ABSTRACT

THE EFFECT OF TEACHER TYPE AND INSTRUCTIONAL TIME ON THE ACHIEVEMENT OF SELECTED FUNDAMENTAL MOTOR SKILLS BY ELEMENTARY AGE TRAINABLE MENTALLY RETARDED CHILDREN

By

Paul Glen Vogel

The purpose of this investigation was to determine the effects of teacher type and varied amounts of instructional time on the achievement of selected fundamental motor skills by elementary age TMR children. The study was conducted within the context of a formative evaluation of the I CAN instructional system in an effort to obtain information relative to implementation and further evaluation of this curriculum. The amount of instructional time for a specific skill was recorded by teacher type and divided into high and low time categories. Teacher type refers to instruction conducted by either physical education specialists or regular classroom teachers. The fundamental motor skills selected for the study were the run, underhand roll, overhand throw and catch.

Because the I CAN instructional treatment was a prototype undergoing formative evaluation, a restricted sample (the top sixty-five percent of the subjects participating in the 1973-74 field test of I CAN) was used. The decision to use a restricted sample reflects the expectation that prototype materials are approximately sixty

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percent effective. The subjects were elementary age (5-14 year old) TMR boys and girls residing in central lower Michigan.

The study was conducted using a pre-experimental, one-group pretest-posttest design. Threats to the internal and external validity of the design are discussed. The treatment was based upon the I CAN instructional system and was monitored to reduce the gap between what occurred and what was intended to occur. Since moderate to high amounts of individualized instruction by the field test teachers were requisite to their participation in the study, the student was used as the experimental unit and unit of statistical analysis. The dependent measure was the criterion-referenced I CAN Developmental Inventory.

The results of the study were determined on a restricted sample and therefore can be generalized appropriately only to a similar sub-population. Statistically significant differences in student performance within time and teacher types indicate that:

1. For the run, the two hour time allotment was more effective than the one hour allotment and physical education teachers were more effective than classroom teachers.

2. The investigation of the underhand roll revealed no significant differences in interaction or main effects.

3. For the overhand throw, a total of two to three hours of instruction by classroom teachers was significantly better than approximately four hours of instruction. Differences between teacher types was significant and favored the classroom teacher.

4. For the catch, one to two hours devoted to instruction by classroom teachers was better than three or more hours of instruction. Classroom teachers were more effective than physical education teachers in the low time category.

Guidelines which reflect the values associated with what the developers of I CAN consider to be of meaningful significance were provided to assist in the interpretation of these results.

The mean difference scores obtained from pretest to posttest were well beyond the one focal point which was considered to be meaningful by the developers of I CAN. This was true for three of four mean difference scores in the run, all of the scores for the underhand roll, two of the three scores for the overhand throw and one of the four scores for the catch.

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Paul Glen Vogel

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DEDICATION

To the family in its broadest sense

It is hoped that the completion of this task will in some small way, perhaps in a sense of accomplishment, repay for the many hours directed toward the project and from the activities of the family.

ACKNOWLEDGEMENTS

The writer wishes to thank the members of his committee, Dr. Howard Teitelbaum, Dr. Wayne Van Huss and Dr. Janet Wessel, for their assistance in the planning, implementation and reporting of the results of this investigation.

Special thanks are due Dr. Philip (Sam) Reuschlein, the committee chairman, for his assistance in all phases of the study, but in particular for his willingness and tenacious ability to be productive throughout uncommon working hours of the day and night.

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CHAPTER I

THE PROBLEM

Introduction

The focus of physical education in the public schools has been characterized by constant change. Programs have evolved from body alignment and postural exercises, to activities focusing on fitness, to the acquisition of sport skills, to movement education, and most recently, to programs of perceptual motor activities. Much of this realignment of purpose has been emotionally charged and has occurred with limited use of the knowledge base which relates the potential contributions of activity programs to man's well-being.

Recent developments in the area of educational accountability have caused educational institutions to demonstrate the effects of their programs in terms of student behavioral changes. The identification and justification of the goals of physical education is a common request of contemporary physical educators. Subsequent to goal identification, instructors are expected to specify performance objectives which will operationalize the intent of the broader goal statements. Assessment techniques, delivery system analysis, and evaluation of student outcomes are additional expectations necessary to implement educational accountability.

Many of the decisions required to implement an accountability system deal directly with: what should be taught, why it should be taught, and how it can be taught most efficiently. A comprehensive review of the literature related to activity and its impact on man is one of the requisites necessary to answer these questions. Such a review has not been apparent in the development of physical education curriculum materials.

Unlike science, math, language development and other curriculum areas, physical education is characterized by a lack of systematically developed, replicable, instructional materials. Most published materials are game or movement oriented and only relate casually to stated instructional or program objectives.

The lack of systematically developed, replicable, instructional programs, in general, is even more acute in the case of physical education for special population groups. In many instances, instructional programs intended for normals have been subjectively modified for the mentally retarded. Such a procedure maintains the limitations inherent in the original program as well as creating new limitations when the modified program is applied to a mentally retarded population group.

The United States Office of Education-Bureau of Education for the Handicapped has recently moved to improve the quality of instructional programs for the mentally retarded. Four national curriculum projects have been funded to develop replicable, instructional materials for special population groups. Physical education

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(I CAN) was one of the curriculum areas funded (along with math, science and social learnings) for this purpose.

Recent advances in the area of instructional design have provided developers with models to guide the development of replicable programs of instruction. The models should be implemented for a specific population group and commonly incorporate the following components:

1. Goals founded in the body of knowledge related to the contributions of various kinds and amounts of physical activity to the quality of life.

2. Goals operationalized in a hierarchy of clearly stated performance objectives.

3. Student assessment techniques directly related to stated objectives.

4. Instructional strategies directly associated with the stated instructional objectives.

5. Content and procedures verified through formal program evaluation techniques.

The I CAN physical education materials (see Appendix A, page 80, for a brief description of the I CAN program) represent the first set of replicable physical education curriculum materials specifically designed for trainable mentally retarded students (hereinafter referred to as TMR students). The materials were developed for primary age (5-14) TMR students using the instructional design components listed above.

There is considerable evidence that the TMR can achieve improved levels of motor performance (Nunley, 1965; Harvey, 1966; Lillie, 1968; Funk, 1971; Bundschuh, 1972). There is little evidence, however, on how motor performance may be improved most efficiently. Age (Rarick, 1968) and duration of treatment do not appear to be related to the ability to learn motor skills. The amount of instructional time associated with increments in motor performance has not been investigated with special or normal population groups. Although the effect of teacher type on motor performance has been investigated with normals, similar information was not available for the TMR's. Information related to each of the variables included in the above discussion may be of assistance in determining how the motor performance of the TMR may be most effectively improved. Since no information was available on time and teacher type, they were considered of primary importance and were, therefore, the focus of this investigation.

Currently, there are no replicable instructional materials available to permit a large scale, well controlled experiment which investigates the effect of instructional time and teacher type on the motor performance of the TMR. Although the I CAN materials were replicable, they were also in prototype form and undergoing a formative evaluation. Because instructional time and teacher type were identified as variables important to the subsequent implementation and evaluation of I CAN, these two variables were selected for study within the context of the formative evaluation.

Statement of the Problem

It was the purpose of this investigation to determine the effects of instructional time and teacher type on the performance of selected fundamental motor skills by elementary age TMR children. Teacher type refers to instruction conducted by either physical education specialists or regular classroom teachers. Time refers to the amount of instructional time consumed for each specific fundamental skill.

The instructional treatment was specified by the 1973-74 field test edition of the I CAN curriculum materials. Since the field test edition is a prototype, to be revised prior to widespread dissemination, a restricted sample of the total field test population was used. This decision was based upon the expectation that prototype instructional materials would be effective for approximately sixty percent of the students involved in the field test (Sorenson, 1971).[1] Specifically, the study was designed to answer the following three questions:

1. What are the effects of interactions between teacher type and amount of instructional time on the performance of elementary age TMR students on selected fundamental motor skills.

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[1] A more complete description of the rationale for using a restricted sample is included in Chapter III, page 45, under the heading "Rationale for the Conditional Hypothesis."

2. What are the effects of varied amounts of instructional time on the performance of elementary age TMR students on selected fundamental motor skills?

3. What are the relative effects of physical education specialists and classroom teachers on the performance of elementary age TMR students on selected fundamental motor skills?

Scope of the Investigation

The I CAN materials include the following content areas: Aquatics, Body Management, Fundamental Skills, and Health-Fitness. Each content area is comprised of several terminal performance objectives (TPO's) and their sequentially arranged enabling objectives (EO's).[1] Although the formative evaluation of these materials involved all of the above content areas, this investigation focused on the fundamental skills of running, catching, overhand throwing and underhand rolling.

The delivery of physical education services to the elementary school children of Michigan is predominantly of three types. In the first type, the responsibility for instruction in physical education is placed on the classroom teacher. In the second type, the responsibility for instruction is placed on the physical education specialist. In the third type, joint responsibility for instruction is placed on the physical education consultant and the classroom teacher. Since only three of the twenty-nine teachers involved in the formative

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[1] An outline of the TPO's and the EO's for the Fundamental Skills Module and an example of a TPO and its EO's are included in Appendix B, page 87.

evaluation of I CAN were classified as "combinations", this delivery mode was not included as a level of teacher type in the present investigation.

Limitations of the Study

The most apparent limitation of this study was the fact that the results could be generalized only to a restricted population. This limitation was due to the fact that the treatment was a prototype undergoing formative evaluation. Since prototype materials are expected to be approximately sixty percent effective, the study was designed to reflect that expectation while investigating the time and teacher variables. Operationally this involved using the top sixty-five percent of the students participating in the field test of I CAN as the sample for this study.

Two factors which relate to the internal validity of the design should also be considered when viewing the results of this study. The pretest-posttest, one group design, as it was used in this study, did not control for maturation and instrumentation. Although maturation was a plausible source of internal invalidity, the short term nature of the treatment reduced its probable effect. Instrumentation remained a source of possible invalidity even though the observers were the same for the pre- and posttest. Changes in observer skill, familiarity with the instrument and modification of personal standards could have contributed to differences independent of a treatment effect.

Definition of Terms

Classroom teacher - A certified special educator, with less than an undergraduate minor in physical education, who is responsible for the physical education of his/her assigned class.

Educable mentally retarded (EMR) - Students with a measured IQ between fifty-one and eighty on a standardized intelligence test.

Elementary age - Students within the age range of five to fourteen years figured to the nearest six months.

Enabling objective (EO) - A specific statement of an intermediate learning task necessary for acquiring a terminal performance objective.

Focal point - A behavioral criterion describing an element of a skilled performance specific to each EO with a TPO which serves to outline the content of an objective, structure the assessment-reassessment process and focus the instructional activities.

Fundamental motor skill - A skill which involves two or more body segments and results in the transfer or reception of the body or some other external object (Seefeldt, 1971).

Motor performance - The execution of movement behavior.

On-task-time - The amount of time that each student in a class is engaged in movement either because he is receiving instruction, is engaged in practice, or is using a specified skill in a game situation.

Physical education specialist - A certified special educator, trained as a major or minor in the field of physical education, who is responsible for the physical education of students assigned to his/her classes.

Terminal performance objective (TPO) - A specific statement of a learning outcome expressed in behavioral terms which describes what the learner is able to do at the end of instruction.

Trainable mentally retarded (TMR) - Students with a measured IQ between thirty and fifty on a standardized intelligence test.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This chapter is divided into three major sections, entitled: introduction, physical activity and motor performance, and summary. The introduction outlines the topical divisions and general content of the chapter, and provides the justification for including studies related to EMR and normal children. The section on physical activity and motor performance is organized into topical areas which are important to this investigation. The motor performance status of the mentally retarded appears first, followed by the effects of activity programs on motor performance. A discussion of the effects of teacher type and instructional time on the performance of motor skills completes the section. The chapter is concluded with a summary statement which incorporates the key elements of the review.

The studies included in this review involve three population groups: TMR, EMR and children of normal intelligence. The decision to use information from all three population groups was based upon: 1) the limited amount of information available on the motor performance of TMR children; 2) the similarity of the developmental lags between TMR and EMR children, and EMR and normal children; 3) the similarity of performance gains between retarded and normal children; and

4) indications of significant motor achievements by retarded groups attributed to programs designed for normals and modified for use with retarded children. The studies which provide the support for these statements are discussed in the following section.

Physical Activity and Motor Performance

The following discussion of the research related to physical activity and motor performance of the mentally retarded is organized into four major issues:

1. Motor performance of the mentally retarded
2. The effects of activity programs on motor performance
3. The effects of teacher type on motor performance
4. The effects of instructional time on motor performance

Motor Performance of the Mentally Retarded

The available evidence indicates that the EMR child lags well behind his normal peers in measures of motor performance (Howe, 1959; Francis, 1960; Stein, 1965; Rarick, 1970). Similar performance lags are apparent between the EMR and the TMR, with the EMR's being superior (Francis, 1960; Bundschuh, 1972).

In a comparison of EMR and normal children, with respect to their performances on a variety of motor tasks, Howe (1959) found that the normals scored higher on all measures. Francis (1960), in a descriptive study, found elementary age EMR's two to four years behind the performance of normal children of similar ages on the AAHPER Fitness Test. While investigating the effects of a physical education program on middle school boys, Stein obtained pretest scores which supported

the findings of Howe and Francis with respect to performance lags (Stein, 1965). Using a large national sample of EMR children ranging in age from eight to eighteen, Rarick (1970) found the retarded children scoring well below the standards achieved by their normal peers.

In a small pilot study (N=23) of elementary age students, Francis (1960) found a lag in the performance of TMR students of approximately five years behind a comparison group of normal preschool children. Bundschuh (1972), in an attempt to teach a group of EMR and TMR children to swim, found that the EMR children performed better than the TMR children on both the pre- and posttests.

The evidence, related to the performance status of the TMR, suggests that their motor achievement is inferior to that of both EMR and normal children. The performance lags among TMR, EMR and normals is apparent, but not explained in terms of causal factors. Rarick (undated) suggests that limited physical activities offered by society, slow physical development, and its associated disadvantage in the child's world of play, may be plausible reasons for this apparent performance lag. He further suggests that a slight disadvantage may be magnified if repeated failures lead to a lack of confidence, a defeatist attitude and a tendency to withdraw from activity.

In a national survey, Rarick (1967) found that less than twenty-five percent of a sample of EMR students received sixty minutes of physical education per week. Although currently data are not in hand, it is probable that this percentage would be substantially lower for

students classified as TMR. Such a finding would support Rarick's speculation that a culturally established, sedentary way of existence may be a primary factor in the motor retardation of EMR and TMR children.

The Effects of Activity Programs on Motor Performance

Mental retardation should not be associated, necessarily, with low levels of motor performance. Stein (1965) cites evidence of EMR boys attaining near normal levels of performance on the AAHPER Youth Fitness Test to substantiate this contention. His pretest scores for the EMR boys were similar to those reported for EMR and normal children by Howe (1959) and Francis (1960). Posttest scores which established EMR student performance at or near the performance levels expected of normals caused Stein to attribute the observed changes to a daily program of physical education (Stein, 1965).

Solomon and Pangel's study supports Stein's position. After implementing a structured physical education program, and comparing experimental and control groups, they concluded that the fitness levels of educables, thirteen to seventeen years of age, can be significantly improved and favorably compared with a nonretarded peer group (Solomon, 1967). Ross (1960) found similar results using game oriented motor skills as the dependent measure.

There is little doubt that programs of physical education can significantly improve the motor performance of the TMR (Nunley, 1965; Harvey, 1966; Lillie, 1968; Funk, 1971; Bundschuh, 1972). Nunley, Harvey and Bundschuh report significant findings supporting

the ability of physical activity programs to elevate the motor performance of the TMR. Nunley found that approximately eighty percent of her eleven subjects either maintained the highest possible score or improved one or more rating levels on thirteen skill oriented measures. In a study which linked the dependent measure to the instructional objectives, Harvey (1966) found significant improvement across all parameters of the dependent measure. Bundschuh (1972), in a study of fourteen TMR's and twenty-six EMR's, reported that ninety percent of the subjects learned to swim six feet or more, and that all of the TMR subjects became adjusted to the water.

In a study involving early elementary age TMR students, Lillie (1968) found significant gains in fine motor skills and non-significant gains in gross motor skills. A review of Lillie's treatment shows that the program was composed primarily of fine motor activities and was remarkably void of gross motor skills. For this reason his results are considered positive and in line with the instructional program. Funk (1971) used a more comprehensive program of gross motor activities, but selected a dependent measure that was not congruent with the instructional objectives. Non-significance in that situation was not surprising. In the same study, using the instructional objectives of the program as the dependent measure, the results were significant. In this situation improvements in fitness were reported in favor of later elementary and secondary TMR's over those of a control group.

Although it may be correct to say that programs of physical activity improve the motor performance levels of the TMR, the statement must be interpreted in light of the strengths and limitations of the individual studies reported. A summary of the studies reviewed in this section of the chapter is included in Tables 1, 2 and 3 on pages 16, 17, and 18.

Table 1 summarizes studies related to the TMR, while Tables 2 and 3 summarize studies related to EMR and normal children, respectively. The key elements of each study are listed in the left-hand margin of each table. In the boxes corresponding to a particular study and its key elements are indications which summarize the strengths and weaknesses of each study reviewed.

Examination of the research related to the motor performance of the TMR's indicates that positive performance gains to not appear to be linked to age. Insufficient information is provided in the studies to determine whether the teacher type (physical education specialist or classroom teacher) was of meaningful importance. Gains were reported for both short and long term studies, thereby ruling out duration of the study as a key variable. The treatment, although cited in brief form within the reports, was not sufficiently detailed to replicate any of the studies with the possible exception of Bundschuh (1972). Although the information provided by the dependent measure was usable, only the studies by Harvey (1966) and Bundschuh (1972) selected dependent measures which were closely associated with the objectives of the instructional program.

Table 1 Summary of Research Related to TMR's

Elements of the studies	Author and Year: Francis 1960	Nunley 1965	Nunley 1965	Harvey 1966	Lillie 1968	Funk 1971	Funk 1971	Bundschuh 1972
Age	7-12	9-14	9-14	3-13	4-6	8-18	8-18	5-19
Teacher[a]	N/A[b]	3	3	?[c]	?	?	?	?
Duration (days)	N/A	300	300	?	?	58	58	20
Days/week	N/A	5	5	?	?	5	5	5
Minutes/day	N/A	30-45	30-45	?	?	30	30	?
Time-skill relationship[d]	N/A	no	no	no	no	no	no	no
Treatment cited	N/A	yes	yes	no	yes	yes	yes	yes
Monitored	N/A	?	?	?	?	?	?	?
Replacable	N/A	no	no	no	no	no	no	?
Dependent measure								
Fitness/skill	F,S	F	S	?	S	F	S	S
CRT[e]	no	no	no	yes	no	no	no	yes
Appropriate[f]	yes	yes	yes	yes	no	yes	?	yes
Usable	yes	yes	yes	yes	yes	yes	yes	yes
Appropriate analysis[g]	yes	no	no	yes	no	no	no	yes
Sample size	23	11	11	34	48	36	36	14
Results	N/A	+	+	+	+,-	+,-	-	+
Control group	N/A	no	no	yes	yes	yes	yes	no
Comparison group	yes	yes	yes	yes	yes	yes	yes	yes

a 1=P.E. specialist, 2=classroom teacher, 3=combination of 1 and 2
b Not applicable to this study
c Information not reported
d Amount of instructional time specified by specific skill
e Criterion-referenced test as the dependent measure
f A judgment based upon congruence with program objectives
g A judgment based upon the congruence between the analysis and the data obtained

Table 2 Summary of Research Related to EMR's

Elements of the studies	Author and Year										
	Howe 1959	Francis 1960	Stein 1965	Corder 1966	Goheen 1967	Solomon 1967	Rarick 1968	Ross 1969	Schwartz 1970	Chasey 1971	Bundschuh 1972
Age	6-12	7-14	13-17	12-17	10-15	13-17	6-13	4-10	6-9	6-12	5-19
Teacher[a]	N/A[b]	N/A	1	?[c]	1	2	3	?	?	1	?
Duration (days)	N/A	N/A	140	20	39	40	100	120	?	75	20
Days/week	N/A	N/A	5	5	3	5	5	3	?	5	5
Minutes/day	N/A	N/A	?	60	60	45	35	20-25	?	60	?
Time-skill relationship[d]	N/A	N/A	no	no	no	no	no	no	no	no	no
Treatment cited	N/A	N/A	no	yes	yes	yes	yes	yes	yes	yes	yes
Monitored	N/A	N/A	?	?	?	no	?	?	?	?	?
Replicable	N/A	N/A	no	no	?	no	?	no	no	no	?
Dependent measure											
Fitness/ skill	S	F	F	F	S	F	F	S	S	S	S
CRT[e]	no	no	no	no	no	no	no	?	no	no	yes
Appro-riate[f]	yes	yes	yes	yes	?	yes	yes	?	?	?	yes
Usable	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Appropriate analysis[g]	yes	yes	yes	no	?	no	yes	no	?	no	yes
Sample size	86	284	24	24	82	42	480	60	380	47	26
Results	N/A	N/A	+	+	+	+	+	+	+	+	+
Control group	N/A	N/A	no	yes	yes	yes	yes	yes	no	yes	no
Comparison group	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

a 1=P.E. specialist, 2=classroom teacher, 3=combination of 1 and 2
b Not applicable to this study
c Information not reported
d Amount of instructional time specified by specific skill
e Criterion-referenced test as the dependent measure
f A judgment based upon congruence with program objectives
g A judgment based upon the congruence between the analysis and the data obtained

Table 3 Summary of Research Related to Normals

Elements of the studies	Author and Year: Zimmerman 1959	Ross, B. 1960	Whittle 1961	Whittle 1961	Hallstrom 1965	Scott 1967	Scott 1967	Workman 1968	Johnson 1969	Masche 1970
Age	10-13	6-12	12	12	7-10	6-7	6-7	12	14	7-8
Teacher[a]	1,2	1,2	?[b]	?	1,2,3	2	2	1,2	1	1
Duration (days)	?	?	?	?	70	80 40[c]	80 40	?	?	20
Days/week	5	?	?	?	5	4 2	4 2	?	?	2
Minutes/day	?	?	?	?	?	20 30	20 30	?	?	30
Time-skill relationship[d]	no	no	no	no	no	no	no	no	no	no
Treatment cited	yes	no	no	no	yes	yes	yes	no	no	yes
Monitored	no	no	no	no	no	?	?	no	no	?
Replacable	no	no	no	no	no	?	?	no	no	no
Dependent measure										
Fitness/skill	F	S	F	S	F	F	S	S	F,S	S
CRT[e]	no	no	no	no	no	no	no	no	no	no
Appropriate[f]	yes	no	yes	yes	yes	yes	?	yes	?	yes
Usable	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Appropriate analysis[g]	yes	yes	yes	yes	no	no	no	yes	yes	no
Sample size	150	240	162	162	483	145	145	400	745	48
Results	+	+	+	+	+	+	0	+	+	+
Control group	no	no	no	no	no	yes	yes	no	no	no
Comparison group	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

a 1=P.E. specialist, 2=classroom teacher, 3=combination of 1 and 2
b Information not reported
c Unequal days, days/week and minutes/day of the two study groups
d Amount of instructional time reported by specific skill
e Criterion-referenced test as the dependent measure
f A judgment based upon congruence with program objectives
g A judgment based upon the congruence between the analysis and the data obtained

The studies involving EMR subjects show very strong support for the positive effect which programs of physical activity can have on motor performance (Stein, 1965; Corder, 1966; Goheen, 1967; Solomon, 1967; Rarick, 1968; Ross, 1969; Schwartz, 1971; Chasey, 1971). Although these findings do not permit generalization to the TMR, one must be sensitive to studies on both EMR's and normals when designing a study for the TMR. Support for this position is provided by reviewing the congruence between the results of motor performance studies investigating normal, EMR and TMR populations. The retardation in motor performance of EMR's relative to the performance of normals reported by Francis (1960) is similar to the performance lag of TMR's behind the EMR's described by Bundschuh (1972). In a large descriptive study, Rarick (1970) notes similar achievement trends in motor performance for EMR and normal children with the EMR's retarded from two to four years.

The age of the TMR or EMR learner appears to have no important relationship to improved motor performance. Three studies used students in the age range from four to ten and found significant results (Rarick, 1968; Ross, 1969; Schwartz, 1970). All four of the researchers, who investigated groups from ten to seventeen years of age, found significant positive changes (Stein, 1965; Corder, 1966; Goheen, 1967; Solomon, 1967). Two studies, Chasey (1971) and Bundschuh (1972), which used both TMR and EMR students, also found significant positive results. Only one study (Rarick, 1968) specifically tested for age differences. The population of that study was comprised of EMR and minimally brain injured students. The

results of the study show that ten to thirteen year old children were superior in motor performance to children six to nine years of age. The differences obtained, however, were not significant.

No evidence which would reflect upon the relative effectiveness of physical education specialists or classroom teachers was generated in the studies conducted with EMR's. It does appear, however, that both of the above delivery modes can effect positive changes insofar as both teacher types were included in studies reporting significant results (Goheen, 1967; Rarick, 1968; Solomon, 1967; Chasey, 1971; Stein, 1965).

Insufficient evidence was reported in the studies conducted with EMR subjects to judge the effects of program duration, length of class period, or number of periods per week on motor performance. It can be said, however, that EMR gains in motor performance are apparent in programs of both long and short duration, long and short activity periods and in daily or spaced instructional periods. This is consistent with studies of both normal and TMR subjects.

Similar to the TMR studies, the investigations reported on EMR and normal subjects generally are not replicable (see Tables 2 and 3 on pages 17 and 18). Twenty of the studies reviewed were judged as not being described sufficiently to be replicated. In only four instances was there sufficient description of the treatment, or references to where the treatment could be obtained to provide for possible replication.

The common discrepancy found between a written instructional program and what occurs in the gymnasium is well known. For this

reason monitor data describing what occurred during the instructional setting is requisite for replicating an effective treatment. Monitor data were not mentioned in any of the studies reported.

The Effects of Teacher Type on Motor Performance

The literature related to the mentally impaired provides little insight into the relative efficiency of physical education specialists and classroom teachers in promoting improved student performance. From the available evidence it is appropriate to say that both teacher types have demonstrated a capability for effecting positive change in the motor performance of mentally retarded children.

The motor performance characteristics of the TMR, EMR and normals, which have been noted in the preceding two sections of this chapter, provide insight into programming for the mentally retarded. From the data available on normal youngsters it appears that the physical education specialist is more effective in promoting improvements in motor performance than is the classroom teacher (Zimmerman, 1959; Hallstrom, 1965; Workman, 1968). In each of these studies the results identified the specialist as being significantly more effective than the classroom teacher on nearly all measures, and on no measure were significant results reported in favor of the classroom teacher. Ross (1960) compared these same teacher types and found the specialist more effective than the classroom teacher on only one of four dependent measures, with no significant results reported on the other three measures. Incongruence between the three non-significant measures and the instructional objectives they were

purported to evaluate would have caused one to predict the results obtained.

From the available evidence, one can conclude that motor performance can be guided successfully by both the physical education specialist and the classroom teacher. Where comparisons have been made between both teacher types it appears that the specialist is more effective than the classroom teacher, at least with normal students. No evidence was found describing the effect of teacher type on motor performance when both teacher types were provided with a performance based, diagnostic-prescriptive activity program.

The Effects of Instructional Time on Motor Performance

A review of the studies reported in this chapter indicated that there was a gap in the knowledge regarding the amount of time necessary to effect significant motor performance changes in specific motor skills. The effect of instructional time on student achievement of fundamental motor skills has not been investigated with retarded or normal populations. Most of the investigations reported in this review cite the duration of their treatments, the number of periods per week and the length of the class periods. However, this information is of value only when it is linked to a complete description of the instructional treatment as it occurred or, at a very minimum, as it was intended to occur. Such a description of the treatments was not reported sufficiently in any of the studies to determine the relative effects of time on motor performance.

It is vitally important for the systematic planning of instruction to have information related to the amount of time necessary for a percentage of the students to achieve a given program element. To merely indicate that the treatment involved instruction in locomotor skills, games, or activities commonly incorporated in programs of elementary school physical education for the TMR provides little direction to the teacher who is attempting to systematically teach selected motor skills. Instructional time must be reported in such a way that it can be used to plan and allot priorities to selected skills or content areas when time is restricted. In only one instance was the amount of instructional time reported or available through reference. Bundschuh (1972) reported twenty hours of instruction over twenty days and indicated that TMR subjects all became adjusted to the water, and that a substantial number of these made sufficient progress to swim a minimum of six feet. Such information, although far from complete, is important to planning and conducting swimming programs for the TMR. The amount of instructional time associated with improved performance in each specific skill must be specified to enable full utilization of research results in curriculum planning.

Summary

As has been discussed in the preceding paragraphs, the literature related to the motor achievement of the mentally retarded suggests that the motor performance of the TMR can be improved through programs of physical education but that little information has been collected regarding how that improvement can be facilitated most effectively.

The content of Chapter III describes how this study was conducted in an effort to extend the body of knowledge which relates to the latter point.

CHAPTER III

METHODS AND PROCEDURES

Population and Sample

Population

The population of interest in this study was elementary age (5-14 years), trainable mentally retarded (TMR) children. In Michigan, TMR children are defined as having a measured IQ within the range of thirty to fifty points on a standardized intelligence test. Children categorized as trainable are capable of acquiring the basic skills of self care, social adjustment to the home and neighborhood, oral communication, and economic productivity in a sheltered workshop situation.

Sample

The responsibility for the education of TMR children residing in Michigan lies with the intermediate school districts.[1] For this reason, invitations to participate in a field test of the I CAN

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[1] An intermediate school district usually covers a county or multi-county area, depending on population density. Its function is to provide educational services of a special nature which are too expensive for individual districts to maintain. Examples of intermediate school district services include: vocational education centers, special education programs, and curriculum resource consultants.

materials were mailed to the director of special education at each intermediate school district. A majority of the trainable centers, which requested to participate in this study, had specialists teaching the physical education program. Such a sample was inadequate for the purpose of investigating the effect of the teacher variable. It was determined through the assistance of Fred Chappel, consultant for trainable programs, Michigan Department of Education, that in Livingston and Clinton County Intermediate School Districts the classroom teachers were responsible for the physical education of their students. Follow-up calls to the directors of these programs, explaining the purpose and nature of the field test, resulted in their agreement to participate. This added four additional classroom teachers to the field test sample, providing a reasonable balance between specialists (13) and classroom teachers (12).

Of the twenty-four TMR centers that were contacted, twenty requested to participate in the field test. A list of the field test sites and their geographic locations is included in Appendix C, page 92.

The I CAN "Field Test Participation Agreement" form, signed by each field test site, is included in Appendix D, page 95. This agreement form explicates the mutual responsibilities and agreements between the field test sites and the I CAN project. Appendices C and D are included, in addition to the preceding narrative, to enable the reader to make a more accurate judgment regarding the implications of this study for another sample of TMR students.

Since the treatment (I CAN) utilized prototype materials, which were undergoing formative evaluation, it was expected to be approximately sixty percent effective (Sorensen, 1971). To provide information regarding the effects of teacher type and appropriate amounts of instructional time for future implementation of I CAN, it was decided to align the sample with the expectations of program effectiveness. Therefore, the obtained sample was restricted to include the top sixty-five percent of the subjects.

Selection of the Fundamental Motor Skills

Rationale for Selection

Comprehensive programs of physical education include cognitive and affective, as well as psychomotor content. Although significant contributions to the cognitive and affective parameters of student behavior can be made through a comprehensive physical education program, it is the development of psychomotor skills which is the unique contribution of physical education.

This is true especially for the TMR at the elementary school level. The fundamental skills of locomotion and object control are basic ingredients of the sport skills and activities so important to the enjoyable and wise use of leisure time. Without these basic skills, a student may be relegated to motor performance levels far below that which is commensurate with innate ability. This situation, coupled with retarded physical proficiency, which is characteristic of the mentally retarded, may prove of sufficient magnitude to cause TMR children to withdraw from motor activities (Rarick, undated).

Should this occur, a performance area in which TMR children may most closely approximate individuals of higher mental abilities could be eliminated from their potential lifestyle. Because of the importance of the fundamental motor skills to the TMR child, this study will focus on this area of the physical education curriculum.

Criteria for Selection

The locomotor, object control and basic rhythm skills judged most important for TMR students in creating a broad motor skill base are those skills which form the content of the Fundamental Skills Module of the I CAN instructional system.[1] The specific skills investigated in this study were selected from the instructional plans developed by the (1973-74) field test teachers. Two criteria were used in the selection process: 1) the frequency with which a given terminal performance objective was selected, and 2) the degree to which a terminal performance objective was uniformly selected across both teacher types. Application of these criteria resulted in the selection of the run, underhand roll, overhand throw, and catch as the dependent measures in this study.

Design

General Approach

Since the investigation of the effects of instructional time and teacher type on student achievement occurred in a natural social

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[1] See Appendix B, page 87, for a listing of the skills included in the Fundamental Skills Module.

setting, and did not contain the controls characteristic of laboratory experiments, its design was characterized as pre-experimental (Campbell-Stanley, 1966). That is, the scheduling of data collection lacked the full control necessary for true experimentation, yet it maintained a degree of internal and external validity such that new information became available.

The design selected for this study was the one-group, pretest-posttest design. Campbell-Stanley (1966) described this design with the following notation:

$$O_1 \quad X \quad O_2$$

where O_1 = pretest, X = treatment, and O_2 = posttest. It is considered a pre-experimental design because of the limited control over factors which relate to internal validity. Internal validity, as Campbell and Stanley use the term, refers to the basic minimum of control without which any experiment is uninterpretable. External validity relates to the question of generalizability: "To what populations, settings, treatment variables and measurement variables can this effect be generalized?" (Campbell and Stanley, 1966).

The one-group, pretest-posttest design has several classes of extraneous variables which may produce effects that could be confounded with the effect of the experimental treatment. Of the eight classes of variables listed as threats to internal validity, Campbell and Stanley identify this design as having strengths in two classes, selection and mortality, and weaknesses in five classes, history, maturation, testing, instrumentation, and interaction of selection

with each of the above. The class labeled "regression" has not been identified as a strength or weakness. Each class of variables, as they relate to this experiment, will be discussed in the following paragraphs.

Threats to Internal Validity

History is the term which refers to the possible effect of specific events, in addition to the experimental variable, which occur between the first and second measurement. To be a plausible explanation of change, an event should have occurred to most of the subjects involved. Since this investigation collected data on students in different communities, under the direction of different teachers and at different times, it seemed unlikely that extraneous events would have occurred to most of the subjects. The concern for history as a rival hypothesis was further reduced in that the treatment was of short duration. Although the experimental isolation associated with the laboratory cannot be assumed in studies on teaching, it may be present in the special case of research with the TMR. The limited mental capacity of the TMR to observe and process information sets him apart from many phenomena which could influence post treatment performance. Due to the combination of the above characteristics of this study, history, as a rival hypothesis, was considered unimportant.

Maturation is the class of variables (biological or psychological) which varies with the passage of time, relatively independent of external events. Maturation was conceded to be a weakness of the

design used in this investigation. Its effect, however, was greatly reduced due to the short term nature of the treatment.

Testing is the class of variables which refers to the effect of taking a pretest, on the posttest performance of subjects. The proper implementation of I CAN requires a pretest, and therefore pretesting was part of the instructional treatment. Since each group included in the design received the pretest as a part of the instructional treatment, it was not considered to be a systematic biasing factor.

Instrumentation is the class of confounding variables which refers to the reliability of measurement across time. Instrument calibration and changes in an observer are examples of possible sources of measurement error that are independent from the treatment. Although the observer was the same on the pre- and posttest assessments, it was possible that changes in observer skill, familiarity with the instruments or modification of personal standards of judgment could have exerted an influence on mean differences that was independent of the treatment. The data and conclusions obtained in this study should be interpreted in light of this weakness. Since an important quality of the I CAN curriculum is that it can be replicated, the problem of instrumentation could be overcome by conducting additional studies which control for this source of invalidity.

Regression has been documented as a phenomenon that inflates change scores when students have been selected on the basis of their extreme scores. Because of the nature of student selection in this study, regression was not a concern.

Threats to External Validity

Threats to external validity represent a specificity of the effects of the treatment to some limited set of conditions and are therefore threats to generalizability. For the one-group, pretest-posttest design, Campbell and Stanley (1966) list the interaction of testing and treatment, and the interaction of selection and treatment as definite weaknesses, and reactive arrangements as a potential source of concern. Each of these concerns is discussed below as it relates to this study.

Interaction of testing and treatment refers to a situation where the experimental effects attained are unique to a pretested population. Since a pretest always occurs with the proper implementation of I CAN, it becomes part of the treatment and therefore was not a serious limitation of the design for this study.

Interaction of selection and treatment refers to the specificity of obtained results to the population tested. When difficulty in getting subjects occurs, as indicated by a high refusal rate (which was quite the opposite for this study), this interaction effect can be very serious. The key concern is: are there characteristics of the schools and/or subjects which are highly unique to the experimental situation? Since the number of schools included in this investigation was relatively large and since they were widely divergent in size, geographical location and instructional programs, this type of interaction was considered of little consequence to the initial sample. The interaction of selection and treatment does, however, reduce the generalizability of this investigation to the restricted population

specified in the conditional hypothesis. A discussion of the conditional hypothesis and a rationale for its use in this investigation is included in this chapter under the heading, "Rationale for the Conditional Hypothesis" on page 45.

Reactive arrangements refer to the artificiality of the experimental setting and the student's knowledge of the experiment. Within the context of this study, pre- and posttesting were built unobtrusively into the instructional program and conducted, as was the treatment, by regular staff members. The uniqueness of the TMR population is such that students' awareness of their involvement in an experiment is remote. This source of invalidity was judged to pose little threat to the external validity of this investigation.

Although many of the potential sources of internal and external invalidity are associated with the one-group, pretest-posttest design, the circumstances of its use in this study made it an appropriate selection. Maturation and instrumentation are the two known threats to the validity of this design which may restrict the interpretation of the results of the study.

Specific Design

The specific design of the study involved two variables, instructional time and teacher type. The effect of teacher type included two levels: 1) the physical education specialists, and 2) the classroom teacher. Two levels of instructional time were tested to determine its influence on student performance. The amount of instructional time consumed was categorized into one of two levels based on

natural break points in the time data reported by the field test teachers. The time categories obtained were specific to each skill and are reported in Chapter IV. Interaction effects between teacher type and instructional time also were tested. A schematic of the design appears below:

		TEACHER TYPE	
		P.E.	CLRM.
TIME	Low		
	High		

The Treatment

Specification of the Treatment

The I CAN materials include two basic resources, the instructional materials and a teacher's guide.[1] The instructional materials are characterized best as a large resource bank of terminal performance objectives, supplemented with sequential enabling objectives. Each enabling objective is supplemented with teaching-learning activities designed to guide the instructional treatment. A developmental inventory, used to assess student levels of performance, accompanies each terminal performance objective.

The I CAN teacher's guide is a procedural handbook used to guide the implementation of the program and includes information related to:

1. Long term planning
2. Assessment of student status

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[1] See Appendix A, page 80, for a brief description of the instructional materials and the teacher's guide as well as a reference for obtaining the complete documents.

3. Prescription of instruction

4. Teaching the I CAN materials

5. Evaluating, recycling, and re-planning instruction

Each of the above areas is written as a teacher competency. Each competency area includes exercises and/or activities which assist the teacher in obtaining the stated ability.[1]

The I CAN materials are not a set of sequentially ordered lessons, but a resource from which an instructional program can be built to local specifications. The teacher's guide provides the information necessary to systematically construct and conduct a physical education program.

Administration of the Treatment

Administration of the treatment in this study followed the guidelines established in the I CAN teacher's manual. The initial steps in field testing involved the I CAN staff working with the field test teachers to orient them to I CAN. The procedure involved working through each competency of the teacher's guide at the pace of each individual field test teacher. When competence was demonstrated through a knowledge of the material in the teacher's guide, and through staff monitoring of classroom action, the focus on teacher training ceased and periodic monitoring of the treatment began.

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[1]See Appendix A, page 80, for a brief description of the guide and a reference for obtaining the complete document.

Monitoring the Treatment

Throughout the first two chapters of this dissertation, reference has been made to the ability to replicate a study. This quality of an investigation is of crucial importance, yet it was not apparent in reporting the results of every study reviewed in Chapter II. Presumably, when a study is conducted, there is a rationale for both the treatment(s) and the selection of the dependent measure(s). In order to replicate treatments of interest, it is not enough to report the treatment in terms of a general descriptive statement or even reference to a book or guide which provides a complete description of that treatment. In such an instance one is forced to make the assumption that the treatment occurred as intended or as described. Anyone who has taught in the public schools is quite aware of the fallacy of this assumption. The information necessary to replicate a study is that information which describes what did occur, rather than that which was intended to occur. Such information is important for the accurate interpretation of both non-significant and significant results.

Two monitor forms were developed for this study. The first form was a guide for consultant use in monitoring the treatment, and the second was a teacher, self-reporting monitor form. Both forms, and a brief description of how they were scored, are included in Appendix E, page 97. The teacher's self-monitoring form is accompanied by a user's guide.

The purpose of the monitoring was to determine the degree to which the instructional program was implemented as intended.

Monitoring was conducted by I CAN staff members during each visit to a field test class. The data incorporated in this study were contingent upon monitor information. Unless the instructional program was implemented as intended, data from that teacher were eliminated from analysis. Application of this criterion resulted in dropping two physical education teachers and two classroom teachers from the study. The specific criteria used to determine the inclusion-elimination of a teacher from the study are included with the monitor forms in Appendix E, page 97.

Instrumentation

The selection of dependent measures is an important concern in studies which investigate the effect of an instructional treatment. When investigating the effect of an instructional program, the measure of effectiveness should be closely aligned with the objectives of the instruction (Glaser, 1963; Proger, 1972). Such a situation was not characteristic of the research reviewed in Chapter II, particularly if one reviews the studies using measures other than fitness tests.

I CAN Developmental Inventory

Changes in student performance levels were measured using the I CAN developmental inventory. A perusal of the inventory will identify it as a criterion referenced, measurement device closely linked to the teaching of I CAN. Its specific purpose in this context was to provide assessment information for the prescription of

teaching-learning activities and for planning future instruction.[1]

The inventory includes both qualitative and quantitative standards which specify skilled performance levels beginning with immature patterns and proceeding through mature and functional capacities. The elements of skilled performance which comprise the inventory are called focal points for activity. Each focal point describes an important element of skilled performance which is specific to each enabling objective within a terminal performance objective, and serves to outline the content of the objective, structure the assessment-reassessment process, and focus the instructional activities.[2] Since the focal points are closely related to a specific instructional activity, they are quite large when used as an index of performance improvement. Changes in performance which occur prior to mature performance, such as the development stages identified by Seefeldt (1972), are not identified by this instrument. Data currently in hand from the 1973-74 field test of I CAN support the above contention. In response to the statement, "Please indicate below whether or not your class improved their performance in a way that was impossible to record on the Developmental Inventory-Student Performance Score Sheet", field test teachers answered "yes" as follows: run - eighty percent, underhand throw - sixty percent, overhand throw - seventy-one percent, and catch -

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[1] A brief description of the I CAN Teacher's Guide along with a reference to where it can be obtained is included in Appendix A, page 80.

[2] Appendix F, page 111, includes the Developmental Inventory for the Underhand Roll.

sixty-three percent. This information suggests that the Developmental Inventory should be modified to become more sensitive to student improvements prior to conducting additional investigations similar in nature to this study.

The Inventory is unobtrusive in that the pretest (assessment) data were gathered through the implementation of an assessment activity for each terminal performance objective. Each assessment activity was instructional in nature and therefore, the various performance levels were taught and assessed simultaneously. The inventory is conservative in that students who are near mastery on a given focal point may gain competence within the instructional aspect of the assessment lesson and thereby score higher than expected in a more traditional pretest situation.

Posttesting (re-assessment) was continuous during the planned periods of instruction. As students met criteria, achievements were noted on the student performance score sheet. In intances where re-assessment data were not recorded during the course of instruction, the assessment activity was repeated to provide a context for the re-assessment process.

Validity of the Instrument

The use of criterion-referenced measurement requires an alternative to the traditional concept of test content validity. Since the learning task is specified in observable terms and the criterion is an operational definition of what is meant by the objective, the question, "Does the test measure what it is supposed to measure?" clearly can be answered "yes."

The question of criterion-related validity was of concern in this investigation. Criterion-related validity is defined by Isaac (1971) as a substitute for the combination of older terms, "concurrent validity" and "predictive validity." It is computed by comparing the test scores (ratings) with an external standard which is considered to be a direct measure of the behavior or characteristic in question.

Before meaning can be attached to the reliability with which ratings of student performance are reported by field test teachers, it is important that the accuracy of these ratings be compared with an acceptable standard. For the purpose of describing the degree to which the developmental inventory maintains criterion-related validity, a coefficient of criterion-related validity[1] was calculated. The obtained coefficient provided a measure of the extent of association between expert ratings[2] and ratings of the field test teachers.

The procedure for making this determination involved viewing loop films of children engaged in the following fundamental motor skills: run, underhand roll, overhand throw, and catch. The performances projected within each TPO were randomly selected from films of elementary TMR students who represented the stages of development

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[1]The coefficient of criterion-related validity is a percent correct score calculated by using the formula PC=R/N, where PC = the percent correct, R = the number of correct responses (as judged by their agreement with expert ratings on the focal points of the developmental inventory) and N = the total number of possible responses.

[2]The standard to which the teacher ratings were compared reflected perfect agreement of 4 I CAN staff members on student performance of each specific focal point.

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characteristic of children as they move towards mature performance (Seefeldt, 1972). The teachers rated the filmed performers using the I CAN Developmental Inventory to assess the focal points characteristic of those skills. The inventory for the underhand roll is includded in Appendix F, page 111. Subsequent to the rating procedure, the inventories were compared to the criterion scores established by experts. The value computed to characterize the relationship between teacher ratings and the acceptable standard provided for a range of values from 0 to 1.0.

The criterion-related validity coefficient that was selected for including data in the investigation was PC $\geq$ .75. Each coefficient was calculated by teacher and by skill for a total of thirty-seven estimates. Of these, six (16%) did not meet criterion. Data associated with those six were deleted from the study. The criterion-related validity coefficients obtained are presented in Table 4 by skill and by teacher type.

Reliability of the Instrument

The reliability of the I CAN Developmental Inventory was calculated from the data collected during the process of establishing criterion-related validity.

The process of estimating test reliabilities by correlating two measures is well known. When an investigator is dealing with performance ratings, it is characteristic to have more than two sets of scores available. In this situation, Ebel (1951) suggests that it is desirable to establish an index of their agreement with each other.

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Table 4 Criterion-Related Validity Coefficients Presented by Skill and Teacher Type

Teacher Type	Skill			
	Run	Underhand roll	Overhand throw	Catch
P.E.				
A	.63[a]	1.0	.80	.83
B	.75	.88	.90	.83
C	.88	.75	-[b]	-
D	-	.75	-	1.0
E	.88	.75	-	.67[a]
F	-	-	.80	-
G	.38[a]	.88	.60	.67[a]
CLRM.				
A	1.0	.75	.80	.67[a]
B	-	1.0	.90	-
C	-	-	1.0	.67[a]
D	1.0	-	-	1.0
E	.88	-	.80	1.0
F	1.0	.88	-	.83

a Deleted from the study (did not meet criterion of $\geq$ .75)
b Skill was not selected by the field test teacher for instructional treatment

Using Ebel's concept of estimating the degree of agreement among raters as an index of inter-rater reliability, the following simple ratio was selected. The procedure involved calculating a ratio of A=1-B/C, where A = inter-rater reliability, B = smallest number of agreement ratings, and C = largest number of agreement ratings. Estimates of this type may range in value from 0 to 1.0.

The decision to use this index of inter-rater reliability was based on the information that the following components are primarily

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responsible for inconsistency between observations (Isaac, 1971):

1. Response variation by the subject
2. Variations in test content or test situations
3. Variations in administration
4. Variations in the process of observation

Of the factors listed above, one, two and three were controlled through the use of filmed subjects, identical test content and one administration of the test using all of the raters at one time. The degree to which component four varies should account for most of the variation reported as the index of inter-rater reliability.

The procedure used to calculate the index involved tallying correct and incorrect ratings by focal point, calculating the focal point ratio and then averaging across focal points to represent the total skill. Table 5 portrays the reliability coefficients obtained by skill and teacher type.

Table 5 Inter-Rater Reliability Coefficients Presented by Skill and Teacher Type

Teacher Type	Fundamental Motor Skills			
	Run	Underhand roll	Overhand throw	Catch
P.E.	.81	.79	.89	.94
CLRM.	.97	.86	.82	.94

There were two limitations to the procedure described above: 1) the index of inter-rater reliability obtained was specific to one

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point in time, and 2) the index was specific to filmed performances. These limitations were imposed by time and cost constraints, and therefore the reliability coefficients must be cautiously interpreted by the reader with respect to their generalizability to other measurement situations.

Hypotheses

The purpose of this investigation was to determine the effects of instructional time and teacher type on the achievement of selected fundamental motor skills by elementary age TMR children. Because the study was conducted within the context of the formative evaluation of I CAN, a restricted sample (the top sixty-five percent) was used. More specifically, the study was designed to answer the following three questions for each of the four fundamental motor skills: run, underhand roll, overhand throw, and catch.

1. What are the effects of interactions between teacher type and amount of instructional time on the performance of a restricted sample of elementary age TMR students on selected fundamental motor skills?

2. What are the effects of varied amounts of instructional time on the performance of a restricted sample of elementary age TMR students on selected fundamental motor skills?

3. What is the effect of teacher type on the performance of a restricted sample of elementary age TMR students on selected fundamental motor skills?

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Rationale for the Conditional Hypothesis

Research may be conducted either independent of, or within the context of, the curriculum development process. The methods and procedures for conducting research independent of the curriculum development process are well known. The characteristics of research which is conducted within the various stages of the curriculum development process are not well established. Research conducted within the context of curriculum development must align its purpose, and therefore its approach, with the specific stage of curriculum development within which the research is conducted.

Formative and summative evaluation are two stages of the curriculum development process which are particularly conducive to conducting research activities. Formative evaluation is characterized by small sample, descriptive studies designed to generate data that will provide developers with information for revising both implementation procedures and the instructional product. Summative evaluation is characterized by comparative studies conducted with large samples representative of a broad population for the purpose of providing consumers with information relevant to the adoption of an educational product.

Research conducted within the context of formative evaluation has as its purpose the generation of new information necessary to enhance implementation, evaluation or research within subsequent stages of the curriculum development process. Research conducted within the context of the summative evaluation stage of curriculum development

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is similar in terms of purpose and approach to research conducted independent of curriculum development.

Research conducted within the context of formative evaluation should be aligned with the operational constraints of prototype materials. Since I CAN is an instructional prototype (the object of formative evaluation), it is expected to be approximately sixty percent effective (Sorenson, 1971). Therefore, a restricted sample, representative of this expectation of effectiveness was used. To investigate the effect of instructional time and teacher type within the context of the formative evaluation of I CAN, the top sixty-five percent of the field test sample was used. The sixty-five percent is slightly more conservative than the sixty percent suggested by Sorenson. The use of a restricted sample is in contrast to the use of a 100 percent sample for similar research conducted within a summative context. It should be noted that the restricted sample can only be generalized appropriately to a restricted sub-population, whereas a 100 percent sample allows one to generalize to the entire population from which the sample was drawn.

Specification of the Research and Alternative Hypotheses

The intent of this investigation was to test the main effects of time and teacher type as well as to test time by teacher type interactions. The design involved testing three hypotheses for each of four skills for a total of twelve tests. The three generic hypotheses used to guide the study are stated below.

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1. No interactions will be found between the effects of instructional time and teacher type on the performance of the top sixty-five percent of the elementary age TMR students on the fundamental motor skills of run, underhand roll, overhand throw and catch as measured by the I CAN Developmental Inventory.

2. No difference will be found in performance, as measured by the I CAN Developmental Inventory, of the fundamental skills of run, underhand roll, overhand throw and catch by the top sixty-five percent of the elementary age TMR students taught under two levels of instructional time.

3. No difference will be found in performance, as measured by the I CAN Developmental Inventory, of the fundamental skills of run, underhand roll, overhand throw and catch by the top sixty-five percent of the elementary age TMR students taught by physical education or classroom teachers.

Analysis of the Data

Experimental Unit and the Unit of Statistical Analysis

The formal definition of an experimental unit is that it corresponds to the smallest division of the experimental treatment such that any two units may receive different treatments in the actual experiment (Cox, 1966). Experimental units must respond independently of each other to insure that the treatment applied to one unit does not markedly affect another unit. Disruptions by a troublemaker or general class interaction both violate assumptions of independence and thus invalidate the use of individual students rather than

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classrooms as the appropriate experimental unit (Lindquist, 1963; Lumsdaine, 1963; Campbell-Stanley, 1966; Cox, 1966; Glass and Robbins, 1967; Raths, 1967; Glass and Stanley, 1970). Although the above definition strongly suggests that the classroom is the appropriate experimental unit, other interpretations are viable when a program is individualized. When individualization occurs, each student is receiving a unique treatment within the experimental context. By definition, the individual student is therefore the appropriate experimental unit.

In addition to the criterion, "implementing I CAN as intended", a second criterion, "high to moderate individualization of instruction", was imposed prior to including a teacher in the study. Item seventeen of the consultant monitor form and item fifteen of the self-reported monitor form (see Appendix E, page 97) were used to establish the degree to which individualization occurred. The above items were scored as indicated in Appendix E. Teachers who obtained scores below high or moderate were deleted from the study. Application of this criterion eliminated one physical education teacher and one classroom teacher in addition to the teachers deleted as a result of the more general monitor criterion described on page 37. Since the criterion of "high to moderate individualization of instruction" was held as prerequisite to teacher participation in the study, the individual student was used as the unit of statistical analysis.

To determine the effect of time and teacher type, a two-way fixed effects analysis of variance model was used. The dependent measure used in the analysis was the index of response obtained by subtracting the Developmental Inventory pretest scores from the posttest scores.

Selection of this statistical procedure was based upon: 1) the need to compare pre- and posttest scores, 2) the fact that more than two samples were to be compared, and 3) that the data were interval.[1] Four univariate tests, one for each dependent variable, were calculated rather than one multivariate analysis, since the samples obtained for each dependent measure were different. Interactions between teacher type and time were tested across the treatment levels noted above.

The allotment of time within the instructional plan of the teachers was not fixed. In the case of the run and overhand throw, time allotments were such that a two-way analysis model did not provide for a meaningful test. In this instance time was tested within teacher type using a t test. Similar modifications in the analysis procedure were made for testing the effects of teacher type for these two skills.

Statistical and Meaningful Significance

Both statistical and meaningful significance are criteria commonly used as decision points for subsequent action. Statistical significance refers to the probability that obtained difference scores could have occurred by chance whereas meaningful significance

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[1]When instruction was conducted such that a student gained one focal point for activity, it was viewed as one unit of achievement. This was true regardless of entry status. The student who achieved his first focal point and the student who entered with three focal points and achieved the fourth, each gained one instructional unit. Therefore, the difference between zero and one was consided equal to the difference between three and four and as such, the requirement for interval data was achieved.

is the minimal value which represents an important change in student behavior. Usually such a change is operationally defined as the smallest change in behavior that would be judged important enough to cause teachers, supervisors, or administrators to take action. The action may be either positive (support wide scale implementation or further development) or negative (terminate implementation or require further development and evaluation prior to implementation). Although the developers of I CAN have assigned the value of one focal point on the I CAN Developmental Inventory as the amount of difference that should be achieved to be meaningful, that criterion was not imposed on these data. Rather, the data were analyzed for possible statistical significance. Meaningful significance was referred to only in the discussion as a guideline to assist in the interpretation of the results.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

It was the purpose of this investigation to determine the effects of two levels of instructional time and two teacher types on the performance of the fundamental motor skills of run, underhand roll, overhand throw and catch by a restricted sample of elementary age TMR children. More specifically the investigation was designed to test the following generic hypotheses:

1. No interactions will be found between the effects of instructional time and teacher type on the performance of the top sixty-five percent of the elementary age TMR students on the fundamental motor skills of run, underhand roll, overhand throw and catch as measured by the I CAN Developmental Inventory.

2. No difference will be found in the performance, as measured by the I CAN Developmental Inventory, of the fundamental skills of run, underhand roll, overhand throw and catch by the top sixty-five percent of the elementary age TMR students taught under two levels of instructional time.

3. No difference will be found in the performance, as measured by the I CAN Developmental Inventory, of the fundamental skills of run, underhand roll, overhand throw and catch by the top sixty-five

percent of the elementary age TMR students taught by physical education teachers or classroom teachers.

The results of this investigation will be presented for each of the four dependent measures in the following order: run, underhand roll, overhand throw and catch. A discussion will follow the presentation of results for each specific skill. A general discussion, which reviews each skill in relation to the other skills in this investigation and the studies reviewed in Chapter II concludes the chapter.

Run

Results

The data obtained on the run were not amenable to analysis by a two-way ANOVA model. The amount of instructional time utilized in the teaching of this skill could not be divided into the four cells necessary for a two-way analysis to be computed. Table 6 portrays the amounts of instructional time distributed by teacher type.

Table 6 Distribution of Instructional Time by Teacher Type for the Run

Teacher Type	Time in Hours				
	0-1:00	1:40-2:15	2:16-3:00	3:01-4:00	4:01 +
Physical education specialists		17[a]		[b]	4
Classroom teachers	13	[b]	18		

a Equals the number of students included in this teacher-time block.
b Demarcation line establishing the two levels of instructional time.

Since the data collected on the run could not be divided into two levels of instructional time across both teacher types, no test of the main effects of time was possible. The analysis of these data compared the two levels of time within teacher types. A t test was used to compare the mean differences between two populations with unknown variances that were assumed to be equal. This statistic was selected subsequent to determining that the equality of the variance assumption could be met.[1]

The t values calculated to compare the two levels of time within each teacher type show a significant difference only for classroom teachers in favor of the high time category. A summary of the test results is presented in Table 7.

Table 7 The Effects of Instructional Time Within Teacher Types on Student Performance of the Run

Teacher Type	Time 1 (low)			Time 2 (high)			Difference	
	N	$\bar{D}$	SD	N	$\bar{D}$	SD	$\bar{D}_1-\bar{D}_2$	t
P.E.	17	2.18	2.33	4	1.75	2.24	.43	1.10
CLRM.	13	.31	.58	18	1.06	1.35	.75	2.99[a]

a Significant at $P<.05$.

[1] To test this assumption an F test of the ratio of variables of the two independent populations was used. For physical education teachers, with $S_1^2=.40$ and $S_2^2=.92$, and for classroom teachers, with $S_1^2=.64$ and $S_2^2=.23$, the tests failed to reject the null hypotheses at ($P<.05$).

Since there was a significant difference between the two levels of instructional time for the classroom teachers, and since the amount of time allotted for the teaching of the run was much higher for the physical education specialists than the classroom teachers, two analyses were computed to compare teacher effect. The first analysis merely pooled all scores and tested for mean differences between two populations with unknown variances that were assumed to be equal. Selection of this statistic was based upon the fact that the equality of variance assumption could be met.[1] The second analysis was conducted in an attempt to control for the possible influence of time by eliminating the low time group from the classroom teachers and the high time group for the physical education teachers. The resultant comparison was made between teacher types within the middle time category portrayed in Table 6, page 52. The test for equality of variance indicated that the same t statistic used previously was appropriate. Significance favoring the physical education specialists was obtained for both tests. The results of these two tests are displayed in Table 8.

Discussion

The results of the run reflect data obtained from rather widely separated instructional time allotments. The low time block for classroom teachers involved less than one hour of time devoted to

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[1]F tests were used to test the equality of variance assumption for the pooled and time controlled tests. For the pooled test, with $S_1^2=.49$ and $S_2^2=.64$, and for time controlled test, with $S_1^2=.40$ and $S_2^2=.64$, the null hypotheses were not rejected at ($P<.05$).

Table 8 The Effects of Teacher Type on Student Performance of the Run

Analysis	Teacher Type: P.E. N	P.E. $\bar{D}$	P.E. SD	Classroom N	Classroom $\bar{D}$	Classroom SD	Difference $\bar{D}_1-\bar{D}_2$	Difference t
Pooled	21	2.10	2.32	31	.74	1.08	1.35	6.37[a]
Time Controlled	17	2.18	2.33	18	1.06	1.48	1.12	4.62[a]

a Significant differences in favor of the physical education specialist over the classroom teacher, ($P<.05$).

instruction in this skill while the high time category involved from one hour and forty minutes to two hours, a difference of approximately one hour of instructional time. Examination of the mean difference score for the low time group (.31 focal points) suggests that for TMR youngsters less than one hour of time allotted by classroom teachers to instruction in running is excessively low. As instructional time increased to approximately two hours, the mean difference score shows a significant increase from .31 to 1.06 focal points. The indication that at least two hours of instructional time be allotted to teaching running skills seems warranted for classroom teachers.

Physical education specialists allotted a minimum of two hours and a maximum of five hours of instructional time to running. The mean gains obtained for the low time category (2.18 focal points) suggest that this time allotment is sufficient to significantly improve performance. Further support for the two hour recommendation

over a five hour time allotment is suggested by the mean difference score (1.75 focal points) attained by the five hour time group. Since there was no significant difference between the two levels of time, it is suggested that physical education teachers allot at least two hours, but less than five hours, of instructional time for teaching TMR youngsters to run.

A comparison of the effects of teacher type indicates that the physical education teacher is more effective in teaching the run than is the classroom teacher. These data suggest that instruction in running, for elementary age TMR children, should be conducted under the direction of a physical education specialist in order to expect maximum improvements in student performance.

Underhand Roll

Results

The data obtained on the underhand roll were amenable to analysis by a two-way ANOVA model. Table 9 indicates the distribution of instructional time by teacher type for this skill. Table 10 provides the sample size, mean differences and standard deviations by cell for the data obtained on this skill.

To analyze the data obtained on the underhand roll a two-way ANOVA model was used. The statistics were computed through use of the MANCOVA Program developed by Jeremy D. Finn and modified for use on the Michigan State University CDC 6500 by Scheifley and Schmidt (1973).

Table 9 Distribution of Instructional Time by Teacher Type for the Underhand Roll

Teacher Type	Time in Hours 1:20-2:30	2:31-3:40	3:41 +
Physical education specialist	22[a]	[b] 22	
Classroom teacher	18		10

a Equals the number of students included in this teacher-time block.
b Demarcation line establishing the two levels of time.

Table 10 Descriptive Statistics by Time and Teacher Type for the Underhand Roll

N		Mean Differences		S.D.	
	Teacher		Teacher		Teacher	
	P.E.	CLRM.	P.E.	CLRM.	P.E.	CLRM.
Time low	22	18	1.32	1.33	.72	.77
Time high	22	10	1.64	1.50	.90	1.35

The interaction and main effects were found to be non-significant. Table 11 summarizes the results of that test.

Table 11 The Effects of Instructional Time and Teacher Type on Student Performance of the Underhand Roll

Source	df	MS	F	Probability
Time	1,68	1.1991	1.4998	.2250
Teacher	1,68	.1219	.1525	.6974
Interaction	1,68	.0931	.1165	.7340
Error	68	.7994		

Since the results of all three statistical tests were non-significant, no further analysis was conducted.

Discussion

The time allotments for this skill ranged from less than two hours of time devoted to instruction to over three hours. Examination of the mean difference scores for the low time category suggests that approximately two hours of instruction devoted to this skill are sufficient to obtain meaningful changes. Tables 9 and 10, on page 57, portray the allotments of instructional time and the mean differences for the underhand roll. No corresponding change in performance occurred as the instructional time allotment increased to over three hours. The indication that at least two hours of instructional time, but less than three or more hours, be allotted

to teaching the underhand roll seems warranted for both classroom and physical education teachers.

The data suggest that physical education teachers and classroom teachers, using the I CAN materials, are equally adept at teaching TMR children this skill, at least within the time allotments analyzed in this study.

Overhand Throw

Results

The data obtained on the overhand throw were not amenable to analysis by a two-way ANOVA model. The amount of instructional time utilized in the teaching of this skill was such that a comparison of the effect of time was possible only for classroom teachers. The two physical education specialists that selected this skill utilized the same amount of instructional time. Table 12 portrays the distribution of the amounts of instructional time utilized on this skill and identifies the two levels of instructional time used for the analysis.

Since the data obtained on the overhand throw could not be divided into two levels of instructional time across both teacher types, no test of the main effect of time was possible. As indicated in Table 12, two levels of instructional time could be established for only classroom teachers. Analysis of these data was conducted through application of a t test to compare mean differences between two independent populations with unknown variances that were assumed to be equal. This statistic was selected subsequent to determining

Table 12 Distribution of Instructional Time by Teacher Type for the Overhand Throw

Teacher Type	Time in Hours 2:00-3:00		4:00 +
Physical education specialists	12[a]		
Classroom teacher	24	[b]	10

a Equals the number of students included in this teacher-time block.
b Demarcation line which establishes the two levels of time for subsequent analysis.

that the equality of variance assumption could be met.[1] The t value calculated to compare the two levels of instructional time within classroom teachers was significant. Inspection of the mean difference scores indicates that the significance favors the low time category. A summary of the results of this test is provided in Table 13.

Table 13 The Effects of Instructional Time Within Classroom Teachers on Student Performance of the Overhand Throw

Teacher Type	Time 1 (low) N	$\bar{D}$	SD	Time 2 (high) N	$\bar{D}$	SD	Difference $\bar{D}_1-\bar{D}_2$	t
Classroom	24	1.54	1.88	10	.70	1.0	.84	2.39[a]

a Significant at ($P<.05$).

[1] To test this assumption, an F test of the ratio of variances of two independent populations, with $S_1^2=1.04$ and $S_2^2=.46$, was calculated. The test failed to reject the null hypothesis at ($P<.05$).

A comparison between teacher types was possible only in the low time category (see Table 12). A *t* test was used to compare the mean differences between two independent populations with unknown variances that were assumed to be equal. Selection of this statistic was based upon the fact that the equality of variance assumption could be met.[1] The *t* value calculated was significant and favored the classroom teacher group. A summary of the results of that test is included in Table 14.

Table 14 The Effects of Teacher Type on Student Performance of the Overhand Throw

Teacher Type							
P.E.			CLRM.			Difference	
N	$\bar{D}$	SD	N	$\bar{D}$	SD	$\bar{D}_1-\bar{D}_2$	*t*
12	1.08	1.45	24	1.54	1.88	.46	3.57[a]

a Significant at ($P<.05$).

Discussion

Inspection of the mean difference scores for the low time category (1.54 focal points for the classroom teachers and 1.08 for the physical education teachers) suggests that two to three hours of instruction are sufficient to effect meaningful changes in student

[1] An F test for determining the equality of variances of two independent populations, with $S_1^2=.81$ and $S_2^2=1.04$, was calculated to determine the appropriate *t* statistic for comparing teacher types. The test failed to reject the null hypothesis at ($P<.05$).

performance for both teacher types. The mean difference score for the high time category (.70 focal points for the classroom teachers) suggests that the classroom teachers allot two to three hours of time to instruction on the overhand throw rather than four or more hours of instruction.

The distribution of time allotments for this skill allowed only one comparison of teacher effect. As indicated in Table 14, the magnitude of the difference between teacher types was significant.

Examination of the mean difference scores (1.08 for physical education teachers and 1.54 for the classroom teachers) suggests that classroom teachers are more capable of instructing elementary TMR students in this skill than are physical education specialists, at least within the time allotments analyzed in this study.

Catch

Results

The data obtained on the catch were amenable to analysis by a two-way ANOVA model. Table 15 portrays the distribution of the amounts of instructional time obtained on this skill and identifies the division point separating the two levels of instructional time used for the analysis.

The sample size, mean differences and standard deviations associated with each cell of the design are presented in Table 16.

The interaction and main effects between instructional time and teacher type were all significant. The results of those tests are summarized in Table 17.

Table 15 Distribution of Instructional Time by Teacher Type for the Catch

Teacher Type	Time in Hours 0-1:00	1:01-2:00	2:01-3:00	3:01 +
Physical education specialist		12[a]	[b] 9	
Classroom teacher	8	14		7

a Equals the number of students included in this teacher-time block.
b Demarcation line which establishes the two levels of time for statistical analysis.

Table 16 Descriptive Statistics by Time and Teacher Type for the Catch

	N		Mean Differences		S.D.	
	Teacher		Teacher		Teacher	
	P.E.	CLRM.	P.E.	CLRM.	P.E.	CLRM.
Time low	12	22	.33	1.45	.78	.60
Time high	9	7	.22	.14	.44	.38

Total: N=50

Table 17 The Effects of Instructional Time and Teacher Type on Student Performance of the Catch

Source	df	MS	F	Probability
Time	1,46	5.2889	14.7146	.0004
Teacher	1,46	2.8359	7.8898	.0073
Interaction	1,46	3.7658	10.4771	.0023
Error	46	.3594		

To establish the nature of the interaction effect the mean differences obtained were plotted by time and teacher type. Figure 1 graphically portrays the catching interaction effect.

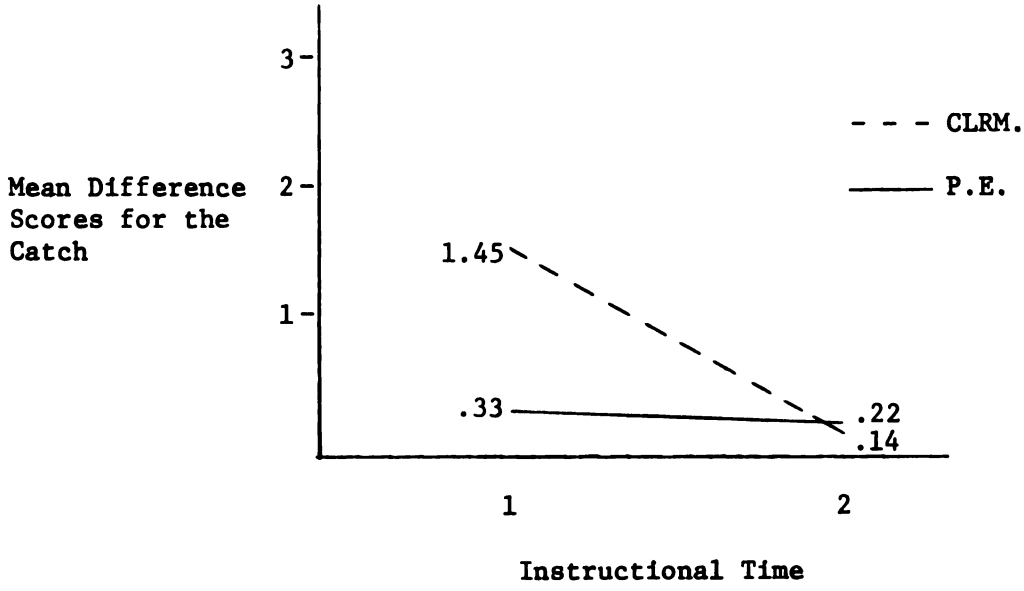


Figure 1 Disordinal Interaction Effect Between Teacher Type and Instructional Time for the Catch

Due to the difficulty associated with the interpretation of significant main effects when a significant disordinal interaction occurs, two additional analyses were conducted. The two levels of time were compared within teacher type and both teacher types were compared within each level of time. The effect of time within teacher types was significant for classroom teachers in favor of the low time category. Table 18 summarizes the comparison of two levels of instructional time within each teacher type.

Table 18 The Effects of Instructional Time Within Teacher Types on Student Performance of the Catch

Source	df	MS	F	Probability
Time: P.E.	1,46	.0635	.1766	.68
Time: CLRM.	1,46	9.1366	25.4195	.0001
Error	46	.3594		

Analysis of the effect of teacher type within categories of time revealed a significant difference between teacher types in the low time category which favored the classroom teacher ($P<.0001$). Within the high time category, no significant differences were obtained. Table 19 summarizes the analysis of teacher type within time categories.

Discussion

Examination of the mean difference scores associated with classroom teachers and the low time category (1.45 focal points)

Table 19 The Effects of Teacher Type Within Instructional Time Categories on Student Performance of the Catch

Source	df	MS	F	Probability
Teacher: Time 1	1,46	9.7611	27.1571	.0001
Teacher: Time 2	1,46	.0248	.0690	.7940
Error	46	.3594		

suggests that for TMR youngsters approximately two hours of instruction in catching are sufficient to obtain meaningful change. As instructional time is increased to three or more hours, a significant decrement in performance is obtained (.14 focal points). For physical education teachers, neither time allotment was sufficient to effect a substantial change in performance. There is no apparent reason for this finding.

Analysis of teacher type within time indicated a significant difference between teacher types within the low time category which favored the classroom teachers. These data indicate that classroom teachers, rather than physical education teachers, should be responsible for teaching the catch to this population group.

General Discussion

The literature reviewed during the formative stages of this investigation contained no information relative to the effect of varied amounts of instructional time on performance increments in specific fundamental motor skills. The only basis for a comparison

of the results of this study with additional information on instructional time was the skills included in this study.

With respect to amount of instructional time, it appears that the allotment of approximately two hours for instruction was as effective as, and in two cases (classroom teachers within the overhand throw and the catch) superior to, the larger time increments. It is interesting to note the consistency of the mean difference scores which favor the lower time categories. Of the four skills studied, in only one instance (the underhand roll) was the mean difference of the three-hour plus time allotment greater than the two-hour time allotment. Figure 2, page 68, provides a graphical overview of the mean difference scores obtained by time and teacher type. Although these data provide no apparent reason for such a finding, it is possible that instruction planned and conducted for shorter time increments is better organized and implemented than when larger time allotments are used.

A comparison of the effects of teacher type across the four skills investigated in this study yields conflicting results. Contrary to the results obtained on the run, classroom teachers appeared significantly more effective than physical education specialists in teaching the catch and the overhand throw. No significant differences in teacher type were noted in the underhand roll.

Hallstrom (1965) found significant differences favoring physical education specialists over classroom teachers on all measures, whereas Zimmerman (1959), Workman (1968), and Ross (1960) found significant differences in a majority of their dependent measures

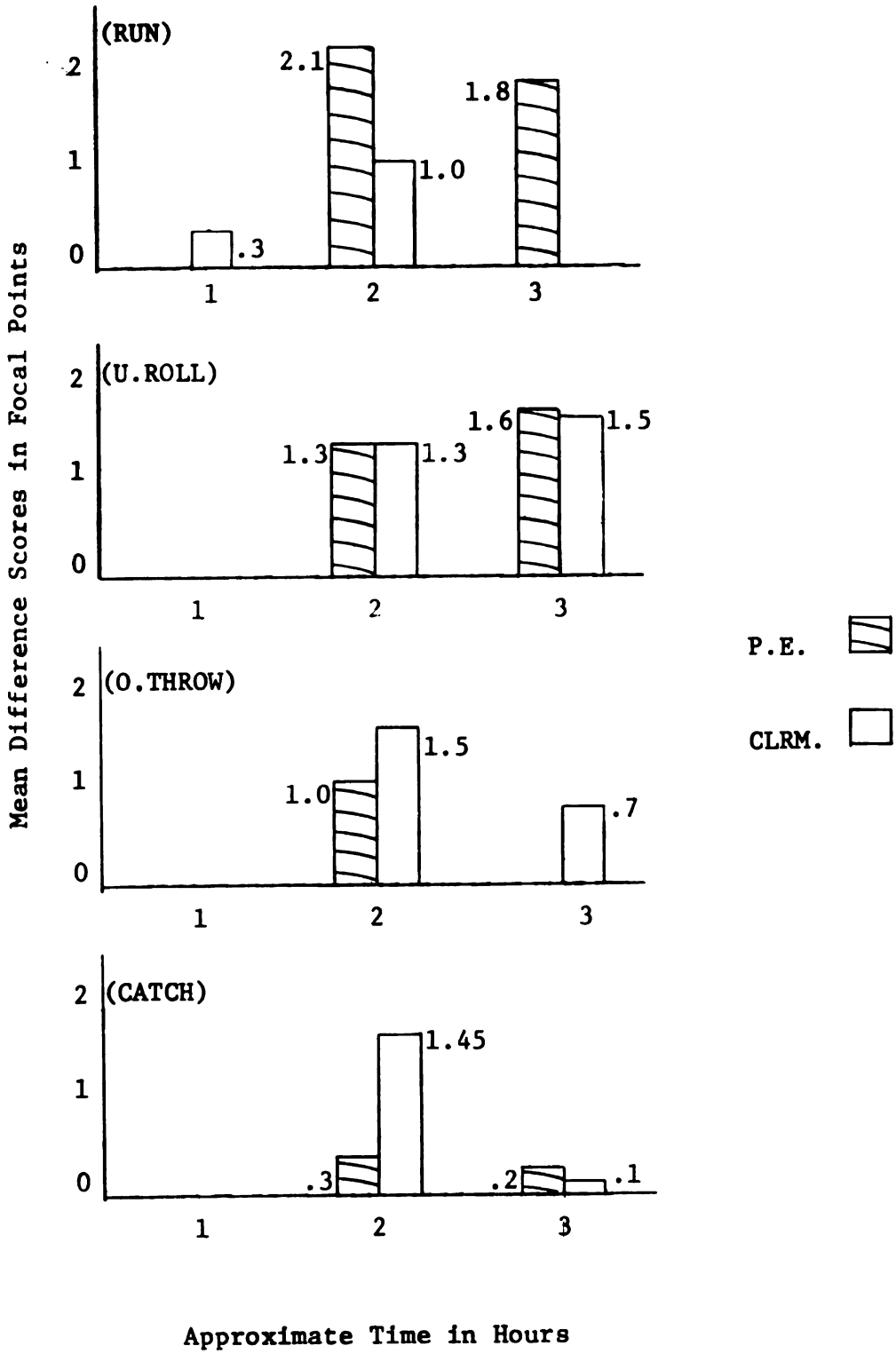


Figure 2 Overview of Results for the Run, Underhand Roll, Overhand Throw and Catch

favoring physical education teachers. There were cases, however, in the three studies cited immediately above, in which both teacher types were equally effective. In no instance was significance reported in favor of classroom teachers. It should be noted, however, that all of the above studies were conducted with normal elementary age subjects and utilized a broad physical education program as the instructional treatment, rather than the single skill focus characteristic of this investigation.

A comparison of the studies summarized above, with the results of this investigation, yields conflicting results. The data on the run (significant results favoring physical education teachers over classroom teachers) are supportive of Hallstrom's findings and consistent with the findings of Zimmerman, Workman and Ross. The results of the underhand roll (no difference between teacher types) are consistent with the results of Zimmerman, Workman and Ross and contrary to the results of Hallstrom. In the overhand throw and in the catch the results of this study (significant results favoring classroom teachers over the physical education specialists) are contrary to each of the studies cited above.

The differential effects of teacher type by skill found in this study may be attributed to the unique characteristics of each specific skill. The relatively static nature of the underhand roll, overhand throw and catch as compared to the dynamic nature of the run could partially account for the results obtained.

To provide a fair test between types and amounts of instructional time, it appears necessary to provide the same amount of assistance and materials to the comparison groups. The fact that

diagnostic-prescriptive materials and implementation methods were provided for both teacher groups may tend to minimize differences in teacher effectiveness. Such a condition could account for part of the discrepancy between the results of this study and the results of Hallstrom (1965), Zimmerman (1959), Workman (1968) and Ross (1960), since these studies did not provide this type of assistance.

The results of this study appear to provide evidence supporting the specificity of relative amounts of instructional time and teacher type in interaction with the specific skills under investigation. Such a finding suggests that studies which utilize a total physical education program (as opposed to specific elements of a program) to investigate a characteristic(s) of interest may prove to be misleading. The results of this study suggest that future research treat this possibility when investigating activity programs, for their effect upon motor performance.

The developers of I CAN have suggested that a mean difference of at least one focal point on the I CAN Developmental Inventory is necessary, in addition to statistical significance, to claim meaningful significance. The insensitivity of the 1973-74 I CAN Developmental Inventory, however, limits the confidence that can be placed in the value of one or more focal points as a definition of meaningful significance. The fact that the revised edition of the Developmental Inventory has been sensitized, by dividing it into smaller focal points, lends to support the use of a smaller value for this criterion. Although the value may be conservative at this point in time, it remains an important decision aid to judgments concerning the utility of the results of this investigation.

The following results met both meaningful and statistical significance:

1. Physical education specialists were more effective than classroom teachers in teaching the run.

2. For classroom teachers the low time category was more effective than the high time category in teaching the run.

3. In the low time category classroom teachers were more effective than physical education specialists in teaching the catch.

An examination of Table 20, page 72, provides a summary of all twelve hypotheses tested and a comparison of instances where statistical and meaningful significance were obtained.

Table 20 Summary of Statistical Tests for the Fundamental Skills: Run, Underhand Roll, Overhand Throw and Catch

Skill		Hypotheses	Summary: Statistical Significance	Summary: Direction	Summary: Meaningful[a] Significance
	1.	Interaction	(No Test)		
	2.	Time:			
RUN		P.E. Teacher	No	None	No
		CLRM. Teacher	Yes	High	No
	3.	Teacher	Yes	P.E.	Yes
UNDERHAND	4.	Interaction	No	None	No
ROLL	5.	Time (Main)	No	None	No
	6.	Teacher (Main)	No	None	No
	7.	Interaction	(No Test)		
OVERHAND	8.	Time:			
THROW		CLRM. Teacher	Yes	Low	No
	9.	Teacher	Yes	CLRM.	No
	10.	Interaction	Yes	-	-
		Time: P.E.	No	None	No
CATCH		Time: CLRM.	Yes	Low	Yes
		Teacher: Time 1	Yes	CLRM.	Yes
		Teacher: Time 2	No	None	No
	11.	Time (Main)[b]	Yes	Low	Yes
	12.	Teacher (Main)[b]	Yes	CLRM.	Yes

a To meet the criterion of meaningful significance the magnitude of D_1-D_2 must be equal to or greater than one unit and be statistically significant. The value "one" (1) was set by the developers of I CAN as the smallest unit of change that would be accepted as having practical utility.

b For a more accurate interpretation of the effects of time and teacher type review the tests within categories of time and teacher type under the interaction effect.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

Summary

The purpose of this investigation was to determine the effects of teacher type and varied amounts of instructional time on the achievement of selected fundamental motor skills by elementary age TMR children. The study was conducted within the context of a formative evaluation of the I CAN instructional system in an effort to obtain information relative to implementation and further evaluation of this curriculum. The amount of instructional time for a specific skill was recorded by teacher type and divided into high and low time categories. Teacher type refers to instruction conducted by either physical education specialists or regular classroom teachers. The fundamental motor skills selected for the study were the run, underhand roll, overhand throw and catch.

The review of literature related to this investigation revealed that the motor performance levels of the TMR could be improved through programs of physical education. Indications were that both physical education teachers and classroom teachers could effect significant gains in motor performance. However, physical education teachers appeared to be more effective, at least with normal populations using a broad activity program as the treatment. No

information regarding the effects of diagnostic-prescriptive programs or various instructional time allotments in specific fundamental motor skills was reported in the literature reviewed. With respect to research methodology, no studies were reviewed that described and monitored the treatment such that replication could occur.

This study was designed to investigate the effects of two levels of time and two teacher types on the motor performance of elementary age (5-14 year old) TMR boys and girls. The treatment was based upon the I CAN instructional system. Since the materials used for the instructional treatment were in prototype form and undergoing formative evaluation, a restricted sample (the top sixty-five percent of the subjects participating in the 1973-74 field test of I CAN) was used to determine the effects of teacher type and time. The field test was conducted in central lower Michigan and involved both rural and urban TMR children. Teachers who did not meet moderate to high implementation criteria, as judged by monitoring procedures, were dropped from the study. The I CAN Developmental Inventory was the dependent measure used to determine increments in performance.

Indexes of criterion-related validity and inter-rater reliability obtained for the inventory were moderate to high. Three hypotheses dealing with the effect of interaction, the main effect of time and the main effect of teacher type were investigated for each skill. Since moderate to high amounts of individualized instruction by the field test teachers were requisite to their participating in the study, the student was used as the experimental unit and the unit of statistical analysis.

The results of the study are cited in summary form below. Differences in student performance within time and teacher type categories indicate that:

1. For the run, the two hour time allotment was more effective than the one hour allotment and physical education teachers were more effective than classroom teachers.

2. The investigation of the underhand roll revealed no significant differences in interaction or main effects.

3. For the overhand throw, a total of two to three hours of instruction by classroom teachers was significantly better than approximately four hours of instruction. Differences between teacher types were significant and favored the classroom teacher.

4. Interpretation of the main effects within the catch was confounded by a significant disordinal interaction. For physical education specialists, there was no difference between high and low time categories. For classroom teachers, however, there was a significant difference favoring the low time category. Differences in teacher type within the low time category were significant and in favor of the classroom teacher. In the high time category, no difference between teacher types was obtained.

Guidelines which reflect the values associated with what the developers of I CAN consider to be of meaningful significance were provided to assist in the interpretation of these results.

The mean difference scores obtained from pretest to posttest were well beyond the one focal point which was considered to be meaningful by the developers of I CAN. This was true for three of

four mean difference scores in the run, all of the scores for the underhand roll, two of the three for the overhand throw and one of the four for the catch.

Conclusions

Within the limitations of these data, the following conclusions were drawn:

Run

1. For physical education specialists, approximately two hours are as effective as five hours of instructional time.

2. For classroom teachers, two hours of time are significantly more effective than one hour of instructional time.

3. Physical education teachers are more effective than classroom teachers within the two hour time category.

Underhand Roll

4. Two hours of instruction are as effective as three to four hours of instruction for both physical education specialists and classroom teachers.

5. Physical education specialists and classroom teachers are equally effective in both two- and three-to-four hour instructional time blocks.

Overhand Throw

6. For classroom teachers, two to three hours are more effective than four to seven hours of instructional time.

7. Within the two to three hour instructional time allotment, classroom teachers are more effective than physical education teachers.

Catch

8. For physical education specialists, one to two hours are as effective as two to three hours of instructional time.

9. For classroom teachers approximately one to two hours of instructional time are more effective than three to four hours.

10. Within the one to two hour instructional time allotment, classroom teachers are more effective than physical education specialists.

11. Within the two to three hour instructional time allotment, physical education and classroom teachers are equally effective.

Implications

1. The future implementation of the I CAN instructional system with elementary age TMR children should consider the allotment of two hours, but less than approximately four hours, of time for instruction in the run, underhand roll, overhand throw and catch.

2. It appears that the I CAN materials can be used effectively by both physical education and classroom teachers with differential effectiveness across the specific skills selected for instructional treatment.

3. The establishment of a program of physical education for elementary age TMR youngsters should consider the possibility of assigning teaching responsibilities to physical education and classroom teachers. Such an assignment should be based on evidence of differential effects between teacher types on the specific skills included in the program.

4. The design of further research or evaluation of I CAN, as a treatment, should consider: 1) the investigation of effects by specific skills, 2) the use of a modification of the I CAN Developmental Inventory which is more sensitive to performance increments, 3) maintenance of the procedure of monitoring the treatment such that differences between what was intended to occur, and what did occur, can be adequately described or controlled, and 4) maintenance of the practice of providing the same amount of assistance and materials to comparison groups to assure a fair test of the dependent variable of interest.

Recommendations

Further research concerned with the effects of teacher type and amount of instructional time on the achievement of selected fundamental motor skills should consider the following points:

1. Investigation of the effects of various allotments of time which are conducted within the context of formative evaluation should specify the time categories. Such a procedure provides for testing specific time allotments of interest and is more compatible with the small samples characteristic of formative evaluation.

2. There is a need to extend the knowledge regarding the skills and variables investigated in this study through research conducted with an unrestricted sample. Such investigations could expand the generalizability of the results to a much broader population than was possible in the present investigation.

Questions generated during this investigation, which are important to the implementation and further evaluation of the I CAN

instructional materials, are as follows: 1) What are the effects of various lengths of instructional treatments within single class periods on specific motor skills?; 2) What are the effects of various spacings of instructional time by skill across the duration of the time allotments for selected motor skills?; 3) Are there interactions between the variables listed above?; 4) What are the effects of various combinations of specific skills taught simultaneously or in sequence? Questions such as these need to be investigated to generate information specific to the implementation, development and further evaluation of I CAN. They are of equal interest and should be investigated, independent of the curriculum development process as they relate to other treatments, population groups and research on the teaching-learning process.

APPENDICES

APPENDIX A

OVERVIEW OF I CAN

I CAN

A LETTER FROM THE DIRECTOR

One of the most significant advances in physical education during the past decade is the emphasis that has been and is being placed on developing instructional materials specifically designed for handicapped children and youth. The emphasis of this effort is two-fold. First, it is directed toward the preparation of the instructional materials themselves. Secondly, it is directed toward the professional preparation of special education teachers in the classroom and gymnasiums throughout the country.

The I CAN series is the first physical education curriculum especially designed for mentally retarded children. It will, when properly used, enable the teacher, in the classroom, in the gym, in the pool, or on the playground, to function more effectively and efficiently.

The series was developed for special education teachers by special educators and professional physical educators. It brings into focus the contributions of the profession and heralds further advances in providing equal opportunities for all children to achieve their potential by providing:

- relevant appropriate instructional materials based on need assessment.
- competency based training of special education teachers.
- evaluation of pupil achievement.

The I CAN Individualized Physical Education Curriculum Project was funded by the Division of Research, Bureau of Education for the Handicapped, United States Office of Education, in June, 1971. The Project was charged with writing, field testing, evaluating, and disseminating curriculum materials for trainable mentally impaired children and youth. The initial materials development activities are directed toward the preschool through primary age group, 3-14 years old. The instructional materials are assembled into modular teaching kits which, together with the comprehensive teacher's guide, make it easy for the teacher to provide the student with prescriptive teaching-learning activities that are carefully sequenced.

The Primary Skill Modules of I CAN in this 1973-74 edition include:

Modules

I. Aquatics
II. Body Management
III. Fundamental Skills
IV. Health-Fitness

***I**ndividualize instruction*
***C**reate social leisure competence*
***A**ssociate all learnings*
***N**arrow the gap between theory and practice*

Over the past two years the I CAN modules and Teacher's Guide have been written, pilot tested, modified and reviewed by experts and teachers. Through suggested modifications the materials have been synthesized, evaluated and revised by the I CAN Staff. The large number of individuals involved in the production of these materials and their extensive pilot and field testing in experimental classes of trainable and severely mentally retarded students at the Beekman Training Center and in 20 other centers in lower Michigan, provide us with assurance that the program is effective.

The I CAN Primary Skills Modules spans from preschool, through early and later primary and into intermediate years. The pace is set by the teacher based on the individual needs, interests, and on preactivity experiences of each learner in the classroom. Teaching strategies have been suggested, based on the student's level of response. Strategies include modeling, physical and environmental manipulation, verbal direction and inquiry.

In the following words you can see much of the philosophy that guides us in this project.

"Life's battles don't always go to the stronger or faster man. But sooner or later, the man who wins is the man who thinks he can."

Together we can herald the future advancement of our profession in equal opportunity for all children to achieve their potentials.

Cordially yours,

Janet A Wessel

Janet A. Wessel, Ph.D.
I CAN Project Director
135 Women's Intramural Building
Michigan State University
East Lansing, Michigan 48823
(517) / 355-4740

MATERIALS DESIGN

The structure of the I CAN curriculum is composed of a number of descriptive divisions. Five of these divisions or titles serve to break the materials down into teachable components:

MODULES
PERFORMANCE AREAS
TERMINAL PERFORMANCE OBJECTIVES
ENABLING OBJECTIVES with their
FOCAL POINTS for activity

Under other titles, information is contained that will make the job of teaching the Enabling Objectives easier. These titles include:

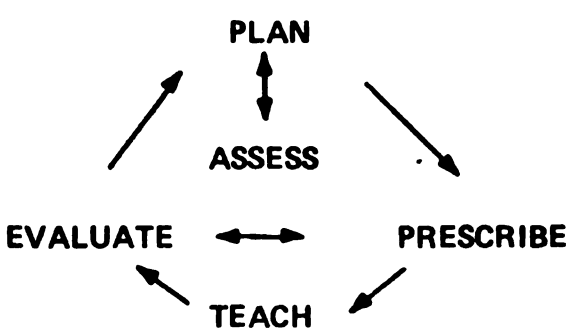
TEACHING LEARNING ACTIVITIES, which are used in teaching to promote student learning.
GAME ACTIVITIES, which are used along with skill development.
DEVELOPMENTAL INVENTORY, which contains assessment activities student performance levels, student performance score sheets, and general expectancies.

The Performance Objectives or behavioral objectives, tell what the learner should be able to do, such as, demonstrate a functional run. The Enabling Objectives break down the Performance Objectives into steps which enables the child to reach the terminal performance capacity. The Enabling Objectives are described in terms of one or more "key-discrete" behaviors of interest. These terms are referred to as the Focal Points for activity. A Teaching Learning Activity is written for each focal point.

GUIDE FOR TEACHERS

The Guide for Teachers was constructed from suggestions and questions of teachers using the I CAN Materials. It is written as an aid for enabling teachers to function effectively and efficiently while using this curriculum. The guide should be used as a resource in planning a program that can be individualized to the needs of the learner, the class group, and the teaching schedule.

The use of the curriculum is structured around the following teacher behavior model:



MODULE I
Aquatics

Swimming provides an opportunity for the retarded child to engage in many popular recreational and social group activities. Not only is swimming a valuable skill in itself, but it is also considered a necessary prerequisite for safe participation in any water-related activity such as boating, water skiing, fishing, ice skating, etc. Aquatic activity also provides a resource for the development of self-concept, physical fitness, independence and safety skills. The Aquatics Module includes the basic water adjustment skills, basic strokes and self-rescue skills which provide the child with the necessary prerequisites to acquiring other more advanced aquatic skills.

BASIC SKILLS

Mental Adjustment to Water
Functional Front Float with Kick
Functional Back Float with Kick
Functional Water Entry Ability

STROKES

Functional Finning Stroke
Functional Human Stroke
Functional Crawl Stroke
Functional Back Crawl Stroke
Functional Elementary Backstroke

SELF RESCUE SKILLS

Change Directions and Positions
Functional Survival Float
Functional Treading Water

MODULE II
Body Management

The Body Management Module contains not only the elements necessary for the retardate's motor, cognitive and affective development through student-centered activity programs, but also many learnings associated with growth in other subject areas (art, numbers, language, music, and self-help skills). This module is designed specifically as a foundation for sensory motor learnings and environmental interaction. The selection of the gross motor elements was based on criteria in the following areas:

- perceptual-motor development
- balance and stability
- mobility

Such criteria encompass body awareness, directionality - laterality, spatial awareness, and body balances.

BODY AWARENESS

Body Actions
Body Parts
Body Areas

AWARENESS OF ENVIRONMENT

Shapes and Sizes
Spatial Directions
Personal and General Space

AWARENESS OF BODY POSTURE

Static Body Postures
Pulling, Pushing and Turning
Dynamic Body Postures
Transporting Objects

CONTROLLING THE BODY

Total Body Rotations
Static Upright Body Balances
Static Inverted Body Balances
Dynamic Body Balances
Climbing

MODULE III
Fundamental Skills

The learning of fundamental skills forms the foundation for all other motor skill learning. These fundamental skills provide a base for the acquisition of skills necessary for socio-leisure, daily living, and vocational tasks.

Although of great value to all children, fundamental skills are especially important in enhancing the quality of life of the retardate. While normal children seem to "instinctively" learn the basic skills involved in play activities, the retarded child needs to be "taught" many of these skills. It is, therefore important that educators include a strong fundamental skills base in their programs, to enable the retarded child to reach his potential performance level.

LOCOMOTOR SKILLS

- Functional Run
- Functional Leap
- Functional Horizontal Jump
- Functional Vertical Jump
- Functional Hop
- Functional Gallop
- Functional Slide
- Functional Skip

OBJECT CONTROL

- Functional Underhand Roll
- Functional Underhand Throw
- Functional Overhand Throw
- Functional Kick
- Functional Continuous Bounce
- Functional Catch
- Functional Underhand Strike
- Functional Overhand Strike
- Functional Forehand Strike
- Functional Backhand Strike
- Functional Two-Handed Sidearm Strike

RHYTHMIC SKILLS

- Functional Movements to an Even Beat
- Functional Movements to an Uneven Beat
- Accent and Phrasing
- Imitate Movements
- Communication

MODULE IV
Health/Fitness

The development of physical fitness is as important to the mentally retarded child as it is to the normal child. In gaining the fitness components of muscular strength, stamina, flexibility and relaxation, the child develops a basis for engaging in a wide variety of physical activities and movement experiences. The Health/Fitness Module contains selected exercises and vigorous daily living activities which can be used in developing functional levels of fitness. Also, activities related specifically to weight control and diet are contained in this module.

PHYSICAL FITNESS SKILLS

- Abdominal Strength & Muscular Endurance
- Arm/Shoulder-Chest Strength & Muscular Endurance
- Stamina & Heart/Lung Endurance
- Trunk & Leg Flexibility
- Relaxation
- Basic Conditioning Program

WEIGHT CONTROL

- Exercise & Weight Control
- Body Shape
- Body Changes
- Diet & Performance

APPENDIX B

FUNDAMENTAL MOTOR SKILLS: PERFORMANCE OBJECTIVES OVERVIEW AND EXAMPLE

Locomotor Skills

1. Functional Run
   - 1.1 mature run
   - 1.2 mature run with pacing
   - 1.3 mature run around obstacles

2. Functional Leap
   - 2.1 mature leap
   - 2.2 mature leap over obstacles

3. Functional Horizontal Jump
   - 3.1 mature horizontal jump
   - 3.2 mature horizontal jump with running approach

4. Functional Vertical Jump
   - 4.1 mature vertical jump
   - 4.2 mature vertical jump with running approach

5. Functional Hop
   - 5.1 mature hop
   - 5.2 mature hop with changing speed
   - 5.3 mature hop around obstacles

6. Functional Gallop
   - 6.1 mature gallop
   - 6.2 mature gallop with changing speed
   - 6.3 mature gallop around obstacles

7. Functional Slide
   - 7.1 mature slide
   - 7.2 mature slide with changing speed
   - 7.3 mature slide around obstacles

8. Functional Skip
   - 8.1 mature skip
   - 8.2 mature skip with changing speed
   - 8.3 mature skip around obstacles

Object Control

9. Functional Underhand Roll
   - 9.1 mature underhand roll
   - 9.2 mature underhand roll with accuracy

10. Functional Underhand Throw
    - 10.1 mature underhand throw
    - 10.2 mature underhand throw with accuracy

11. Functional Overhand Throw
    - 11.1 mature overhand throw
    - 11.2 mature overhand throw with accuracy

12. Functional Kick
    - 12.1 mature kick
    - 12.2 mature kick with accuracy and running approach

13. Functional Continuous Bounce
    - 13.1 mature bounce
    - 13.2 mature bounce while running
    - 13.3 mature bounce with accuracy

14. Functional Catch
    - 14.1 mature catch
    - 14.2 mature catch with accuracy

15. Functional Underhand Strike
    - 15.1 mature underhand strike with hand
    - 15.2 mature underhand strike with paddle
    - 15.3 mature underhand strike with accuracy

16. Functional Overhead Strike
    - 16.1 mature overhead strike with hand
    - 16.2 mature overhead strike with a short paddle
    - 16.3 mature overhead strike with accuracy

17. Functional Forehand Strike
    - 17.1 mature forehand strike with hand
    - 17.2 mature forehand strike with paddle
    - 17.3 mature forehand strike with accuracy

18. Functional Backhand Strike
    - 18.1 mature backhand strike with paddle
    - 18.2 mature backhand strike with accuracy

19. Functional Two-Handed Sidearm Strike
    - 19.1 mature two-handed strike
    - 19.2 mature two-handed strike with accuracy

Rhythmic Skills

20. Functional Movements to an Even Beat
    - 20.1 movement to an even drum beat
    - 20.2 movement to an even musical beat
    - 20.3 combined movement to an even beat

21. Functional Movements to an Uneven Beat
    - 21.1 movement to an uneven drum beat
    - 21.2 movement to an uneven musical beat
    - 21.3 combined movement to an uneven beat

22. Accent and Phrasing
    - 22.1 movement in relation to rhythmic accent
    - 22.2 movement in relation to rhythmic phrasing

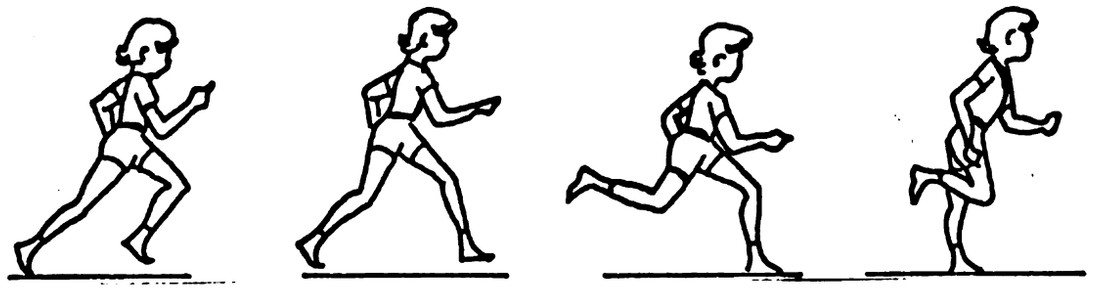
23. Imitate Movements
    - 23.1 common objects

24. Communication
    - 24.1 feelings
    - 24.2 gestures

MODULE 3: Fundamental Skills PERFORMANCE AREA: Locomotor Skills

TERMINAL PERFORMANCE OBJECTIVE 1: To demonstrate a functional run.

ENABLING OBJECTIVE	FOCAL POINTS FOR ACTIVITY
1. To demonstrate a mature run.	1. Given a verbal request and a demonstration, the student can run 100 feet in a manner characterized by: a. consistent periods of non-support b. knee of non-support leg bent more than 90° from side view c. foot placement near on-line, (2 inches either side of a 1 inch line) d. arms in opposition to legs - elbows bent



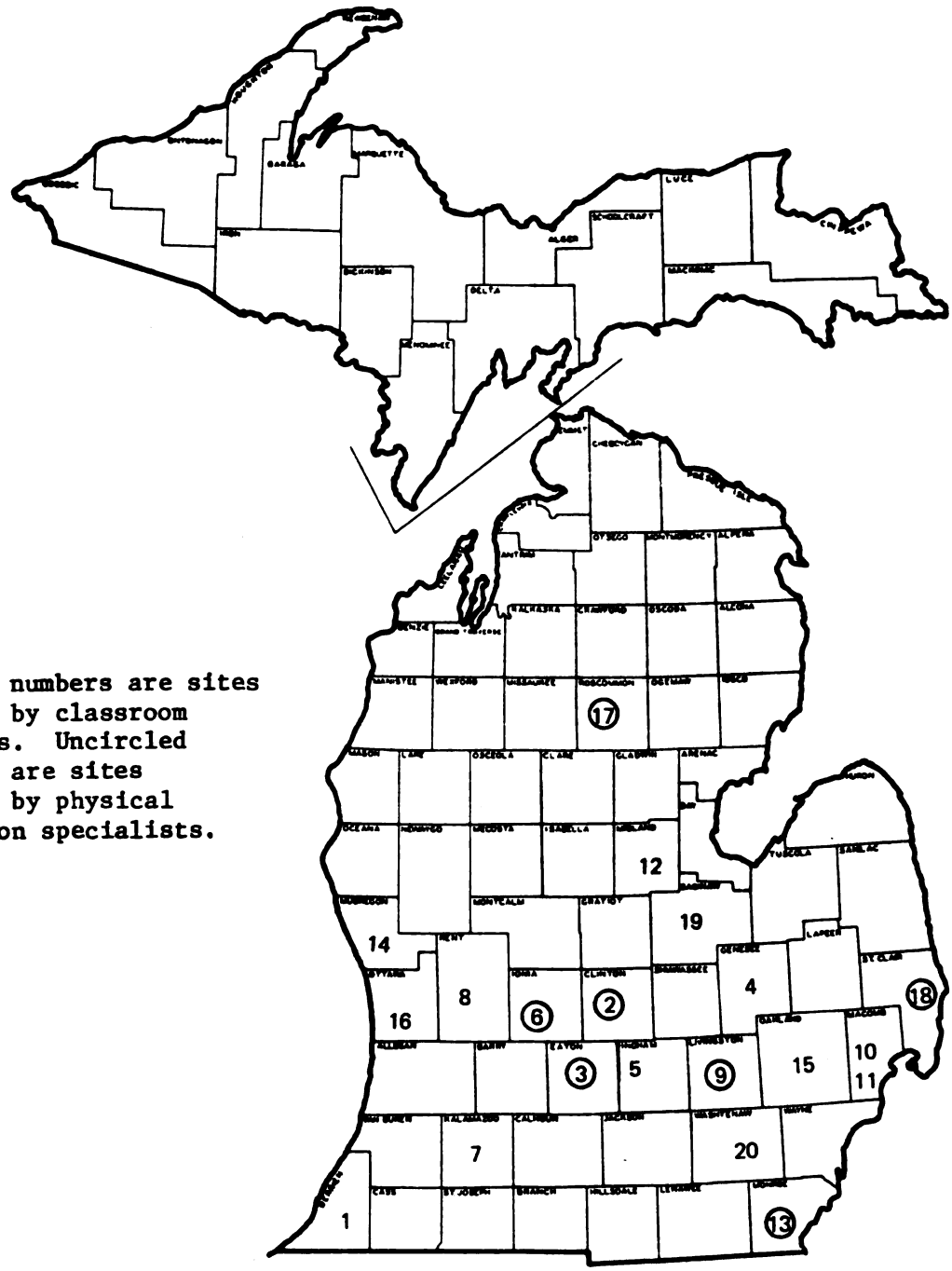
ENABLING OBJECTIVE	FOCAL POINTS FOR ACTIVITY
2. To demonstrate a mature run with pacing.	2. Given a verbal request and a demonstration, the student can run with a mature pattern in a manner characterized by: a. accelerating and decelerating - increases the size of steps when accelerating, decreasing size of steps when decelerating - forward lean of the body when accelerating, backward lean when decelerating b. pacing - in such a manner that the first 100 yards and the second 100 yards, of a 200 yard run, are within 5 seconds of each other - upright body in maintaining pace - stopping by lowering body weight and leaning backward

PERFORMANCE OBJECTIVE (CONTINUED)

ENABLING OBJECTIVE	FOCAL POINTS FOR ACTIVITY
3. To demonstrate a mature run around obstacles.	3. Given a verbal request and a demonstration, the student can run with a mature pattern, an obstacle course which includes right and left turns, reversals, acceleration and deceleration, in a manner characterized by: a. correctly executing the course pattern b. bends knees to lower center of gravity c. stops forward movement to change direction d. leaning to the inside of each turn

APPENDIX C

I CAN FIELD TEST SITES 1973-74



Circled numbers are sites staffed by classroom teachers. Uncircled numbers are sites staffed by physical education specialists.

Field Test Centers, 1973-1974

1. Berrien County
   Gard School
   St. Joseph, Michigan
   Mary Wilhelmsen, Principal
   Jean Ryan, Teacher

2. Clinton County
   Clinton I.S.D.
   St. Johns, Michigan
   Larry Schwartzkopf,
   Special Ed. Director
   Margie Harbut, Teacher

3. Eaton County
   Eaton I.S.D.
   Charlotte, Michigan
   Janeen Mauldin, Principal
   Margorie Springman, Teacher
   Claudia Tanner, Teacher
   Jane Williams, Teacher

4. Genesee County
   Roosevelt Center
   Flint, Michigan
   Elden Carlson, Principal
   Tim Jahn, Teacher

5. Ingham County
   Beekman Training Center
   Lansing, Michigan
   John Breaugh, Principal
   Judy Flachs, Teacher
   Don Kopec, Teacher
   Susan Sponeybarger, Teacher

6. Ionia County
   Forrest Grove School
   Ionia, Michigan
   Clarice Cummings, Principal
   Jim Paris, Teacher

7. Kalamazoo County
   J.F. Kennedy Center
   Kalamazoo, Michigan
   Dick Pattison, Principal
   Sis DeWitt, Teacher
   Pat Milley, Teacher

8. Kent County
   Lincoln School
   Grand Rapids, Michigan
   Bill McMillan, Principal
   Diane Gahan, Teacher

9. Livingston County
   Livingston I.S.D.
   Howell, Michigan
   Jane Burke, Teacher
   Bob Steinkamp, Teacher

10. Macomb County
    Glen Peters School
    Mt. Clemens, Michigan
    William Harding, Principal
    Jan Daniels, Teacher
    Bob Schroeder, Teacher

11. Macomb County
    Bovenschen School
    Warren, Michigan
    Don Bates, Principal
    Joe Daniels, Teacher
    Paul Duda, Teacher

12. Midland County
    Midland Public School
    Midland, Michigan
    Lynn Marvin, Director
    of Special Education
    Mary Branson, Teacher

13. Monroe County
Monroe County Ed. Center
Monroe, Michigan
Gary R. McLean, Principal
Sue Palmer, Teacher
Linda Brunette, Teacher

14. Muskegon County
Muskegon Public Schools
Muskegon, Michigan
Charles Wilks, Principal
Maxine Cobb, Teacher

15. Oakland County
Twin Sun School
Walled Lake, Michigan
Hugh Davies, Principal
Sue Kolp, Teacher
Madge Davidson, Teacher
Sue Baltani, Teacher
Thelma Johnson, Teacher

16. Ottawa County
Ottawa Area Center
Zeeland, Michigan
Harry Mulder, Principal
Raul Iribarren, Teacher

17. Roscommon County
COOR I.S.D.
Roscommon, Michigan
John Gretzinger, Jr., Principal
Janice Ferguson, Teacher

18. St. Clair County
Woodland School
Marysville, Michigan
Shirley Swegles, Principal
Mark Wengblad, Teacher

19. Saginaw County
Holland Avenue School
Saginaw, Michigan
John Laatch, Principal
Paul Sauvie, Teacher

20. Washtenaw County
Sullivan Special
Education Center
Ann Arbor, Michigan
Chuck Foster, Principal
Tom Sampson, Teacher

APPENDIX D

FIELD TEST PARTICIPATION AGREEMENT

FIELD TEST PARTICIPATION AGREEMENT

The following lines detail the commitments of teachers; schools, centers or districts; and the PROGRAMMATIC RESEARCH PROJECT Staff relative to field testing the I CAN curriculum during the 1973-74 school year.

A. The Teacher Should:

1) be highly recommended
2) be willing to spend extra time in preparation of the I CAN materials
3) be willing to work with the I CAN Staff and participate in a training session prior to implementation and other training sessions as mutually scheduled
4) be willing to teach the materials in at least 1 elementary program
5) spend a minimum of 70 minutes per week teaching the I CAN materials
6) be willing to complete evaluation reports (a small honorarium will be provided upon receipt of feedback)
7) agree to occasional observers

B. The Center, School or District Should:

1) agree to the involvement as a field test site
2) agree to presence of occasional observers in the class
3) agree to support the inservice education of participating teachers by providing released time up to as much as 5 days total
4) provide for a minimum of 70 minutes of scheduled physical education time per week
5) provide the teacher with the equipment necessary to implement locally selected I CAN curriculum components
6) be willing to supply at no expense, class roster with selected information on background of each child

7) be willing to supply clearance for each child to participate in the field test*

C. The I CAN Project Will:

1) provide the district with at least 1 set of I CAN materials
2) provide revised materials at cost when available
3) provide inservice education relevant to implementing I CAN and individualizing instruction
4) credit involved teachers in published versions of I CAN
5) provide support service - on-site and by phone to assist in problem areas
6) provide a copy of the evaluation report if requested

I have reviewed and find the commitments of the Field Test Participation Agreement acceptable and wish to participate in the field testing of I CAN.

Signed:_____
(Authorized Administrator)

School(s):_____

School District:_____

*See Page 3-5 of this attachment for sample forms used by the Beekman Training Center for such permission. Such forms must be on file at the University to assure approval of the use of human subjects. Page 5 of this attachment supplies the necessary clearance in the portion related to University affiliation. Page 3 satisfies our need to provide clearance evidence to the University and the United States Office of Education.

APPENDIX E

I CAN MONITOR FORMS

I CAN MONITORING: FORMS AND SCORING

Introduction

To identify the degree to which I CAN was implemented as intended, I CAN consultants and field test teachers monitored the treatment according to the items included on the Consultant Monitor Form and the Teachers Monitor Form. The Consultant Monitor Form, page , includes the response score values and item weights explained below. The Teachers Monitor Form, page 104, is supplemented with a users guide. The users guide appears on the page facing the monitor form.

Scoring

Scoring the monitor forms required multiplying a response score value times an item weight and dividing the resultant adjusted score by the maximum score possible to obtain a percentage. The values assigned to the various response options for each item are included below the response space they are associated with on the Consultants Monitor Form, pages 99 - 102. The importance of each item to the proper implementation of I CAN is included on the same form in the margin to the right of each item.

Higher confidence was placed in the scores of the consultant than in the self-reported scores of the teachers. For this reason, the average scores for each teacher, as reported by I CAN consultants,

were assigned a weight which was double the weight of the teachers self-reported monitor data. Consultant and teacher self-reported scores were then combined to establish a composite percent score for each teacher.

Teacher Acceptance Criteria

Composite percent scores were categorized, with respect to implementing I CAN as intended, as high, moderate, or low on the following basis:

High = 90% and above

Moderate = 73-89%

Low = Less than 73%

Teachers who scored "low" were deleted from the study.

CONSULTANT MONITOR FORM

Monitor: _____

Teacher: _____

Date: _____

No. Students: _____

No. Teachers and Helpers Present: ___

Modules	TPO	EO	TLA
_____	___	____	_____
_____	___	____	_____
_____	___	____	_____
_____	___	____	_____
_____	___	____	_____
_____	___	____	_____

1. Was this lesson taught as part of a predetermined long-range plan*?

☐ "All" (100-90%) ☐ Most (89-50%) ☐ Some (49-1%) ☐ None (0%)

3a 2 1 0 3^b

2. Was this lesson organized based upon previous student assessment*?

☐ "All" (100-90%) ☐ Most (89-50%) ☐ Some (49-1%) ☐ None (0%) Comment:

3 2 1 0 5

3. In instances in which students did <u>not</u> have prerequisite skills* listed on the TLA(s) selected, were those prerequisite skills taught?

☐ Yes ☐ No Comment:

3 0 3

4. Were game activities* (if used) related to the specified lesson focal points*?

☐ "All" (100-90%) ☐ Most (89-50%) ☐ Some (49-1%) ☐ None (0%) ☐ Not Used

Comment:

3 2 1 0 3

---

*All terms to be interpreted as they are defined and explained in the I CAN Teacher's Manual.

a Response score value
b Item weight

5. Based upon your observation of this class and an indication by the teacher as to follow-up plans, was an appropriate decision (i.e., review prerequisite, recycle, continue) made concerning future instruction?

☐ Yes ☐ No Comment:

3 0 2

6. Could you detect an introductory phase* as a part of this lesson? (In the form of warm-up, review, prerequisite learnings or Health/Fitness work.)

☐ Yes ☐ No Comment:

3 0 1

7. Could you clearly identify focal points of the lesson as they were being taught?

☐ Yes ☐ No Comment:

3 0 5

8. Could you detect a summary* as a part of this lesson? (In the form of review of the focal points, reinforcement for tasks well done and/or motiviation for further work.)

☐ Yes ☐ No Comment:

3 0 1

9. Indicate the effective - ineffective strategies used by the instructor in this lesson. Identify those that appeared effective - ineffective.

TEACHING STRATEGIES

	USED	EFFECTIVE
Manipulation		
Response Chaining		
Environmental Manipulation		
Modeling		
Verbal		
Inquiry		
Others:		
_____		
_____		

In the box labeled "EFFECTIVE" enter a ‡, +, -, ⁼ according to the representations below:

‡ = Excellent, + = Effective,

- = Ineffective, ⁼ = Totally Ineffective

10. Did any of the TLAs taught appear deficient? (In your judgment were the students profitably engaged in learning activity related to the selected focal points?)

☐ Deficient ☐ OK

0 3

List deficient TLAs here:

NOTE: (Cite the deficiency, the alternative(s) and rationale for the alternative(s) on a separate 8 1/2 by 11 sheet and append to this form.)

	MODULE	TPO	EO	TLA
1.	____	____	____	____
2.	____	____	____	____
3.	____	____	____	____
4.	____	____	____	____
5.	____	____	____	____

TPO - TLA Identification Code:

(1.23a where: 1 = Module, 2 = TPO, 3 = EO and a = TLA focal point)

11. (To be completed if deficient TLAs are listed in Question 10.) Of those TLAs listed directly above what was the degree to which the instruction related to each focal point was implemented according to the specifications of the TLA? (Record above under "Implementation Dimension" using: 1 = as intended, 2 = high, 3 = moderate, 4 = low and 5 = not as intended. 4[a]

NOTE: Judgments on implementation should be based on the intent of the TLA as suggested in the general directions column not on a word for word, item for item recital.

IMPLEMENTATION DIMENSION

	High					Low
	1	2 3		4 2	5 1 0	
1.	1	2	3	4	5	
2.	1	2	3	4	5	
3.	1	2	3	4	5	
4.	1	2	3	4	5	
5.	1	2	3	4	5	

(circle one)

12. In your opinion, the instructor was well prepared to teach this lesson?

Strongly Agree 1 2 3 4 5 Strongly Disagree

Comment:

13. Did the instructor use the concept of "double pay off" planning in this lesson?

☐ Yes ☐ No Comment:

---

a Item weight for items 10 and 11 one of which is scored

14. In your opinion, the students, with few exceptions, responded to this lesson with:

☐ High Interest ☐ Moderate Interest ☐ Indifference

☐ Resistance ☐ Hard to Rate

Identify specific TLA discrepancies from this general reaction to the lesson - include TLA I.D. and interest level.

	MODULE	TPO	EO	TLA	HIGH	MOD.	INDF.	RESIS.	UNABLE TO RATE
1.	____	____	____	____	____	____	____	____	____
2.	____	____	____	____	____	____	____	____	____
3.	____	____	____	____	____	____	____	____	____
4.	____	____	____	____	____	____	____	____	____
5.	____	____	____	____	____	____	____	____	____

15. List and comment on motivational and/or reinforcement techniques used by the instructor which were particularly effective-ineffective. (Briefly include why you thought it was good or bad.)

16. Were there interruptions which prevented the lesson from being conducted as was intended?

☐ Yes ☐ No

If yes, describe their impact. (List the TLAs affected)

Comment:

17. The teacher taught this lesson using the student assessment data to individualize instruction to a:

☐ High Degree (50% on task time) 3 ☐ Moderate Degree (50-25% on task time) 2 ☐ Low Degree (<25% on task time) 1 4

☐ Not Individualized ☐ N/A

NOTE: Use the back of this page to record any anecdotal information which will be helpful to your remembering this lesson or which you judge to be of special significance (positive or negative occurrences) to the developers of this lesson.

Step 2

1. To what degree was the information and activities of this class a part of your long-term plan? Check the box which most nearly reflects the % of the class which was a part of your long-term plan.

2. Check the box which most nearly reflects the % of this class that was planned using student assessment data from a previous assessment. Comment if it will clarify your response.

3. In considering the prerequisites listed on the TLA(s) selected for your class, did you teach those which you had not previously taught or know that your children already have? Comment if it will clarify your response.

4. If you used game activities as a part of this lesson, check the box which most nearly represents the degree to which these activities related to specified lesson focal points. Comment if it will clarify your response.

TEACHER'S MONITOR FORM

Teacher: _____

Date: _____

No. Students: _____

No. Teachers and Helpers Present: ____

Modules	TPO	EO	TLA
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

1. Was this lesson taught as part of a predetermined long-range plan*?

☐ "All" (100-90%) ☐ Most (89-50%) ☐ Some (49-1%) ☐ None (0%)

2. Was this lesson organized based upon previous student assessment*?

☐ "All" (100-90%) ☐ Most (89-50%) ☐ Some (49-1%) ☐ None (0%) Comment:

3. In instances in which you judge your students as <u>not</u> having some prerequisite skills* listed on the TLA(s) selected, did you teach those prerequisite skills?

☐ Yes ☐ No Comment:

4. Were game activities* (if used) related to the specified lesson focal points*?

☐ "All" (100-90%) ☐ Most (89-50%) ☐ Some (49-1%) ☐ None (0%) ☐ Not Used

Comment:

*All terms to be interpreted as they are defined and explained in the I CAN Teacher's Manual.

5. Did you review what happened in this lesson (i.e. student performance, student interest) and make a decision about what you will do in the next lesson with this class? Check the appropriate box. Comment if it will clarify your response.

6. Did you include an introductory phase as a part of this lesson?

7. Was the primary emphasis (body) of this lesson the presentation or practice of specific I CAN instructional focal points?

8. Did you include a summary as a part of this lesson? Comment if it will clarify your response.

9. As you think about the TLA's you taught in this lesson, did any of them not go as well as you think they should? List the code numbers for these TLA's in the space provided. If you are filling out a Teacher Feedback Form on this TPO, you need not do any additional work on this question. If you are not filling out a Teacher Feedback Form on this TPO, please elaborate upon the deficient TLA(s) on a separate sheet citing the deficiency, alternatives and rationale.

5. Did you review what happened in this lesson and make an appropriate decision (i.e., review prerequisite, recycle, continue)?

☐ Yes ☐ No Comment:

6. Did you include an introductory phase* as a part of this lesson? (In the form of warm-up, review, prerequisite learnings or Health-Fitness work.)

☐ Yes ☐ No Comment:

7. Was the body of your lesson designed to present and/or practice specific I CAN instructional focal points*? (Could an observer easily determine each focal point included in your lesson?)

☐ Yes ☐ No Comment:

8. Did you include a summary* as a part of this lesson? (In the form of review of the focal points, reinforcement for tasks well done and/or motivation for further work.)

☐ Yes ☐ No Comment:

9. Did <u>any</u> of the TLAs taught appear deficient? (In your judgment were the students profitably engaged in learning activity related to the selected focal points?)

☐ Deficient ☐ OK

List deficient TLAs here:

	MODULE	TPO	EO	TLA
1.	____	____	____	____
2.	____	____	____	____
3.	____	____	____	____
4.	____	____	____	____
5.	____	____	____	____

NOTE: (Cite the deficiency, the alternative(s) and rationale for the alternative(s) on a separate 8 1/2 by 11 sheet and append to this form if you are not scheduled to complete a Teacher Feedback form on these TPO-TLAs.)

TPO - TLA Identification Code:

(1.23a where: 1 = Module, 2 = TPO, 3 = EO and a = TLA focal point)

10. If deficient TLAs are listed in Question 9, proceed to answer this question. You are asked to rate the degree to which you implemented the TLA(s) in question as was suggested on the TLA sheet. Rate your implementation according to the general directions (i.e., you could rate yourself "High" and not have used the specific word-for-word suggestions in the TLA).

11. Did you consciously plan for "double pay off" in putting together the components of this lesson? Comment if it will clarify your response.

12. Rate the degree of interest the students in your class showed toward this lesson (in general). It may be that the students generally responded to a specific TLA in a way which differed from the others in the lesson. In this case, list this TLA(s) code number and rate accordingly.

10. (To be completed if deficient TLAs are listed in Question 9.) Of those TLAs listed directly above what was the degree to which the instruction related to each focal point was implemented according to the specifications of the TLA? (Record above under "Implementation Dimension" using: 1 = as intended, 2 = high, 3 = moderate, 4 = low and 5 = not as intended.

Note: Judgments on implementation should be based on the intent of the TLA as suggested in the general directions column not on a word for word, item for item recital.

IMPLEMENTATION DIMENSION

	High					Low
1.	1	2	3	4	5	
2.	1	2	3	4	5	
3.	1	2	3	4	5	
4.	1	2	3	4	5	
5.	1	2	3	4	5	

(circle one)

11. Did you use the concept of "double pay off*" planning in this lesson?

☐ Yes ☐ No Comment:

12. In your opinion, the students with few exceptions responded to this lesson with:

☐ High Interest ☐ Moderate Interest ☐ Indifference

☐ Resistance ☐ Unable to Rate

Identify specific TLA discrepancies from this general reaction to the lesson - include TLA I.D. and interest level.

	MODULE	TPO	EO	TLA	HIGH	MOD.	INDF.	RESIS.	UNABLE TO RATE
1.	____	____	____	____	____	____	____	____	____
2.	____	____	____	____	____	____	____	____	____
3.	____	____	____	____	____	____	____	____	____

13. An opportunity to pass along particularly effective or inefficient techniques used as a part of this lesson. Be sure to indicate in some way why you feel as you do about the technique.

14. Occassionally, interruptions or circumstances of one kind or another will prevent the presentation of a lesson as you had planned it. If you check the "Yes" response on this day, list the TLA(s) affected by this problem and describe its nature.

15. This question asks you to rate the % of time that a typical student in your class, on this day, was "on task" (meaningfully engaged in activity directed toward a specific I CAN focal point). For example:

1. If all 16 members of your class are appropriately working on the same focal point and you teach them one at a time, the on-task time for one student would be 1/16 of the total class time.

2. If 4 of your class members are being taught on a focal point and the rest of the class members are actively engaged in practice on focal points already taught, the on-task time for one student would be 100%.

13. List and comment on motivational and/or reinforcement techniques used which were particularly effective-ineffective: (briefly include why you thought it was good or bad).

14. Were there interruptions which prevented the lesson from being conducted as was intended?

☐ Yes ☐ No

If yes, describe their impact. (List the TLAs affected.)

	MODULE	TPO	EO	TLA
1.	___	___	___	___
2.	___	___	___	___
3.	___	___	___	___
4.	___	___	___	___

15. You taught this lesson using the student assessment data to <u>individualize instruction</u> approximately:

☐ High Degree (50% on task time)

☐ Moderate Degree (50-25% on task time)

☐ Low Degree (Less than 25% on task time)

NOTE: Use the back of this page to record any anecdotal information which will be helpful to your remembering this lesson or which you judge to be of special significance (positive and negative occurances) to the developers of this lesson.

APPENDIX F

I CAN DEVELOPMENTAL INVENTORY

MODULE III FUNDAMENTAL MOTOR SKILLS

DEVELOPMENTAL INVENTORY

Introduction

The I CAN Developmental Inventory consists of the following parts: 1) Assessment Activity, 2) Student Performance Level Sheet, 3) Performance Objectives, 4) Directions for the Teacher, 5) Student Performance Score Sheet, 6) Individual Student Profile and 7) General Expectancies. The above forms are designed to provide teachers with a mechanism for establishing student performance levels prior to and following instruction.

The Assessment Activities were written by the individual teachers as an instructional activity within which students could be assessed on the focal points included on the Student Performance Score Sheet.

The Student Performance Level sheet duplicates the information on the Performance Objectives and adds information necessary to score sub-mature performances. Sub-mature performances were not used in the present investigation. The Student Performance Level Sheet is included for review on page 115.

The Performance Objectives sheet provides a description of student behavior which focuses assessment and instruction. An example is included on pages 113 and 114.

Directions for the Teacher simply acts as a procedural guide for the implementation of the assessment. It specifies that the following steps are to be taken to properly implement I CAN: 1) implement the Assessment Activity written for the selected TPO, 2) record the levels of student performance on the Student Performance Score Sheet, 3) select and implement the appropriate Teaching Learning Activities from the I CAN materials, and 4) during or following instruction record changes in student performance on the Student Performance Score Sheet.

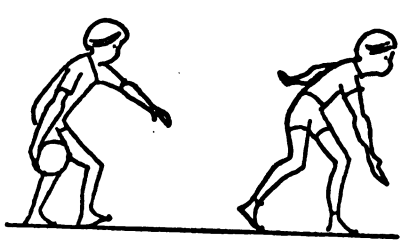
The Student Performance Score Sheet is the form upon which assessment-reassessment data are recorded. (An example for the underhand roll is included on page 116.) A check in the upper left-hand portion of the box, corresponding to a student and a focal point, indicates that the student achieved the focal point prior to or during assessment. A check in the lower right portion of the box indicates that the student achieved the focal point during instruction or at reassessment.

The Individual Student Profile and General Expectancies sheets are long term recording forms used for reporting to parents and maintaining accumulative folders. They were not pertinent to this study.

MODULE 3: Fundamental Skills PERFORMANCE AREA: Object Control

TERMINAL PERFORMANCE OBJECTIVE 9: To demonstrate a functional underhand roll.

ENABLING OBJECTIVE	FOCAL POINTS FOR ACTIVITY
1. To demonstrate a mature underhand roll.	1. Given a verbal request and a demonstration, the student can roll a tennis ball 2 out of 3 times in a manner characterized by: a. a full pendular arm motion under the shoulder. b. a release close to the floor with a bend at the knees and at the hips c. a stride forward with the foot opposite the throwing arm d. eyes focused on target; follow through well beyond ball release



PERFORMANCE OBJECTIVE (CONTINUED)

ENABLING OBJECTIVE	FOCAL POINTS FOR ACTIVITY
2. To demonstrate an underhand roll with accuracy.	2. Given a verbal request and a demonstration, the student can demonstrate an underhand roll with a mature pattern, 2 out of 3 times by rolling a 3" to 8" diameter ball to targets 3 feet wide placed at distances of 10, 30, and 50 feet, in a manner characterized by: a. lengthening backswing and forward stride with each successive distance b. approach is in a straight line, body remains erect

Module III: Fundamental Skills

STUDENT PERFORMANCE LEVELS

TPO 9: Functional Underhand Roll

Directions:

This sheet is to be used in conjunction with the Student Performance Score Sheet and the Terminal Performance Objective Assessment Activity. It describes levels of performance which may be observed while rating students on the Student Performance Score Sheet.

Given participation in the Terminal Performance Objective Assessment Activity written for this TPO the student will perform in a manner characterized by one of the following levels:

Level	Description
. Primary Responses	Responses which indicate that the student needs instruction or assistance in developing capacities which would enable achievement in this TPO. Example: Non Attending Behavior, No Response, Unrelated Response, Etc.
. Intermediate Responses	Appropriate Responses which are immature and/or incomplete in terms of the mature pattern described in Enabling Objective number one.
3. Mature Responses	Responses characterized by: a. a full pendular arm motion under the shoulder b. a release close to the floor with a bend at the knees and at the hips c. a stride forward with the foot opposite the throwing arm d. eyes focused on target; followthrough well beyond ball release
. Accuracy Responses	Responses characterized by: a. lengthening backswing and forward stride with each successive distance b. approach is in a straight line, body remains erect

STUDENT PERFORMANCE SCORE SHEET

Module: Fundamental Skills **TPO:** #9 Underhand Roll

Instructor_____

School_____

Year_____

*** Learning Style**

1 = Manipulation
2 = Modeling
√ = Verbal

**** Primary Responses**

a = Non Attending
b = No Response
c = Unrelated Response
d = Other (specify in comments)

Format

Pre Assessment → Post Assessment ←

PERFORMANCE LEVELS | LEARNING STYLE*

a Pendular Arm Motion
b Release Close to Floor
c Stride Forward
d Eyes Focused; Follow Through
a Longer Backswing - Stride

Primary Responses**

E # 1 | O 1 | EO #2

Name	Absent	a	b	c	d	a	Comments
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							

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