INFORMATION TO USERS

This dissertation was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.

2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in "sectioning" the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again – beginning below the first row and continuing on until complete.

4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from "photographs" if essential to the understanding of the dissertation. Silver prints of "photographs" may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.

University Microfilms

300 North Zeeb Road
Ann Arbor, Michigan 48106

A Xerox Education Company

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

A COMPARISON OF THE EFFECTIVENESS OF EIGHT-WEEK CAMPUS SESSIONS AND ONE-WEEK WORKSHOPS IN TEACHING OUTDOOR RECREATION ACTIVITIES

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF EDUCATION

BY

LAURA MAE SWITZER

Norman, Oklahoma

1972

A COMPARISON OF THE EFFECTIVENESS OF

EIGHT-WEEK CAMPUS SESSIONS AND ONE-WEEK

WORKSHOPS IN TEACHING OUTDOOR RECREATION ACTIVITIES

APPROVED BY

Mary Clare Kelly

William J. Erb

Herbert A. Hoyt

George A. Fetchworth

DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

It would be impossible to mention every individual who has been helpful during the implementation and writing of this dissertation. It has taken an extensive amount of cooperation from so many associates.

For their aid and guidance throughout the course of study, a great deal of appreciation is expressed to the following members of my advisory committee: Dr. Mary Clare Petty, Chairman; Dr. William F. Eick; Dr. Herbert R. Hengst and Dr. George A. Letchworth.

Very special thanks is extended to Dr. Joe Anna Hibler for her patience and tolerance during this research and also for typing and editing the copy.

Special recognition is given to Dr. L. J. Van Horn, Physical Education Department Chairman at Southwestern State College for making the study possible and for proofreading the copy. Recognition is also given to the Physical Education Department faculty, student instructors and students of Southwestern State College for being so cooperative in the administration of the tests and for being subjects for the experiment.

A note of gratitude is expressed to the writer's parents, Mr. and Mrs. F. G. Switzer for their understanding and encouragement throughout this study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

A COMPARISON OF THE EFFECTIVENESS OF EIGHT-WEEK CAMPUS SESSIONS AND ONE-WEEK WORKSHOPS IN TEACHING OUTDOOR RECREATION ACTIVITIES

CHAPTER I

INTRODUCTION AND PROBLEM

Educators and psychologists are concerned with the question whether different types of learnings can occur in less time resulting in economy of time, facilities, equipment and cost (Pietrasinski, 1969; Bilodeau and Bilodeau, 1969; Starch, 1912; Pyle, 1913). They further tend to question whether economy of time will not enable the learner to be introduced to more varied learning experiences throughout the learner's education career.

The purpose of this study was to determine the superiority of the massed or distributed practice on the learnings of outdoor recreation activities. Two one-week Outdoor Education Workshops were compared to two eight-week campus sessions to assess whether undergraduate students differ in cognitive and psychomotor learnings of and attitudes concerning six recreational activities.

Pietrasinski (1969) illustrated the necessity for economy of time for school students by the following statement:

> A stimulus which may lead to a proper observance of the principles of rational learning is the need for a more economic and better utilization of time. Today lack of time is a serious problem, even for school pupils, and an even worse one for students. The principles of rational learning deserve to be considered very seriously, as a code of recommendations through which he will shorten his working day and at the same time achieve increased and more lasting results (p. 6).

One aspect in regard to economy of time is the controversy over whether massed or distributed practice is more effective. Experimental investigations of efficiency of massed versus distributed practice began with Ebbinghaus in 1885. Many of the early experimenters examined this variable in order to determine the more efficient method for a given learning situation, while many of the later studies have been designed primarily to test Hull's theory of inhibition (Hall, 1966). Exploratory work on the distribution of practice phenomena persisted until 1930 when several factors caused a fundamental change in the nature of research which had been accomplished (McGeoch and Irion, 1961).

A substantial amount of research literature has been reported on the distribution of learning trials. The basis of this literature has been to determine the superior block of time in which the greatest amount of learning occurs--whether the practice period is massed or distributed.

Most of the research reviewed showed that distributed practice is superior especially when teaching beginning subjects or in activities which involve boredom or fatigue. Hull (1952), in studying the simple learning process, found that distributed trials will be more efficient than massed trials. He stated the following:

> Tests made after the termination of simple trial-and-error learning will show a greater spontaneous increase (reminiscence) in reaction potential if the material is learned by massed trials than if it is learned by distributed trials (p. 36).

Researchers have found both advantages and disadvantages to each method of practice, depending substantially on the types of learning to be achieved and on the learner himself (Frandsen, 1957; Geldard, 1963; Mouly, 1960; Crow and Crow, 1956). Some of the studies have dealt with animal learning (Warden, 1923); some with human behavior and skill (Carron, 1967; Churdar, 1967; Mitchell, 1969); while other studies have been conducted in the classroom with the material of the school subjects (Rosin, 1969; Waechter, 1966; Miller, 1967).

Various blocks of time have been used in different studies of the relative effectiveness of massed and distributed practice schedules. The superior time-block identified has depended upon the type of learning expected to occur. In general, if the task involved discrimination learning, massed practice has been found superior (Estes, 1970). However, if the learning task involved acquisition of simple responses, distribution of practice in short intervals has been found superior (Geldard, 1963).

Two important factors to be considered before reaching a decision as to which block of time is superior are: (1) how to determine the degree of learning and (2) how to determine when the maximum degree of learning has been achieved.

In many situations, the question of how to determine the degree of learning of each subject is very difficult to answer. The following studies have been done in various areas of education in an endeavor to determine an answer to this question.

Wang (1970) using elementary students, found the best indicator of the learning rate in mathematics to be the number of mathematics skills completed during a period rather than verbal I.Q., nonverbal I.Q.,

mental age, mathematics achievement, reading achievement or attention span. Furthermore, Carver (1970) found that in an introductory psychology course the learning ability and the amount learned are highly related.

The second factor important in learning is the ability to determine when the maximum degree of learning has been achieved in order to economize on the time of the instructor and the time of the student. LeBow (1971) found that with adults, the degree of training was not a crucial variable, if the tasks were simple. For all groups, adults and children, he concluded that extra-training trials did not enhance the learning ability.

Review of Literature

A substantial number of studies concerning the distribution of practice trials have been reported. The common concern for these studies has been to determine the superior block of time in which the greatest amount of learning occurs--whether the practice period is massed or distributed.

Cognitive Learning

Distributed practice superior. Several studies have been conducted using different types of cognitive learning in which the researchers found that the distributed practice sessions resulted in a greater amount of learning. In general, when the tasks involved required continuous concentration, or the learner was a youngster, the shorter practice periods have been found superior.

Certain studies researched pertained to the learning of science. For example, Waechter (1966) using college earth science students,

Miller (1967) using human anatomy, physiology, microbiology and nursing chemistry students and Hunt (1969) using flexibility of mental set in solving mathematics problems, found that distributed practice in cognitive learning was superior.

Warden (1923) using maze learning with rats, found that distributed practice was superior. Moreover, Rosin (1969) using welding knowledge, also observed that distributed practice was the superior method of learning.

Massed practice superior. Several studies have been conducted in which the researchers found that the massed practice sessions resulted in a greater amount of cognitive learning. In general, when the task was simple or an organization period was required before practice, the longer practice periods were found superior.

Certain studies researched pertained to the learning of science. For example, Channin (1969) using introductory biology students, Hurst (1954) using simple arithmetic problems as the task and Hunt (1969) using speed and accuracy in mathematics problem solving, discovered that massed practice was superior in cognitive learning.

For programmed instruction, Scanlon (1967) found that massed practice was superior in cognitive learning for high school vocational agriculture students. Moreover, Hansen (1965) found that massed practice was superior for achieving typewriting knowledge.

No difference in distributed and massed practice. Several studies have been conducted in which the researchers found that for some types of learning there were no differences in the effectiveness of distributed and massed practice sessions. Waechter (1966) in evaluating retention

of earth science facts and Scanlon (1967) in evaluating retention using programmed instruction in teaching high school vocational agriculture, found that there was no difference in using distributed or massed practice sessions. Also, Gabel (1955) found that there was no difference in using distributed or massed practice sessions for freshman mathematics students.

Whitley (1970) conducted a study concerned with the learning of a fine motor task. He found that there was no difference between groups in the amount learned, even though there was a difference in their actual performance.

Combined program superior. A study was directed by Mitchell (1969) to compare the effectiveness, as determined by individualized behavioral change criteria, of each of three sensitivity training conditions--distributed, massed and combined--when compared with each other and with a control group that had not received sensitivity training. The results of Mitchell's study showed the following order: (1) at the termination of training--combined, massed and distributed and (2) in the follow-up study--combined, distributed and massed.

Psychomotor Learning

Factors involved in psychomotor learning. In determining the amount of time required to learn a psychomotor skill, several factors must be considered. Examples of these factors are: (1) amount of retention of tasks, (2) the learning curve--trials plotted against time and (3) the effect of fatigue on practice time.

The first factor which affects the amount of time required to learn a psychomotor skill is the amount of task retention. In a study

using college men as subjects, Lersten (1968) administered a set of psychomotor learning tests with different lay-off periods. Lersten found that the mere passage of time between practice days caused significant initial increases in both inter-individual and intra-individual variances.

The second important point, concerning the amount of time required to learn a psychomotor skill, is the period of time where optimum learning occurs within the practice period. Rivenes and Mawhinney (1968) using college males as subjects, found that most of the subjects performed more accurately after only 40 minutes rest, rather than after resting 21 to 23 days.

A third factor that affects the amount of time required to learn a psychomotor skill is the amount of fatigue that occurs during practice sessions and the effect of such fatigue on the learning and skills performance. Naturally, the longer the practice sessions, the greater the amount of fatigue. However, the amount of physical fatigue will be greater than the amount of mental fatigue during long sessions of motor activity. Carron (1969) using college women, and Schmidt (1969) using college men, studied the effects of fatigue, physical performance and amount of learning. Both researchers agreed that fatigue affected physical performance but did not affect the amount of learning.

Distributed practice superior. Using different types of activities, several studies have been conducted in which the researchers found that the distributed practice sessions resulted in greater psychomotor learning. In general, when the learners were in the beginning stages of learning, or when the type of activity resulted in fatigue or boredom, the shorter practice sessions were found superior.

Pyle (1921), Hansen (1965) and Hamed (1968) found that distributed practice was superior when evaluating typewriting perfo mance. Also, Whitley (1970) using fine motor tasks with college men, and Kimble (1949) using upside-down printing tasks, found that distributed practice was superior.

Landry (1968) studying the effects of physical exercise on organic functioning, Stelmack (1967) studying balance, Bruno (1968) studying a perceptual-motor learning task, found that distributed practice was superior. Moreover, Young (1953), Singer (1964) and Stull (1961) found that distributed practice was superior in the psychomotor learning of badminton, novel basketball tests and beginning swimming skills.

Massed practice superior. Several studies, using different types of activities, have shown that the massed practice sessions resulted in a greater amount of psychomotor learning. In general, when the learners were in the precision stage of learning, and when warm-up or special equipment or uniforms are required, the longer practice sessions were found superior.

Certain studies researched pertained to balance, coordination and exercise. Stelmack (1967) studying balance on a stabilometer, Churdar (1967) studying the effects of exercise on the physical fitness of college males and Carron and Leavitt (1968) studying large muscle-mass motor coordination tasks, found that massed practice sessions were superior in psychomotor learning.

Pyle (1921) in teaching to throw a javelin, Young (1953) in teaching archery and Stull (1961) in teaching bowling skills, found that massed practice was more effective than distributed practice. Although

Hamed (1968) found that with short typewriting production tests distributed practice was superior, he discovered that massed practice was superior when using long production typewriting tests.

No difference in distributed and massed practice. Using different types of activities, several studies have been conducted in which the researchers found that there was no difference in distributed and massed practice sessions in the amount of psychomotor learning. Kingsley (1970) conducted a study in which one group of subjects alternated practice in archery and badminton and another group participated in archery continuously for the same length of time. Kingsley found that there was no difference in the two techniques of teaching either archery or badminton.

Montgomery (1967) and Dunham (1968) found no differences in distributed and massed practice of either knot tying or on a pursuit rotor. Keough (1962) evaluated the effect of physical education upon the motor fitness of third grade subjects and O'Toole (1966) evaluated creativity in artistic performance. Both Keough and O'Toole found that no difference existed between the blocks of practice time used.

Affective Learning

Although there has been a great deal of research conducted concerning affective learning, there have been only two studies pertaining either to outdoor recreation or to the effects of massed or distributed practice on the subjects' attitudes. Chase (1969) conducted a study to identify changes in the attitudes of school administrators and elementary teachers resulting from participation in an Outdoor Education Workshop. Specifically, the study examined these two attitude changes: (1) school

administrators toward the usefulness of outdoor education in achieving academic goals and (2) elementary teachers toward the usefulness of outdoor education in the academic goals achieved by their students. The results indicated significant differences in the attitudes both at the beginning and at the end of the project. Furthermore, the grade level of the teachers did not affect judgment as to which academic areas would benefit most from outdoor education studies.

Waechter (1966) found no statistically significant difference in the change of attitudes by either the distributed or massed practice groups of earth science students. In essence, there was no difference in the students' attitudes whether they were subjected to the distributed or massed learning periods in learning science facts.

Recreation Education

As an affluent society in today's space age, Americans are enjoying an increased amount of leisure time. Along with the increase in leisure time has come the demand for recreational activities teachers (Kraus, 1964). The Outdoor Recreation Resources Review Commission reported in 1962 that by the year 2000, our population will nearly double and overall demand for outdoor recreation will triple. Not only will there be more people, but they will have more free time, more money and more mobility (Outdoor Recreation, 1962).

The increased emphasis on recreational activities has placed new demands on the public schools to incorporate recreational activities into their curricula. In turn, demands have been placed on the institutions of higher learning to train college students as public school recreational activities teachers (Hjelte and Shivers, 1963). Therefore,

recreation educators have become concerned with the relative effectiveness of massed and distributed practice sessions in teaching recreational activities.

Availability of qualified instructors. With respect to the availability of qualified instructors in recreation, these three factors are considered: (1) the problem of accreditation, (2) meeting the present demand for qualified teachers and (3) adequate salaries to maintain the supply presently being trained.

Kleindienst and Weston (1964) summarized the accreditation problem. They stated that administrators of recreation programs are having a difficult time finding an organization that can and will work with the accreditation of programs in recreation. Until the recreation profession solves the problem of accreditation, the personnel for school recreation will continue to be drawn from the ranks of teachers already certified and employed, rather than from people trained specifically in recreation.

In later publications, Kleindienst and Weston (1964) and Guggenheimer (1969) addressed the issue of recreational teacher demands. They concluded that as school recreation expands, impositions are made on the existing supply of personnel, facilities and training locations. Colleges have a difficult time training students in recreation as quickly as they are needed for the rapid expansion in the area of recreation.

In dealing with the problem of salaries, Butler (1959) emphasized the need for adequate salaries in the following statement:

> The comparatively low salary scale for recreation personnel that has prevailed in most cities has been a deterrent to the employment of competent workers. Until recreation departments offer salaries and working conditions that compare favorably with those available

> to school personnel and workers in other fields of public service that require comparable education and experience, they cannot compete successfully for qualified workers (p. 137).

Problems in expanding college recreation programs. Based upon an increase in leisure time and a demand for additional, qualified recreation personnel, certain problems are associated with expanding a college recreation program. The primary limiting factors are: (1) limited recreation curricula, (2) shortage of qualified college trainers and (3) available funds for equipment and supplies.

The first problem colleges must face when expanding their recreation program is a lack of courses offered in the curriculum to adequately train recreation personnel. Meyer, Brightbill and Sessoms (1969) and Kraus (1964) reported that any attempt to increase the number of recreational courses is met with the traditional emphasis on the three R's in the American schools. Also, many school administrators are still uncertain as to the place of recreation in the organizational structure of the curriculum. These two factors, in particular, have prevented the schools from having sufficient opportunities to train qualified recreation personnel.

The second problem associated with the expansion of a recreation program is a lack of qualified trainers at the collegiate level. While physical education teachers are available, they are not trained specifically in recreation, a profession in its own right. Too often, physical education teachers tend to be too academic and formal and lack a recreational point of view. In particular, Kraus (1964) related that the school will often assign a physical education teacher to the recreation responsibility, which results in a one-sided program. Meyer, Brightbill

and Sessoms (1969) emphasized the need for qualified college educators in recreational areas in the following statement:

> The success of organized recreation depends primarily upon the quality and availability of the professional personnel associated with it. Leadership, perhaps more than anything else, is a resource which must be strengthened greatly in recreation. More people must be brought into the profession who have natural talents and interests in recreation (p. 81).

Difficulty in financing. In addition, a comprehensive recreational program is very difficult to finance. Several factors contribute to this difficulty. Of particular importance are: (1) inadequate school budgets, (2) expensive equipment needed for recreational activities and (3) the utilization of recreational facilities.

The first reason that most programs in recreation are limited is that they do not receive adequate operational funds from the parent institution or outside organizations. Butler (1959) explained the financial problem in this way. Because of the high costs involved in the construction of buildings and equipment for the other school disciplines, the funds remaining in the budget for recreational supplies and equipment are inadequate. Furthermore, Kraus (1964) substantiated this argument by stating: "Often the schools, because of other pressing needs, are unwilling to grant sufficient funds to support an effective recreation program."

Yukic (1970), Butler (1959) and Kleindienst and Weston (1964) emphasized that in many cases, funding a recreation program is difficult because the equipment and supplies are more expensive than the total allocation for recreation. The allocation for recreational equipment and supplies has become one of the largest items in the departmental budget. Proper procedures in the purchase and care of equipment and supplies may

well determine whether these funds are wisely expended. Many of the activities require delicate equipment and supplies which must receive careful, persistent attention; while other equipment and supplies have a hazardous existence. The initial cost for equipment and supplies is extensive. Likewise, a sizable expense is involved in replacing worn parts and adding new equipment to replace equipment which is irreparably damaged (Kleindienst and Weston, 1964).

The third factor which enhances the cost of a recreation program is that the recreational facilities and equipment are idle during part of the school day. In comparing the facilities used by other disciplines, some administrators argue that having idle facilities in the recreational area is much more expensive for the school (Butler, 1959).

Solutions to training problems. There is an urgent need to train qualified recreational workers at less cost, in less time and with less equipment than ever before. Meeting this need would greatly facilitate the development of recreational facilities and programs for the American public. Several suggestions have been made by leaders in the field of recreation. These suggestions include the following: (1) use of non-paid volunteers, (2) abbreviation of the formal recreation education process, (3) use of in-service training for recreation workers and (4) partial support of the recreation program through gifts and donations.

Guggenheimer (1969) and Yukic (1970) related that even though volunteers may not be as well trained as recreation program graduates, much can be said in favor of using non-paid volunteers. The use of non-paid volunteers would provide needed assistance in the recreational program. In turn, the volunteer worker would receive on-the-job training.

Also, graduate assistants or student assistants could be utilized at reduced salaries to supplement the staff in conducting the recreational activities.

In some instances, a second alternative to the personnel training problem is to abbreviate or bypass the formal educative process and enter a specialized area of recreational leadership. Many successful recreation specialists have foregone a formal education (Yukic, 1970). Two examples of abbreviated learning situations in recreation are special short courses sponsored by the American Red Cross and apprenticeship programs which serve as on-the-job training.

A third method for training recreation leaders in less time, at less cost and with less equipment is through in-service training. In-service training is possible when various community agencies offer employed professional recreation leaders an opportunity to enhance their job understandings and competencies (Yukic, 1970). As in other professions, in-service training and supervised field service provide the practical information which is usually lacking in the more theoretical and philosophical college and university courses (Guggenheimer, 1969).

A final method suggested for training recreation leaders is through gifts and donations from interested individuals and private organizations. The availability of such gifts and donations will necessitate an effective college public relations program promoting either existing or future plans for development of a recreational program (Guggenheimer, 1969).

Conclusion

In conclusion, several studies have been reviewed which pertain to cognitive, psychomotor and affective learning. Three of the variables which seemed to contribute to the disagreements between the authors and researchers were the types of activities to be learned, the learning stage of the learner and certain characteristics of the learner at the time the tests were administered.

With respect to the types of activities, it depended upon the amount of fatigue or boredom which was involved in each type of activity (Pyle, 1921; Hansen, 1965; Hamed, 1968; Miller, 1967). The learning stages which affected the studies were the beginning, intermediate or precision stage depending upon the amount of previous experience the learners had had in the particular activity tested (Stull, 1961; Singer, 1964; Kimble, 1949; Channin, 1969). Some of the characteristics of the learners which affected the results of the studies reported were the mental and chronological age, attention span and intelligence of the subjects used in the studies (Wang, 1970; Keough, 1962; Whitley, 1970; Hansen, 1965; Scanlon, 1967; Warden, 1923).

On the basis of the literature reviewed concerning recreation education, it seemed that there is a great deal of concern regarding the worthy use of leisure time. If educators in this area are to meet the demands of society and the increased amount of leisure time of Americans, they must endeavor to train more and better recreation leaders more quickly. Recreation education is far behind on monies to finance the purchase of equipment and supplies and to provide appropriate salaries for employees in recreation. Steps are being taken toward this goal by

outdoor education workshops and majors in recreation being offered by some of the colleges and universities.

Theoretical Framework

The theoretical framework of this study was based on the assumption that different blocks of learning time will affect the amount of material learned, the skill proficiency attained and the students' attitudes toward the area. The question of whether practice is more efficient if trials are massed or if they are distributed is a classical problem which has been studied extensively. Therefore, the question of massed versus distributed practice will be discussed through the presentation of various psychologists' theories.

Distributed Practice Superior

Several theorists have advocated that distributed practice sessions resulted in a greater amount of behavior change. Garrison and Gray (1955) referred to experiments conducted by Lorge, which substantiated the theory that learning under the condition of distributed is more efficient than under the condition of massing. There is a time interval beyond which efficiency does not increase. For example, both too long work periods and too long rest intervals, alike, may adversely affect the learning of immature learners. Also, the length of time interval should vary with the nature of the materials being learned and the stage of the learning. The superiority of the distributed practice periods over massed learning lies mainly in the retention of the materials learned. The increased time seemed to permit certain learning parts to become better organized into a behavior pattern, which allowed for greater efficiency in learning and retention.

With respect to learning motor skills, Frandsen (1957) in testing learning verbal and motor skills, Cimmins and Fagin (1954) and Garrison and Gray (1955) in determining learning to play musical instruments, theorized that distributed practice was superior to massed practice. Concerning learning in a classroom situation, Hull (1952) in testing learning which required a simple learning process, Mead (1923) in evaluating the memorization of nonsense syllables and Cole and Bruce (1950) in determining learning mathematics and French concluded that distributed practice was also superior.

Other theorists--Estes (1970) in studying learning activities which required short-term memory, Mouly (1960) and Mursell (1952) for longterm retention and immediate recall and Crow and Crow (1956) with younger children--stated that distributed practice was superior. Also, Geldard (1963) in evaluating learning activities with dissimilar tasks, Estes (1970) in testing learning which required changes in stimulus context, Vinacke (1968), Gagne and Bolles (1963) and Ebbinghaus (Mead, 1923) in determining learning activities which may result in fatigue, boredom, or loss of interest and Ebbinghaus (Meumann, 1913) for economy of energy in learning, advocated that distributed practice was superior to massed practice.

Massed Practice Superior

On the basis of other research some psychologists' have theorized that massed practice is advantageous. In activities which require a warm-up period or special equipment, Frandsen (1957) and Mouly (1960) advocated that massed practice is superior to distributed practice. Moreover, in the classroom situation, Frandsen (1957) when complex problem

solving is required or in project teaching and Garrison and Gray (1955) in learning in the precision stage, theorized that massed practice is also superior.

Considering other types of learning, Gagne and Bolles (1963) when items must be relearned on the next trial and Pyle (1921) where the problem involved is the connection of a movement with a particular stimulus, believe that massed practice is superior. Also, Cimmins and Fagin (1954) in studying learning material which will not be helpful again and Cole and Bruce (1950) with creative work, also agree with Gagne and Bolles and Pyle in that massed practice is superior.

Conclusion

In conclusion, many of the theorists agreed that the distributed practice learning sessions are superior. Distributed practice seemed to be superior to massed practice because of fatigue, boredom and lack of interest--which are usually present in the longer learning session and which hinder learning. Also, retention is greater if the subject is interrupted before the completion of the task, which is a characteristic of the distributed practice session rather than the massed practice session. On the other hand, if the activity required an organization period preceding the practice session, massed practice is more advantageous.

Statement of Problem

The problem of this study is: (1) to determine if college students can learn outdoor recreational activities more quickly in a one-week outdoor education workshop at Fort Cobb Lake or in an eight-week session on

the campus of Southwestern State College and (2) to compare the attitudes of these students concerning outdoor recreation activities.

Statement of Purpose

The purpose of this research was to determine the relative effectiveness of massed and distributed practice of outdoor recreation activities. Specifically, two one-week outdoor education workshops were compared to the eight-week campus courses to assess whether the students differ in their acquisition of skill and their comprehension of the activities and their attitudes toward recreational activities.

Operational Definitions

1. Baitcasting.--An activity in which the participants use closed-faced reels with release buttons and propel a rubber weight toward wooden targets which are three feet in diameter.

2. College Students.--Students who either participate in the recreational activities during the workshops or were enrolled in the same activities during the summer or fall sessions on the Southwestern State College campus.

3. Distributed Practice.--Shorter practice sessions over a longer period of actual time.

4. Leisure.--Free, unoccupied time during which a person may indulge in rest, recreation and the like (Meyer, Brightbill and Sessoms, 1969).

5. Massed Practice.-- Longer practice sessions over a shorter period of actual time.

6. Modified Chicago Round.--An archery test which consists of eight ends (48 arrows) being shot toward a 36-inch target from a distance of 20 yards (Zabik and Jackson, 1969).

7. Physical Education.--That phase of the total process of education which is concerned with the development and utilization of the individual's movement potential and related responses (Nixon and Jewett, 1969).

8. Recreation.--Any activity or pursuit which is voluntarily chosen by the participant within his leisure time, with the primary

motivation of achieving personal pleasure, and with a minimum of other hoped-for goals or compulsions surrounding it (Kraus, 1964).

9. Student Assistants.--Students who have previously participated in an outdoor education workshop.

10. Team Teaching.--Two or more teachers assume the responsibility for pre-instructional planning and teaching a particular recreational activity to a group of students enrolled in either the Outdoor Education Workshop or Southwestern State College summer school or fall semester.

11. Trapshooting.--A recreational activity that consists of shooting at clay pigeons which have been thrown by an automatic machine thrower.

12. Vanderhoof Golf Test.--A golf test which consists of a "drive test" and a "5-iron test" (Barrow and McGee, 1964).

13. Workshop.--A seven-day session sponsored by Southwestern State College at Fort Cobb Lake which includes instruction in each recreational activity followed by practice periods.

Hypotheses To Be Tested

Cognitive Domain

1. The cognitive learning of those students who complete the archery course in summer school at Southwestern State College exceeds the cognitive learning of those students who participate in archery in the Outdoor Education Workshop.

2. The cognitive learning of those students who complete the baitcasting course in the fall semester at Southwestern State College exceeds the cognitive learning of those students who participate in baitcasting in the Outdoor Education Workshop.

3. The cognitive learning of those students who complete the canoeing course in summer school at Southwestern State College exceeds the cognitive learning of those students who participate in canoeing in the Outdoor Education Workshop.

4. The cognitive learning of those students who complete the golf course in the fall semester at Southwestern State College exceeds the cognitive learning of those students who participate in golf in the Outdoor Education Workshop.

5. The cognitive learning of those students who complete the sailing course in summer school at Southwestern State College

exceeds the cognitive learning of those students who participate in sailing in the Outdoor Education Workshop.

6. The cognitive learning of those students who complete the trapshooting course in the fall semester at Southwestern State College exceeds the cognitive learning of those students who participate in trapshooting in the Outdoor Education Workshop.

Psychomotor Domain

7. The psychomotor learning of those students who participate in archery in the Outdoor Education Workshop exceeds the psychomotor learning of those students who complete the archery course in summer school at Southwestern State College.

8. The psychomotor learning of those students who complete the baitcasting course in the fall semester at Southwestern State College exceeds the psychomotor learning of those students who participate in baitcasting in the Outdoor Education Workshop.

9. The psychomotor learning of those students who complete the canoeing course in summer school at Southwestern State College exceeds the psychomotor learning of those students who participate in canoeing in the Outdoor Education Workshop.

10. The psychomotor learning of those students who participate in golf in the Outdoor Education Workshop exceeds the psychomotor learning of those students who complete the golf course in the fall semester at Southwestern State College.

11. The psychomotor learning of those students who participate in the sailing in the Outdoor Education Workshop exceeds the psychomotor learning of those students who complete the sailing course in summer school at Southwestern State College.

12. The psychomotor learning of those students who participate in trapshooting in the Outdoor Education Workshop exceeds the psychomotor learning of those students who complete the trapshooting course in the fall semester at Southwestern State College.

Affective Domain

13. The attitudes toward recreational activities of students who participate in the Outdoor Education Workshop exceeds the attitudes of students completing the same activities in summer school or the fall semester at Southwestern State College.

Delimitations

The focus of the study was delimited to the cognitive, affective and psychomotor areas of learning of the participants. Further delimitations included:

1. All subjects were students at Southwestern State College, Weatherford, Oklahoma. Of the 519 subjects, 337 subjects were enrolled in the June and August, 1971, Outdoor Education Workshops. The other 182 subjects were enrolled in classes of archery, baitcasting, canoeing, golf, sailing and trapshooting during the summer and fall sessions, 1971, on the campus of Southwestern State College.
2. The activities studied are only a segment of the total program completed by a prospective recreational activities leader.
3. This study did not attempt to determine if differences in skills and knowledges occurred between male and female subjects.
4. Different instructors were used in the massed and distributed practice sessions in all activities except trapshooting. However, it is highly relevant that for each activity the instructors were members of a single teaching team, that parallel procedures were planned for providing massed and distributed practice, and that all instructors had a depth of experience working together planning for and evaluating programs. All instructors were regular faculty members of the Southwestern State College Department of Physical Education.

Assumptions

The following assumptions were basic to the study.

1. Tests could be constructed to evaluate the cognitive learning of each student in each of the recreational activities tested.
2. Tests could be constructed to evaluate the psychomotor learning of each participating student.
3. Cognitive and psychomotor learning progress could be determined between pre- and post-tests.
4. Concerning recreational activities, concepts could be selected to evaluate the affective domain of the students.

CHAPTER II

METHODS AND PROCEDURES

This study was concerned with comparing the differences in the cognitive and psychomotor learning and attitudes of students participating in one of the one-week Outdoor Education Workshops in June or August, 1971, offered by the Physical Education Department at Southwestern State College, Weatherford, Oklahoma and students successfully completing the same activities courses on the Southwestern State College campus either during the eight-week summer term, 1971, or the first eight weeks of the fall term, 1971. The comparisons were made by use of pre- and post-tests on knowledge and skill and an attitude test given to each subject at the beginning of each course.

The specific outdoor activities studied were archery, canoeing, baitcasting, golf, sailing and trapshooting. With each activity, three types of tests were given to the subjects. The three types of tests which were given were: (1) an objective, written comprehension test, (2) a skill proficiency test and (3) an attitude inventory composed of several semantic differential concepts of each activity.

Pre-Experimental Procedures

The pre-experimental procedures for this study were divided into the following parts: (1) selection of instruments, (2) establishing the validity and reliability of the instruments, (3) development of data

collection instruments and (4) construction of the archery, baitcasting, canoeing, golf, sailing and trapshooting comprehension tests. However, the order of presentation does not imply the manner in which decisions were made concerning these two parts. The validity and reliability of the instruments were determined before the final selection of tests was made.

Selection of Instruments

The skills proficiency for the recreational activities were evaluated by the following tests:

1. The golf students were given the Vanderhoof Golf Test.
2. The archery students shot the Modified Chicago Round.
3. The trapshooting students shot three shots at clay pigeons from five different positions.
4. The baitcasting students casted four times each toward targets from distances of 20, 30 and 40 feet.
5. The sailing and canoeing students raced against time and were rated by student instructors on thirteen other aspects of skill.

The comprehension tests were constructed for each activity both for the Outdoor Education Workshops and the 1971 summer and fall sessions at Southwestern State College.

Validity and Reliability of the Instruments

The test-retest reliability of the "drive test" is reported as .90 and test-retest reliability of the "5-iron test" is .84. The predictive validity of the "drive test" is reported as .71 and the predictive validity of the "5-iron test" is .66 (Barrow and McGee, 1964).

The test-retest reliability coefficient found by Zabik and Jackson (1969) for the Modified Chicago Round archery test was .86.

The Semantic Differential technique was developed by Osgood, Suci, and Tannenbaum for the purpose of measuring attitudes about different concepts (Osgood, Suci and Tannenbaum, 1957). This instrument has been found to be both reliable and valid as a measure of attitude and attitude change. The reliability coefficients range from .84 to .94 and validity measures range from .76 to .85 (Buros, 1965).

The remainder of the tests were found to be both reliable and valid by the actual administration of the tests either preceding or during the study. The archery, golf, sailing and canoeing cognitive tests, and sailing and canoeing psychomotor tests were administered to the students completing the courses in these activities at the completion of the spring semester, 1971, at Southwestern State College. The tests were given in order to determine the validity and reliability coefficients before commencing the study.

The predictive validity and test-retest reliability coefficients for the remainder of the activities were obtained following the first administration of the tests during the June, 1971, Outdoor Education Workshop. The results of the tests given to the students of the June, 1971, Workshop were used both for purposes of comparison and also for obtaining the coefficients. The validity and reliability coefficients are presented in Table 1. The difficulty and phi indices used to determine these coefficients are presented in Tables 19-24, Appendices C-H.

Each of these tests was given to the massed practice and the distributed practice groups. The final version of each of the tests is shown in Appendices C, D, E, F, G and H. The correct responses to the items are not provided on the test form.

Table 1

Statistical Data on Reliability and
Valdity of Instuments

Test	Test-Retest Reliability	Predictive Validity	Mean Diff.	Mean PHI(Ø)
Archery Knowledge	.823	.621	.493	.512
Archery Skill	.871	.711	---	---
Baitcasting Knowledge	.862	.754	.512	.461
Baitcasting Skill	.742	.711	---	---
Canoeing Knowledge	.793	.621	.634	.384
Canoeing Skill	.893	.920	---	---
Golf Knowledge	.947	.762	.484	.490
Golf Skill	.861	.571	---	---
Sailing Knowledge	.873	.762	.671	.529
Sailing Skill	.882	.742	---	---
Trapshooting Knowledge	.774	.693	.471	.623
Trapshooting Skill	.863	.912	---	---

Development of Data Collection Instruments

The researcher was unable to find standardized tests for measuring the comprehension of the archery, baitcasting, canoeing, golf, sailing and trapshooting subjects. After consulting with recreation experts, the tests were constructed, analyzed and norms developed on comprehension tests in the recreational areas cited. Each test was developed and given to a sample of students. After the results were analyzed and the necessary corrections made, the tests were administered again to a larger sample of subjects. The results of these test construction procedures are presented in the following sections of the dissertation.

Construction of the Archery, Baitcasting, Canoeing, Golf, Sailing and Trapshooting Comprehension Tests

All of the comprehension tests were composed of 50 multiple-choice and analogy items except the archery test which was composed of 58 such items. The statistical data are presented in Tables 19-24, Appendices C-H.

Nature and Sources of Data

This study encompassed the three following areas for the collection of data:

Area I: The cognitive domain of students enrolled in courses offered by the Physical Education Department at Southwestern State College.

Area II: The psychomotor domain of students enrolled in courses offered by the Physical Education Department of Southwestern State College.

Area III: The affective domain of students enrolled in courses offered by the Physical Education Department of Southwestern State College.

The sources of data were: (1) students enrolled in the June and August, 1971, Outdoor Education Workshops at Fort Cobb Lake, (2) students enrolled in the same activities during summer school and the fall semester, 1971, on the campus of Southwestern State College, (3) instructors in the Outdoor Education Workshops at Fort Cobb Lake and (4) instructors of the same activities during the summer and fall sessions, 1971, on the campus of Southwestern State College.

Experimental Procedures

Of the 519 subjects used for this study, 337 were students who were enrolled in the June and August, 1971, Outdoor Education Workshops offered by the Southwestern State College Physical Education Department. These

workshops were conducted at Fort Cobb Lake. The remaining 182 subjects were enrolled in the 1971 summer and fall sessions at Southwestern State College in Weatherford, Oklahoma. Only those students who completed all pre- and post-tests and the attitude measure were used as subjects. All students used as subjects participated in at least one of the following activities: archery, baitcasting, canoeing, golf, sailing or trapshooting.

The number of subjects in each of the activities are as follows:

1. In the June workshop there were 47 archery, 105 baitcasting, 99 trapshooting and 24 golf subjects.
2. During the summer session on campus there were 31 archery, 18 canoeing and 19 sailing subjects.
3. In the August workshop there were 31 canoeing and 31 sailing subjects.
4. During the fall session on campus there were 40 baitcasting, 21 trapshooting and 53 golf subjects.

In each activity, both during the workshops and summer and fall sessions, the subjects were given 30 minutes of lecture on aspects of skill, knowledge and safety, between the pre- and post-tests. The instructors allotted one and one-half hours for supervised practice in each four-hour period. Since safety is a very important aspect in activities such as archery, sailing and trapshooting, some safety factors were pointed out to the subjects preceding the pre-skill tests. This aspect of skill could not be eliminated because of the danger involved.

Five tests were administered to each subject. The scheduling of the tests is shown graphically in Figure 1. The specific tests given to the subjects of the workshops and regular term enrollees at Southwestern State College were as follows:

A. Cognitive Domain

1. A theory pre-test given during the first hour of each of the different activities offered during the summer and fall sessions.

2. A theory pre-test given during the enrollment preceding the beginning of each of the workshops.

3. A second theory test given during the eighth class meeting of the archery and baitcasting classes offered during the summer and fall sessions.

4. A second theory test given during the third meeting of the trapshooting, sailing and golf classes offered during the summer and fall sessions.

5. A second theory test given during the fifth week of the canoeing class during the summer session.

6. A second theory test given during the last day of the workshops.

7. A theory post-test given during the next-to-last hour of the archery class offered during the summer session.

B. Psychomotor Domain

8. A skills proficiency pre-test given during the second hour of each of the different activities during the summer and fall sessions.

9. A skills proficiency pre-test given during the first hour of each of the different activities in the workshops.

10. A second skills proficiency test given during the seventh class meeting of the archery and baitcasting classes offered during the summer and fall sessions.

11. A second skills proficiency test given during the third meeting of the trapshooting, sailing and golf classes meeting during the summer and fall sessions.

12. A second skills proficiency test given the fifth week of the canoeing class meeting during the summer session.

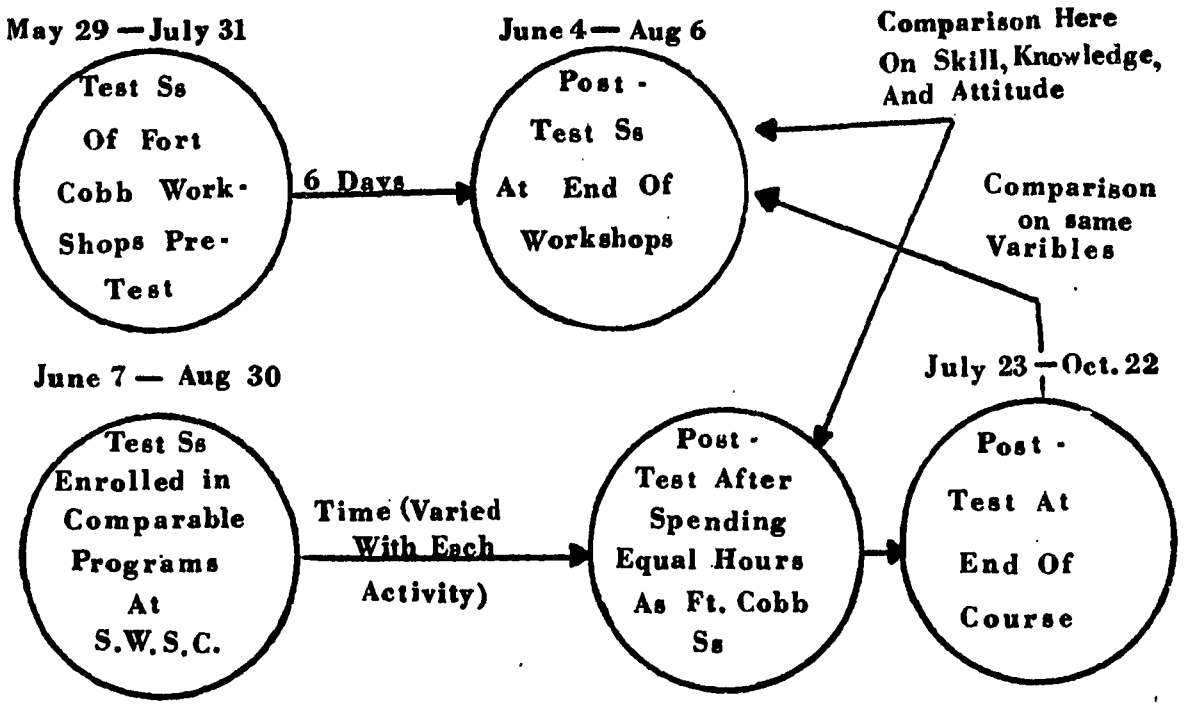
13. A skills proficiency post-test given during the last hour of the archery class offered during the summer session.

C. Affective Domain

14. An attitude test given to all subjects immediately following the pre-knowledge tests.

Figure 1

Procedural Time Line



The method of team teaching was used in all activities in which the same instructor was not used in both the Outdoor Education Workshops and summer and fall sessions. Trapshooting was the only activity in which the same instructor was used in both the workshops and the sessions on campus.

Distributed Practice Sessions

The classes offered during the summer and fall sessions on campus at Southwestern State College were defined as distributed practice, while the activities during the workshops were defined as massed practice. The college credit and the length of each course is as follows:

Credit Hours

With respect to credit hours during the summer session, the archery students receive one hour and the sailing and canoeing students receive two hours undergraduate credit upon the successful completion of the various courses. The trapshooting and golf classes were offered for one hour undergraduate credit during the first eight weeks of the fall semester. Furthermore, the baitcasting tests were given to the students enrolled in the archery class which met the first eight weeks of the fall semester.

Length of Courses

The 31 archery subjects met four days per week for eight weeks during summer school. The preliminary activities of attendance checks and assembly of equipment consumed the first 30 minutes of each session and 30 minutes remained for testing, instruction and practice. Moreover, the practice and instruction between pre- and post-tests required one week. The last two days of the second week were used for both the knowledge and the skill post-tests.

The 40 baitcasting subjects met four days per week for three weeks in conjunction with the fall archery class. Thirty minutes daily were allowed for testing, instruction and practice. The practice and instruction between the pre- and post-tests required one week. The last two days of the second week were used for the knowledge and skill post-tests.

The 53 golf subjects met for two hours, two days weekly for eight weeks during the fall semester. Thirty minutes of each session was occupied with the preliminaries such as roll check and class organization.

This time loss caused the experimenter to have to give skill and knowledge post-tests on the third day instead of the second day as previously planned.

The trapshooting class met four hours daily, one day weekly for eight weeks during the fall semester. The first week was spent in administering the pre-tests and discussing the rules of safety in handling the guns. After the preliminary duties of attendance taking, gun selection, 30 minutes for safety discussion and organization of students, the 21 subjects had one remaining hour for each to practice. The post-tests were administered the last half of the third class meeting, following a 30-minute practice session.

The 19 sailing and 18 canoeing subjects met one day weekly for four hours during summer school. By the time the students transported the boats to and from the water front, rigged and unrigged the sailboats, the instructor checked the roll and gotten them organized, two hours remained for sailing instruction and practice of the second week. The sailing post-tests were given the third week.

In respect to the canoeing portion of the class, three and one-half hours of the fourth meeting remained for canoeing pre-tests, practice and instruction. Because of the time required for the preparation of the equipment and organization of the students, the post-canoeing tests were given the fifth week of the sailing and canoeing class.

Massed Practice Sessions

The workshops offered during June and August at Fort Cobb Lake were defined as massed practice. The college credit for the workshops and length of each activity is as follows:

Credit Hours

With respect to credit hours received during the workshops, all students who successfully completed the workshops received two hours of either graduate or undergraduate credit. Most of the subjects used in the study were of undergraduate status.

Length of Each Activity

All of the activities, except golf, in the workshops followed the same testing schedule. The 47 archery, 105 baitcasting, 31 canoeing, 31 sailing and 99 trapshooting subjects participated in a four-hour block of time, once during the week, of each activity. All pre-knowledge tests were administered Saturday morning immediately preceding enrollment. The pre-skill tests were administered the first hour of each activity, followed by 30 minutes of instruction and one and one-half hours practice. The post-skill tests were administered the last hour of each four-hour block of each activity. The post-knowledge tests for all activities were administered to all subjects the final day of the workshops immediately preceding the contests in all activities.

With respect to the golf students, they participated in golf classes the entire week. The 24 golf subjects were given the post-skill tests at the conclusion of the first four-hour block. The golf post-knowledge tests were given the fifth hour of class.

CHAPTER III

RESULTS

The investigator used 519 college students enrolled in June and August Workshops and summer school and fall term at Southwestern State College in Weatherford, Oklahoma, to determine the effects of massed and distributed practice on the skills and comprehension learning scores of six different recreational activities. A pre- and post-test measure of skill and comprehension was recorded for students enrolled in archery, baitcasting, canoeing, golf, sailing and trapshooting. The independent variables pertinent to the dependent measures being taken were controlled by random selection, inclusion in the statistical design, and by using an Analysis of Covariance statistical tests (Popham, 1967).

The massed practice groups were presented knowledge and skills material during one-week workshops held at Fort Cobb Lake in Southwestern Oklahoma. The distributed practice subjects were presented knowledge and skills material during an eight-week summer school session held on the campus of Southwestern State College, Weatherford, and during the fall semester of the 1971-72 academic year. Only those subjects who had completed all tests were used in the study. The test scores included knowledge and skill scores of each recreational area, an indicant of the subjects' previous experience level, sex, major field of study, attitude and certain other measures of those independent variables pertinent to the recreational skill being measured.

Treatment of Data

The data collected on each of the groups was coded and punched onto IBM cards. The card formats for the data are shown in Tables 17 and 18 in Appendices A and B.

The second card format was used to enter the skill scores of subjects in each of the recreational areas. The data punched on cards using format in Table 17 in Appendix A were scored for each subject and their comprehension score was entered with their skill score on another card. The card format of the transgenerated data is shown in Table 18 in Appendix B. The data shown in Appendix B include pre- and post-test archery scores, pre- and post-test baitcasting scores, pre- and post-test canoeing scores, pre- and post-test golf scores, pre- and post-test sailing scores and pre- and post-test trapshooting scores.

Data Analysis Procedures

The pre-written programs, Biomedical Computer Programs (The University of California Press, 1970), were used in the calculations necessary for testing the hypotheses stated in this study. The attitude measure was treated as a covariable in the statistical tests performed on the first 12 hypotheses. The following tests were used in the analyses:

1. Hypotheses 1-6 were tested by using a One-Way Analysis of Covariance on the massed practice and distributed practice groups' pre- and post-test difference scores. This test was performed for each of the comprehension exams of all six recreational areas.

2. Hypotheses 7-12 were tested by using a One-Way Analysis of Covariance on the massed practice and distributed practice groups' pre- and post-test difference scores. Comparisons were made for each of the skill scores of all six recreational areas.

3. Hypothesis 13 was tested by using a Student's t test between the attitude scores of the June and August Workshop students and the summer school and fall enrollment students.

Several other ancillary tests were performed on the data. For instance, it was necessary to perform as F_{max} Test for Homogeneity of Variance to determine the suitability of the groups for performing an Analysis of Covariance (Hays, 1963). Additional descriptive statistics were computed for each of the subgroups of subjects. The results of the F_{max} Test for Homogeneity of Variance showed the variances of the groups to be compatible enough for further analysis, and the researcher continued with the ANCOVA procedures.

The statistical tests were computed on the differences noted between the pre- and post-test scores. These mean differences are presented in Table 2.

The results of testing the 13 hypotheses are presented in Tables 3-15. The analysis of covariance results are reported after the necessary adjustment had been made in the sum-of-squares values. All hypotheses were tested at the .05 level of significance, but more stringent levels were reported if they were obtained.

Results of Testing Hypothesis One

The analysis of covariance results of hypothesis one showed no significant difference in the archery comprehension gain scores of the two groups of subjects ($F = 0.32$; $df = 1, 79$; $p > .05$). The June Workshop group showed a mean gain of 6.27 and the summer school group showed a mean gain of 6.64. This would indicate that there was little demonstratable effect in the two methods of presenting archery comprehension material. Table 3 shows the analysis of covariance results of hypothesis one.

Table 2

Mean Gains* For The Comparison Groups For
Each of The Recreational Activities

Different Length Sessions	Archery		Baitcasting		Canoeing		Golf		Sailing		Trapshooting	
	Compre-hension	Skill	Compre-hension	Skill**	Compre-hension	Skill	Compre-hension	Skill	Compre-hension	Skill	Compre-hension	Skill
June Workshop	6.27	24.30	4.53	-19.22			5.18	1.91			0.89	6.17
August Workshop					4.23	14.21			6.27	23.21		
Summer School	6.64	22.03			9.16	6.03			11.13	4.17		
Fall Semester			8.80	-11.39			6.20	6.56			3.82	2.85

*Mean gains were obtained by subtracting the pre- from the post-tests.
**Lowest score is the best.

Table 3

Analysis of Covariance of Archery Comprehension Scores With Attitude and Previous Experience as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Summer School)	1	217.13	0.319	n.s.*	.4021
Error	79	680.66			99.5971
Total	80				

*Not significant at $p > .05$

Results of Testing Hypothesis Two

The analysis of covariance results of hypothesis two showed a significant difference in the baitcasting comprehension gain scores of the two groups of subjects ($F = 9.21$; $df = 1, 89$; $p < .01$). The June Workshop group showed a mean gain of 4.53 while the fall semester group showed a mean gain of 8.80. The results indicated that the workshop subjects had significantly lower gain scores than the fall session practice group of subjects, which indicates that the fall students acquired more knowledge concerning baitcasting than the workshop group acquired. Table 4 shows the analysis of covariance results of hypothesis two.

Results of Testing Hypothesis Three

The analysis of covariance results of hypothesis three showed a significant difference in the canoeing comprehension gain scores of the

Table 4

Analysis of Covariance of Baitcasting Comprehension Scores With Attitude and Previous Experience as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Fall Semester)	1	61.04	9.21	$<.01$	9.4248
Error	89	6.63			90.5751
Total	90				

two groups of subjects ($F = 9.04$; $df = 1, 119$; $p < .01$). The August Workshop group showed a mean gain of 4.23 while the summer school group showed a mean gain of 9.16. The results indicated that the workshop students had significantly lower gain scores than the summer school students, which indicates that the summer school subjects acquired more knowledge concerning canoeing than the workshop subjects acquired. Table 5 shows the analysis of covariance results of hypothesis three.

Results of Testing Hypothesis Four

The analysis of covariance results of hypothesis four showed no significant difference in the golf comprehension gain scores of the two groups of subjects ($F = 2.16$; $df = 1, 102$; $p > .05$). The June Workshop group showed a mean gain of 5.18 and the fall semester group showed a mean gain of 6.20. This would indicate that there was little demonstratable effect in the two methods of presenting golf comprehension material. Table 6 shows the analysis of covariance results of hypothesis four.

Table 5

Analysis of Covariance of Canoeing Comprehension Scores With Attitude and Previous Experience as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Summer School)	1	419.21	9.043	$<.01$	7.0621
Error	119	46.36			92.9378
Total	120				

Table 6

Analysis of Covariance of Golf Comprehension Scores With Attitude and Previous Experience as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Fall Semester)	1	87.19	2.164	n.s.*	2.4746
Error	102	33.36			97.5253
Total	103				

*Not significant at $p > .05$

Results of Testing Hypothesis Five

The analysis of covariance results of hypothesis five showed a significant difference in the sailing comprehension gain scores of the two groups of subjects ($F = 4.18$; $df = 1, 111$; $p < .05$). The August Workshop group showed a mean gain of 6.27 and the summer school group showed a mean gain of 11.13. These results indicated that the workshop subjects had significantly lower gain scores than the summer school subjects, which indicates that the summer school subjects acquired more knowledge concerning sailing than the workshop subjects acquired. Table 7 shows the analysis of covariance results of hypothesis five.

Table 7

Analysis of Covariance of Sailing Comprehension Scores With Attitude and Previous Experience as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Summer School	1	211.04	4.181	< .05	2.7860
Error	111	66.34			97.2139
Total	112				

Results of Testing Hypothesis Six

The analysis of covariance results of hypothesis six showed a significant difference in the trapshooting comprehension gain scores of the two groups of subjects ($F = 4.271$; $df = 1, 43$; $p < .05$). The June Workshop group showed a mean gain of 0.89 and the fall semester group

showed a mean gain of 3.82. These results indicated that the workshop subjects had significantly lower gain scores than the fall semester subjects, which indicates that the fall subjects acquired more knowledge concerning trapshooting than the workshop subjects acquired. Table 8 shows the analysis of covariance results of hypothesis six.

Table 8

Analysis of Covariance of Trapshooting Comprehension Scores With Attitude and Previous Experience as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Fall Semester)	1	14.02	4.271	$< .05$	9.0416
Error	43	3.28			90.9583
Total	44				

Results of Testing Hypothesis Seven

The analysis of covariance results of hypothesis seven showed no significant difference in the archery skill gain scores of the two groups of subjects ($F = 2.71$; $df = 1, 72$; $p > .05$). The June Workshop group showed a mean gain of 24.30 while the summer school group showed a mean gain of 22.03. This would indicate that there was little demonstratable effect in the two methods of acquiring archery skill. Table 9 shows the analysis of covariance results of hypothesis seven.

Table 9

Analysis of Covariance of Archery Skill Scores With Attitude, Previous Experience, Time of Day, Wind Direction and Wind Velocity as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Summer School)	1	511.00	2.71	n.s.*	3.6273
Error	72	188.56			96.3726
Total	73				

*Not Significant at $p > .05$

Results of Testing Hypothesis Eight

The analysis of covariance results of hypothesis eight showed a significant difference in the baitcasting skill gain scores of the two groups of subjects ($F = 8.075$; $df = 1, 117$; $p < .01$). The June Workshop group showed a mean gain of (-19.22)* while the fall semester group showed a mean gain of (-11.39)*. The scores were recorded in negative numbers according to the distances the weights landed from the targets (zero if target was hit). These results indicated that the workshop subjects had significantly lower gain scores than the fall semester group of subjects, which indicates that the workshop group acquired more baitcasting skills than the fall semester group acquired. Table 10 shows the analysis of covariance results of hypothesis eight.

*Lowest score is best

Table 10

Analysis of Covariance of Baitcasting Skill Scores With Attitude, Previous Experience, Time of Day, Wind Direction and Wind Velocity as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Fall Semester)	1	1,142.10	8.075	$<.01$	6.4559
Error	117	141.44			93.5440
Total	118				

Results of Testing Hypothesis Nine

The analysis of covariance results of hypothesis nine showed a significant difference in the canoeing skill gain scores of the two groups of subjects ($F = 17.09$; $df = 1, 89$; $p < .001$). The August Workshop group showed a mean gain of 14.21 and the summer school group showed a mean gain of 6.03. These results indicated that the workshop subjects had significantly higher gain scores than the summer school group of subjects, which indicates that the workshop students acquired more canoeing skill than the summer school students acquired. Table 11 shows the analysis of covariance results of hypothesis nine.

Results of Testing Hypothesis Ten

The analysis of covariance results of hypothesis ten showed a significant difference in the golf skill gain scores of the two groups of subjects ($F = 4.621$; $df = 1, 80$; $p < .05$). The June Workshop group

Table 11

Analysis of Covariance of Canoeing Skill Scores With Attitude, Previous Experience, Time of Day, Wind Direction and Wind Velocity as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Summer School)	1	304.61	17.09	$<.001$	16.2650
Error	89	17.82			83.7349
Total	90				

showed a mean gain of 1.91 and the fall semester group showed a mean gain of 6.56. These results indicated that the workshop subjects had significantly lower gain scores than the fall semester subjects, which indicates that fall semester subjects acquired more golf skill than the workshop subjects acquired. Table 12 shows the analysis of covariance results of hypothesis ten.

Results of Testing Hypothesis Eleven

The analysis of covariance results of hypothesis eleven showed a significant difference in the sailing skill gain scores of the two groups of subjects ($F = 17.62$; $df = 1, 102$; $p < .001$). The August Workshop group showed a mean gain of 23.21 and the summer school group showed a mean gain of 4.17. These results indicated that the workshop subjects had significantly better gain scores than the summer school group of subjects, which indicates that the workshop subjects acquired more sailing

Table 12

Analysis of Covariance of Golf Skill Scores With Attitude, Previous Experience, Time of Day, Wind Direction and Wind Velocity as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Fall Semester)	1	1,280.62	4.621	$<.05$	5.4608
Error	80	277.13			94.5391
Total	81				

skill than the summer school subjects acquired. Table 13 shows the analysis of covariance results of hypothesis eleven.

Table 13

Analysis of Covariance of Sailing Skill Scores With Attitude, Previous Experience, Time of Day, Wind Direction and Wind Velocity as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Summer School)	1	901.21	17.62	$<.001$	14.7292
Error	102	51.15			85.2707
Total	103				

Results of Testing Hypothesis Twelve

The analysis of covariance results of hypothesis twelve showed a significant difference in the trapshooting skill gain scores of the two groups of subjects ($F = 6.21$; $df = 1, 79$; $p < .01$). The June Workshop group showed a mean gain of 6.17 and the fall semester group showed a mean gain of 2.85. These results indicated that the workshop subjects had significantly better gain scores than the fall semester group of subjects, which indicates that the workshop subjects acquired more trapshooting skill than the fall semester subjects acquired. Table 14 shows the analysis of covariance results of hypothesis twelve.

Table 14

Analysis of Covariance of Trapshooting Skill Scores With Attitude, Previous Experience, Time of Day, Wind Direction and Wind Velocity as Covariables

Source of Variation	df	Adjusted Mean Squares	F	p	Variance Accounted For
Comparison Groups (Workshop vs Fall Semester)	1	501.07	6.21	<.01	7.2876
Error	79	80.69			92.7123
Total	80				

Results of Testing Hypothesis Thirteen

Hypothesis thirteen was tested by performing a one-tailed t test on the semantic differential attitude scores (See Appendix O) of the two groups. One group was composed of the summer school subjects and the

fall semester subjects and the other group was composed of the June Workshop subjects and the August Workshop subjects. The results of the t test computation are shown in Table 15.

Table 15

Results of Semantic Differential Attitude Comparisons

	Group	Mean	s.d.	t Value
One	Summer School Fall Semester	169.39**	29.64	t = 2.81*
Two	June Workshop August Workshop	161.58**	31.27	

*Significant; $p < .01$
**The lower the score, the more positive the attitude.

These results indicated that the two workshop groups had significantly more positive attitudes than the summer school and fall subjects. The attitude measure was treated as a covariable in the statistical tests performed on the other twelve hypotheses.

Summary of Hypothesis Testing Results

Thirteen hypotheses were tested using an analysis of covariance on the first twelve and a student's t test on the final one. As expected, some of the hypothesized propositions were supported and some were not. The results of all hypotheses tested are synthesized in Table 16.

Table 16

Summary Table of Results
of Hypotheses Tested

Hypothesis Number	Area	F	p	Better Scores
1.	Archery Comprehension	0.32	n.s.	-----
2.	Baitcasting Comprehension	9.21	$<.01$	Fall Semester
3.	Canoeing Comprehension	9.04	$<.01$	Summer School
4.	Golf Comprehension	2.16	n.s.	-----
5.	Sailing Comprehension	4.18	$<.05$	Summer School
6.	Trapshooting Comprehension	4.27	$<.05$	Fall Semester
7.	Archery Skill	2.71	n.s.	-----
8.	Baitcasting Skill	8.08	$<.01$	June Workshop
9.	Canoeing Skill	17.09	$<.001$	August Workshop
10.	Golf Skill	4.62	$<.05$	Fall Semester
11.	Sailing Skill	17.62	$<.001$	August Workshop
12.	Trapshooting Skill	6.21	$<.01$	June Workshop
13.	Attitude Measures	t = 2.81*	$<.01$	Workshops (Both)

*Not an F Value; Results of a student's t test.

The results of the 13 hypotheses tested showed some significant differences between the massed practice and the distributed practice groups of subjects. In general it can be said that the skills of recreational activities can be taught better in one-week workshops and the comprehension can be taught better during regular school sessions. The exceptions to the teaching of skills were as follows: (1) There was no

differences in the archery skill scores of the two groups and (2) The highest golf skill scores were recorded for the fall semester golf students. The comprehension scores of the recreational activities are not as well defined as the skill scores. The exceptions of the comprehension scores were as follows: (1) There were no differences in the archery and golf examination comprehension scores of the two groups of subjects and (2) Baitcasting, canoeing, sailing and trapshooting comprehension scores were better for the summer and fall semester than for the groups of workshop subjects.

The skills part of the recreational activities taught in this study can, for the most part, be taught better in a one-week workshop situation. However, the teaching of comprehension of these recreational activities is not as well defined and the results of this study are inconclusive in archery and golf.

Ancillary Findings

A Two-Way Analysis of Variance was run on the pre- and post-test change scores using sex and class schedule--workshop or regular session--as the two independent variables. The results of these calculations are presented in Tables 25-36 in Appendix P. None of the F values was significant and an interpretation of the individual tables is unnecessary.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the relative effectiveness of massed and distributed practice of archery, baitcasting, canoeing, golf, sailing and trapshooting skills and knowledge. The 519 Southwestern State College subjects enrolled in one of the two Outdoor Education Workshops, in the regular summer school session or in the fall session were exposed to massed and distributed practice blocks. Tests of skill and comprehension in these six recreational activities were administered to the subjects taught by the members of the college Physical Education Department.

The appropriate independent variables--previous experience, attitude and environmental factors such as wind velocity, temperature and wind direction--were used as covariables in each of the activities. The tests given to determine the difference for each subject were pre- and post-tests of knowledge and skill and one attitude test.

An analysis of covariance was used to compare the scores of the massed and the distributed practice groups. The experimenter hypothesized that the workshop would be more effective in some areas of instruction and the summer or fall session would be more effective in other areas.

Thirteen hypotheses were tested. The results indicated that:

1. Distributed practice was more effective for cognitive learning related to baitcasting, canoeing, sailing and trapshooting. No significant difference was found for cognitive learning related to archery and golf, but the differences found did favor distributed practice.
2. Massed practice was more effective for teaching skills in baitcasting, canoeing, sailing and trapshooting. Distributed practice was more effective for teaching skills in golf. No significant difference was found for psychomotor learing in archery, but did favor massed practice.
3. Subjects involved in massed practice sessions had more favorable attitudes on the semantic differential tests.

The results on the attitude tests disagreed with Waechter's (1966) study which showed no difference in the attitudes of students exposed to massed and distributed practice in the learning of earth science facts. It is assumed that the discrepancy between Waechter's study and the present study occurred because of the difference in the emphasis on subject matter, procedures or goals.

The activities in which the massed skill practice was found to be superior were baitcasting, canoeing, sailing and trapshooting. On the other hand, the golf subjects benefited most from the distributed practice schedule. The results from the baitcasting, canoeing, sailing and trapshooting tests reinforced, and the results of the golf tests disagreed with studies conducted by Young (1953), Stull (1961) and theories of Gagne and Bolles (1963) and Pyle (1921). Gagne, Bolles and Pyle agreed

that when special equipment was required for an activity, the massed practice session was superior. Even though special equipment was required in all activities, the golf equipment was the only equipment which was not provided by the school. It did not require time at the beginning of the practice period to issue golf clubs as it did with the other equipment.

The results from the baitcasting, canoeing, sailing and trapshooting tests disagreed with, and the results of the golf skill tests agreed with studies done by Pyle (1921), Hansen (1965), Hamed (1968) and Whitley (1970) and the theories of Frandsen (1957) and Cimmins and Fagin (1954). Even though all the subjects in the present study were beginners, boredom and fatigue may have had more effect on skill acquisition in golf than they did on learning skills in baitcasting, canoeing, sailing and trapshooting.

There was no significant difference found in the skill acquisition of the archery subjects whether they were exposed to the massed practice or to the distributed practice. The results of the archery tests were in agreement with the studies of Kingsley (1970), Montgomery (1967) and Dunham (1968).

When acquisition of knowledge was considered, the data showed that in baitcasting, canoeing, sailing and trapshooting, the distributed practice method was more effective. The results found in this study agreed with Waechter's (1966), Miller's (1967) and Hunt's (1969) studies and the theories of Garrison and Gray (1955) and Hull (1952) probably because all activities either required continuous concentration or the experimenter used beginning students as subjects for the comparisons, as was true in the present study. On the other hand, this study disagreed with the studies conducted by Channin (1969), Hurst (1954) and Hunt (1969) and the

theories of Frandsen (1957) and Garrison and Gray (1955), probably because the massed sessions allowed for inhibitions and forgetting to occur and because the subjects in this study were not in the precision stages of learning of complex tasks.

There were no significant differences shown in the distributed or massed practice for the learning in archery or golf. The failure to obtain differences in massed and distributed practice in archery and golf comprehension scores agreed with studies done by Waechter (1966), Scanlon (1967) and Gabel (1955). Possibly, the testing period was too short to detect any differences in the two methods of teaching facts concerning golf and archery.

Explanations for the results found are complex and theoretical. Factors involved include the amount of boredom and fatigue involved in each activity, the presence or absence of inhibitions and forgetting and the involvement of the subjects in the preparation of equipment.

Results are not reported separately for male and female subjects. Findings reported in Tables 25-36 indicated that the two independent variables of sex and class schedules had very little effect on the total scores recorded for the individual subjects.

Cognitive Domain

The experimenter hypothesized that the knowledge concerning all six recreational activities tested would be enhanced by the distributed learning sessions. Even though each activity was directed and instructed in the same manner in both the workshops and during the summer and fall terms, the remainder of the day during summer or fall involved academic pursuits rather than moving to another similar activity as the students in the

workshops did. The subjects in the workshops were involved in more informal types of learning situations--recreational activities--the entire day each day of the week.

The experimenter assumed that the results derived from the baitcasting, canoeing, sailing and trapshooting knowledge tests, which were more favorable during the distributed practice, could be attributed to the same factors as was hypothesized. The archery and golf knowledge results showed no significant difference in the two methods of teaching either activity.

Psychomotor Domain

Archery. The experimenter hypothesized that archery skills could be taught better by massed practice because of the results of Young's (1953) study of acquisition of archery skills. Even though the difference was not significant, the results of the archery skill ratings showed the massed practice to be superior. A possible explanation of this result is that the massing of practice did not involve inhibition and forgetting. Also, the fatigue involved was not likely an overriding factor to be considered.

Baitcasting. Because of the lack of activity involved in baitcasting, the experimenter hypothesized that boredom, resulting in a dissipation of time during the concluding part of the practice block, would hinder the learning of skills during a four-hour session. However, the results did not support this hypothesis. A possible explanation is that the time lapse between learning sessions was more detrimental than the effect of boredom on the learning of baitcasting skills.

Canoeing. The hypothesis made by the experimenter concerning the acquisition of canoeing skills was also rejected. The experimenter felt that canoeing skills could be achieved more adequately through a distributed method of practice because of the exhaustion involved in a four-hour canoeing lesson. Again, a possible explanation is that inhibition and forgetting had more effect than exhaustion in the ability to better perform canoeing skills.

Golf. The results did not support the hypothesis that massed practice sessions would be superior in the improvement of golf performance. Prior to giving the tests, the experimenter analyzed the skills development, and hypothesized that because of the nature of golf, too much relearning would be required at the beginning of each class meeting. The results negated this reasoning, which lead to the conclusion that the exhaustion involved in walking for four hours from hole to hole, and the boredom involved for beginners, was more detrimental to golf performance.

Sailing. The hypothesis was made and the results indicated that massed practice sessions were superior for increasing sailing skills. A possible explanation is that the students were not concerned with preparing the equipment for use. Instead, the sailing subjects were allowed to concentrate fully on the activity of sailing.

Trapshooting. The hypothesis that massed practice was superior for learning trapshooting skills was supported by the results. Massed practice was assumed superior in both cases because no exhaustion factor prevailed within the four-hour time period. Also, there was no time lapse between sessions to allow forgetting, and no relearning at the beginning of each session was required.

Affective Domain

The results of the semantic differential tests supported the hypothesis that the workshop subjects would have better attitudes toward recreational activities than the summer and fall subjects. The experimenter assumed that this would be true because of the informal nature of the workshops versus the more formal atmosphere which exists during the regular term. Because of the informality of the classes in the workshops, the students enjoy the outdoor activities more.

Conclusions

Based on the results, the following conclusions have been derived:

1. Findings support the generalization that in learning in which boredom and fatigue are involved the distributed practice is superior.
2. For activities which require special equipment or warm-up time, the massed practice is superior.
3. The findings seem to support the contention that the more relaxed and informal atmosphere during the workshops allows for more skills to develop.
4. During the regular terms on campus the classes are more formal and structured and encourage more concentration on cognitive learning.
5. Under the conditions imposed by this study, the relative effectiveness of massed and distributed practice, in terms of gain scores, is not significantly different for male and female subjects.

Recommendations

Based on the findings of this study and the conclusions drawn from the results, the following recommendations are suggested for further study:

1. Additional study should be conducted using college subjects attending other colleges and universities in Oklahoma.
2. Studies should be undertaken using other recreational activities which were not tested in the present study.
3. Further studies should be conducted using subjects other than college students in the same activities tested or other activities not tested in this study.
4. The effects of massed and distributed practice should be assessed using longer total practice time.
5. Other instruments should be utilized to evaluate learning in the same six recreational activities to determine which practice session is superior. Furthermore, the archery, baitcasting and golf skill tests could be given indoors to better control the weather factors.
6. Research should be undertaken to determine the superior practice schedule for intermediate and advanced students of recreational activities.
7. Similar studies should be considered for other areas of education.
8. Media--tapes and films--other than traditional methods could be utilized to relate the information to the subjects. Also, a similar study should be conducted to determine the influence of the instructor variable.

9. A similar study should be conducted to determine the superior practice schedule using activities which occur in the same environments--either restricted to campus or to the workshop site.
10. More extensive studies should be conducted to determine the differences in psychomotor and cognitive learning of male and female subjects exposed to massed and distributed practice in these six recreational activities as well as in other similar activities.

BIBLIOGRAPHY

Books

American National Red Cross. Canoeing. Garden City, N.Y.: Doubleday & Co., Inc., 1965.

Baley, James A., and Field, David A. Physical Education and the Physical Educator. Boston: Allyn and Bacon, Inc., 1970.

Barrow, Harold M., and McGee, Rosemary. A Practical Approach to Measurement in Physical Education. Philadelphia: Lea & Febiger, 1964.

Bilodeau, E.A., and Ina McD., ed. Principles of Skill Acquisition. New York & London: Academic Press, 1969.

Buros, O.K. The Sixth Mental Measurements Yearbook. Highland Park, N.J.: The Gryphon Press, 1965.

Butler, George D. Introduction to Community Recreation. New York: McGraw-Hill Book Co., 1959.

Chapman, Charles F. Piloting, Seamanship and Small Boat Handling. New York: The Hearst Corp., 1968.

Cimmins, W.D., and Fagin, Barry. Principles of Educational Psychology. New York: The Ronald Press Co., 1954.

Cole, Lawrence E., and Bruce, William F. Educational Psychology. New York: World Book Co., 1950.

Crow, Lester D., and Alice. Human Development and Learning. New York: American Book, Co., 1956.

Davis, Elwood Craig, and Miller, Donna Mae. The Philosophic Process in Physical Education. Philadelphia: Lea & Febiger, 1967.

Dixon, W.J. BMD: Biomedical Computer Programs. Berkeley, California: The University of Calif. Press, 1968.

Estes, William K. Learning Theory and Mental Development. New York: Academic Press, 1970.

Forsythe, Charles E. Administration of High School Athletics. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1959.

Frandsen, Arden N. How Children Learn. New York: McGraw-Hill Book Co., Inc., 1957.

Gagne, Robert M., and Bolles, Robert C. "A Review of Factors in Learning Efficiency," of Human Learning in the School. Edited by John P. DeCecco. New York: Holt, Rinehart and Winston, 1963.

Garrison, Karl C., and Gray, J. Stanley. Educational Psychology. New York: Appleton-Century-Crofts, Inc., 1955.

Geldard, Frank A. Fundamentals of Psychology. New York: John Wiley & Sons, Inc., 1963.

George, M.B. Basic Sailing. New York: The Hearst Corp., 1966.

Good, Carter V.; Barr, A.S.; and Scates, Douglas E. The Methodology of Educational Research. New York: Appleton-Century-Crofts, Inc., 1941.

Grieve, Andrew. Directing High School Athletics. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963.

Guggenheimer, Elinor C. Planning for Parks and Recreation Needs in Urban Areas. New York: Twayne Publishers, Inc., 1969.

Hall, John F. The Psychology of Learning. Philadelphia & N.Y.: J.B. Lippincott Co., 1966.

Hays, William L. Statistics. New York: Holt, Rinehart and Winston, 1963.

Hjelte, George, and Shivers, Jay S. Public Administration of Park and Recreational Services. New York: The Macmillan Co., 1963.

Hughes, William Leonard; French, Esther; and Lehsten, Nelson G. Administration of Physical Education for Schools and Colleges. New York: The Ronald Press Co., 1954.

Hull, Clark L. A Behavior System. New York: John Wiley & Sons, Inc., 1952.

Kerlinger, Fred N. Foundations of Behavioral Research. New York: Holt, Rinehart, & Winston, 1964.

Kleindienst, Viola K., and Eston, Arthur. Intramural and Recreation Programs for Schools and Colleges, of Appleton-Century-Crofts Series in Health, Physical Education, Physical Therapy, and Recreation. Edited by Charles A. Bucher. 3 vols. New York: Appleton-Century-Crofts, 1964.

Kraus, Richard G. Recreation and the Schools. New York: The Macmillan Co., 1964.

McGeoch, John A., and Irion, Arthur L. The Psychology of Human Learning. New York: David McKay Co., Inc., 1961.

Mead, Arthur Raymond. Learning and Teaching. Philadelphia & New York: J.B. Lippincott, Co., 1923.

Meumann, E. The Psychology of Learning. New York: D. Appleton and Co., 1913.

Meyer, Harold D.; Brightbill, Charles K.; and Sessoms, H. Douglas. Community Recreation: A Guide to Its Organization. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969.

Mouly, George J. Psychology for Effective Teaching. New York: Henry Holt and Co., 1960.

Mueller, Pat, and Mitchell, Elmer D. Intramural Sports. New York: The Ronald Press Co., 1960.

Mursell, James L. Educational Psychology. New York: W.W. Norton and Co., Inc., 1939.

Mursell, James L. Psychology for Modern Education. New York: W.W. Norton and Co., Inc., 1952.

Nixon, John E., and Jewett, Anne E. An Introduction to Physical Education. Philadelphia: W.B. Saunders Co., 1969.

Osgood, C.; Suci, G.; and Tannenbaum, P. The Measurement of Meaning. Urbana, Illinois: The University of Illinois Press, 1957.

Pietrasinski, Zbigniew. The Art of Learning. New York: Pergamon Press, 1969.

Popham, W. James. Educational Statistics: Use & Interpretation. New York: Harper & Row, Publishers, 1967.

Pyle, William Henry. The Psychology of Learning. Baltimore: Warwick and York, Inc., 1921.

Russell, Charles W., ed. Basic Sailing. Washington, D.C.: The American National Red Cross, 1966.

Scott, M. Gladys, ed. Research Methods in Health, Physical Education, and Recreation. Washington, D.C.: American Association for Health, Physical Education and Recreation, 1959.

Vannier, Maryhelen, and Fait, Hollis F. Teaching Physical Education in Secondary Schools. Philadelphia: W.B. Saunders Co., 1962.

Vinacke, W. Edgar. Foundations of Psychology. New York: Van Nostrand Reinhold Co., 1968.

Voltmer, Edward F., and Esslinger, Arthur A. The Organization and Administration of Physical Education. New York: F.S. Crofts & Co., 1942.

Yukic, Thomas S. Fundamentals of Recreation. New York: Harper & Row, Publishers, 1970.

Periodicals

Bourgeois, A. Donald. Recreation and the Inner City Crisis. Journal of Health, Physical Education and Recreation, 1969, 40, 20-24.

Bowers, Louis E.; Crickenberger, Margaret E.; Hoffman, Hubert A.; Klesius, Stephen E.; Smith, Charles D.; Stoval, Jack; and Tanner, Patricia W. Personal Professional Preparation in Physical Education. Journal of Health, Physical Education and Recreation, 1970, 41, 23-25.

Cannon, Frances C. Shortage of College Trained Black Recreators. Journal of Health, Physical Education and Recreation, 1970, 41, 83.

Carron, Albert V. Physical Fatigue and Motor Learning. American Association of Health, Physical Education and Recreation Research Quarterly, 1969, 40, 682-686.

Carron, Albert V., and Leavitt, J.L. Effects of Practice Upon Individual Differences and Intra-Variability in a Motor Skill. American Association of Health, Physical Education and Recreation Research Quarterly, 1968, 39, 470-475.

Carver, Ronald P. A Test of a Hypothesized Relationship Between Learning Time and Amount Learned in School Learning. Journal of Educational Research, 1970, 54, 57-58.

DeFries, Gerald B. Will I Ever Catch Another Butterfly? Journal of Health, Physical Education and Recreation, 1970, 41, 41-43.

Diehl, Henry C. Mobile Recreation. Journal of Health, Physical Education and Recreation, 1970, 41, 46-47.

Gray, David. New Values, New Mission, New Role, New Preparation for Recreation Personnel. Journal of Health, Physical Education and Recreation, 1969, 40, 38-39 and 52.

Hackensmith, C.W. Volunteer Military Companies: A Form of Recreation in the 1850's. Journal of Health, Physical Education and Recreation, 1969, 40, 50-52.

Jackson, Henry M. Recreation and a Quality Environment. Journal of Health, Physical Education and Recreation, 1969, 40, 31-32.

Kimble, G.A. An Experimental Test of Two-Factor Theory of Inhibition. Journal of Experimental Psychology, 1949, 39, 15-23.

LeBow, Michael D. Age, Degree of Training, and Type of Extradimensional Shift in Normally Intelligent Humans. Journal of Experimental Education, 1971, 39, 46-53.

Lersten, Kenneth C. Inter- and Intra-Individual Variations During The Progress of Motor Learning. American Association of Health, Physical Education and Recreation Research Quarterly, 1968, 39, 1013-1019.

Lewis, Charles. Integrating Outdoor Education Into The Curriculum. Journal of Health, Physical Education and Recreation, 1969, 40, 63-64.

Locke, Lawrence F. The Workshop That Worked. Journal of Health, Physical Education and Recreation, 1970, 41, 19-21.

Loret, John. A Happening in the Out-of-Doors: Interdisciplinary Experiences in Outdoor Education. Journal of Health, Physical Education and Recreation, 1969, 40, 45-46.

Melnick, Merrill J. Effects of Overlearning on the Retention of a Gross Motor Skill. American Association of Health, Physical Education and Recreation Research Quarterly, 1971, 42, 60-69.

Meyer, Martin W. Workshop on Research in Therapeutic Recreation. Journal of Health, Physical Education and Recreation, 1962, 33, 8 and 10.

Meyers, Judith L. Motor Learning and Retention: Influence of Practice and Remoteness on Individual Differences. American Association of Health, Physical Education and Recreation Research Quarterly, 1968, 39, 314-320.

Noonan, William E. Lifetime Sports Education Project: A Progress Report of Its Past, Present, and Future. Journal of Health, Physical Education and Recreation, 1969, 40, 10 and 12.

Pace, Judy, and Lau, Richard S. Teach Why. Journal of Health, Physical Education and Recreation, 1969, 40, 21-24.

Phye, Gary, and Baller, William. Verbal Retention As a Function of the Informativeness and Delay of Informative Feedback. Journal of Educational Psychology, 1970, 61, 380-381.

Pyle, William Henry. Concentrated Versus Distributed Practice. Journal of Educational Psychology, 1914, 5, 247-251.

Pyle, William Henry. Economical Learning. Journal of Educational Psychology, 1913, 4, 148-158.

Rivenes, Richard S., and Mawhinney, Martha. Retention of Perceptual Motor Skill: An Analysis of New Methods. American Association of Health, Physical Education and Recreation Research Quarterly, 1968, 39, 684-689.

Rosenstein, Irvin. Recreation As a Responsibility of State Education Departments. Journal of Health, Physical Education and Recreation, 1969, 40, 50.

Ruch, T.C. Factors Influencing the Relative Economy of Massed and Distributed Practice in Learning. Psychological Review, 1928, 35, 19-45.

Schmidt, Richard A. Performance and Learning A Gross Motor Skill Under Conditions of Artificially-Induced Fatigue. American Association of Health, Physical Education and Recreation Research Quarterly, 1969, 40, 185-190.

Smith, Julian. A Review and Forward Look With The Outdoor Education Project. Journal of Health, Physical Education and Recreation, 1970, 40, 44-45.

Starch, D. Periods of Work in Learning. Journal of Educational Psychology, 1912, 3, 209-213.

Two States Join Forces To Meet Recreational Needs. Journal of Health, Physical Education and Recreation, 1969, 40, 48-49.

Tyrance, Herman J. Cooperative Evaluation: A Method of Teaching Activities, Journal of Health, Physical Education and Recreation, 1969, 40, 32-35.

Wang, Margaret C. Use of the Canonical Correlation Analysis in an Investigation of Pupil's Rate of Learning in School. Journal of Educational Research, 1970, 64, 35-45.

Warden, C.J. The Distribution of Practice in Animal Learning. Comparative Psychology Monogram, 1923, 1.

Whitley, Jim D. Effects of Practice Distribution on Learning a Fine Motor Task. American Association of Health, Physical Education and Recreation Research Quarterly, 1970, 41, 576-583.

Zabik, Roger M., and Jackson, Andrew S. Reliability of Archery Achievement. American Association of Health, Physical Education and Recreation Research Quarterly, 1969, 40, 254-255.

Unpublished Materials

Bruno, Frank Joe. Stimulus Change as a Factor in Massed and Distributed Practice. Unpublished doctoral dissertation, Claremont Graduate School and University Center, 1968.

Carron, Albert Vital. Performance and Learning in a Discrete Motor Task Under Massed Versus Distributed Practice. Unpublished doctoral dissertation, University of California, Berkeley, 1967.

Chanin, Lynne Shepard. An Investigation of the Relative Effectiveness of Two Scheduling Patterns of an Introductory College Biology Course. Unpublished doctoral dissertation, New York University, 1969.

Chase, Craig Carleton. Changes in Attitude Toward Outdoor Education By Teachers and Administrators After Participation in the Cooperative Outdoor Education Project, Title III, ESEA. Unpublished doctoral dissertation, Southern Illinois University, 1969.

Churdar, John Bunyan. A Study of the Effect of Four Different Frequencies of a Specific Exercise Program on Physical Fitness. Unpublished doctoral dissertation, Florida State University, 1967.

Dunham, Paul Louis. The Effect of Serial Versus Sequence Practice on Performance Level. Unpublished doctoral dissertation, University of Arkansas, 1968.

Gabel, Kenneth Eugene. A Study of the Relative Effectiveness of Four Distributions of Weekly Instructional Time in College Freshman Mathematics. Unpublished doctoral dissertation, Syracuse University, 1955.

Hamed, Charles J. The Effectiveness of Spaced Practice and Massed Practice as Contrasted Methods of Developing Production Typewriting Ability. Unpublished doctoral dissertation, Northern Illinois University, 1968.

Hansen, Kenneth LeRoy. The Effect of Varied Scheduling on Achievement in Advanced College Typewriting. Unpublished doctoral dissertation, Colorado State University, 1965.

Hunt, Barbara Jean. The Effects of Massed and Distributed Practice on Problem Solving. Unpublished doctoral dissertation, University of Nebraska, 1969.

Hurst, Francis Marion. Differential Effects of Verbal Reinforcement on Fourth Grade Pupils of Various Ability Levels Under Massed and Spaced Acquisition in a Classroom Situation. Unpublished doctoral dissertation, Indiana University, 1954.

Keough, Betty Jean. The Effects of a Daily and Two Day Per Week Physical Education Program Upon Motor Fitness of Children. Unpublished doctoral dissertation, State University of Iowa, 1962.

Kingsley, Joan Lenore. The Effectiveness of Teaching Large Motor Skills by the Spaced-Unit Method as Compared with the Continuous-Unit Method. Unpublished doctoral dissertation, New York University, 1970.

Landry, Joseph Fernand. Adaptation of Organic Functions to Continuous and Intermittant Exercise Patterns in Four Male Subjects. Unpublished doctoral dissertation, State University of Illinois, 1968.

Malpass, Roy Southwell. The Effects of Attitude on Learning and Memory: The Influence of Instruction-Induced Sets. Unpublished doctoral dissertation, Syracuse University, 1968.

Miller, Beverly White. A Study of Distributed Versus Massed Practice in Human Anatomy and Physiology Instruction in a Collegiate Program For Student Nurses. Unpublished doctoral dissertation, University of Toledo, 1967.

Mitchell, Rie Rogers. An Evaluation of the Relative Effectiveness of Spaced, Massed, and Combined Sensitivity Training Groups in Promoting Positive Behavior Change. Unpublished doctoral dissertation, University of California at Los Angeles, 1969.

Montgomery, Margaret Anne Patricia. The Effects of Various Rates of Presentation in Combination with Massed and Spaced, Concurrent and Noncurrent Practice Modes on Film-Mediated Perceptual Motor Performance. Unpublished doctoral dissertation, Indiana University, 1967.

Montgomery, Richard. Immediate, 24 Hour, 14 Day Retention as a Function of Associative Strength. Unpublished doctoral dissertation, University of Oregon, 1967.

O'Toole, Ora Marlene. The Effects of Massed and Spaced Practice Upon Learning Perspective, and Resultant Effects Upon Selected Aspects of Creativity in Art. Unpublished doctoral dissertation, Colorado State University, 1966.

Reed, Henry Judson. Studies of the Interference Process in Short-Term Memory. Unpublished doctoral dissertation, University of California at Los Angeles, 1970.

Rosin, William John. A Comparison of Student Achievement Between Two- and Three-Hour Public School Trade and Industrial Education Welding Classes. Unpublished doctoral dissertation, Texas A&M University, 1969.

Scanlon, James Arnold. The Relative Effectiveness of Supplementing Programmed Instruction With Blocked Versus Spaced Review. Unpublished doctoral dissertation, Cornell University, 1967.

Singer, Robert Norman. Massed and Distributed Practice Effects on the Acquisition and Retention of a Novel Basketball Skill. Unpublished doctoral dissertation, Ohio State University, 1964.

Stelmack, Edward. Effectiveness of Motor Skills Practice as a Function of Various Practice Schedules. Unpublished doctoral dissertation, University of California, Berkeley, 1967.

Stockton, Gerald Ethan. The Relationship of Four Time Schedules to the Development of Selected Basketball Skills. Unpublished doctoral dissertation, University of Utah, 1970.

Stull, G. Alan. Relationship of Quantity and Distribution of Practice to Endurance, Speed, and Skill Development by Beginners. Unpublished doctoral dissertation, Pennsylvania State University, 1961.

Waechter, Richard Fredrick. A Comparison of Achievement and Retention by College Junior Students in an Earth Science Course After Learning Under Massed and Spaced Conditions. Unpublished doctoral dissertation, The Pennsylvania State University, 1966.

Young, Oliver Graves. Rate of Learning in Relation to Spacing of Practice Periods in Selected Physical Education Activities. Unpublished doctoral dissertation, State University of Iowa, 1953.

Miscellaneous

Basic Sailing Instructor's Manual, Washington, D.C.: The American National Red Cross, 1967.

Boating Instructor's Visual Aids, Washington, D.C.: The American National Red Cross, 1969.

Commission of Outdoor Recreation Resources Review. Report of the President and the Congress. Outdoor Recreation for America. Washington, D.C.: United States Government Printing Office, 1962.

Guide for Training Small Craft Instructor Aides, Washington, D.C.: The American National Red Cross, 1969.

Making the Classroom Test: A Guide for Teachers. Princeton, N.J.: Educational Testing Service, 1969.

Multiple-Choice Questions: A Close Look. Princeton, N.J.: Educational Testing Service, 1963.

Sailing Instructor's Visual Aids, Washington, D.C.: The American National Red Cross, 1969.

Southwestern State College August Outdoor Education Workshop Schedule, 1971.

Southwestern State College Catalog, 1971-73.

Southwestern State College Fall Schedule, 1971.

Southwestern State College June Outdoor Education Workshop Schedule, 1971.

Southwestern State College Summer Schedule, 1971.

APPENDIX A

CARD FORMAT: RAW DATA

Table 17

Card Format For Recording Raw Data

Information	Column
1. Name	1-13
2. Pre or Post Test	14
A. Pre test = 1	
B. Post test = 2	
3. Type of Test	15
A. Knowledge = 1	
4. Activity	16
A. Archery = 1	
B. Baitcasting = 2	
C. Canoeing = 3	
D. Golf = 4	
E. Sailing = 5	
F. Trapshooting = 6	
5. Blank.	17
6. Raw Age.	18-19
7. Classification	20
A. Freshman = 1	
B. Sophomore = 2	
C. Junior = 3	
D. Senior = 4	
E. Other = 5	
8. Previous Experience.	21
A. Great Deal = 1	
B. Some = 2	
C. Very Little = 3	
D. None = 4	
9. Responses to Each Test Item.	22-79
A. Response of A = 1	
B. Response of B = 2	
C. Response of C = 3	
D. Response of D = 4	
E. Response of E = 5	

APPENDIX B

CARD FORMAT: TRANSGENERATED DATA

Table 18

Card Format of Transgenerated Data

	Information	Column
1.	Name	1-15
2.	Archery Pretest Comprehension Score	16-17
3.	Archery Posttest Comprehension Score	18-19
4.	Archery Pretest Skill Score	20-22
5.	Archery Posttest Skill Score	23-25
6.	Baitcasting Pretest Comprehension Score	26-27
7.	Baitcasting Posttest Comprehension Score	28-29
8.	Baitcasting Pretest Skill Score	30-31
9.	Baitcasting Posttest Skill Score	32-33
10.	Canoeing Pretest Comprehension Score	34-35
11.	Canoeing Posttest Comprehension Score	36-37
12.	Canoeing Pretest Skill Score	38-40
13.	Canoeing Posttest Skill Score	41-43
14.	Golf Pretest Comprehension Score	44-45
15.	Golf Posttest Comprehension Score	46-47
16.	Golf Pretest Skill Score	48-50
17.	Golf Posttest Skill Score	51-53
18.	Sailing Pretest Comprehension Score	54-55
19.	Sailing Posttest Comprehension Score	56-57
20.	Sailing Pretest Skill Score	58-60
21.	Sailing Posttest Skill Score	61-63
22.	Trapshooting Pretest Comprehension Score	64-65
23.	Trapshooting Posttest Comprehension Score	66-67
24.	Trapshooting Pretest Skill Score	68-69
25.	Trapshooting Posttest Skill Score	70-71
26.	Previous Experience Level	72
27.	Sex of Student	73
28.	Attitude of Student	74-76
29.	Various Covariable Measures Unique to the Recreational Area Being Measured	77-79
	Wind Velocity	77
	A. More than 20 = 1 C. 5-10 = 3	
	B. 10-20 = 2 D. Less than 5 = 4	
	Temperature	78
	A. 95-higher = 1 C. 75-85 = 3	
	B. 85-95 = 2 D. Less than 75 = 4	
	Wind Direction	79
	A. From 12:00 = 1 C. From 6:00 = 3	
	B. From 3:00 = 2 D. From 9:00 = 4	

APPENDIX C

ARCHERY COMPREHENSION TEST

ARCHERY TEST

Multiple Choice

1. After loosing the arrow it is important to -----
   a. watch the flight of the arrow
   b. hold the shooting position for one to one-third seconds
   c. nock another arrow immediately
   d. relax the position before the next shot

2. In shooting, the right-handed archer should sight with -----
   a. the right eye, left eye closed
   b. the left eye, right eye closed
   c. the right eye, left eye open
   d. the left eye, right eye open

3. When the bow arm is in position for shooting, the arrow is at the -----
   a. left of the bow, with the cock feather to the right
   b. right of the bow, with the cock feather to the right
   c. right of the bow with the cock feather to the left
   d. left of the bow with the cock feather on top

4. If the arrow falls off the bow hand it is generally due to -----
   a. cross wind
   b. not holding arrow with left index finger
   c. holding arrow too tightly with right hand
   d. holding arrow too loosely with right hand
   e. tipping bow to left

5. The object at which the archer aims should be in vertical alignment with the -----
   a. gold of the target
   b. right side of the target
   c. bottom edge of the target
   d. top edge of the target

6. The most common error sending an arrow too low is -----
   a. following arrow with right hand
   b. jerking loosing-hand away from face
   c. hunching the left shoulder
   d. dropping bow hand

7. Six arrows are shot at a distance of 80 yards with the following result: 1 arrow hits the gold and drops off, 1 arrow hits the black and drops off, 1 arrow hits in the petticoat, 3 in the blue. The complete score is -----
   a. 9, 7, 7, 7, 3, 1 - 6 - 33
   b. 9, 5, 5, 5, 3, 0 - 5 - 27
   c. 5, 5, 5, 5, 5, 1 - 6 - 26
   d. 5, 5, 5, 5, 5, 0 - 5 - 25
   e. 7, 7, 7, 5, 5, 0 - 5 - 25

8. An end is shot with the following results: 1 in gold, 2 in blue, 1 in petticoat, 2 in red. The complete record is -----
   a. 7, 7, 3, 3, 1, 0 - 5 - 21
   b. 9, 7, 7, 5, 5, 0 - 5 - 33
   c. 9, 7, 7, 5, 5, 1 - 6 - 34
   d. 9, 5, 5, 3, 3, 1 - 6 - 26
   e. 9, 5, 5, 3, 3, 0 - 5 - 25

9. The left wrist in shooting is -----
   a. flexed toward palm
   b. hyperextended
   c. straight
   d. flexed to little finger side
   e. flexed to thumb side

10. To prevent breaking the bow one should never -----
   a. shoot on a range where there are rocks and stones
   b. hang the bow up upstrung
   c. shoot with too long an arrow
   d. draw the bowstring without an arrow on it

11. The most common error sending an arrow high is-----
   a. following the arrow with the right hand
   b. jerking loosing hand away from face
   c. hunching left shoulder
   d. dropping bow hand

12. To errors which send arrows to the left are -----
   a. dropping the bow hand and jerking the loosing hand
   b. jerking the loosing hand away from the face and following the arrow with the right hand
   c. hunching the left shoulder and throwing bow arm to the left
   d. watching the flight of the arrow and following the arrow with the right hand
   e. hunching the left shoulder and jerking loosing hand way from face

13. The serving is placed on the bowstring
    a. opposite the handle
    b. opposite the upper edge of the handle
    c. opposite the lower edge of the handle
    d. just below the loops
    e. at the place the knot is tied

14. The score of six arrow landing as follows: white 1, miss 1, gold 1, red 2, black 1, -- would read -----
    a. 6 hits, score 27
    b. 9, 7, 7, 3, 1, 0 - 5 - 27
    c. 9, 7, 7, 3, 1, 0 - 6 - 27
    d. 9, 9, 5, 3, 1, 0 - 5 - 27
    e. 9, 7, 5, 5, 1, 0 - 5 - 27

15. Which of the following materials make the best bowstrings?
    a. hemp
    b. wire
    c. rawhide
    d. gut
    e. flax

16. The object at which the archer aims is called the
    a. target
    b. gold
    c. point of aim
    d. ground
    e. goal

17. The arrow should be released by -----
    a. pushing the arrow
    b. relaxing the fingers
    c. extension of the fingers
    d. jerking the right hand off the string
    e. relaxing the muscles of the right shoulder

18. The upper and lower limbs of the bow differ in that the upper limb is -----
    a. more curved
    b. less curved
    c. heavier
    d. lighter
    e. made of a different kind of wood

19. Which of the following practices would cause the bowstring to bruise the archer's arm?
    a. incomplete draw
    b. bending left wrist
    c. drawing back too close to arm
    d. using too heavy a bow
    e. hyper-extended elbow

20. Which of the following criteria determines the length of the arrow used by an archer?
    a. length of the archer's arm and length of bow
    b. weight of the bow
    c. distance from target
    d. weight and length of bow
    e. weight of the bow and length of archer's arm

21. The cock feather can be distinguished from the rest of the feathers by the fact that it is always -----
    a. at right angles to the nock
    b. parallel to the nock
    c. a different color than the others
    d. a different shape than the others
    e. set a little back of the others

22. A bow with back and belly made of different wood would be called a -----
    a. spliced bow
    b. backed bow
    c. reinforced bow
    d. pieced bow
    e. self bow

23. The distance from the center of the gold of the target to the ground should be -----
    a. two feet
    b. four feet
    c. six feet
    d. three feet
    e. five feet

24. Which two shooting errors will send arrows too far to the right?
    a. hunching left shoulder and throwing the bow arm to the left
    b. dropping bow hand and jerking the loosing hand away from the face
    c. jerking the loosing hand away from face and following arrow with the right hand
    d. watching the flight of the arrow and following the arrow with the right hand
    e. hunching the left shoulder and jerking the loosing hand away from the face

25. Which of the following woods are most commonly used for making arrows?
    a. birch, hickory, Norway Pine
    b. Port Oxford cedar, birch, hickory
    c. birch, yew, Norway Pine
    d. Port Oxford cedar, birch, Norway Pine
    e. birch, hickory, yew

26. In bending or stringing a bow with the right hand on the handle -----
    a. the tip of the bow should be in the arch of the left foot
    b. pressure should be exerted with the fingers
    c. the right hand is held in place while the string is drawn into place with the left hand
    d. the left hand pulls the bow against the arch of the right foot
    e. the upper limb of the bow is bent by pressure of the heel of the left hand

27. When the bow is bent the distance between the bow and string at the handle should be -----
    a. five to seven inches
    b. six to ten inches
    c. one to two feet
    d. one to three inches
    e. less than one inch

23. Which of the following woods are most commonly used in making bows?
    a. hickory, birch, lemonwood
    b. yew, lemonwood, osage orange
    c. Norway Pine, hickory, osage orange
    d. yew, hickory, birch
    e. Norway Pine, yew, hickory

29. The bow should be grasped by the -----
    a. thumb and forefinger of the left hand
    b. left hand at the bottom of the handle
    c. left hand at the top of the handle
    d. left hand reaching around from the back of the bow
    e. fingers (not thumb) of the left hand

30. A Columbia Round for women consists of
    a. 6 arrows each at 60, 50, 40 yards
    b. 12 arrows each at 50, 40, 30 yards
    c. 48 arrows each at 50, 40, 30 yards
    d. 12 arrows each at 40, 30, 20 yards
    e. 24 arrows each at 50, 40, 30 yards

31. Which of the following is the most common hazard of shooting in damp weather?
    a. feathers come off the arrows
    b. bows increase in weight
    c. bowstrings rot
    d. colors on target face run
    e. piles come off arrows

32. The term "ARCHER'S PARADOX" is used in reference to the _____.
    a. length of bows
    b. sound caused by bowstrings
    c. flight of arrows
    d. weight-pull of bows

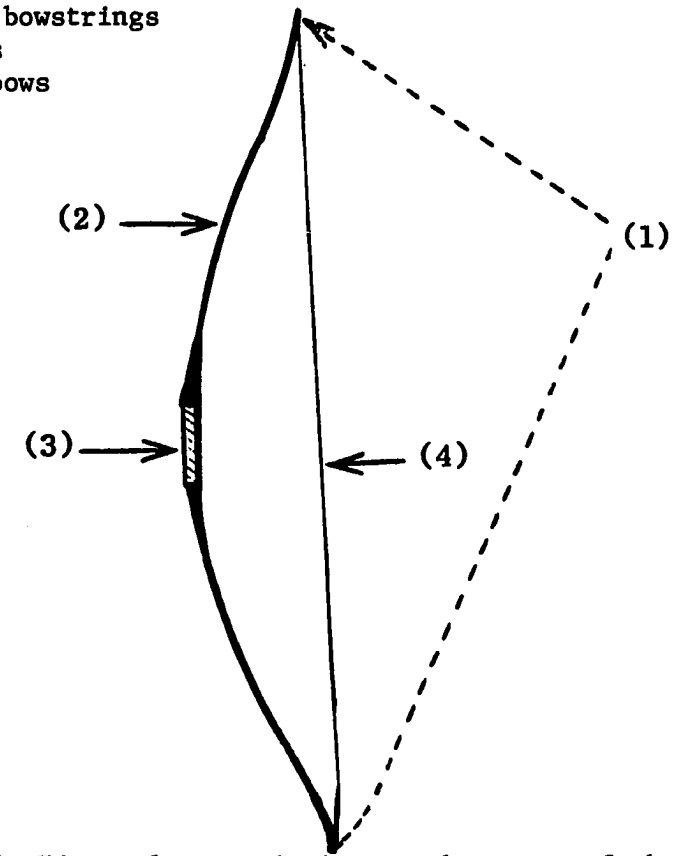


Figure 1

33. The number (1) arrows in Figure 1 are pointing to the _____ of the bow.
    a. lower limbs
    b. sight windows
    c. shafts
    d. nocks

34. Arrow number (3) in Figure 1 indicates the _____ of the bow.
    a. sighting window
    b. arrow rest
    c. nock
    d. string

35. Which of these materials would normally be used on the part indicated by arrow number (4) in Figure 1?
    a. beeswax
    b. marine spar varnish
    c. furniture polish
    d. powder solvent

36. The part indicated by arrow number (2) in Figure 1 is known as the _____ of the bow.
    a. sighting window
    b. upperlimb
    c. upper arch
    d. upper parabola

37. Bow "weights" are determined by the number of pounds -----
    a. the bow weighs
    b. the user should weigh
    c. the impact pressure of arrows shot from 10-feet distances
    d. required to draw the bowstring a given distance

38. Shooting directly into the wind will usually cause an arrow to -----
    a. veer to the left
    b. strike too high on the target
    c. strike too low on the target
    d. veer to the right

39. Three ends of shooting would be _____ arrows.
    a. 12
    b. 18
    c. 3
    d. 30

40. The distance between the bowstring and the bow handle when the bow is strung but not drawn is known as the _____ of the bow.
    a. nock
    b. fistmele
    c. belly
    d. pull

41. Which of the following types of bows is NOT allowed in regular archery competition?
    a. cross bows
    b. long bows
    c. self bows
    d. laminated bows

42. The "pull-push" is a method commonly used to -----
    a. string a bow
    b. retrieve arrows from a target
    c. shoot arrows that are too short
    d. shoot arrows from a long distance

43. Which of the following is considered to be the MOST IMPORTANT item of the archery tackle?
    a. bowstring
    b. bow
    c. arrow
    d. armguard

44. The degree of flexibility of an arrow is often referred to as its -----
    a. elasticity
    b. flexibility
    c. resilience
    d. spine

45. The feathers on an arrow are know as its -----
    a. nocks
    b. fletching
    c. shaft
    d. aiming device

46. If the head or tip of an arrow is increased in weight, the feathers of the arrow should be -----
    a. increased in length
    b. decreased in length
    c. changed to figerglass or plastic
    d. removed

47. "Flu-flu" fletching is often used by the archer who is hunting -----
    a. fish
    b. big game
    c. birds
    d. rodents

48. FORE : Ggolf :: _____ : ARCHERY
    a. safety
    b. warning
    c. tally ho
    d. timber

49. When shooting for greater distances the draw of the bow should -----
    a. remain the same
    b. be increased
    c. be decreased
    d. be more than 40 inches

50. Which of the following would NOT be an aiming technique?
    a. crosswinding
    b. bow sights
    c. instinctive
    d. point-of-aim

51. That place on an archer's face where he places his hand when he has the bowstring at full draw is known as the -----
    a. aiming point
    b. nocking point
    c. anchor point
    d. contact point

52. From the 50 yard range, Jim shot six arrows with the following results: 3 in the red, 1 in the blue, and 2 passing completely through the target. What is his score for these six arrows?
    a. 30
    b. 36
    c. 26
    d. 40

53. The presiding official in a ladies archery tournament is known as the _____ .
    a. field judge
    b. field captain
    c. lady paramount
    d. captainess

54. If an archer is looking for arrows behind a target, which of the following is the best way to warn other archers that the target area is not clear for shooting?
    a. Place an arrow in the target and hang your quiver on it.
    b. Lay the target face down on the ground.
    c. Call out, "timber" every few minutes.
    d. Lean your bow against the target.

55. The distance a bow will shoot an arrow is known as the bow's _____.
    a. reach
    b. range
    c. cast
    d. flight

56. A "Self Bow" is a bow that is -----
    a. highly prized by its owner
    b. made of one kind of wood
    c. made in the shape of an "S"
    d. make of artificial materials

57. ORNOTHOLOGIST : BIRDS :: _____ : ARCHERY
    a. research
    b. Robin Hood
    c. archeologist
    d. Toxophilite

53. HORSE SHOES : BLACKSMITH :: BOWS : _____
    a. Smith
    b. Bowman
    c. Bowyer
    d. Manufacturer

Table 19

Archery Comprehension Test
Difficulty and Phi Indices

Item Number	Item Difficulty	Phi Coefficient	Item Number	Item Difficulty	Phi Coefficient
1.	.61	.42	30.	.66	.60
2.	.34	.54	31.	.32	.35
3.	.38	.67	32.	.68	.78
4.	.35	.87	33.	.28	.29
5.	.28	.41	34.	.79	.62
6.	.26	.36	35.	.60	.31
7.	.41	.58	36.	.45	.81
8.	.78	.75	37.	.69	.23
9.	.70	.39	38.	.36	.47
10.	.42	.48	39.	.38	.40
11.	.50	.59	40.	.78	.63
12.	.51	.64	41.	.81	.46
13.	.69	.66	42.	.52	.74
14.	.57	.22	43.	.61	.66
15.	.39	.40	44.	.69	.73
16.	.66	.49	45.	.52	.47
17.	.52	.56	46.	.45	.30
18.	.43	.42	47.	.56	.66
19.	.81	.21	48.	.32	.39
20.	.30	.64	49.	.32	.40
21.	.79	.61	50.	.26	.37
22.	.77	.58	51.	.52	.38
23.	.60	.41	52.	.30	.49
24.	.70	.39	53.	.51	.25
25.	.50	.78	54.	.66	.18
26.	.80	.58	55.	.39	.51
27.	.73	.16	56.	.40	.46
28.	.64	.39	57.	.36	.22
29.	.57	.40	58.	.76	.36

APPENDIX D

BAITCASTING COMPREHENSION TEST

BAITCASTING TEST

Multiple Choice

1. Which of the following fish would normally hit a top-water lure?
   a. carp
   b. drum
   c. bass
   d. channel catfish

2. Artificial flip-tail worms are usually made of -----
   a. plastic
   b. pork rind
   c. rubber
   d. manila

3. Which of the following fish are commonly caught on dry flies?
   a. muskies
   b. rainbow trout
   c. sturgeons
   d. alligator gars

4. The _____ is one of the most famous dry flies used by fishermen.
   a. Royal Coachman
   b. Tadpolly Spook
   c. Paul Bunyan
   d. Lazy Ike

5. Which of the following is a live bait and not an artificial lure?
   a. jigs
   b. flatfish
   c. popping bugs
   d. chubs

6. Which of the following is a Crustacheon?
   a. oyster
   b. salmon
   c. crayfish
   d. carp

7. One of the following types of "catfish" is errorenously classified as such, it is the -----
   a. spoonbill catfish
   b. flathead catfish
   c. channel catfish
   d. blue catfish

8. One of the best live baits for catching flathead catfish is -----
   a. jigs
   b. goldfish
   c. doll flies
   d. popping bugs

9. One of the major advantages of monofilament fishing line is that it -----
   a. is stronger than fabric line
   b. floats
   c. will not stretch
   d. is practically invisible

10. If a fishing line has a rating of 20-lb. test, this means that it -----
   a. weights 20 lbs. per 1,000 feet
   b. has a breaking strength of 20-lbs. or more
   c. should be used on 20-lb. rods
   d. has a tinsel strength of 20 lbs.

11. Camaflouge line is most often used in fishing for -----
   a. drum
   b. dolphin
   c. Black bass
   d. tuna

12. Which of the following figures most nearly approximates the weight of the record Black Bass caught in the U.S.?
   a. 20 lbs.
   b. 15 lbs.
   c. 10 lbs.
   d. 35 lbs.

13. The largest Black Bass in America was caught -----
   a. at Bull Shoals, Missouri
   b. in the Florida Everglades
   c. at Table Rock, Missouri
   d. at Eufala, Oklahoma

14. Which of the following is <u>NOT</u> considered to be a gamefish?
   a. Flathead catfish
   b. White crappie
   c. Blue catfish
   d. Rainbow trout

15. Floating line is used most often in fishing with _____.
   a. plastic worms
   b. spoons
   c. flies
   d. jig and eels

16. The major disadvantage of floating line is that -----
    a. its tinsel strength is very low
    b. its wet strength is very low
    c. it is too easily seen by the fish
    d. it is so large that it fills the reel too quickly

17. When casting for Black bass the best path of retrieval would be -----
    a. toward the bank
    b. away from the bank
    c. parallel to the bank
    d. none of the above

18. When fishing for "Muskies" the proper type of leader to use would be made of -----
    a. steel
    b. floating line
    c. camaflouged line
    d. monofilament

19. Which of the following salt water fish is considered to be the most sporting?
    a. Dolphin
    b. Red Snapper
    c. Blue-Fin Tuna
    d. Croaker

20. Pond fishing for bass is usually hampered by a fresh water plant called -----
    a. Green Slime
    b. Water Cress
    c. Seaweed
    d. Algae

21. One of the most common catfish baits, stink bait, is made of -----
    a. cereal grains
    b. blood
    c. artificial feathers
    d. salmon eggs

22. The main reason black bass bite lures in the spring of the year is that -----
    a. they are fighting the lure away from their nest
    b. they are hungry from their winter's fast
    c. they are trying to rid their area of smaller fish and insects
    d. they are attracted by the sound of the lure

23. In which of the following water temperatures are gamefish the most active?
    a. 75 - 85 degrees
    b. 85 - 95 degrees
    c. 60 - 70 degrees
    d. 30 - 40 degrees

24. Bass will hit top water lures in the _____ of the year more often than any other time.
    a. Summer
    b. Spring
    c. Fall
    d. Winter

25. How big must a bass be before he is "legal" size in Oklahoma?
    a. 2 feet
    b. 10 inches
    c. 4 lbs.
    d. 2 lbs.

26. Most fishing boats are _____ feet long?
    a. 16-20
    b. 20-22
    c. 22-25
    d. 14-16

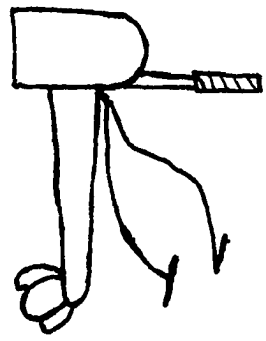
27. One of the best live baits to use for Black bass fishing is -----
    a. gadflies
    b. popping bugs
    c. shiners
    d. river runts

28. Which of the following outboard motors would be best for use on a fishing rig?
    a. 35 horse power
    b. 7.5 horse power
    c. 50 horse power
    d. 80 horse power

29. Which of the following is a leading manufacturer of fishing equipment?
    a. Daisy
    b. Garcia
    c. Winchester
    d. Wilson

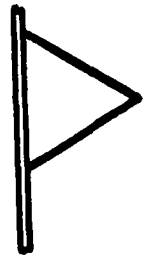
30. The fishing equipment shown in Figure 1 is used to -----
    a. aeriate bait tanks
    b. scale fish
    c. clear brush and weeds
    d. troll with

Figure 1



31. If lake officials display the pennant show in Figure 2, it is an indication that _____.
    a. the fish are biting on the lake
    b. the wind is too strong for launching small boats
    c. only sail boats are allowed on the lake
    d. swimmers are not allowed in certain areas of the lake

Figure 2



32. When "playing" a fish the tip of the rod should be _____.
    a. pointed directly at the fish
    b. at right angles to the fish
    c. submerged below the surface of the water
    d. pointed straight up

33. If you are "playing" a 6 lb. fish on a 10 lb. test line and he breaks the line, it is an indication that the _____.
    a. fish was bigger than you thought
    b. test rating of the line was incorrect
    c. drag was improperly set
    d. lure was improperly attached

34. Which of the following types of fishing usually requires the longest rod?
    a. fly
    b. spinning
    c. bait casting
    d. spin-casting

35. Channel: Catfish :: _____ : Bass
    a. Sporting
    b. Fresh Water
    c. Game
    d. Black

36. Tarpon : Salt :: Bluegill :
    a. Fresh
    b. Ocean
    c. Surf Casting
    d. Marlin

37. Tip : Eye :: Fin :
    a. fish
    b. gill
    c. rod
    d. reel

38. Fingerling : Fish :: Colt :
    a. Horse
    b. Seahorse
    c. Riding
    d. Recreation

39. Cast : Lure :: _____ : Fly
    a. catch
    b. tie
    c. glove
    d. sport

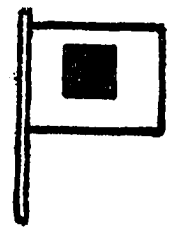
40. Smallmouth : Sandies :: Blue :
    a. water
    b. largemouth
    c. channel
    d. bass

41. Trout : Crappie :: Speckled :
    a. jigs
    b. docks
    c. pan fish
    d. black

42. Trolling : "Sandies" :: _____ : "Channels"
    a. blocking
    b. catfish
    c. trot-lining
    d. bass

43. Canoe : Boat :: Paddle :
    a. oar
    b. float
    c. fly
    d. water safety

44. When lake officials display a square red flag, it is a warning to small craft owners that -----
    a. swimmers are in the area
    b. scuba divers are in the area
    c. the wind is too strong to fish or boat
    d. fishing season is closed



45. When a powered boat and a sail boat are on a collision course -----
    a. the powered boat has the right of way
    b. the craft moving against the wind has the right of way
    c. the craft moving with the wind has the right of way
    d. the sailboat has the right of way

46. Which of the following boat hull materials will usually withstand the most abuse from sharp objects?
    a. fiberglass
    b. aluminum
    c. plywood
    d. red cedar

47. When rowing a boat, it is best for the person who is rowing to face the -----
    a. front of the boat
    b. back of the boat
    c. wind
    d. current of the water

43. If you are travelling at 35 m.p.h. with an outboard motor and the propeller and drive unit hit a submerged stump, what keeps the lower-drive unit of the motor from being broken off?
    a. the motor is hinged to allow it to fly up and pass over the stump
    b. the motor "saws" through the stump
    c. the lower unit of the motor is made of rubber and is very difficult to break
    d. the boat will stop immediately

49. A motor-boat "motor" is, technically speaking, an engine and not a motor at all. Why is this true?
    a. it is too big to be a motor
    b. motors will not run in the water
    c. it generates its own power internally
    d. engines are always water cooled

50. The activity of gamefish is affected most by -----
    a. the season of the year
    b. the type of lures being used by fishermen
    c. their spawning habits
    d. the water temperature

Table 20

Baitcasting Comprehension Test
Difficulty and Phi Indices

Item Number	Item Difficulty	Phi Coefficient	Item Number	Item Difficulty	Phi Coefficient
1.	.36	.57	26.	.76	.74
2.	.47	.39	27.	.80	.77
3.	.83	.69	28.	.74	.63
4.	.22	.87	29.	.84	.85
5.	.31	.33	30.	.45	.83
6.	.57	.88	31.	.25	.73
7.	.64	.75	32.	.38	.52
8.	.86	.82	33.	.87	.65
9.	.20	.37	34.	.32	.52
10.	.37	.44	*35.	.85	.54
11.	.80	.36	*36.	.29	.20
12.	.55	.68	*37.	.49	.60
13.	.73	.82	*38.	.66	.21
14.	.85	.30	*39.	.75	.36
15.	.61	.79	*40.	.68	.47
16.	.45	.20	*41.	.40	.42
17.	.59	.67	*42.	.48	.51
18.	.63	.46	*43.	.78	.28
19.	.53	.65	44.	.62	.63
20.	.57	.60	45.	.55	.35
21.	.28	.72	46.	.65	.58
22.	.35	.44	47.	.64	.33
23.	.76	.22	48.	.52	.72
24.	.38	.28	49.	.30	.29
25.	.53	.50	50.	.81	.80

*Analogy

APPENDIX E

CANOEING COMPREHENSION TEST

CANOEING TEST

Multiple Choice

1. Which of the following is NOT a material normally used in modern canoe making?
   a. Birch Bark
   b. Aluminum
   c. Fiberglass
   d. Red Cedar

2. Gunwales in wooden canoes are usually made of -----
   a. Cypress
   b. Walnut
   c. White Pine
   d. Hardwood

3. A common rule for selecting a paddle is that it should be about _____ when the tip is resting on the ground.
   a. Half the length of the canoe
   b. Eye level
   c. 6 feet long
   d. Waist high

4. Double-blade paddles are usually made of -----
   a. Spruce
   b. Oak
   c. Cypress
   d. Ash

5. The type of coating most recommended for covering paddles and oars is -----
   a. Lead Base Paint
   b. Marine Spar Varnish
   c. Linseed Oil
   d. Vinyl Base Paint

6. A square-type racing paddle named after a famous canoeist is known as the _____.
   a. Jackson
   b. Leacher
   c. Samoset
   d. Reedel

7. Paddles used by South Sea Islanders usually have a _____ than U.S. paddles.
   a. much wider blade
   b. much longer handle
   c. bigger shaft
   d. longer life

8. A paddle should weigh about -----
   a. 3 1/2 pounds
   b. 2 1/2 pounds
   c. 4 pounds
   d. 10 pounds

9. Canoes are usually rigged with lines of cotton rope. One of the functions of these lines to to _____.
   a. Hold the center of the canoe rigid
   b. Hold tension on the gunwales
   c. Tow the canoe while swimming
   d. Hold extra equipment in place

10. In order for a canoe to be used as a rowing craft it is necessary to equip it with _____.
   a. A heavy mast
   b. A rigid keel
   c. A heavy ballast
   d. Leeboards or outriggers

11. A _____ is usually installed in the bottom of a rowing canoe.
   a. Detachable keel
   b. Sliding seat unit
   c. Set of foot chocks
   d. Gunwale

12. When canoes are equipped for sailing it is imperative that their stability be established by adding _____.
   a. Double mast
   b. A lead tiller
   c. Lead ballasts
   d. Leeboards

13. Which of the following is the easiest way for one man to move a canoe for a short distance?
   a. Carry it on his head
   b. Drag it by the line
   c. Carry it on his hip
   d. Push it in front of him

14. When two men are boarding a canoe the one who usually boards first is the _____.
   a. Larger of the two
   b. Smaller of the two
   c. Sternman
   d. Bowman

15. The most stable position for canoe paddling is the _____.
    a. Squatting position
    b. Seated position
    c. Kneeling position
    d. Kneeling-on-one-knee position

16. If a canoe encounters heavy waves the two occupants would normally _____.
    a. Move toward the center of the canoe
    b. Move toward the bow of the canoe
    c. Move toward the stern of the canoe
    d. Move closer toward the respective ends of the canoe

17. When trolling from a canoe the fisherman should _____.
    a. Be in a kneeling position
    b. Be seated in the bottom of the boat
    c. Be in a high-kneeling position
    d. Stand facing the paddler

18. The safest way of changing positions in a canoe is by having one passenger _____.
    a. Straddle the other
    b. Lean each way during the exchange
    c. Get out of the craft (bowman)
    d. Get out of the craft (sternman)

19. When paddling downwind, solo, the rule is _____.
    a. Paddle in a sculling motion
    b. Keep the bow down
    c. Keep the stern down
    d. Paddle only for stability

20. Which of these strokes would move the canoe sideways toward the paddler's side?
    a. Bow stroke
    b. Backwater stroke
    c. Pushover stroke
    d. Draw stroke

21. In order to avoid having to paddle on first one side of the canoe and then the other, experienced canoeists use _____.
    a. Their weight to turn the canoe
    b. The "J" stroke on the paddle
    c. A curved paddle
    d. The pushover stroke to correct the canoe's direction

22. A bow rudder will not work unless the canoe is _____.
    a. Standing still in the water
    b. Equipped with a tiller
    c. Moving upstream
    d. Moving faster than the water current

23. Silent paddling is best accomplished by -----
    a. Keeping the paddle submerged at all times
    b. Utilizing the "J" and draw strokes
    c. Paddling from the bow of the boat
    d. Paddling from the stern of the boat

24. Which of the following best describes the relationship of single-blade paddling to double-blade paddling?
    a. Double-blade paddling is superior in smooth water
    b. Single-blade paddling is superior for speed and control
    c. Double-blade paddling is superior for speed and control
    d. Single-blade paddling is much more efficient as far as manpower is concerned

25. In double-blade paddling the two blades are set _____.
    a. At varying angles to each other
    b. In the same direction
    c. Opposing each other
    d. At 90-degree angles to each other

26. Which of the following canoe hull materials would normally endure the most abuse?
    a. Fiber glass
    b. Marine plywood
    c. Tempered aluminum
    d. Laminated cedar

27. When going downstream in very swift water, which of the following strokes would be used most often?
    a. The sculling stroke
    b. Forward "J" stroke
    c. The draw stroke
    d. The full-sweep stroke

28. When canoeists want to obtain maximum speed, they usually assume a _____ position.
    a. Seated
    b. Low-kneeling
    c. High-kneeling
    d. Standing

29. The leader of a rowing team is commonly called the _____.
    a. Cadet
    b. Skipper
    c. Captain
    d. Coxswain

30. The distance between the two gunwales of a craft is known as its _____.
    a. Stern
    b. Beam
    c. Stem
    d. Width

31. CANOE : BOAT :: PADDLE :
    a. Oar
    b. Coast
    c. Float
    d. Water safety

32. 38 :  :: _____ ; 
    a. Wind
    b. Gale
    c. 54
    d. 72

33. CARRYING YOKE : CANOE :: _____ : BUCKET
    a. Bilge
    b. Capsize
    c. Sculling
    d. Bail

34. SINGLE BLADE : CANOE :: DOUBLE BLADE :
    a. Paddle
    b. K-1
    c. Kayaks
    d. Rapids

35. SUMERSET : CHILD :: _____ : CANOE
    a. Eskimo Roll
    b. Swamp
    c. Tip
    d. Rescue

36. GUNWALES : THWART :: TRIGGER :
    a. Outrigger
    b. Barrel
    c. Gun
    d. Camping

37. "J" : STROKE :: REACH :
    a. Capsize
    b. Broad
    c. Sailing

38. DESCEND : STAIRS :: _____ : RAPIDS
    a. Shoot
    b. Float
    c. Danger
    d. Sculling

39. SEATED : TROLLING :: KNEELING :
    a. Bowman
    b. Eskimo Roll
    c. Bait Casting
    d. Rescue

40. CAR : GARAGE :: CANOE :
    a. Rack
    b. Boathouse
    c. Inverted
    d. Storage

41. Canoes should be racked -----
    a. In the open sunlight
    b. In an upright position
    c. With the keel touching the water
    d. In an upside down position

42. The amount of weight a canoe will support is usually determined by-----
    a. Filling it with rocks until it sinks and then weighing the rocks
    b. Simply measuring the canoe's length
    c. Computing the canoe's displacement
    d. Filling it with water and then weighing the water

43. Thirty-eight miles-per-hour is equal to how many knots (nautical miles) per hour?
    a. 38
    b. 40
    c. 33
    d. 19

44. A small craft warning when displayed <u>at night</u> is indicated by _____.
    a. A red light between two white lights
    b. A red light over a white light
    c. A white light over a red light
    d. A white light between two red lights

45. When paddling <u>across</u> wind it is better to paddle _____.
    a. On the windward side of the canoe
    b. From a standing position
    c. From a seated position
    d. On the downwind side of the canoe

46. When the flag shown in Figure 1 is hoisted it is an indication that the wind is
    a. Out of the North
    b. Just right for sailing
    c. Blowing 72 m.p.h. or faster
    d. Blowing at a speed of 50-65 m.p.h.

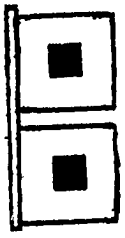
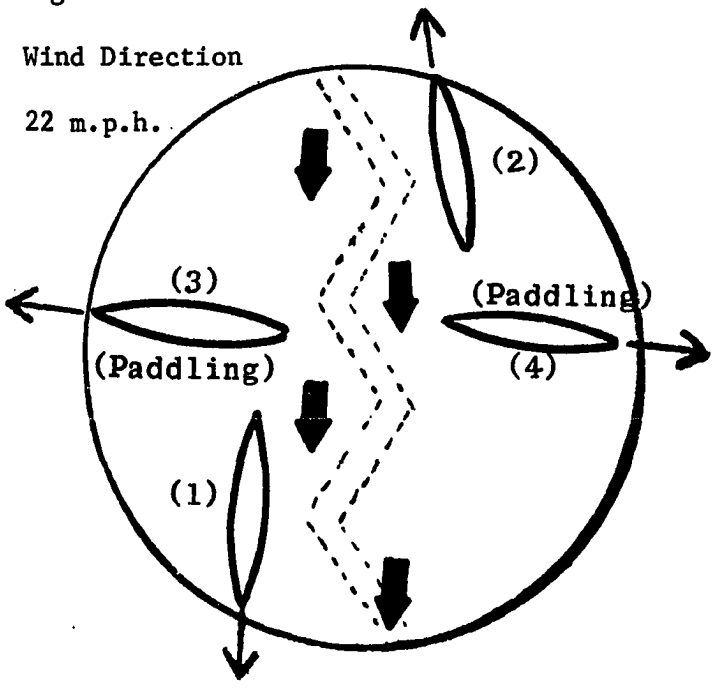


Figure 1

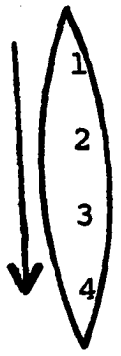
Figure 2



Questions 47-50 are related to the wind directional chart shown in Figure 2. In all questions the canoeist is <u>paddling (solo)</u>.

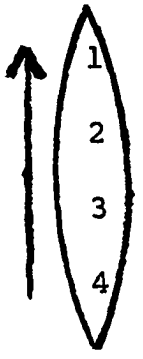
47. Which of the following positions would be the best for the paddler in Canoe #1 to assume?

a. 4
b. 2
c. 1
d. 3



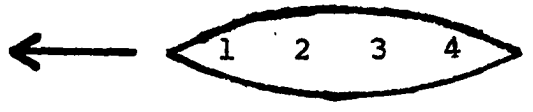
48. Which position would be best for paddler in Canoe #2 to assume?

a. 4
b. 1
c. 2
d. 3



49. Which position would be best for paddler in Canoe #3 to assume?

a. 3
b. 2
c. 1
d. 4



Paddling on this side

50. Which position would be best for the paddler in Canoe #4 to assume?

a. 4
b. 2
c. 3
d. 1

Paddling on this side

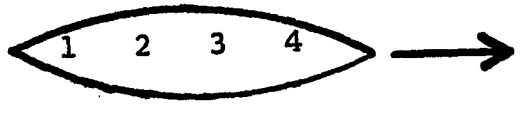


Table 21

Canoeing Comprehension Test
Difficulty and Phi Indices

Item Number	Item Difficulty	Phi Coefficient	Item Number	Item Difficulty	Phi Coefficient
1.	.78	.41	26.	.80	.42
2.	.81	.27	27.	.35	.29
3.	.52	.48	28.	.86	.30
4.	.61	.84	29.	.57	.30
5.	.69	.20	30.	.42	.54
6.	.52	.22	*31.	.88	.70
7.	.45	.29	*32.	.56	.35
8.	.87	.39	*33.	.65	.42
9.	.56	.81	*34.	.62	.75
10.	.86	.46	*35.	.74	.88
11.	.32	.67	*36.	.20	.42
12.	.25	.62	*37.	.85	.41
13.	.76	.65	*38.	.27	.32
14.	.34	.25	*39.	.36	.51
15.	.65	.32	*40.	.54	.31
16.	.28	.74	41.	.46	.63
17.	.64	.49	42.	.35	.77
18.	.33	.56	43.	.60	.29
19.	.30	.71	44.	.58	.59
20.	.72	.79	45.	.80	.37
21.	.38	.86	46.	.79	.28
22.	.32	.87	47.	.70	.37
23.	.61	.56	48.	.37	.60
24.	.53	.90	49.	.64	.60
25.	.22	.54	50.	.54	.90

*Analogy

APPENDIX F

GOLF COMPREHENSION TEST

GOLF TEST

Part I - Multiple Choice

1. What should be done with a divot?
   a. leave it
   b. replace it
   c. lift it
   d. tramp it down

2. Where should the golf bag be placed when a person is going to putt?
   a. on the edge of the green close to the ball so that the bag is easily accessible
   b. off the green close to the ball so that the bag is easily accessible
   c. off the green, at a spot closest to the next tee

3. When is an approach shot used?
   a. when the person is ready to start a new hole
   b. when the person is within a short distance of the green
   c. when the person is on the green

4. What is the name given a hole on which the fairway curves to the left?
   a. hook
   b. dog-leg
   c. slice
   d. stymie

5. Which play should be used if the ball happens to land on the wrong green?
   a. use that green and hole out
   b. use a putter and play the ball off the green
   c. play the ball from the apron of the green
   d. replay the shot

6. Which clubs are good for approach shots over a bunker?
   a. 3 and 5 irons
   b. 7 and 9 irons
   c. 3 and 7 irons
   d. 5 and 9 irons

7. Which is considered a hazard on a golf course?
   a. casual water
   b. trees
   c. rough
   d. sand trap

8. What determines who shall tee off first on each hole?
   a. the one with the least number of strokes on the preceding hole
   b. the one with the most number of strokes on the preceding hole
   c. the one with the least number of total strokes
   d. the one with the most number of total strokes

9. What is the name of the grassy area from the tee to the green?
   a. rough
   b. fairway
   c. field
   d. course

10. What privilege is allowed when playing winter rules?
   a. the ball can be picked up and moved to a grassy spot
   b. the lie of the ball can be improved by using the clubhead
   c. the ball can be played off a wooden tee
   d. the ball can be warmed before each shot

11. When driving a ball, correct position of the ball in relation to the body is on a line -----
   a. midway between the left and the right foot
   b. closer to the right heel than the left heel
   c. closer to the left heel than the right heel
   d. directly in front of the right toe

12. The most important factor in determining the height and distance of the ball's flight is the -----
   a. length of the shaft of the club
   b. angle of the clubface
   c. weight of the clubhead
   d. strength of the player

13. What is the most important point to be checked when addressing the ball?
   a. grip
   b. stance
   c. distance from the ball
   d. lie of the ball

14. Which of the following is the best definition of a slice?
   a. a ball that starts out straight but ends up curving to the left
   b. a ball that starts out straight but ends up curving to the right
   c. a ball that starts out at an angle to the left of where it was aimed
   d. a ball that starts out at an angle to the right of where it was aimed

15. Which of the following is the best definition of a hook?
    a. a ball that starts out straight but ends up curving to the left
    b. a ball that starts out straight but ends up curving to the right
    c. a ball that starts out at an angle to the left of where it was aimed
    d. a ball that starts out at an angle to the right of where it was aimed

16. The most important aspect of the swing is its _____.
    a. accuracy
    b. position
    c. rhythm
    d. speed

17. "Gimme" is the term used for _____.
    a. a receptacle for clubs
    b. an artificial hazard
    c. a conceded putt
    d. a fairway curve to the right

18. When making an approach shot the correct position of the ball in relation to the body would be on a line -----
    a. midway between the left and right foot
    b. closer to the right heel than the left heel
    c. closer to the left heel than the right heel
    d. six inches to the right of the player's left foot

19. Par for a hole is determined by the -----
    a. handicaps of individual players
    b. length of the hole
    c. difficulty of the hole
    d. skill of the players

20. When should the score be recorded?
    a. as each person holes out
    b. after all have holed out and before leaving the green
    c. after all have holed out and have walked to the next tee
    d. as each person finishes the round

21. It is permissible to use a tee in which of the following situations?
    a. when making the first stroke from each hole
    b. at all times when playing "winter rules"
    c. when stroking with one of the wood clubs
    d. when stroking a ball that is in the rough

22. An elevated shot which rolls toward the cup upon landing is called which of the following?
    a. hook
    b. drive
    c. pop-up
    d. pitch and run

23. The club is grasped by which part?
    a. the head
    b. the grip
    c. the handle
    d. the sole

24. What is the term used to denote putting oneself in position to strike the ball?
    a. stance
    b. approaching the ball
    c. addressing the ball
    d. teeing off

25. Which of the following are NOT hazards?
    a. bunker and sandtrap
    b. creek and road
    c. lake and path
    d. casual water and dog-leg

26. Which of the following distances is the best approximation of the overall distance of an 18-hole golf course?
    a. 6,500 - 7,000 yards
    b. 5,000 - 5,500 yards
    c. 3,000 - 4,000 yards
    d. 4,000 - 5,000 yards

27. When two pairs of players compete against each other using the best ball of each pair as their score for a hole, it is referred to as _____.
    a. four-ball tournament
    b. couples match tournament
    c. doubles medal tournament
    d. handicap tournament

28. The cup or hole on the green has measurements of _____ across and _____ deep.
    a. 4 1/2 inches, 4 inches
    b. 6 inches, 12 inches
    c. 12 inches, 6 inches
    d. 2 inches, 12 inches

29. The first stroke taken, the one used in teeing off, is generally referred to as a -----
    a. drive
    b. shot
    c. smash
    d. bogey

30. When computing the par for a golf course, _____ putts are allowed per hole.
    a. 2
    b. 3
    c. as many as it takes
    d. 1

31. Pick the best statement.
    a. Par is the same for men and women golfers.
    b. Par is always 72 strokes.
    c. Par is the same for all 18-hole golf courses.
    d. A bogey is considered to be errorless play for a non-professional golfer.

32. If a ball is lying in the middle of the fairway 195 yards from the cup, the appropriate iron would be -----
    a. #1 iron
    b. #9 iron
    c. #5 iron
    d. putter

33. Which of these irons would loft a ball the highest if it was used appropriately?
    a. #6 iron
    b. #9 iron
    c. #1 iron
    d. #4 iron

34. Which of the following clubs is usually referred to as a "wedge?"
    a. #3 wood
    b. #2 iron
    c. #10 iron
    d. putter

35. The species of grass used on most greens is _____?
    a. Bluestem
    b. Bent Grass
    c. Bermuda Grass
    c. Rye Grass

36. Which of the following clubs would have the LEAST angle of loft?
    a. #3 wood
    b. #9 iron
    c. #3 iron
    d. driver

37. The minimum distance a hole can be from the tee is ____?
    a. 100 yards
    b. 50 yards
    c. determined by the hazards of the hole
    d. not determined by golf rules

38. The approximate diameter of a regulation-play American golf ball is -----
    a. 2.10 inches
    b. 1.68 inches
    c. 1.00 inches
    d. 2.25 inches

39. When driving a ball, the golfer should keep his eye on the -----
    a. ball
    b. line of flight
    c. pin
    d. head of the club

40. If you are playing after a hard rain and your ball comes to rest in a puddle of rain water 6 inches deep in the fairway, which of the following procedures would be correct?
    a. Play the ball from where it is.
    b. Remove the ball and play it with a one stroke penalty.
    c. Remove the ball and play it without penalty.
    d. Wait until the water recedes.

41. When laying out a golf course, which of the following rules must be rigidly observed?
    a. No hole should have more than one hazard.
    b. The fairways should never cross each other.
    c. Fairways should never contain more than one turn.
    d. Greens should be kept level.

42. The angle of loft of a putter should be -----
    a. 10^{o} - 15^{o}
    b. 8^{o} - 10^{o}
    c. 0^{o}
    d. 20^{o} - 40^{o}

43. The four great tournaments in the Western hemisphere are the U.S. Open, The British Open, the U.S.G.A., and the ------
    a. Masters
    b. Firestone 500
    c. Canadian Open
    d. British Amateur

44. Which of the following golfers won <u>all</u> four of the "great" tournaments in one year?
    a. Bobby Jones
    b. Arnold Palmer
    c. Jack Nicklaus
    d. Sam Sneed

45. 3 iron : 175 yards :: putter :
    a. par
    b. green
    c. 30 feet
    d. stance

46. WEDGE : #10 IRON :: SPOON :
    a. #3 wood
    b. #9 iron
    c. sand
    d. hazard

47. BIRDIE : ONE :: _____ : TWO
    a. hazard
    b. par
    c. ace
    d. eagle

48. ACE : HOLE-IN-ONE :: STRIKE :
    a. baseball
    b. bowling
    c. drive
    d. par

49. "Fore" : GOLF :: _____ : TRAFFIC
    a. rules
    b. policeman
    c. horn
    d. warning

50. NICKLAUS : 1960's :: _____ : 1940's
    a. British
    b. Masters
    c. Palmer
    d. Sneed

Table 22

Golf Comprehension Test
Difficulty and Phi Indices

Item Number	Item Difficulty	Phi Coefficient	Item Number	Item Difficulty	Phi Coefficient
1.	.44	.22	26.	.35	.81
2.	.48	.40	27.	.21	.33
3.	.69	.49	28.	.71	.58
4.	.78	.71	29.	.66	.72
5.	.52	.56	30.	.44	.68
6.	.49	.23	31.	.76	.33
7.	.32	.57	32.	.54	.23
8.	.88	.80	33.	.26	.41
9.	.83	.61	34.	.42	.52
10.	.47	.32	35.	.73	.81
11.	.53	.23	36.	.81	.57
12.	.44	.34	37.	.53	.71
13.	.25	.74	38.	.54	.54
14.	.20	.34	39.	.29	.20
15.	.63	.67	40.	.27	.59
16.	.28	.46	41.	.65	.64
17.	.43	.67	42.	.41	.80
18.	.71	.34	43.	.36	.38
19.	.33	.73	44.	.58	.64
20.	.38	.41	*45.	.75	.46
21.	.62	.62	*46.	.31	.73
22.	.76	.61	*47.	.48	.67
23.	.57	.65	*48.	.59	.69
24.	.89	.82	*49.	.64	.68
25.	.80	.36	*50.	.66	.52

*Analogy

APPENDIX G

SAILING COMPRFHENSION TEST

SAILING TEST

Multiple Choice

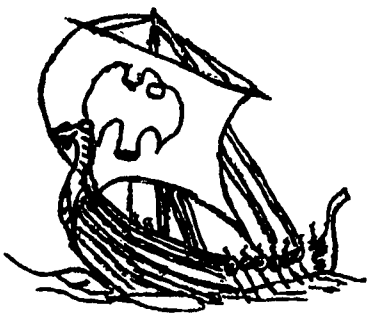


Figure 1

1. Figure 1 is a picture of a _____.
   a. Phoenician trading boat
   b. Viking Long Ship
   c. Swedish Skiff
   d. Spanish Caravel

2. The only commercial sail craft in use in the United States are employed by _____.
   a. Rum runners
   b. Lake patrols
   c. Oyster fisherman
   d. Salmon fisherman

3. "Clipper" ships were built by United States Shipbuilders for parti ipating in _____.
   a. Slave trading
   b. The tea trade with China
   c. Small craft races
   d. The tourist trade on the Hudson River

4. Which of the following is not considered to be a classification of a sailboat racing hulls?
   a. Sailing prams and dinghies
   b. 22-foot outboards
   c. Day sailors
   d. Cruising class hulls

5. The resistance of the hull to capsizing or keeling over is known as its _____.
   a. Righting capacity
   b. Tipping index
   c. Transverse stability
   d. Capsize resistance

6. A boat that is difficult to capsize would have a _____.
   a. High center of buoyancy
   b. Low center of gravity
   c. Low center of buoyancy
   d. High center of gravity

7. Which of the following is the main advantage gained by "hiking" over the side of a boat?
   a. Lessens the weight in the boat
   b. Increases the boat's speed
   c. Acts as an extra sail
   d. Acts as a counterbalance to the wind

8. Most sails are made of _____ material.
   a. Dacron or nylon
   b. Silk
   c. Cotton
   d. Rayon

9. Choose the most accurate statement.
   a. The direction of the wind is not really a factor in determining sailboat direction.
   b. No sailboat can move directly against the wind.
   c. Wind speeds are compensated for by sail shapes.
   d. A sailboat should never move directly away from the wind.

10. Which of the following is the primary function of a "standing rigging?"
   a. Trim the sails
   b. Support the mast
   c. Hoist the sails
   d. Moor the boat

11. Which of the following pieces of equipment is required for sail and motor boats under 16 feet in length?
   a. Whistle
   b. Survival kit
   c. Oars or paddles
   d. Life jackets

12. Which of the following is not considered to be a basic step in boarding or debarking a sailing craft?
   a. Wear non-skid tennis shoes
   b. Grip the gunwales firmly with both hands
   c. Check for the wake of passing boats
   d. Keep weight low while boarding

13. When on a "beat" a sail boat is moving _____ the wind.
    a. Against
    b. Across
    c. With
    d. Without the aid of

14. Sailing against the wind may be accomplished by a sailing technique known as -----
    a. Reaching
    b. Tacking
    c. Running
    d. Beating

Questions 15-18 are related to the directional chart shown in Figure 2.

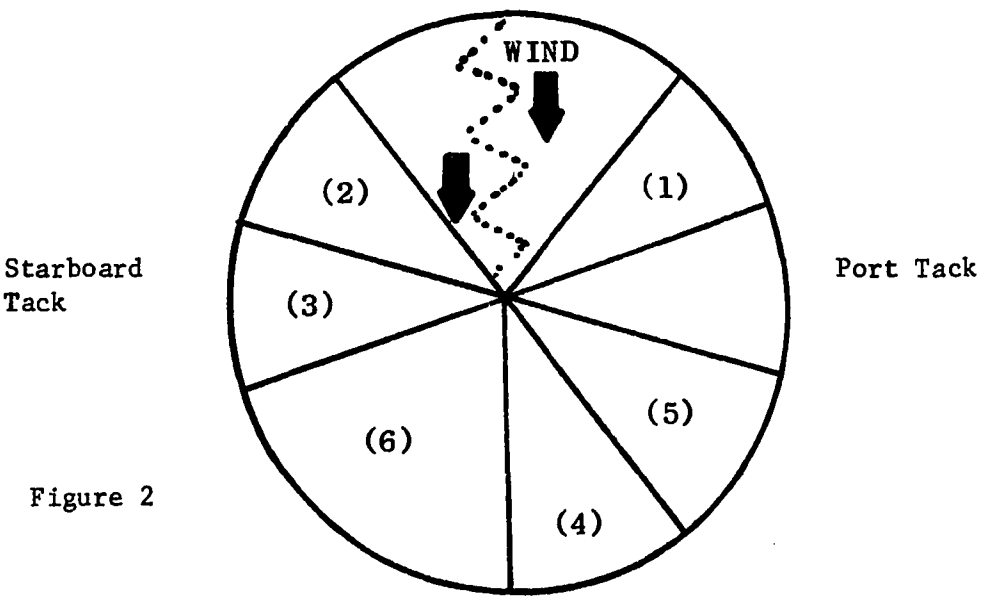


Figure 2

15. The boat shown in area #2 is performing a maneuver called -----
    a. Reaching
    b. Running
    c. Beating
    d. Sculling

16. The Boat shown in area #5 is in the _____ area.
    a. Beating
    b. Broad-reaching
    c. Running
    d. Close-reaching

17. The sails of the boat in area #4 would probably be -----
    a. Wide open on opposing sides of the boat
    b. Luffing
    c. Trimmed very closely and parallel with the boat
    d. Trimmed closely and on opposing sides of the boat

18. Which of the following boats has its sails set and trimmed properly for sailing in area #6?

1.

2.

3.

4.

19. Which of the following procedures should be used in "coming about" (going back in the opposite direction)?
    a. Slow the boat down as much as possible before executing the turn
    b. Trim the sails for reaching after the course has been reversed
    c. Move the tiller away from the sail at an angle of 45 degrees
    d. Take hold of the boom and move the sail over to the new position desired

20. "Luffing" is a process in which unfurled sails are -----
    a. Making maximum use of available wind
    b. Short hauled
    c. Not utilizing available wind at all
    d. On opposing sides of the boat

21. The anchor shown in Figure 3 is commonly known as a _____.
    a. Danforth
    b. Cape Cod
    c. Northill
    d. Mushroom

Figure 3

22. Which of the boats in Figure 4 has the right of way?
    a. #1
    b. #2
    c. both #1 and #2
    d. #3

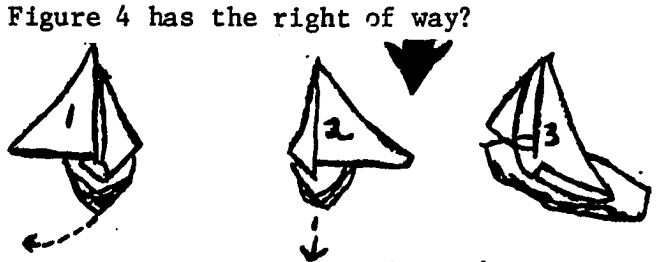


Figure 4

23. If lake or river officials hoist a red triangular flag as a warning to boating enthusiasts, it usually means that _____.
    a. Motor boats only can be operated on the lake
    b. The wind is blowing too hard for a small craft to operate on the waterways
    c. Sailboats only can be operated on the lake
    d. Boaters should be on the alert for swimmers

24. When the flag shown in Figure 5 is hoisted it is an indication that the wind is _____.
    a. Blowing from the north
    b. Just right for sailing
    c. Blowing 72 m.p.h. or faster
    d. Blowing at a speed of 50-65 m.p.h.

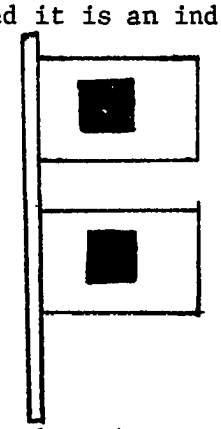


Figure 5

25. Which of the following types of material makes the strongest rope?
    a. Polyethelene
    b. Nylon
    c. Manila
    d. Dacron

26. A distinct advantage of polypropylene rope over all other rope fibers is that it _____.
    a. Retains 100% strength when wet
    b. Floats
    c. Stretches easily
    d. Is not affected by heat

27. The knot shown in Figure 6 is known as a _____.
    a. Sheep shank
    b. Bowline
    c. Reef knot
    d. Reverse hitch

28. The knot in figure 6 is often used in _____.
    a. Securing an anchor line
    b. Furling sails
    c. Splicing two ropes
    d. Typing a rope on a smooth surface

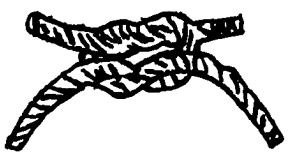


Figure 6

29. The main advantage of a long splice over a short splice is that it _____.
    a. Is stronger than a short splice
    b. Keeps the rope at its original diameter
    c. Takes less time than a short splice
    d. Works well with synthetic ropes

30. Which of the following is the most frequent cause of sailing mishaps?
    a. "Buzzing" by power craft
    b. Inferior hull or sail material
    c. Failure to note changes in wind direction or water conditions
    d. Navigational errors

31. KNOT : SHIP :: _____ : CAR
    a. Tie
    b. Mile
    c. Bolt
    d. Rope

32. SWAMP : BOAT :: _____ : CAR
    a. Drive
    b. Navigation
    c. Florida
    d. Overturn

33. WEATHER : WINDWARD :: ASTERN :
    a. Behind
    b. Storm
    c. Close hauled
    d. Bow

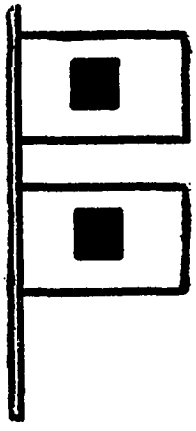
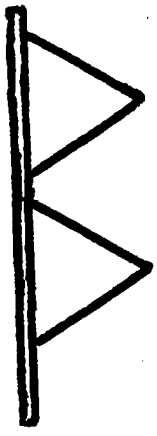
34. PORT : RIGHT :: _____ : LEFT
    a. Astern
    b. Starboard
    c. Topside
    d. Windward

35. C.E. : SAIL :: C.B. :
    a. Mast
    b. Hull
    c. Leeward
    d. Rigging

36. ABEAM : ASTERN :: ASTERN :
    a. Ahead
    b. Tack
    c. Port
    d. Starboard

37. BALLAST : STABILITY :: DISPLACEMENT :
    a. Buoyancy
    b. Tiller
    c. Mast
    d. Center of gravity

33. RISING BAROMETER : STORMY :: FALLING BAROMETER :
    a. Windy
    b. Sunny
    c. Rain
    d. Weather

39.  : HURRICANE ::  :

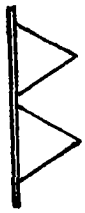
    a. Gale
    b. Warning
    c. Small craft
    d. Wind

40. ANCHOR : RODE :: FISHHOOK :
    a. Pole
    b. Catch
    c. Rope
    d. Line

41. _____ : VERTICAL :: PITCH : HORIZONTAL
    a. Capsize
    b. Heel
    c. Rake
    d. Tack

42. BOOM : JIBE :: SAIL :
    a. Luff
    b. Reaching
    c. Port
    d. About

43. CARAVEL : SPAIN :: _____ : AMERICA
    a. Horse
    b. Sloop
    c. Clipper
    d. Chinese

44. 38 :  :: _____ : 
    a. Wind
    b. Gale
    c. 54
    d. 72

45. CAR : GARAGE :: BOAT :
    a. Dock
    b. Boathouse
    c. Inverted
    d. Dry docked

46. The amount of weight a boat will support is usually determined by _____.
    a. Filling it with rocks until it sinks and then weighing the rocks
    b. Simply measuring the canoe's length
    c. Computing the canoe's displacement
    d. Filling it with water and then weighing the water

47. Thirty-eight miles-per-hour is equal to how many knots (nautical miles) per hour?
    a. 38
    b. 40
    c. 33
    d. 19

48. A small-craft warning when displayed at night is indicated by _____.
    a. A red light between two white lights
    b. A red light over a white light
    c. A white light over a red light
    d. A white light between two red lights

49. DESCEND : STAIRS :: _____ : RAPIDS
    a. Shoot
    b. Float
    c. Danger
    d. Sculling

50. When canoes are equipped for sailing it is imperative that stability be established by adding _____.
    a. Double mast
    b. A lead tiller
    c. Lead ballasts
    d. Leeboards

Table 23

Sailing Comprehension Test
Difficulty and Phi Indices

Item Number	Item Difficulty	Phi Coefficient	Item Number	Item Difficulty	Phi Coefficient
1.	.70	.26	26.	.30	.37
2.	.44	.93	27.	.50	.53
3.	.62	.34	28.	.56	.70
4.	.20	.28	29.	.51	.70
5.	.86	.56	30.	.47	.36
6.	.65	.34	*31.	.90	.66
7.	.47	.56	*32.	.28	.22
8.	.66	.78	*33.	.59	.77
9.	.39	.46	*34.	.27	.48
10.	.40	.27	*35.	.82	.35
11.	.37	.86	*36.	.20	.50
12.	.38	.72	*37.	.78	.85
13.	.49	.45	*38.	.49	.66
14.	.25	.30	*39.	.55	.55
15.	.51	.71	*40.	.27	.78
16.	.68	.39	*41.	.30	.25
17.	.59	.30	*42.	.29	.39
18.	.64	.71	*43.	.73	.84
19.	.60	.48	*44.	.61	.31
20.	.56	.45	*45.	.45	.48
21.	.76	.23	46.	.23	.22
22.	.37	.85	47.	.81	.21
23.	.70	.46	48.	.74	.89
24.	.56	.29	49.	.29	.61
25.	.34	.29	50.	.25	.72

*Analogy

APPENDIX H

TRAPSHOOTING COMPREHENSION TEST

TRAPSHOOTING TEST

Multiple Choice

1. Which of the following is the most popular gauge of shotgun?
   a. 10
   b. 12
   c. 14
   d. 20

2. Which of the following barrel classifications would give the widest pattern of shot coverage?
   a. Cylinder bore
   b. Improved cylinder
   c. Modified
   d. Full choke

3. Most guns used in skeet and trapshooting are _____
   a. Pump or slide actions
   b. Automatics
   c. Single shot
   d. Double barrels

4. The main advantage of a pump over a double barrel shotgun is that the pump -----
   a. Will hold more sheels
   b. Will shoot farther
   c. Is lighter
   d. Has only one barrel to clean

5. Which of the following sizes of shot would normally be used for skeet shooting?
   a. 2
   b. 4
   c. 6
   d. 9

6. Which type of explosive material is normally used in shot shells produced by the leading manufacturers?
   a. Black powder
   b. Nitroglycerene
   c. Cordite
   d. T.N.T.

7. How many drams of powder are there in a shot-shell that is marked (3 1/4 - 1 1/4 - 7 1/2)?
   a. 3 1/4
   b. 7 1/2
   c. 1 1/4
   d. Cannot be determined from the information given

8. If shot shells were loaded with the explosive material normally used in loading rifle cartridges which of the following would be the most probable effect?
   a. Nothing; they use the same material
   b. The shells would probably explode, since the rifle material is too strong
   c. The shells would have very little power
   d. The shells would not even fire

9. Targets used in trap and skeet shooting are normally made of -----
   a. Plastic
   b. Iron
   c. Glass
   d. Clay

10. Which of the following most closely approximates the size (in diameter) of a skeet target?
   a. 1-2 inches
   b. 6-7 inches
   c. 9-10 inches
   d. 4-5 inches

11. How many targets is considered to be "1 round" in skeet shooting?
   a. 15
   b. 20
   c. 25
   d. 50

12. When a skeet target leaves the sling of the throwing mechanism its speed is approximately -----
   a. 50 m.p.h.
   b. 80 m.p.h.
   c. 110 m.p.h.
   d. 140 m.p.h.

13. In order to insure range safety, shooters are usually requested to place only _____ in their weapon at a time.
   a. One round of ammunition
   b. Two rounds of ammunition
   c. Three rounds of ammunition
   d. Four rounds of ammunition

14. While a shooter is not firing on the line, the mechanism of his weapon should be -----
   a. Open
   b. Closed
   c. Closed and locked
   d. Open and locked

15. Choose the best statement.
    a. All guns are dangerous
    b. All guns are safe unless abused
    c. Everyone should know how to shoot a gun
    d. Guns are only as dangerous as the person who uses them

16. BLUE ROCK : REMINGTON :: WHITE FLYER :
    a. Clay pigeon
    b. Peters
    c. Targets
    d. Winchester

17. RIFLE : ETHYL GASOLINE :: SHOT GUN :
    a. Fred, Joan, and Harold
    b. Vacations
    c. Regular gasoline
    d. Highway Patrol

18. RIFLE: SHOT GUN :: CALIBER :
    a. Gauge
    b. Millimeter
    c. 12
    d. Pistol

19. HORIZONTAL : DOUBLE BARREL :: PERPENDICULAR :
    a. Pump
    b. 10 gauge
    c. Automatic
    d. Superposed

20. The first mass-produced shot guns had barrels made of -----
    a. Damascus twist steel
    b. Fiberglass
    c. Aluminum
    d. Corrugated steel

21. A rifle bullet is usually much more accurate than a slug from a shotgun. This is because of the differences in the -----
    a. Bore diameter
    b. Sighting mechanisms
    c. Inner barrel construction of the two weapons
    d. Load specifications

22. There are approximately _____ individual pellets in one ounce of #8 shot.
    a. 400
    b. 800
    c. 1,000
    d. 100

23. Which of the following weapons would normally have the strongest recoil?
    a. 28 gauge shot gun
    b. 30-30 rifle
    c. 22-hornet rifle
    d. 12 gauge shot gun

24. One of the advantages of gas-operated automatic shot guns is that they usually -----
    a. Hold more sheels than other automatics
    b. Are easier to load than other automatics
    c. Have less recoil than most other guns
    d. Make less noise than other automatics

25. Blown patterns are usually the result of
    a. Holding the gun too loosely
    b. Moving the gun just as the trigger is pulled
    c. Too much powder in the shell
    d. The shot was being forced through the shot pattern

26. Which of the following upland gamebirds would probably require a 12-gauge load of (3 3/4 - 1 1/4 - 4)?
    a. Doves
    b. Quails
    c. Pheasants
    d. Woodcocks

27. As the distance from the trap pit increases the amount of lead given to targets should -----
    a. Increase slightly
    b. Decrease slightly
    c. Remain constant
    d. Cannot be determined from information given

23. If a target breaks into two pieces as it leaves the throwing machine the shooter should
    a. Wait for another target
    b. Shoot the biggest piece
    c. Shoot both pieces
    d. Count the target as a hit without shooting

29. The shot gun used more than any other in International skeet and trapshooting is the -----
    a. Browning, "Sweet-16", automatic
    b. Remington, 1100, automatic (12-gauge)
    c. Winchester Model 12, 12-gauge
    d. Browning, Superposed

30. How many clay targets are there in a full case?
    a. 100
    b. 150
    c. 200
    d. 135

31. If you are at the #3 post and your gun breaks, which of the following would be the most appropriate action?
    a. Drop out of the round and take a score of zero
    b. Rack the weapon and ask for another to complete the round
    c. Stop the round until your weapon is repaired
    d. Ask the scorer to pro-rate your score on your performance to that point

32. In shooting doubles if the shooter breaks both targets with one shot and misses only one other target his final score would be -----
    a. 25/25
    b. 25/26
    c. 25/24
    d. zero

33. When the shooter is ready for a target to be released the proper command is -----
    a. "pull"
    b. "let it go"
    c. "shoot"
    d. "ready"

34. When a shooter is on the firing line the weapon should be left "on safety" until the -----
    a. Target emerges from the house
    b. Throwing mechanism is heard
    c. "Pull" command is given
    d. First shell is loaded into the chamber

35. How many boxes of shells will a participant need to shoot <u>four</u> rounds of skeet or trap?
    a. ten
    b. one
    c. twenty
    d. four

36. If a shooter misses a target -----
    a. It usually breaks upon impact
    b. It is usually retrieved and thrown again
    c. He should keep firing until it breaks
    d. It is usually retrieved and "traded in" for a new one

37. The opening at the far end of the gun barrel is commonly referred to as the -----
    a. Chamber
    b. Forearm
    c. Snout
    d. Muzzle

33. The function of the shell extractors is to -----
    a. Bring the loaded shells from the magazine to the chamber
    b. Eject the shell that has just been fired
    c. Move the loaded shells from the chamber to the magazine
    d. Remove primers from hulls that are to be reloaded

39. If the shooter were to move the barrel of his gun sideways as he is pulling the trigger it would -----
    a. Have no effect on the shot pattern
    b. Scatter the shot over a wider area
    c. Cause the wad to jamb in the barrel
    d. Cause the shot to travel in an arc

40. Which of the following guns would have the largest opening at the outer end of the barrel?
    a. .410 gauge shot gun
    b. 30-30 rifle
    c. 28-gauge shot gun
    d. .375 magnum

41. Which of the following shot guns is most suitable for women skeet shooters?
    a. 12-gauge
    b. 28-gauge
    c. 10-gauge
    d. 8-gauge

42. Which of the following men is a world-famous skeet and trap expert?
    a. Sam Sneed
    b. Bobby Hull
    c. Sam Albright
    d. Rudy Etchin

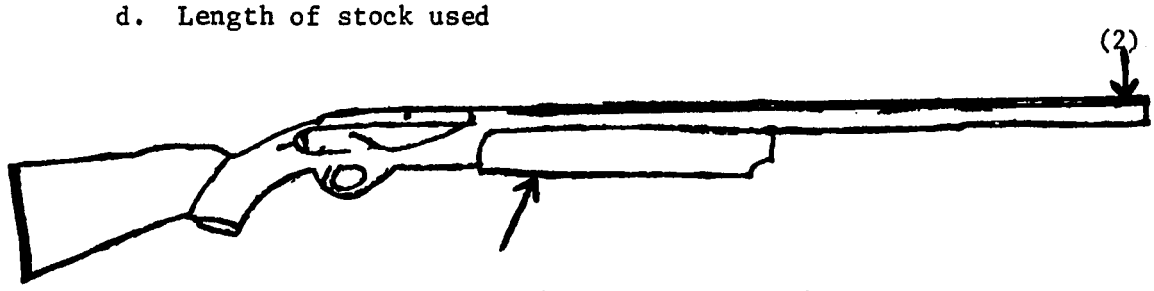
43. MODEL 12 : SHOT GUN :: _____ : RIFLE
    a. Winchester
    b. Model 94
    c. 1873
    d. Browning

44. 28 : MODIFIED :: 26 :
    a. Choke
    b. Full
    c. Improved cylinder
    d. Caliber

45. SKEET : 25 :: GOLF :
    a. Eighteen
    b. Yards
    c. Driver
    d. "Fore"

46. The main purpose of ventilated rib barrels is to -----
    a. Cool the barrel after firing
    b. Improve the looks of the weapon
    c. Add more weight to the weapon
    d. Improve the sighting of the weapon

47. The basic difference between a trap gun and a skeet gun is in the -----
    a. Length and choke of the barrel
    b. Gauges used
    c. Type of actions used (pumps vs. automatic)
    d. Length of stock used



(1) Figure 1

48. The shot gun shown in Figure 1 is a Model 1100 Remington automatic. This gun will hold a total of _____ shells.
    a. 7
    b. 5
    c. 2
    d. 6

49. Arrow Number (1) in Figure 1 is pointing to the gun's _____.
    a. Magazine
    b. Barrel
    c. Front handle
    d. Forearm

50. The part indicated by Arrow Number (2) in Figure 1 is commonly referred to as the _____.
    a. Muzzle
    b. Stock
    c. Breech
    d. Chamber

Table 24

Trapshooting Comprehension Test
Difficulty and Phi Indices

Item Number	Item Difficulty	Phi Coefficient	Item Number	Item Difficulty	Phi Coefficient
1.	.80	.65	26.	.77	.66
2.	.35	.82	27.	.54	.52
3.	.21	.34	28.	.26	.43
4.	.71	.39	29.	.42	.30
5.	.66	.62	30.	.73	.22
6.	.44	.61	31.	.81	.36
7.	.76	.52	32.	.53	.29
8.	.54	.30	33.	.54	.81
9.	.26	.61	34.	.29	.37
10.	.42	.92	35.	.23	.77
11.	.73	.47	36.	.47	.60
12.	.81	.24	37.	.40	.88
13.	.53	.21	38.	.63	.70
14.	.54	.28	39.	.46	.54
15.	.29	.26	40.	.94	.80
16.	.27	.41	41.	.66	.73
17.	.65	.78	42.	.73	.64
18.	.98	.70	*43.	.47	.57
19.	.80	.42	*44.	.80	.66
20.	.35	.50	*45.	.38	.32
21.	.21	.51	46.	.64	.68
22.	.71	.69	47.	.46	.28
23.	.05	.57	48.	.73	.56
24.	.66	.39	49.	.67	.64
25.	.44	.23	50.	.69	.38

*Analogy

APPENDIX I

ARCHERY SKILL SCORE CARD

Figure 2

ARCHERY SCORE CARD

Name _____

	1	2	3	4	5	6	Hits	Score
End 1								
2								
3								
4								
5								
6								
7								
8								
							Total	

APPENDIX J

BAITCASTING SKILL SCORE CARD

Figure 3

BAITCASTING SCORE CARD

Name _____

		20 ft.	30 ft.	40 ft.
#1	Sidearm			
#2	Sidearm			
#3	Backhand			
#4	Backhand			
			Total	

APPENDIX K

CANOEING SKILL PERFORMANCE RATING

Figure 4

Canoeing Skill Performance Rating

Name_____

1.	Speed	Time_____
2.	Ability to maintain direction	1 2 3 4 5
3.	Maneuverabiltiy	1 2 3 4 5
4.	Recovery from predicaments	1 2 3 4 5
5.	Treatment of equipment	1 2 3 4 5
6.	Boarding and debarking techniques	1 2 3 4 5
7.	Observances of lake regulations	1 2 3 4 5
8.	Observance of contest rules	1 2 3 4 5
9.	General attitude	1 2 3 4 5
10.	Sportsmanship	1 2 3 4 5
11.	Balance in craft	1 2 3 4 5

APPENDIX L

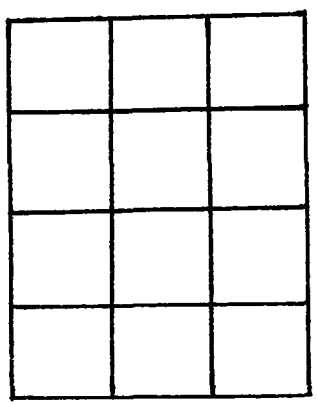
GOLF SKILL SCORE CARD

Figure 5

GOLF SKILL SCORE CARD

Name_____

Drive Test



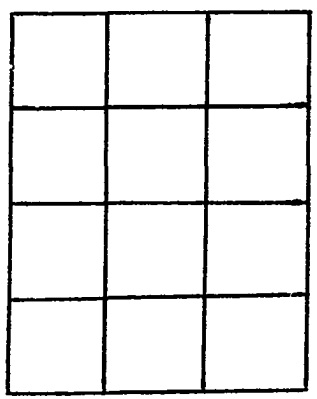
3x_____=

2x_____=

1x_____=

Total_____

#5Iron Test



3x_____=

2x_____=

1x_____=

Total_____

(5) Good (4) Above Average (3) Average (2) Below Average (1) Poor

APPENDIX M

SAILING SKILL PERFORMANCE RATING

Figure 6

Sailing Skill Performance Rating

Name_____

1.	Speed	Time_____
2.	Ability to maintain direction	1 2 3 4 5
3.	Maneuverability	1 2 3 4 5
4.	Recovery from predicaments	1 2 3 4 5
5.	Treatment of equipment	1 2 3 4 5
6.	Boarding and debarking techniques	1 2 3 4 5
7.	Observances of lake regulations	1 2 3 4 5
8.	Observance of contest rules	1 2 3 4 5
9.	General attitude	1 2 3 4 5
10.	Sportsmanship	1 2 3 4 5
11.	Balance in craft	1 2 3 4 5
12.	Utilization of available wind	1 2 3 4 5

APPENDIX N

TRAPSHOOTING SKILL PERFORMANCE RATING

Figure 7

Trapshooting Skill Performance Rating

Name_____

1. The number of hits should be given more weight than any other single factor.
   Possible score: (1-15 possible)

2. Handling of gun
   a. Smoothness of handling gun 1 2 3 4 5
   b. Speed of handling gun 1 2 3 4 5
   c. Accuracy of handling gun 1 2 3 4 5

3. Observation of range safety procedures 1 2 3 4 5

4. Sportsmanship 1 2 3 4 5

5. General deportment 1 2 3 4 5

6. Attitude (general) 1 2 3 4 5

1 - poor
2 - fair
3 - good
4 - very good
5 - excellent

APPENDIX O

SEMANTIC DIFFERENTIAL SCALE

Name_____

SEMANTIC DIFFERENTIAL SCALE

Instructions

The purpose of taking this measure is to assess the meanings of certain concepts to various people by having them judge the concepts against a series of descriptive scales. In doing this exercise, please make your judgment on the basis of what these concepts mean to you. On each page of this booklet you will find different concepts to be judged and beneath them a set of scales. You are to rate the concepts on each of these scales in order of occurrence.

Here is the way you are to use the scales:

If you feel that the concept at the top of the page is very closely related to one end of the scale, you should place your checkmark as follows:

fair __X__:____:____:____:____:____:____ unfair

or

fair ____:____:____:____:____:____:__X__ unfair

If you feel that the concept is quite closely related to one or the other end of the scale (but not extremely), you should place your checkmark as follows:

strong ____:__X__:____:____:____:____:____ weak

or

strong ____:____:____:____:____:__X__:____ weak

If the concept seems only slightly related to one side as opposed to the other side (but is not really neutral), then you should check as follows:

active ____:____:__X__:____:____:____:____ passive

or

active ____:____:____:____:__X__:____:____ passive

The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the concept you are judging.

If you consider the concept to be neutral on the scale, both sides of the scale equally associated with the concept, or if the scale is completely irrelevant, unrelated to the concept, then you should place your checkmark in the middle space.

safe ____:____:____: X :____:____:____ dangerous

IMPORTANT

(1) Place your checkmarks in the middle of the spaces, not on the boundaries:

____: X :____:____:____:X___:_____
(This) (Not This)

(2) Be sure you check every scale for every concept--do not omit any.

(3) Never put more than one checkmark on a single scale.

Sometimes you may feel as though you have had the same item before on the sheet. This will not be the case, so do not look back and forth through the items. Don't try to remember how you checked a similar item that could have appeared earlier. Work at a fairly high rate of speed through this exercise. Do not worry or puzzle over individual items. Remember it's you first impressions, or the immediate "feelings" about the item, that we want. On the other hand, please do not be careless and omit some of the items, because we do want your true impressions.

IF YOU HAVE READ ALL OF THE INSTRUCTIONS, YOU MAY

OPEN YOUR BOOKLET AND BEGIN.

Figure 8

Archery Attitude Scale

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

happy _____:_____:_____:_____:_____:_____:_____ sad

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

clean _____:_____:_____:_____:_____:_____:_____ dirty

safe _____:_____:_____:_____:_____:_____:_____ unsafe

easy _____:_____:_____:_____:_____:_____:_____ difficult

boring _____:_____:_____:_____:_____:_____:_____ exciting

Figure 9

Baitcasting Attitude Scale

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

happy _____:_____:_____:_____:_____:_____:_____ sad

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

clean _____:_____:_____:_____:_____:_____:_____ dirty

boring _____:_____:_____:_____:_____:_____:_____ exciting

safe _____:_____:_____:_____:_____:_____:_____ unsafe

easy _____:_____:_____:_____:_____:_____:_____ difficult

Figure 10

Canoeing Attitude Scale

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

happy _____:_____:_____:_____:_____:_____:_____ sad

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

clean _____:_____:_____:_____:_____:_____:_____ dirty

boring _____:_____:_____:_____:_____:_____:_____ exciting

safe _____:_____:_____:_____:_____:_____:_____ unsafe

easy _____:_____:_____:_____:_____:_____:_____ difficult

Figure 11

Golf Attitude Scale

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

safe _____:_____:_____:_____:_____:_____:_____ unsafe

clean _____:_____:_____:_____:_____:_____:_____ dirty

easy _____:_____:_____:_____:_____:_____:_____ difficult

boring _____:_____:_____:_____:_____:_____:_____ exciting

active _____:_____:_____:_____:_____:_____:_____ passive

Figure 12

Sailing Attitude Scale

good	_____:_____:_____:_____:_____:_____:_____	bad
weak	_____:_____:_____:_____:_____:_____:_____	strong
happy	_____:_____:_____:_____:_____:_____:_____	sad
unpleasant	_____:_____:_____:_____:_____:_____:_____	pleasant
worthless	_____:_____:_____:_____:_____:_____:_____	valuable
high	_____:_____:_____:_____:_____:_____:_____	low
clean	_____:_____:_____:_____:_____:_____:_____	dirty
boring	_____:_____:_____:_____:_____:_____:_____	exciting
safe	_____:_____:_____:_____:_____:_____:_____	unsafe
easy	_____:_____:_____:_____:_____:_____:_____	difficult

Figure 13

Recreation Attitude Scale

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

clean _____:_____:_____:_____:_____:_____:_____ dirty

safe _____:_____:_____:_____:_____:_____:_____ unsafe

easy _____:_____:_____:_____:_____:_____:_____ difficult

boring _____:_____:_____:_____:_____:_____:_____ exciting

active _____:_____:_____:_____:_____:_____:_____ passive

Figure 14

Trapshooting Attitude Scale

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

happy _____:_____:_____:_____:_____:_____:_____ sad

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

clean _____:_____:_____:_____:_____:_____:_____ dirty

boring _____:_____:_____:_____:_____:_____:_____ exciting

safe _____:_____:_____:_____:_____:_____:_____ unsafe

easy _____:_____:_____:_____:_____:_____:_____ difficult

Figure 15

Team Work Attitude Scale

fair _____:_____:_____:_____:_____:_____:_____ unfair

good _____:_____:_____:_____:_____:_____:_____ bad

weak _____:_____:_____:_____:_____:_____:_____ strong

unpleasant _____:_____:_____:_____:_____:_____:_____ pleasant

honest _____:_____:_____:_____:_____:_____:_____ dishonest

worthless _____:_____:_____:_____:_____:_____:_____ valuable

high _____:_____:_____:_____:_____:_____:_____ low

easy _____:_____:_____:_____:_____:_____:_____ difficult

boring _____:_____:_____:_____:_____:_____:_____ exciting

APPENDIX P

TABLES OF TWO-WAY ANALYSIS OF VARIANCE BETWEEN SEX AND CLASS SCHEDULES

Table 25

Two-Way Analysis of Variance of Archery Comprehension Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	217.06	.305	n.s.*	.385
Schedule (B)	1	452.08	.636	n.s.*	.801
A X B	1	301.10	.423	n.s.*	.534
Error	78	711.07			98.281
Total	81				

*Not significant; $p > .05$

Table 26

Two-Way Analysis of Variance of Baitcasting Comprehension Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	150.55	1.500	n.s.*	1.6447
Schedule (B)	1	30.33	.300	n.s.*	.3291
A X B	1	141.45	1.400	n.s.*	1.5351
Error	88	101.03			96.4908
Total	91				

*Not significant; $p > .05$

Table 27

Two-Way Analysis of Variance of Canoeing Comprehension Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	671.09	1.3392	n.s.*	1.1076
Schedule (B)	1	661.05	1.3191	n.s.*	1.0911
A X B	1	121.03	.2415	n.s.*	.1997
Error	118	501.11			97.6014
Total	121				

*Not significant; $p > .05$

Table 28

Two-Way Analysis of Variance of Golf Comprehension Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	401.51	.6262	n.s.*	.6063
Schedule (B)	1	739.58	1.1536	n.s.*	.1168
A X B	1	326.41	.5091	n.s.*	.4929
Error	101	641.10			97.7838
Total	104				

*Not significant; $p > .05$

Table 29

Two-Way Analysis of Variance of Sailing Comprehension Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	711.08	1.9611	n.s.*	1.7455
Schedule (B)	1	70.24	.1937	n.s.*	.1724
A X B	1	71.02	.1958	n.s.*	.1743
Error	110	362.58			97.9076
Total	113				

*Not significant; $p > .05$

Table 30

Two-Way Analysis of Variance of Trapshooting Comprehension Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	181.45	2.0619	n.s.*	4.5771
Schedule (B)	1	74.32	.8445	n.s.*	1.8747
A X B	1	12.51	.1421	n.s.*	.3155
Error	42	88.00			93.2325
Total	45				

*Not significant; $p > .05$

Table 31

Two-Way Analysis of Variance of Archery Skill Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	718.21	1.215	n.s.*	1.5961
Schedule (B)	1	436.54	.738	n.s.*	.9701
A X B	1	81.20	.1373	n.s.*	.1804
Error	74	591.36			97.2532
Total	77				

*Not significant; $p > .05$

Table 32

Two-Way Analysis of Variance of Baitcasting Skill Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	261.63	.5175	n.s.*	.4325
Schedule (B)	1	40.14	.0794	n.s.*	.0663
A X B	1	20.23	.0400	n.s.*	.0334
Error	119	505.53			99.4675
Total	122				

*Not significant; $p > .05$

Table 33

Two-Way Analysis of Variance of Canoeing Skill Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	531.21	.8035	n.s.*	.8690
Schedule (B)	1	51.02	.0771	n.s.*	.0834
A X B	1	381.09	.5764	n.s.*	.6234
Error	91	661.09			98.4239
Total	94				

*Not significant; $p > .05$

Table 34

Two-Way Analysis of Variance of Golf Skill Scores Between Male and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	591.04	1.7494	n.s.*	2.0369
Schedule (B)	1	351.11	1.0392	n.s.*	1.2100
A X B	1	371.02	1.0982	n.s.*	1.2786
Error	82	337.84			95.4743
Total	85				

*Not significant; $p > .05$

Table 35

Two-Way Analysis of Variance of Sailing Skill Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	641.86	1.3296	n.s.*	1.2308
Schedule (B)	1	773.58	1.5279	n.s.*	1.4144
A X B	1	81.19	.1681	n.s.*	.1556
Error	105	482.73			97.1990
Total	108				

*Not significant; $p > .05$

Table 36

Two-Way Analysis of Variance of Trapshooting Skill Scores Between Males and Females and Workshop and Regular Enrollment

Source	df	Mean Squares	F	p	Variance Accounted For
Sex (A)	1	681.11	1.0084	n.s.*	1.2225
Schedule (B)	1	237.58	.3517	n.s.*	.4264
A X B	1	85.61	.1267	n.s.*	.1536
Error	81	675.39			98.1973
Total	84				

*Not significant; $p > .05$

Summary of Tables 25-36

The results shown in Tables 25-36 indicate that the two independent variables of sex and class schedule had very little effect on the total scores recorded for the individual subjects. For this reason, these two variables were not treated as covariables in analyzing the data and testing the hypotheses.