievers perform more learning trials in every lesson than the other two achievement groups. However, there was not a marked difference in the total number of learning trials performed by each achievement group in most lessons.

From Figure 12 it can be seen that following teacher feedback intervention there was an increase over the levels found for baseline classes in the number of learning trials performed by all students in the classes taught by Teacher 1 and Teacher 2. The increase occurred at slightly different rates for the three achievement groups.

While the high achievers performed the most learning trials in every lesson taught by Teacher 1 in the intervention class, this result was not replicated for Teacher 2. In lessons three and four of the intervention class, Class 3,
taught by Teacher 2, the low achievers performed the most learning trials. Students in the follow-up class, Class 3, taught by Teacher 1 performed fewer learning trials when compared to the students in Class 2, the intervention class but this did not reduce to the baseline level. Figure 12 shows that for the three classes taught by Teacher 3, the control classes, a small overall difference occurred within each class in the number of learning trials performed by the students in each achievement group.

From Figure 12 it can be seen that in most of the classes the highest number of learning trials in any one lesson were performed during the first two lessons of the class. This was generally followed by a gradual decline in the number of trials performed during the latter lessons of the class. The number of learning trials performed (see Figure 12) and the amount of Motor-on-Task behaviour (see Figure 10) seem to follow a similar pattern across lessons.

Success Rate When Performing Learning Trials.

The first study established that the number of trials performed is not sufficient by itself to provide information on the quality of participation during a physical education lesson. Table 19, shows the mean percentage of successful trials for the three achievement groups in each class. The most notable result is that the high achievers consistently displayed the highest percentage of success when performing the learning trials in every class. Although the high
Percentage of successful learning trials for the high, average and low student achievement groups in each class during the baseline, intervention and follow-up phase for teacher 1 and 2 and across all classes for teacher 3.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Intervention</th>
<th>Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HIGH ACHIEVERS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher 1</td>
<td>93</td>
<td>88</td>
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</tr>
<tr>
<td>Teacher 2</td>
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<td>75</td>
<td>83</td>
</tr>
<tr>
<td>Teacher 3</td>
<td>91</td>
<td>90</td>
<td>96</td>
</tr>
<tr>
<td><strong>AVERAGE ACHIEVERS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher 1</td>
<td>74</td>
<td>68</td>
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<td>Teacher 2</td>
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<td>51</td>
<td>81</td>
</tr>
<tr>
<td>Teacher 3</td>
<td>82</td>
<td>80</td>
<td>65</td>
</tr>
<tr>
<td><strong>LOW ACHIEVERS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher 1</td>
<td>72</td>
<td>64</td>
<td>53</td>
</tr>
<tr>
<td>Teacher 2</td>
<td>34</td>
<td>37</td>
<td>53</td>
</tr>
<tr>
<td>Teacher 3</td>
<td>60</td>
<td>55</td>
<td>54</td>
</tr>
</tbody>
</table>
achievers consistently had the highest level of success the level of success varied between the classes for all achievement groups.

Students Taught By Teacher 1. Table 19 shows that there was a difference between the three achievement groups within each class taught by Teacher 1. However, no marked differences were recorded in the success rate between the three respective achievement groups in each of Teacher 1's three classes. Non-specific feedback intervention for Teacher 1 does not appear to have had an effect on the rate of success with which the different achievement groups in Classes 2 and 3 performed the learning trials.

Students Taught By Teacher 2. Table 19 shows that the students taught under baseline conditions by Teacher 2 (Class 1 and 2) were recorded as performing the learning trials with similar rates of success as their equivalent achievement in the other classes. From Table 19 it can be seen that following feedback intervention for Teacher 2, the high and average achievers in Class 3 performed the learning trials with a success rate of greater than 80 percent. Compared to the students in the baseline classes (high achievers 75% and average achievers 53%) this result is slightly higher for the high achievers and substantially higher for average achievers. Following intervention there was an increase in the success rate of the low achievers to 50% (baseline result 35%) for Teacher 2.
Students Taught By Teacher 3. In the three classes taught by Teacher 3 for whom no intervention occurred the high achievers in the three classes all had a success rate of greater than 90 percent when performing the learning trials. The average achievers taught by Teacher 3 had a success rate in excess of 80 percent in the first two classes but in the third class the students had considerably less success (65%). The low achievers in all three classes taught by Teacher 3 performed with a success rate of between 50% and 60 percent.

Summary. The pattern to emerge from the overall percentage of success presented in Table 19 was that the high achievers had the most success when performing the learning trials but the degree of success varied across the three classes taught by each teacher. This result was replicated by the average achievers in each class who all performed with more success than the low achievers in their respective classes. While each teacher received the same type of feedback, changes in rates of student success following teacher feedback intervention were not consistent. The averaged class results must be viewed with caution as they are cumulative results for a series of related lessons. A clearer picture emerges from a lesson by lesson presentation.

Success Rate In Learning Trials Within and Between Classes for the Three Student Achievement Groups.

Figure 13 shows the percentage success in learning trials
on a lesson by lesson basis for the three achievement groups in each class. The data show that the high achievers performed with the highest rate of success in all but four lessons. During these four lessons the average achievers performed with a slightly better rate of success than the high achievers. The low achievers consistently performed with the least success in the majority of classes. Figure 13 shows that overall, considerable variability existed for each achievement group in the percentage of success obtained between the lessons in each class.

**Students Taught By Teacher 1.** Figure 13 shows that following teacher feedback intervention for Teacher 1 the high achieving students displayed similar levels of successful trials to those of the high achievers in the baseline class. However, the average and low achieving students in the intervention class had a slightly lower level of success in some lessons when compared to their counterparts in the baseline class. In addition, for Teacher 1 the most variance occurred for the average and low achievers particularly in Class 3, in the follow-up phase of the study. Overall, teacher feedback intervention for Teacher 1 did not seem related to achieving a higher rate of successful participation.

**Students Taught By Teacher 2.** Figure 13 shows that for the classes taught by Teacher 2 following teacher feedback intervention there was a noticeable increase in the percentage
of successful learning trials for all achievement groups.
This involved a small but consistent increase in the success rate of the high achievers compared with the high achievers in the baseline class. Figure 13 shows that for Teacher 2, in the class taught following intervention there was a substantial increase over the baseline classes in the success rate for the average achievers with both the high and average achievers recorded as having a success rate of greater than 80 percent when performing the learning trials in all lessons. The low achievers in the intervention class for Teacher 2 also had a greater overall rate of success than the low achieving students in the two baseline classes taught by Teacher 2. However, the low achievers still performed the learning trials with considerably less success than the high and average achieving students in the class.

**Students Taught By Teacher 3.** Figure 13 shows that across the three classes taught by Teacher 3 the high achievers performed with a success rate of greater than 80 percent in every lesson. While there was some consistency in the percentage of success for the average achievers in Class 1, Figure 13 shows that there was a marked difference between lessons for the success rate of the average achievers taught by Teacher 3 in Class 2 and Class 3 and for the success rate of the low achievers in all three classes. There was considerable within class variability for all achievement groups in the three classes taught by Teacher 3.
Overall Results For Student Behaviour Following Intervention.

The most noticeable result following teacher feedback intervention was the substantial increase over baseline class levels in the amount of Motor-on-Task behaviour occurring for all students in the post-intervention classes taught by Teacher 1 and 2. Not only did the rate of occurrence for Motor-on-Task behaviour increase but it also showed less variability between lessons within these classes. The increase in Motor-on-Task behaviour was paralleled by increases in the number of learning trials performed in the respective lessons. However, the quantitative increase in learning trials was not necessarily matched with an improvement in the overall quality of performance. No overall improvement was recorded in the success rate for the students when performing the learning trials in the post-intervention classes in the case of Teacher 1. However, there were marked increases in the success rate for the average and low achievers and a small increase in high achievers in the classes taught by Teacher 2 following intervention.

The increase in Motor-on-Task behaviour did not occur at the expense of any one other category of student behaviour. The observed changes in the other student behaviours varied between lessons in each class as well as between the classes taught by the two teachers to whom the feedback intervention was applied. However, the changes in other categories of student behaviour were relatively minor.

For the students taught by Teacher 3 the overall pattern
of student behaviour, including the number and quality of learning trials performed, remained relatively stable across the three achievement groups in each of the three classes observed. However, the pattern of within class variability differed markedly between each of the three classes.

Overall, the results show that after teacher feedback intervention for Teachers 1 and 2 there was a substantially improvement in the quantity of student Motor-on-Task behaviour for all students in the class regardless of achievement level. However, for only one of the teachers, Teacher 2, was intervention associated with an increase in the quality of performance of the students in terms of the percentage of successful learning trials. Also, the outcome must be treated with caution given that these comparisons involve different students in each class. It was noted that even for this teacher, students in the low achievement group still performed with a low rate of success. It seems evident that by ensuring that students display higher rates of Motor-on-Task behaviour in physical education lessons may not guarantee that a greater rate of correct practice is occurring for all students.
The Context category that best described the setting in which the student behaviour occurred was also recorded for every observation interval. These data allowed an examination of how the lesson time was allocated for specific components of each lesson. Table 20 show that in only six of the nine classes was more than half of the total lesson time across the entire instructional unit allocated to skill practice (Individual Practice, Group Practice and Game Playing). Three of these classes were taught by Teacher 2 who consistently allocated a higher percentage of class time for skill practice than either of the other two teachers. Another two of the classes occurred after teacher feedback intervention with Teacher 1.

Table 20 shows that for the classes following feedback intervention for both Teacher 1 and 2 the percentage of time allocated for skill practice was greater than that allocated for baseline classes. However, the results for the two teachers are quite distinct. For Teacher 1 the percentage of time allocated for skill practice was 39.9% for the baseline class to 53.1% for the intervention class and to 51.3% for the follow-up class. For Teacher 2 there was a gradual increase in the amount of time allocated for skill practice across the three classes irrespective of intervention. However, the intervention class had slightly more time allocated than either of the baseline classes. The standard deviations for
TABLE 20

Proportion of lesson time spent in each modified ALT-PE class context category during baseline, intervention and follow-up phase for teacher 1 and 2 and across all classes for teacher 3 (means and standard deviation).

<table>
<thead>
<tr>
<th>TEACHER 1</th>
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<th>INTERVENTION</th>
<th>FOLLOW-UP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLASS 1</td>
<td>CLASS 2</td>
<td>CLASS 3</td>
</tr>
<tr>
<td>Non Motor Content</td>
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<td></td>
</tr>
<tr>
<td>Management</td>
<td>13.3 2.5</td>
<td>9.6 2.4</td>
<td>9.3 4.4</td>
</tr>
<tr>
<td>Knowledge</td>
<td>31.0 4.5</td>
<td>23.7 4.4</td>
<td>31.5 3.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>44.3</td>
<td>33.3</td>
<td>40.8</td>
</tr>
<tr>
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<td>13.6 3.2</td>
<td>7.8 2.7</td>
</tr>
<tr>
<td>Allocated for Skill Practice</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>2.5 5.0</td>
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<td>48.6 8.2</td>
<td>48.8 7.0</td>
</tr>
<tr>
<td>Game</td>
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<td>4.5 9.0</td>
<td>0.0 0.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>39.9</td>
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<td>51.3</td>
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</table>

<table>
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<tbody>
<tr>
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<tr>
<td>Management</td>
<td>0.9 2.3</td>
<td>10.7 2.3</td>
</tr>
<tr>
<td>Knowledge</td>
<td>28.3 6.2</td>
<td>26.1 2.2</td>
</tr>
<tr>
<td>TOTAL</td>
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<td>36.8</td>
</tr>
<tr>
<td>Warm Up</td>
<td>10.4 0.9</td>
<td>2.8 4.4</td>
</tr>
<tr>
<td>Allocated for Skill Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual Activity</td>
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<td>9.5 10.9</td>
</tr>
<tr>
<td>Group Activity</td>
<td>41.4 17.8</td>
<td>47.7 8.7</td>
</tr>
<tr>
<td>Game</td>
<td>10.6 21.2</td>
<td>4.3 6.8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>52.0</td>
<td>61.5</td>
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<th>TEACHER 3</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Management</td>
<td>11.8 1.7</td>
<td>9.6 2.6</td>
</tr>
<tr>
<td>Knowledge</td>
<td>33.4 3.8</td>
<td>36.9 3.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>45.2</td>
<td>46.5</td>
</tr>
<tr>
<td>Warm Up</td>
<td>7.0 2.0</td>
<td>8.2 3.5</td>
</tr>
<tr>
<td>Allocated for Skill Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual Activity</td>
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</tr>
<tr>
<td>Group Activity</td>
<td>41.3 5.5</td>
<td>45.6 3.7</td>
</tr>
<tr>
<td>Game</td>
<td>3.1 7.1</td>
<td>0.0 0.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>46.5</td>
<td>45.6</td>
</tr>
</tbody>
</table>
the amount of time allocated to the three different skill practice settings for Teacher 2 suggest that there was considerable between lesson variability in each class as to how the skill practice time was distributed. For Teacher 3, who was not involved in the intervention, there was a only a 5% difference in the amount of time allocated for skill practice between the three classes (46.5%, 45.6% and 51.9%) and minimal variability occurred within each class.

In the first two classes taught by Teacher 1, the standard deviations indicate that there was considerable variability across classes in time allocated for Group Skill Practice and Game Playing and a similar degree of variability in time allocated for Individual and Group Skill Practice in Class 3. Marked degrees of variability existed between lessons for all skill practice context categories in Teacher 2’s classes. With the exception of a small portion of Class 1, all the skill practice in the three classes taught by Teacher 3 occurred in the Group Skill Practice setting.

From Table 20 it can be seen that time used for Warm-up activities were similar in the baseline and intervention classes for Teacher 1 but was substantially lower for Class 3, the follow-up class. Time allocated for Warm-up behaviour by Teacher 2 decreased between the two baseline classes from 10.4% in Class 1 to 2.8% in Class 2 and was eliminated following intervention in Class 3. It can only be inferred that following feedback neither Teacher 1 or 2 valued the contribution of the Warm-Up to skill development during this
instructional unit. However, Teacher 3 consistently allocated 8% of the class time over the three classes to the Warm-Up activities.

From Table 20 it can be seen that the amount of time allocated for the Knowledge category was lower after intervention. For Teacher 1 the amount of class time allocated for Knowledge category reduced from 31.0% to 23.7% and for Teacher 2 from 26.1% to 20.4 percent. In the follow-up class for Teacher 1 the time allocated for the Knowledge category increased to a similar amount of time to that reported for the baseline class (31.8%). Table 20 shows that Teacher 3 consistently allocated more time to the Knowledge category than either of the other two teachers.

Table 20 shows that overall, the three teachers allocated similar amounts of class time for Management activities for their respective classes. However, for Teacher 1 the percentage of class time allocated for Management reduced from 13.3% to 9.6% following teacher feedback intervention and maintained this lower level during Class 3, the follow-up class. The opposite effect was reported for Teacher 2 where a slight increase occurred in the amount of class time allocated for Management from 10.7% to 12.5% following intervention. This was possibly due to the class being taken to an outside area for the lesson. Teacher 3 consistently allocated approximately 10% of all class time for the Management context in each class. This seems quite slight amounts of time and suggests that all three teachers utilized good class management strategies.
Relationship Between Allocated Time and Motor-on-Task Behaviour.

As identified in Study One these results show that allocating more lesson time for practising motor skills did not necessarily mean that the students spent more time in Motor-on-Task behaviour. Figure 14 shows that the difference between the amount of lesson time allocated for Skill Practice and the percentage of lesson time used in Motor-on-Task behaviour varied within and between all classes.

Figure 14 shows that following teacher feedback intervention, for Teacher 1 and Teacher 2 there was a slight increase in the percentage of lesson time allocated for Skill Practice (see also Table 20) and in student Motor-on-Task behaviour (see Table 18). Although this varied between the lessons in each of the post-intervention classes, the levels were higher overall than the baseline measures. The increase was maintained by Teacher 1 when teaching Class 3 during the follow-up phase.

In the control classes, taught by Teacher 3, both allocated time and Motor-on-Task behaviour were relatively stable across the three classes. Although Teacher 3 allocated the most class time for skill practice in Class 3 the students were recorded as having the least amount of Motor-on-Task behaviour in this class.

In summary, when comparing the results of the amount of lesson time each teacher allocated for skill practice and the actual amount of motor engaged time experienced by the
FIGURE 14: Relationship between percentage of lesson time allocated for physical activity and motor-on-task behaviour in each lesson during the baseline, intervention and follow-up phase for teacher 1 and 2 and across classes for teacher 3.
students, the results identify three main outcomes. First, following feedback the allocation of lesson time changed so that students had more time to be actively involved in the learning tasks. Secondly, allocating more time for skill practice did not necessarily result in an increase in the amount of Motor-on-Task behaviour.

TEACHER BEHAVIOUR.

The overall results for teacher behaviour shown in Table 21 indicate that only small differences in teacher behaviour were evident for each teacher during the teaching of their three classes. Table 21 shows that all three teachers spent their lesson time performing six main functions: Preparatory Instruction, Concurrent Instruction, Observing, Management, Teacher Participating and Modelling. Both the mean frequency of occurrence and the standard deviations reported in Table 21 indicate that there was considerable variability within and between classes for each teacher behaviour category. Of the other three teacher behaviours included in the observation system, only Social Matter was recorded as occurring in one class (Teacher 1, Class 1) for less than one percent of the time. Although Concurrent Instruction occurred at different rates for each teacher, this was the dominant behaviour for each teacher in all classes. This suggests that the three teachers were interactive with their students during the
learning activities. However, this category did not differentiate between the different types of interaction that occurred. The anecdotal records made during the observation interval when teacher behaviour was being observed indicate that a considerable portion of this time was used to provide non-specific feedback (e.g. "well done", "it looks good"). This type of interaction was uniformly distributed to individuals, groups of students and the class as a whole. There was also considerable encouragement and additional instruction given to the students while they were performing learning tasks. It appeared that Concurrent Instruction behaviour was also partially used to keep the students involved with the learning activities and to minimize the chance of either modified or non-related activities being initiated. This was particularly noticeable when the difficulty level of the prescribed learning tasks was increased resulting in more challenging activities for the student.

The three teachers allocated similar amounts of class time to giving Preparatory Instructions (ranging between 23% and 29%) to their three respective classes. While there was some consistency in the frequency of occurrence for other behaviours, considerable variance existed between teachers in how these behaviours were used.

Table 21 shows that following teacher feedback intervention there was no common pattern of change in the behaviour of either Teacher 1 or Teacher 2. What changes did
TABLE 21

Proportion of lesson time spent in each modified ALT-PE teacher behaviour category by each teacher during baseline, intervention and follow-up phase for teacher 1 and 2 and across all classes for teacher 3 (means and standard deviations).

<table>
<thead>
<tr>
<th></th>
<th>BASELINE</th>
<th>INTERVENTION</th>
<th>FOLLOW-UP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLASS 1</td>
<td>CLASS 2</td>
<td>CLASS 3</td>
</tr>
<tr>
<td><strong>TEACHER 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparatory Instruction</td>
<td>25.8 (4.4)</td>
<td>24.9 (4.1)</td>
<td>24.1 (4.5)</td>
</tr>
<tr>
<td>Concurrent Instruction</td>
<td>36.4 (7.0)</td>
<td>36.8 (8.4)</td>
<td>49.2 (7.8)</td>
</tr>
<tr>
<td>Modelling</td>
<td>10.2 (5.4)</td>
<td>1.5 (1.7)</td>
<td>2.9 (2.4)</td>
</tr>
<tr>
<td>Teacher Participation</td>
<td>10.7 (5.1)</td>
<td>20.0 (8.6)</td>
<td>8.0 (3.3)</td>
</tr>
<tr>
<td>Social Matter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observing</td>
<td>4.4 (3.0)</td>
<td>5.0 (3.8)</td>
<td>3.9 (3.1)</td>
</tr>
<tr>
<td>Management</td>
<td>12.7 (4.0)</td>
<td>11.8 (5.0)</td>
<td>11.7 (8.0)</td>
</tr>
<tr>
<td>Officiating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recording</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TEACHER 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparatory Instruction</td>
<td>26.9 (5.7)</td>
<td>22.5 (7.4)</td>
<td>20.7 (3.3)</td>
</tr>
<tr>
<td>Concurrent Instruction</td>
<td>38.3 (14.4)</td>
<td>47.3 (10.1)</td>
<td>51.1 (8.2)</td>
</tr>
<tr>
<td>Modelling</td>
<td>5.7 (4.6)</td>
<td>4.0 (5.5)</td>
<td>3.9 (2.7)</td>
</tr>
<tr>
<td>Teacher Participation</td>
<td>6.3 (4.7)</td>
<td>10.3 (7.0)</td>
<td>5.0 (7.4)</td>
</tr>
<tr>
<td>Social Matter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observing</td>
<td>12.2 (4.1)</td>
<td>5.9 (2.8)</td>
<td>8.5 (4.1)</td>
</tr>
<tr>
<td>Management</td>
<td>9.9 (1.9)</td>
<td>9.8 (2.6)</td>
<td>10.9 (2.7)</td>
</tr>
<tr>
<td>Officiating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recording</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>TEACHER 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparatory Instruction</td>
<td>29.5 (5.6)</td>
<td>28.6 (9.4)</td>
<td>26.2 (5.2)</td>
</tr>
<tr>
<td>Concurrent Instruction</td>
<td>33.1 (5.2)</td>
<td>29.5 (5.4)</td>
<td>39.0 (3.3)</td>
</tr>
<tr>
<td>Modelling</td>
<td>5.4 (3.6)</td>
<td>9.6 (6.9)</td>
<td>6.8 (3.0)</td>
</tr>
<tr>
<td>Teacher Participation</td>
<td>0.5 (1.1)</td>
<td>5.2 (5.4)</td>
<td>2.3 (2.9)</td>
</tr>
<tr>
<td>Social Matter</td>
<td>0.4 (0.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observing</td>
<td>11.5 (5.8)</td>
<td>12.9 (6.9)</td>
<td>12.6 (3.4)</td>
</tr>
<tr>
<td>Management</td>
<td>19.2 (4.9)</td>
<td>14.2 (3.9)</td>
<td>11.5 (7.5)</td>
</tr>
<tr>
<td>Officiating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recording</td>
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</tbody>
</table>
occur were not markedly different from the change observed between the three classes taught by Teacher 3 for whom there was no intervention. For example, the three teachers successively reduced the amount of Preparatory Instruction across their three classes and increased the amount of time spent giving Concurrent Instructions. However, the differences between classes were small.

Some of the changes following teacher feedback intervention recorded between classes in teacher behaviour for each teacher are noted. Teacher 1 used considerably less Modelling behaviour (1.5%) compared to the baseline class (10.2%) and doubled the amount of Teacher Participation (10.7% to 20.0%) which was then reduced to 8.0% in Class 3, the follow-up class. On the other hand Teacher 2 reduced the amount of Teacher Participation from 10.3% to 5.0 percent following intervention. Intervention did not seem to influence the amount of time either Teacher 1 or 2 spent in Management behaviour which remained relatively constant at approximately 10% across the three classes for both teachers. Teacher 1 was recorded Observing the class for approximately 5% of each class while the use of this behaviour varied between 5.9% and 12.2% for Teacher 2 across the three classes.

Table 21 shows Teacher 3 slightly increased the use of Concurrent Instruction across the three classes, slightly decreased the amount of Preparatory Instruction behaviour, used approximately 12.0% of the time in each class Observing behaviour while the other behaviours varied between the classes.
From Table 21 it can be seen that across all observations no Recording behaviour was observed for any of the three teachers, suggesting that the lessons were conducted without formal evaluation. In discussing this with the teachers at the conclusion of the study, it was revealed that no formal evaluation had been planned for or was intended to be used in this instructional unit.

**Lesson by Lesson Variability Within and Between Classes For Teacher Behaviour.**

As evident from the standard deviations in Table 21, considerable within class variability existed for each teacher behaviour and no common pattern of behaviour change was noted. It is therefore appropriate to examine teacher behaviour on a lesson by lesson basis to identify any trends that may have occurred for each teacher before and after teacher feedback intervention as well as across the three classes. Figure 15 shows the lesson by lesson data for Concurrent Instruction behaviour, Preparatory Instruction behaviour, Observing behaviour, Modelling behaviour and Management behaviour (i.e. for those categories for which a noticeable amount of time was allocated).

Figure 15 shows that across all classes Concurrent Instruction was the most dominant behaviour in nearly every lesson. In the lessons where this was not the case Preparatory Instruction was the dominant behaviour. The lesson by lesson analysis shows that Concurrent Instruction and Preparatory
FIGURE 15: Percentage of occurrence for preparatory instruction, concurrent instruction, observing, modelling and management teacher behaviour in each lesson during the baseline, intervention and follow-up phase for teacher 1 and 2 and across classes for teacher 3.
Instruction were used with varying degrees of frequency within each class suggesting that the instructional patterns for each teacher varied considerably from lesson to lesson. From Figure 15 it can be seen that no common trend occurred following intervention with the respective classes for Teacher 1 and Teacher 2. The results in the follow-up class, Class 3, taught by Teacher 1 differed markedly from Class 2, the post-intervention class suggesting either that each class has its unique features and makes different demands of the teacher, or that these behaviours did not change as a result of feedback.

Figure 15 shows only one common trend in the behaviour pattern of the three teachers emerges from analyzing the data on a lesson by lesson basis. With the exception of one class, (Class 1-Teacher 3), more Modelling behaviour occurred in the first lesson than any other lesson in the respective classes. This behaviour then gradually decreased across the other lessons in the class. The anecdotal notes suggested that each teacher used demonstrations, that is Modelling behaviour, in conjunction with a verbal explanation to provide the students with appropriate information about the learning tasks. As shown, this was particularly prevalent at the beginning of each instructional unit during which the students were introduced to the new motor skills included in the series of lessons.

In summary, teacher behaviour did not alter greatly as a result of teacher feedback intervention. Data shown in Table 21 and Figure 15 and the anecdotal records made during the
observations suggest that each lesson has its own unique characteristics and is taught according to how the teacher perceived the students' needs on the day in relation to the planned lesson content. The effect of feedback intervention was confined to teachers allocating more time to certain activities, rather than to specific consistent changes in their behaviour during lessons.

Interviews With Teachers.

Teachers 1 and 2, who were involved in the intervention, were interviewed by the researcher prior to teaching the intervention class. Data collected from the lessons of the baseline class were also presented to the teachers at this time. At the conclusion of each lesson in the intervention classes an informal discussion was held with the teacher about the events that occurred during the lesson and any changes that were perceived in student behaviour. This did not include details about specific data. Teacher 3, who was not included in the intervention, was interviewed and presented with the results from his classes at the conclusion of the third class.

A summary of the interviews and discussions provides some insight into the teachers' perceptions of the task of trying to increase the amount of successful Motor-on-Task student behaviour. The results from their baseline class were presented to Teacher 1 and Teacher 2 a few days before they began teaching their respective intervention class. Both
teachers were initially surprised that across the baseline class only 23.4% and 25.8% of the class time respectively was used for Motor-on-Task behaviour and that many of the students did not experience a high rate of success. It was evident that both teachers thought that the amount of successful on-task time was much greater and commented that they felt their students were very active.

Each teacher asked the researcher his opinion on the effectiveness of their instruction in comparison with other teachers observed during the baseline class. Rather than quantify or rate the effectiveness of the teaching, the researcher directed each teacher into a discussion of the results for their class. This was done to encourage the teachers to think about how changes could possibly be made to their teaching and management strategies in order to increase the amount of Motor-on-Task behaviour. Although many topics related to teaching physical education were raised, the discussion focused specifically on:

(1) some of the patterns observed during the baseline lessons and the influence of these patterns on student behaviour
(2) whether the percentage of Motor-on-Task behaviour could be increased and to what level?
(3) what would be required to happen during the lesson for an increase to occur?
(4) how the success rate, particularly for the low and average achievers, could be improved?
It was interesting to note that both teachers raised similar points during the discussion before their intervention class. Initially each teacher assumed they would have to teach using a different style and arranging some of the learning activities in a completely different way. At first the comments indicated that this would be a daunting challenge and its value was doubted. However, there was a change in opinion after the effect of the stop-start pattern of instruction that occurred in the lessons was discussed. Both teachers suggested that presenting one task, allowing only a short period of time for practice and then changing the task was not conducive to high rates of activity and may not be an appropriate way to enhance the learning or practicing of skills.

Some alternative strategies suggested by the teachers to change this included; changing one aspect of the task being performed without stopping the class; providing less information to the class when they are in the Knowledge context; encouraging the students to set goals for themselves such as setting the ball 25 times; avoid stopping the whole class for the sake of a few students; avoid changing the location of the students for different tasks; present the tasks in such a way that the students perceive a greater expectation placed on them; resist the many requests from the students to play a game. While there were many alternatives suggested to try to increase the amount of successful learning behaviour each teacher was left to devise their own strategy to try and achieve this.
Summary of Discussion with Teacher 1 After all Observations were Completed. Teacher 1 reported that at first it was very difficult to maintain the momentum of the lesson. By the third lesson the idea of providing more changes to the tasks during the activity time was easier to implement. It was easy to see how more practice could be provided. Teacher 1 said that his students took a short time to adjust to this as they were conditioned to stop after a very short period of time and wait for an instruction.

The simple changes made to the way the class was introduced to the tasks, particularly limiting the amount of instruction, simplified the class routine and allowed the students to get more involved with the activity earlier in the lesson. The presentation of the tasks seemed to be less confusing to the students. However, it was very easy to revert to the habit of unnecessarily repeating instructions and demonstrations.

Teacher 1 said that while the amount of participation was increased, he found it difficult to improve the success rate, particularly of the lower achievers. Teaching the class as a whole for many activities did not seem appropriate and to change this would be extremely difficult. In addition, Teacher 1 said that he found it quite threatening to try to change his style of teaching and to keep the same control over the class when being observed.

Nevertheless, Teacher 1 reported that by keeping the students on-task for longer periods of time he believed there
was less disruption during the lessons and sensed that the student enjoyment level was increased. He also noted that when watching other teachers in the school teach it was easy to see how so much potential activity time during a lesson is lost to what appeared to be irrelevant events.

Teacher 1 claimed that it was not difficult to increase the rate of skill practice during the lessons but there is more to learning than just practice. Overall, Teacher 1 believed that the changes made to the way the lessons were taught during the intervention class and the follow-up class enhanced the quality of teaching. Whether the students in these classes learned any more is another question. The data on successful trials suggest otherwise.

Reflecting on the experience of being involved in the research project, Teacher 1 felt that many physical education teachers teach the best way they know without being aware of many of the events that occur during the lessons. This minimizes their potential effectiveness as teachers. Teacher 1 asked, "How are the teachers supposed to know what I have just experienced? Many teach for themselves, not the students. This project has shown me that it is not difficult to improve your own performance as a teacher."

Summary of Discussion with Teacher 2 After all Observations were Completed. Teacher 2 commented that the results of the baseline classes provided a new way in which to examine her own teaching and was surprised by what she considered to be a
limited amount of student participation. The value of including a warm-up as a part of a skills lesson was one issue that she had to rationalize for herself. Teacher 2 decided that as the students received only two lesson per week, involving skills lessons that were not physically demanding, it was not really necessary to further erode the already limited amount of class time for skill practice. As a result Teacher 2 eliminated the introductory warm-up session for this and other classes.

Teacher 2 felt that although the tasks were always well presented it was decided that too much time was taken to present the instructions. Teacher 2 said that before receiving the feedback she believed that the information the students received either by instruction or demonstration had a big influence on the the level of performance. However, she did recognize the value of limiting the amount of class time the students stood around listening to what was often unnecessary information. This was a pattern that was assumed to be effective in producing learning. After all, this is how many teachers teach their classes.

Endeavouring to increase the rate of student participation, Teacher 2 reported that keeping the students practicing one specific skill in a number of different ways before changing the nature of the task was an easy teaching modification to make. She also believed that this created a higher level of interest within the class and avoided the boredom that students, particularly the lower achievers,
sometimes experience when learning new skills. There was no doubt that the lesson flow was maintained for greater periods of time.

In trying to determine what specific changes had been made to the teaching strategies in order to increase the amount of student participation, Teacher 2 believed she made only small changes to the way in which the tasks were organized and presented. This possibly provided a different level of expectation for the students in the class as they were probably used to a stop-start pattern during the previous lessons.

Although the level of success for the low achievers in classes following intervention was greater than that experienced by low achievers in the baseline classes, Teacher 2 claimed that this remained a real problem for her to confront as all her classes were taught as a whole.

Overall, Teacher 2 said that being included in the research project was a valuable experience as it revealed some things about her own teaching. She said that nearly all teachers would benefit from such an experience as well as finding out how to improve their own level of effectiveness. Teacher 2 felt that the majority of teachers would be very surprised if they knew how little participation many students have during physical education classes. It also became very clear that expecting the students to learn new skills through playing games in large groups was unrealistic. The idea of playing a game to practice the skills during the latter part
of a lesson appears to be an unrealistic expectation particularly for students at an introductory level. To include work-shop sessions related to analysing teaching in physical education during physical education in-service courses would not only create a great deal of interest but also help many teachers to begin examining their own teaching in a different way.

Summary of Discussion with Teacher 3 After all Observations were Completed. Teacher 3, who did not receive feedback until the completion of the study, reacted in a similar way to that of Teacher 1 and Teacher 2. Initially Teacher 3 had difficulty in accepting the results for individual student participation as high rates of participation were considered to a priority in his teaching. Like the two teachers involved in the intervention, Teacher 3 believed that it was really important to provide the students with plenty of information about the skills being learned. However, he did accept that the real value in learning skills, particularly at the introductory level, was to have the opportunity to practice. Teacher 3 said that as he tried to teach each content area with some consistency to each class he was pleased to learn that the overall patterns between the three classes were similar. However, he would have preferred the amount of practice time to be higher. While he expected the low achievers to struggle a little in this class it was explained that some of these students were more competent performers in
other activities.

In summary, Teacher 3 was really disappointed not to have had the chance to receive feedback during the project. However, he claimed that while the results had disappointed him in one way, they motivated him in another. Teacher 3 was still able to use the information in future lessons. It was Teacher 3's intention to increase the learning time during the future lessons. Receiving the feedback was valuable and would influence his teaching for the better.
CHAPTER NINE

DISCUSSION STUDY TWO

In physical education relatively few studies have shown that a planned intervention can effect changes in teacher and student behaviour (e.g. Whaley, 1980; Birdwell, 1980; McKenzie, 1981; Siedentop, 1981; Siedentop, 1982; Paese, 1984; Giebank and McKenzie, 1985; Dunbar and O'Sullivan, 1986; Ratliffe, 1986; van der Mars, 1987). Given such a limited data base there would seem to be a need for research on ways of increasing student learning behaviour in physical education through changes in teaching strategies (Placek and Randall, 1986). Study Two employed a within-subject multiple baseline design to examine the relationship between feedback to a teacher and the quantity and quality of participation of high, average and low skilled students in the same class across a series of related physical education lessons. Intervention in the form of feedback to the teacher was chosen because evidence suggests that teachers can improve their teaching if they receive accurate feedback about their performance (Ratliffe, 1986). Also, teacher feedback intervention allows each teacher to choose how to change their behaviour. This may result in responses that are more readily maintained than an intervention that prescribes new teacher behaviour (Siedentop, 1981; Placek, 1983; Borys, 1986).
The feedback provided to the teachers in the present study was based on observations of the teachers and the students during baseline conditions. Comparisons of the performance of the students in the classes taught under baseline and under intervention conditions was used as evidence of teacher behaviour change. The measurement of student behaviour in successive classes became the unit of analysis by which changes in teacher behaviour and teaching processes were monitored over time. Student behaviour was measured in the present study because of the growing acceptance of using student time-on-task as a proxy variable for achievement, there being no agreed set of outcome or "achievement" measures in physical education (Siedentop and Taggart, 1984; Graham, 1985). In addition, predictable patterns of teacher behaviour do not produce predicable class responses (Rushall and Richards, 1981) and teacher behaviour is not consistent between lessons (Rink, 1983; Gusthart, 1985).

Feedback Intervention

Feedback was provided at the completion of teaching the baseline class. Each teacher was required to make their own decisions about what changes would be made to the teaching process. A third teacher who did not receive any feedback served as a non-intervention control to increase the internal validity of the study. While using data based feedback to improve teaching has strong conceptual support (Landin, Hawkins and Weigand, 1986) it can be difficult to identify the exact
strategies involved in any changes in teacher behaviour that may subsequently occur. However, this form of intervention has a place in teaching research in physical education as specific changes in teacher behaviour do not necessarily produce predictable response within the classes (Rushall and Richards, 1981; Rink, 1983). Nor does it seem possible to write generic prescriptions for specific teacher behaviours which will increase successful Motor-on-Task behaviour (Metzler, 1983). From the perspective of intervention research there is also evidence that teachers have greater confidence of gaining success when they share with the researcher in deciding what changes need to be made in order to improve student participation and performance (Joyce and Showers, 1980; Siedentop, 1981).

Teachers may be sceptical about being involved in experimental research unless the proposed changes are satisfying to them personally (Siedentop, 1982). If researchers try to tell teachers how to produce more student learning and the teachers do not relate the ideas to success for their class it is possible that the teacher will not implement the researcher's ideas (Placek and Randall, 1986; Borys, 1986). The effectiveness of any research intervention may well depend on the teachers perception of and identification with the researchers intent and whether the researcher's goals are relevant to the teacher (Locke, 1984; Leach and Dolan, 1985).
A feature of the present study was that it was conducted in the naturalistic setting of the secondary school environment. Also, the study did not interrupt the teachers regular programme of instructional units of work (series of lessons) presented to successive classes for predetermined periods of time in the school year. The arrangements in the research schools was typical of the way physical education is organized in many New Zealand secondary schools. Morris (1983) has claimed that true experimental designs are often incompatible with the administrative and environmental constraints of the school. In the present study however, the teachers were observed as they worked with their three regularly scheduled successive third form classes in the schools gymnasium at the usual times scheduled for physical education.

From the multiple baseline design employed in this study it may be suggested that a causal link was found between the teacher feedback intervention and student behaviour because changes in student motor-on-task behaviour occurred only at the time of intervention for each of the two teachers who received feedback. The teacher who did not receive feedback did not generate higher rates of Motor-on-Task behaviour across successive classes.
Motor-on-Task Behaviour.

Following teacher feedback intervention Teachers 1 and 2 modified their teaching in such a way that Motor-on-Task behaviour became the most prevalent behaviour in all lessons within their successive classes. This contrasts with the results for the baseline classes taught by these two teachers, with the results of the three control classes taught by Teacher 3 and all the classes included in Study One of the research project in which Cognitive behaviour was found to be the most prevalent student behaviour in the majority of the lessons. No clear differences were recorded in Motor-on-Task behaviour between the high, average and low student achievement groups within each class.

Similar levels of student Motor-on-Task behaviour to those recorded in the first lesson of the intervention classes were maintained across successive lessons. In the follow-up class taught by Teacher 1 the amount of Motor-on-Task behaviour was slightly lower than that in the intervention class but still considerably higher than that of Teacher 1’s baseline class. Metzler (1983) suggested that teachers are unlikely to return to previous instructional patterns after experiencing a positive change in student behaviour as a result of changing their teaching behaviour. While the rate of increase between the baseline and intervention classes was similar for both teachers (+15%) there was a slight difference in the overall amount of Motor-on-Task behaviour the students of each teacher displayed. Teacher 1’s baseline class averaged 23.4% in
Motor-on-Task behaviour and the intervention class 37.7% while Teacher 2's two baseline classes averaged 27.5% and 25.1% respectively and the intervention class 40.1 percent. This result supports those of other studies (e.g. Siedentop, 1981; McKenzie, 1981; Ratliffe, 1986; Siedentop, 1986) which indicate that providing teachers with objective feedback on student performance can help increase the amount of appropriate Motor-on-Task behaviour in physical education classes.

In contrast, the three classes taught by Teacher 3 all under baseline conditions showed only a small difference in Motor-on-Task behaviour between the three successive classes. Also, the classes taught by Teacher 3 showed less Motor-on-Task behaviour time (approximately 23% in each class) than was evident in the post-intervention classes for Teacher 1 (37.7%) and Teacher 2 (40.0%).

The interview data suggested some reasons why teachers do not change their instructional patterns may include:

(1) the quick and continual change of lesson events make it difficult for teachers to perceive the actual level of activity of individual students,

(2) teachers are not trained to monitor the behaviour of their class,

(3) teachers rarely receive systematic feedback about what happens in their classes.

Godbout, Brunelle and Tousignant (1983) reported that teachers teach in such a way that student behaviour remains
relatively stable over time within their classes but that notable differences occur between teachers. A similar pattern was observed in the present study prior to intervention. Past researchers (e.g. Pieron, 1982; Rink, 1983; Rink et.al., 1986) have indicated marked variability between teachers in their instructional patterns across lessons. The present study also found differences between teachers in Motor-on-Task levels. Nevertheless, both teachers who participated in the intervention increased the levels of Motor-on-Task behaviour in their classes following feedback. However, as found in Study One and by Yerg (1983) more Motor-on-Task behaviour does not of itself produce greater success rates for all students.

*Number of Learning Trials.*

Although Teacher 1 and 2 achieved similar increases in student Motor-on-Task behaviour, each teacher produced a slightly different change in the number of learning trials performed by their students. While the increase in the number of learning trials performed by all students following teacher feedback intervention varied between the lessons within each class, the pattern of change corresponded with the increase in Motor-on-Task behaviour. That is, more Motor-on-Task behaviour was associated with an increase in the number of learning trials performed. However, it must be noted that the amount of student Motor-on-Task behaviour is not the only factor which determines how many learning trials students perform during a given lesson in physical education. The
structure of the activities (Pieron, 1981; Salter and Graham, 1985; Twardy and Yerg, 1987) and the expectations provided by the teacher (Tousignant and Siedentop, 1983) will also influence the number of trials each student will perform.

Both Teachers 1 and 2 claimed that it was not too difficult to change the basic structure of the lessons to ensure an increase in the amount of student Motor-on-Task behaviour and the number of learning trials performed. Following feedback intervention in the present study it was found that both of the teachers who received feedback organized their students into smaller groups to practice the motor tasks than in their baseline classes. In addition, simple modifications were made to the initial task before changing the activity to allow greater opportunity for the students to practice one skill for a longer period of time. This maintained the momentum of the lesson activity for a longer period of time. In contrast, in their baseline classes, these teachers had frequently changed the focus of the class activity and grouping of the students resulting in students having less time available for participation in learning activities. This seems to be one reason why students experienced less Motor-on-Task behaviour and consequently performed fewer learning trials in baseline classes.

For Teacher 3 no obvious differences were found in the way his three classes were taught. Teacher 3 also claimed to have taught each class in a similar way. As a result, the students in each of Teacher 3's successive classes not only spent a
similar amount of time in Motor-on-Task behaviour but also performed a similar number of learning trials.

Although physical education teachers do utilize regular routines by which they manage and implement their lesson content (Siedentop, Mand and Taggart, 1986) the present study shows that teachers can modify their routines to provide a greater amount of student participation. Although feedback on student participation may be important for prompting change, it is the teachers themselves who must find their own way in their own settings to increase student participation (Metzler, 1983). But to assist them in this task a research consultant is a helpful strategy.

Quality of Learning Trials.

While both Teachers 1 and 2 who received feedback were able to increase the number of learning trials following teacher feedback intervention, the three different student achievement groups with each class differed in regard to the quality of the learning trials they performed. Teachers 1 and 2 were made aware from feedback of the limited amount of success the low achievers and some of the average achievers experienced in their baseline classes. However, receiving this particular feedback did not necessarily mean that they could easily enhance the success rate with which all students in successive intervention classes performed the tasks.

Teacher 1 did not achieve any increase in the rate of success for any of the students in either the intervention or
follow-up class. High achievers in each of Teacher 1's post intervention classes performed with a success rate of greater than 80%, which was not noticeably different from that observed in the baseline class. Similarly, the average and low achievers in Teacher 1's classes were recorded as having a success rate (of approximately 70%) that was similar across all classes. While there were minor changes in levels of success across different classes the success rate remained relatively high overall.

In contrast, Teacher 2 did achieve an increase in the rate of success for all students following teacher feedback intervention. The baseline success levels for Teacher 2's classes were much lower than those in Teacher 1's class. However, the high and average achievers in the intervention classes taught by Teacher 2 displayed high success rates (greater than 80%) in every lesson. This was 30% higher than that of the average achievers in Teacher 2's baseline class. The low achievers in the intervention class taught by Teacher 2 displayed a success rate of 50 percent. This was approximately 20% higher than that of the low achievers in Teacher 2's two baseline classes.

For Teacher 3 the success rate for the three achievement groups in each successive class was markedly similar. The high achievers had the highest rate of success (average 90%) and the average achievers displayed a higher rate of success (average 75%) than the low achievers (average 58%).
It would appear that increasing the amount of participation time for each student is a much easier task for the teacher to achieve than structuring activities to ensure that each student has a high rate of success and can therefore gain maximum value from performing the learning trials. It would seem then that teachers can attend to cues about student involvement and judge the effectiveness of their lessons (Housner and Griffey, 1985). However, the teachers in the present study claimed when there is a marked difference in skill level within a given class it is difficult to devise appropriate instructional strategies to provide satisfactorily for all the students at the same time during the class and these days almost all classes will display a wide difference in skill levels. Earls (1983) claims that few teachers really make a difference in skill development for many students.

Siedentop (1983a) indicated that teachers are inclined to focus on the nature of the class activity without regard for the successful involvement of the individual. Hoffman (1983) suggests that because so much occurs at a given time within the class many teachers do not focus on diagnosing the individual learner's performance. The two teachers who received feedback in the present study placed considerable value on increasing the quantity of student participation without being so concerned for the quality of the performance, believing increased practice would of itself benefit all students. While the value of matching student skill level and task difficulty was recognized as being important, following
feedback intervention the two teachers did not alter their lessons along these lines. This reflects Pieron’s (1977) finding that there is a considerable difference between the ideal instructional strategy expressed by the teacher and that practiced during specific lessons.

Teacher 1 and 2 also felt that having all the students in the class achieve a success rate of greater than sixty percent was very satisfying when teaching new motor skills. This is similar to the finding by Arrighi and Young (1987) who found that teachers identified student responsiveness as a critical measure of their success. Other research (e.g. Silverman, 1985; Pieron, 1983) has suggested that a high ratio of successful to not successful trials is a more positive predictor of achievement than Motor-on-Task behaviour or the number of learning trials performed. Nevertheless, contrary to this, Yerg (1981) reported a positive relationship between the amount of practice and achievement scores after studying small groups of students being taught one motor task.

While there seems to be uncertainty about the relation of the number of trials to the success rate, it should be noted that not all studies on this issue have been conducted in the natural context of regularly scheduled series of lessons in the school setting. Different findings may, therefore, reflect different settings. In the present study it was not possible to ascertain whether the students in the intervention classes acquired greater skill levels than the students in the baseline classes who experienced less Motor-on-Task behaviour.
However, it has been noted that high rates of Motor-on-Task may be insufficient in themselves to produce high achievement gains (Dodds et al., 1982). It is well documented that high rates of successful on-task behaviour is an important learning behaviour (e.g. McLeish et al., 1981; Pieron, 1982; Silverman, 1985). However, the level of individual achievement attained by the students observed in the classes in the present study did not appear to be of great importance to the teachers since no evaluation or recording of student performance occurred. This observation reflects findings reported by Imwold, Rider and Johnson (1982) who claim that there is a lack of objective testing in physical education classes. Nevertheless, the teachers in the present study were able to accurately select the three achievement groups indicating that they are able to make global assessments of individual student's skill level.

Placek (1983) claims that success is not always equated with student learning and that teachers view success differently from each other and from researchers. However, it is the learner behaviour during the instruction that ultimately affects final performance (Yerg 1983). By differentiating between student achievement levels as a unit of analysis rather than randomly selecting students as being representative of the class being observed, the present study challenges the findings from a review of Experimental Teaching Units by Graham (1983) who reported that the physical education teachers utilization of time correlated positively with student learning. When all the students in a class are
analyzed collectively no engaged time variable is a significant predictor of achievement (Silverman, 1985). However, the results of the present study make a case for targeting selected groups of students (according to skill levels) within a class for observation. Overall correlations between time utilized and student learning may obscure important differences between individual students with different skill levels.

**Lesson Organization.**

It is well documented that the lesson content influences the amount of available active learning time (Godbout et al., 1983; Silverman et al., 1984; Dunbar and O'Sullivan, 1986). In the present study observing three teachers undertaking an instructional volleyball unit with common goals helped to minimize the effect of differences in lesson content on the amount of student participation within the classes observed. Teacher 1 increased the time allocated for participation in the motor tasks from 39.9% for the baseline class to 53.1% for the intervention class and 51.0% for the follow-up class. Teacher 2 increased the allocated time for participation in the motor tasks from 52.0% and 61.5% respectively for the two baseline classes to 66.7% for the class following teacher feedback intervention. The present study showed that despite considerably different percentages of lesson time allocated by the teachers for participation, similar levels of student Motor-on-Task behaviour occurred. Motor-on-Task was 37% and
40% in the respective intervention classes. This supports the finding in Study One and studies by de Knop (1983), Metzler (1982) and Phillips and Carlisle (1983) that allocated time is not in itself a predictor of Motor-on-Task behaviour and should not be used as a predictor of more and less effective physical education teaching.

The increase in time allocated for skill practice occurred in a different way for each teacher in this study. Following teacher feedback intervention Teacher 1 allocated more time to Group Skill Practice while Teacher 2 maintained the same amount of time in Group Skill Practice as in the baseline classes but increased the amount of time spent in Individual Activities. This clearly supports the commonly held belief that there is yet no one particular best way to teach or structure physical education lessons. However, it is clear that the teaching strategies that are used influence what occurs during the lesson time (Siedentop, 1986; Salter and Graham, 1985). In the present study and in Study One of the present research the teachers used the direct instructional method and taught each class as a whole. This required all the students to do the same activity at the same time. Although Singer and Pease (1977) claim that direct instruction is more effective than other instructional approaches when teaching initial motor skills the results of the present study suggest that in the context of a large class setting direct instruction may not be effective for all students of different levels of skill.
Teacher 1 and 2 provided the students in their intervention classes with a greater opportunity to practice motor skills and increase their level of competency than they provided for students in their baseline classes. In classes following feedback intervention Teachers 1 and 2 also introduced more goal oriented tasks (e.g. set the ball 25 times with your partner) than they did in the baseline classes. The interview data suggested that Teachers 1 and 2 often required the students to monitor their own performance and sometimes either extend or simplify the original task to match their needs. This form of instruction seldom occurred during the baseline classes for either teacher. The change enabled the teachers to keep the class involved with the same task for longer periods of time and helped to encourage student decision making in relation to the tasks. Rink et.al.(1986) found that the teachers who achieved higher rates of Motor-on-Task behaviour provided the class with more related learning tasks in each lesson than those teachers who were reported as having less student Motor-on-Task behaviour in their classes.

In contrast, during classes taught under baseline conditions nearly all lessons were continually interrupted by the teacher stopping the whole class to deliver each instruction or discuss an observed difficulty even though the information was not always relevant for all students. These stoppages were often accompanied by student transition from one place to another which further disrupted student participation.
Both intervention teachers claimed that encouraging student decision making resulted in better lesson momentum and allowed students more time to practise a particular skill in a variety of settings before the nature of the activity was changed. Both intervention teachers in the present study reported in their interviews that to keep the students continuously engaged in related tasks for longer periods of time required better preparation before teaching the lessons. Metzler and Young (1984) reported that although well planned lessons can result in increased learning opportunities, more detailed planning does produce greater amounts of student Motor-on-Task behaviour. Both teachers who received feedback in the present study claimed also that higher levels of student participation resulted in greater student interest, avoided boredom, promoted a more activity oriented environment for all students and increased the level of student enjoyment. Siedentop, Mand and Taggart (1986) contend that students enjoy physical education more when they are active more of the time. Earls (1981) and Arrighi and Young (1987) claimed that promoting the level of student interest, enjoyment and success for the students was important to teachers.

The three teachers in this study claimed that although the instructional goals for the lessons were all motor skill related, other goals should also be considered when teaching a class. This is consistent with the viewpoint of Placek and Randall (1986) who argue that motor skill acquisition is only one important outcome of physical education and objectives
such as socialization and cognitive knowledge may be of equal importance. Although the goals for the instructional unit taught in the present study were agreed to by the teachers before teaching their classes, the results suggest it is not clear as to whether or not the teachers were actually trying to have their students achieve a high level of competency with the motor skills. The interview data did indicate that the three teachers claim the social and cognitive goals are important but were unsure about their specific importance within a series of lessons that focuses solely on skill attainment. Regardless of the lesson content or age of the students successful programmes focus on specific goals and achieve them (Siedentop, Mand and Taggart, 1986).

**Effects of Intervention on Other Behaviour.**

The increase in student Motor-on-Task behaviour following teacher feedback intervention did not necessarily occur at the expense of the same behaviours within each class. Good teaching involves more than the combination of a few isolated behaviours (Gusthart, 1985). As for Motor-on-Task behaviour any changes that did occur following intervention did so at similar rates for the high, average and low achievement groups within a given lesson. That is, the changes were not specific to individual students or achievement groups. All students were provided with relatively equal opportunity for involvement in the learning tasks within their respective classes.
One change common to both Teacher 1 and Teacher 2 following teacher feedback intervention was a reduction in the amount of time allocated for the Knowledge Context (i.e. providing information about the tasks). This result corresponded with a 7% and 5% reduction in the amount of time the students spent in Cognitive behaviour in their respective intervention classes. This can be viewed as a positive change as many of the studies that have analyzed student behaviour in physical education report Cognitive behaviour is often more prevalent than Motor-on-Task behaviour (e.g. Pieron and Hann, 1980; McLeish et al., 1981). This change is given even more support when related to the results of other studies (e.g. Phillips and Carlisle, 1983; Silverman, 1985; Rink et al., 1986) which indicate that the amount of time the students spend in Cognitive behaviour does not necessarily influence skill learning. Siedentop (1983a) suggests that the more time giving instructions while the class are inactive the less effective the lesson. In addition too much information may be difficult for the students to absorb, particularly when many of them are at the introductory level of skill learning.

Other noticeable changes which occurred following teacher feedback intervention in the present study were a 7% reduction in the amount of Waiting behaviour by the students in Teacher 1's class. Waiting behaviour has often been reported as being one of the most prevalent behaviours in the gymnasium (Siedentop, 1983a). There was also a 10% reduction in Indirect Participation behaviour for the students in Teacher 2's class.
This change was a direct result of Teacher 2 grouping the students into smaller groups for skill practice and eliminating Game Playing from the lessons. This modification is supported by Earls (1983) who suggested that students are often placed in complex game playing situations which results in poor quality performance and non-desirable movement patterns.

The other behaviour changes which occurred following teacher feedback intervention were not as marked as those previously reported. Teacher 1 decreased the amount of class time allocated to the Management context from 13% in the baseline class to 9% in the intervention class. Although this did not affect the amount of student time in Organization behaviour which was 9% for both classes it did allow additional class time to be allocated for skill practice. Overall, the three teachers in the present study all allocated approximately one tenth of the class time for Management related activities in each of their three classes. This result is comparatively low when compared with results from other studies (eg. Metzler and Young, 1984; Paese, 1985; Ratcliffe, 1986) which often report up to 20% of the class time being spent in management related events. It can be inferred that the three teachers in this study were effective managers of their classes. This also meant that the two teachers involved in the intervention did not need to make major changes to the management strategies in order to increase the rate of student participation.
Summary

Data from the present study show that providing teachers with feedback about some of the events that occur within their classes can be an effective way to enhance their awareness of the amount of time students spend being active and inactive during physical education lessons. The two teachers who received feedback made changes to their instructional strategies which were associated with an increase in student participation. No change was observed for a third teacher who served as a control and did not receive feedback. Both intervention teachers allocated more class time for physical activity and had the students utilize a higher portion of this time for participating with the learning tasks than they did in the baseline classes. Following the teacher feedback intervention, students in the intervention classes had higher levels of class time in Motor-on-Task behaviour than students in the baseline classes. This increase was consistent across all lessons in the intervention classes. No such changes were recorded in the three classes taught by the teacher who did not receive feedback.

The increase in student Motor-on-Task behaviour was accompanied by all students performing a greater number of learning trials. However, there were differences between student achievement groups in the proportion of successful learning trials. One intervention teacher effected a higher level of success for all three achievement groups in the
intervention class compared with those of the three groups in the baseline classes, although this occurred at different rates for each group. The other intervention teacher did not obtain a higher success rate for any of the three achievement groups in the intervention class compared with the rate of corresponding groups in the baseline class. The teachers' comments in the interviews indicated that they found it difficult to discriminate between the level of success the students were attaining at a given time during the lessons. To see the students participating was perceived as one form of successful teaching. In fact, the teachers claimed that prior to discussions with the researcher they were not aware of either the lack of physical activity that occurred during the lessons which they were teaching motor skills or the different success rate attained by the students during their lessons. Although all the students in each class all had similar opportunity for participation, there was inequity for the lower skilled students.

While it is inferred that the two intervention teachers became more task oriented in their approach, the more generic teaching processes were not sufficient to identify which specific teacher behaviours resulted in the change in student behaviour. However, the data do support the idea that ineffective teaching may often result from teachers not being aware of their own teaching behaviour and associated organizational processes when teaching physical education.
CHAPTER 10

CONCLUSIONS AND IMPLICATIONS FROM STUDY ONE AND STUDY TWO.

This chapter presents some conclusions and implications from the two studies presented in this dissertation. The primary goals of the research were to:

(i) describe student and teacher behaviour across a series of related physical education lessons (Study 1),
(ii) to evaluate the effects on quantity and quality of student participation across a series of physical education lessons which might result from providing two teachers with feedback on teacher and student behaviour (Study 2).

CONCLUSIONS

The outcomes of both studies in the research project showed the importance of taking repeated measurements to identify patterns of teacher and individual student behaviour that occur across a series of physical education lessons. The results for each participating class showed that, when data were reduced to class means, the important between lesson variability that can be shown in a lesson by lesson analysis was not evident. The present studies also showed that lesson by lesson analysis is important when differentiating between
the behaviour of groups of students of different achievement levels within each class.

Although in both studies the instructional goals were the same for every class, the data showed that each teacher organized and instructed their class in different ways. Hence, the amount of student Motor-on-task behaviour that occurred in each class varied considerably. There were also differences within the classes taught by each teacher included in the study. While observations suggested that the teachers were well organized and the students participated in the activities as directed by the teacher, the interview data from Study Two suggested that none of the teachers were aware of either the limited amount of active learning behaviour or the low rate of success many of the students experienced. The teachers taught in the same way for all the students in their respective classes.

Although the outcome of the feedback intervention in Study Two can not be generalized to other teachers in other settings, the results support a case for further investigation of this intervention strategy. Feedback on student and teacher activities from an informed and trusted consultant may be one way of helping teachers make changes that may increase the level of student participation with learning tasks during a physical education class.

The intervention study showed that teachers can respond to feedback by increasing student participation for all students. However, the two teachers involved in the feedback
intervention could only provide those students classified as high and average achievers within their classes with relatively high levels of success. High achieving students benefited most from physical education lessons. Something more may need to be done in order to increase the levels of success for the lower achieving students in these classes, otherwise these students are placed in a context where they have a low rate of successful participation. The teachers studied were concerned with the act of teaching, that is keeping the students involved with the task related activities on the assumption that participation implied learning was occurring. However, one possibility suggested by the present study is that it may be more worthwhile for researchers and teachers to target specific student groups within a class for intervention than to observe a random sample from the whole class assuming all the students behave in similar ways.

Of all the measures used in the present research project, the measure of percentage of successful trials was the most useful variable for determining differences between students within the same class. Results from both studies showed that while there was no disparity between students of different skill levels in the opportunities available to participate in the motor tasks there was a notable difference between students of different skill levels in the level of success achieved. This finding supports the modifications made to the Academic Learning Time – Physical Education observation system for use in the present study. In the present research, event
recording was included with the interval recording during the observational interval. This allowed for the recording of all Motor-on-Task behaviour (i.e. performing the task stated by the teacher) as well as the total number of learning trials and success rate obtained by each individual student. This data provided additional detail about the individual student's performance and highlighted important differences which occurred in learning behaviour between student achievement groups within the fourteen separate classes observed across 65 lessons in the two studies included in this research project.

The research observation strategies and the research design used in the present studies proved valuable for continually monitoring and analyzing the events which occurred during the teaching of physical education without disrupting the natural setting where the lessons occurred. The methodological strategy of observing successive classes within a multiple baseline design enabled an analysis within a highly naturalistic series of teaching tasks which was able to show positive gains in the teachers who received feedback intervention. These data suggest that providing teachers with feedback that is relevant and meaningful to them will enable them to make some adjustments to achieve more effective teaching which is reflected in student learning. Nevertheless, the actual adjustments teachers made to their behaviour in Study 2 may not be to the events or behaviours that are targeted by the researcher. This issue requires further detailed observations.
Implications for Future Research.

1. Future studies could usefully obtain naturalistic descriptive observation data on student behaviour across different physical education activities in secondary schools. Such data could provide a cumulative base of information on student and teacher behaviour in physical education.

2. The effect of teacher feedback intervention on student behaviour could usefully be investigated further. In particular, studies could focus on the behaviour of selected individuals or groups of students, particularly those students who experience a low success rate, rather than observe a random sample of students within the physical education class. Using the individual student as the unit of analysis would seem a valuable strategy for providing detailed information on individual variability.

3. Through the continual observation of one class taught by one teacher over a series of successive lessons it would be possible to identify and examine the relationship between some of the antecedent events and in-class teacher behaviour and student behaviour.

4. Data from the present studies suggest that it is possible to achieve a greater understanding of student behaviour during physical education lessons by making modifications to the ALT-PE observation system to suit the needs of the specific study.
5. Few research studies on teaching physical education have been conducted in the secondary school. It would, therefore, seem useful for more attention be given to this area. Also, the present study suggests that physical education teachers value involvement in research and see such studies as having credibility for teachers as consumers of research on teaching.

Implications for Physical Education Teachers

1. The present studies suggest that when student achievement of skills is the focus of the physical education lesson then teachers should ensure that their instructional strategies result in a maximum amount of time for students to perform the tasks to be learned.

2. The present studies also suggest that physical education teachers should devise ways of monitoring those students who continually perform motor skills with a low rate of success. This will require the teachers to focus on the accuracy of student performance as well as attending to whether or not the students are specifically participating in the assigned task.
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REFERENCES


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MODIFIED ACTIVE LEARNING TIME-PHYSICAL EDUCATION CODING SHEET

OBSERVER: _______________  TEACHER: _______________  DATE: ______

SCHOOL: ___________________  CLASS: ____  LESSON NO: ____

LESSON TIME: ____ to ____  NUMBER IN CLASS: ________

TOTAL LESSON TIME: ____ minutes  NUMBER PRESENT: ________

LESSON PATTERN (as described by the teacher).

OBSERVER COMMENTS ON THIS CLASS
## MODIFIED ACTIVE LEARNING TIME-PHYSICAL EDUCATION OBSERVATION SYSTEM

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MODIFIED ALT-PE RESULTS SHEET

**Observer:**

**Teacher:**

**Date:**

**School:**

**Class:**

**Lesson No:**

**Lesson Time:**

<table>
<thead>
<tr>
<th><strong>Student Behaviour</strong></th>
<th><strong>High</strong></th>
<th><strong>Average</strong></th>
<th><strong>Low</strong></th>
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<tbody>
<tr>
<td></td>
<td>Freq %</td>
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| Cognitive            |          |             |         |
| Organization         |          |             |         |
| Waiting              |          |             |         |
| Bystanding           |          |             |         |
| Off Task             |          |             |         |
| Warm-Up              |          |             |         |
| Motor-on-Task        |          |             |         |
| Motor Modified       |          |             |         |
| Supporting           |          |             |         |
| Interim              |          |             |         |
| Indirect Part.       |          |             |         |

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<th><strong>Context</strong></th>
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<td>Freq %</td>
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<td>Management</td>
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<td>Warm Up</td>
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<td>Skill Pract.</td>
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<td>Practice</td>
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<tr>
<th><strong>Teacher Behaviour</strong></th>
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<td>Prep Inst.</td>
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<td>Con Inst.</td>
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<td>Modelling</td>
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<td>Tchr Part.</td>
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<td>Management</td>
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<td>Officiating</td>
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<td>Recording</td>
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<td>Social Matter</td>
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<table>
<thead>
<tr>
<th><strong>Number of Learning Trials &amp; Rate of Success</strong></th>
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<tr>
<td>Successful</td>
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<td>Freq %</td>
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APPENDIX B
Dear [Name],

Further to the group meeting I provide details agreed to regarding the teaching of the instructional unit to your class as a part of the research project outlined.

1. Each teacher will plan and implement a series of related lessons with the same instructional goals so at the completion of the unit the students will be able to:
   a) use an underhand pass (or dig) to make the ball available for someone else to easily play,
   b) control the ball above head height using an overhead pass (or set) by themselves and in a small group activity,
   c) use the underarm serve to successfully hit the ball in order to initiate a group activity,
   d) demonstrate competency and confidence when performing the three skills together in a variety of small group activities.

2. Although no social or cognitive objectives are stated it does not mean that these skills can not be developed.

3. The number of lessons planned for your students should not be changed from the "typical" plan you normally use.

4. The way in which the lessons are planned and implemented is your choice but it is wished that you do not deviate too much from your typical teaching style. This should include an evaluation of the student performance.

5. There will be a minimum ratio of one volleyball for every two students in your class.

6. Prior to each lesson I will ask you for a very brief verbal outline for that lesson.

7. Please do not converse with the observers during the lesson. At the completion of the instructional unit you are most welcome to have access to the data collected.

Several days prior to the instructional unit being implemented the observers will visit the class for familiarization with the setting and the class. In addition you will be asked to identify the groups of high, average and low skilled students within that class for the skills to be taught.

Many thanks for your co-operation.

Yours sincerely,

Bevan Grant.