

AN ANALYSIS OF SELECTED SIMULATION GAMES AND
THE ASSESSMENT OF THE SUBJECTIVE FEELINGS OF
STUDENTS AND TEACHERS WHO USE SIMULATION
GAMES IN SOCIAL STUDIES INSTRUCTION

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This is to certify that the

thesis entitled

AN ANALYSIS OF SELECTED SIMULATION GAMES AND THE
ASSESSMENT OF THE SUBJECTIVE FEELINGS OF STUDENTS
AND TEACHERS WHO USE SIMULATION GAMES IN SOCIAL
STUDIES INSTRUCTION

presented by

James J. Harpstrite

has been accepted towards fulfillment
of the requirements for

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A handwritten signature in cursive script, reading "Dale V. Olson", written over a horizontal line.

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ABSTRACT

AN ANALYSIS OF SELECTED SIMULATION GAMES AND THE ASSESSMENT OF THE SUBJECTIVE FEELINGS OF STUDENTS AND TEACHERS WHO USE SIMULATION GAMES IN SOCIAL STUDIES INSTRUCTION

By

James J. Harpstrite

The Problem

The instructional simulation game has been used extensively by business executives, members of the Armed Forces, teachers, and students. The teaching potential and learning value of simulation games is yet undetermined.

The problem, therefore, in this study was to assess the attitudes of teachers and students who participated in a selected simulation game compared to the attitudes of teachers and students who did not participate in a simulation game and to analyze the differences in teacher and student feelings toward simulation as a teaching strategy compared to their feelings toward lecture-discussion as a teaching strategy in social studies instruction.

Methodology of the Study

The experimental procedures used in this study included:



- (1) An extensive review of the research literature on the value and rationale of simulation games;
- (2) the random selection of eight groups of students from eight selected high schools in Hawaii;
- (3) six student groups were treated experimentally in that each participated in a selected simulation game while the other two groups served as control groups (one group received no treatment while the other received the lecture-discussion treatment);
- (4) one teacher group was treated experimentally while the other teacher group received no treatment and served as a control;
- (5) the experimental design for the study was adapted from D. I. Campbell and J. C. Stanley's "Design 6 --the POST-TEST only Control Group Design";
- (6) the deviations from Campbell and Stanley's "Design 6" were the inclusion of a time extension feature, the non-treatment control section and the polydiagnostic method of forced ranking;
- (7) the polydiagnostic inventory was used as the post-test for all ten sections;
- (8) and the tests used to examine the experimental vs. control group differences were the test for mean differences for the effects of two treatments, one way analysis of variance for the eight



treatments and the Studentized Range Test for the differences between pairs of means.

Major Findings

The study revealed that both teachers and students held positive associations toward simulation games and negative associations toward lecture discussion. Students who were tested after two months delay also had high opinions toward simulation games. It was found that there were no significant differences in the attitudes of high school teachers who received the simulation treatment and those teachers who did not receive the treatment.

There were significant differences, however, in the attitudes of high school students who received the simulation treatment and the two control groups. It was found that students participating in the Ghetto game, Crisis game, Black and White game, Sunshine game, and Dangerous Parallel game had more positive attitudes toward simulation games than students who did not participate in a simulation game. The major exception was the group receiving the Inter-Nation simulation game treatment. When compared to the control groups there were no significant differences in their feelings toward the simulation game as compared with their feeling toward lecture discussion.

Moreover, the evidence of this study suggested that simulation games are highly motivating and heuristically suggests that simulation requires the student to



conceptualize, apply predictions, interpret propositions and evaluation formations. Furthermore, the study suggests that the most important learning is the effect that simulation games have on the social setting in which learning takes place.

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CHAPTER I

THE PROBLEM, NEED, AND OBJECTIVES

Introduction

We are moving toward the day when sophisticated forms of simulation will dominate our educational environment and provide a more realistic means to individualize instruction. Such was the case when man reached the moon with the assistance of complex computerized simulators. Neil A. Armstrong simulated each critical phase of landing and takeoff in the lunar module (LM) trainer. In fact, all American astronauts have been trained to some degree through the use of simulators. The educational promise of simulation is seen in NASA's definition of simulation: "The creation of an exact computerized replica of a piece of equipment which is used for training purposes."¹ NASA's faith in simulation has resulted in the creation of several simulators which are programmed into a computer to aid the astronauts. Another definition of simulation comes

¹James Larkin, "Simulation Era Can Be Economical, Hasten Training," The State Journal, Lansing, Michigan, March 12, 1969, p. B4.

from Richard R. Wing who has defined simulation as a method of instruction which offers possibilities of providing a more realistic means for decision-making. Simulation replicates the essential features of some object or process. It is usually abstracted in a model which represents the functions of the original and can be manipulated for the purposes of instruction.² More briefly stated, simulation is the imitation of reality for instructional purposes.

Industrial corporations are using simulation techniques to train personnel for more efficient managerial skills and to sensitize executives in the area of interpersonal relations. Examples include the games of Dill,³ the IBM game,⁴ and the UNIVAC game,⁵ in which simulated experiences in business management are provided to the learner. The decisions made by the students are computer

²Richard L. Wing, Use of Technical Media for Simulating Environments to Provide Individualized Instruction (Westchester County, N.Y.: Board of Cooperative Educational Services, First Supervisory District, 1965), pp. I-5-I-6. (Hereinafter referred to as Use of Technical Media.)

³William Dill, "A Complex Management Game as an Environment for Learning" (paper delivered at IBM Conference on Simulated Learning Environments, Thomas J. Watson Research Center, Yorktown Heights, New York, June 28, 1962). (Hereinafter referred to as "Management Game.")

⁴General Information Manual, IBM Management Decision-Making Laboratory (White Plains, N.Y.: IBM Technical Publications Department, 1963).

⁵Marketing Management Simulation (Remington Rand Univac, 1963).

analyzed, providing feedback on planning, interaction and the dynamics of the competitive business situations.

While games have been used extensively by business, the military and by institutions of higher learning, the use of simulation games at the elementary and secondary levels is still in the beginning stages.

Some writers attempt to make clear distinctions between gaming and simulation, others, including this writer, treat simulation and gaming as roughly synonymous. Instructional games are being used to teach international relations at Northwestern University, Michigan State University, and Stanford.⁶ However, the full value of the gaming form of simulation is yet to be determined. Cherryholmes reviewed six studies and indicated that the case for learning and attitude change resulting from simulation games may not be as strong as has been claimed.⁷

The Problem

Statement of the Problem

The production of simulation games for the classroom has spurred a great deal of research on

⁶Richard E. Dawson, "Simulation in the Social Sciences," in Stimulation in Social Science Readings, ed. by Harold Guetzkow (Englewood Cliffs, N.J.: Prentice-Hall, 1962), p. 218. (Hereinafter referred to as "Simulation.")

⁷Cleo H. Cherryholmes, "Some Current Research on Effectiveness of Educational Simulations: Implications for Alternative Strategies," American Behavioral Scientist, X, 2 (October, 1966), 4-7. (Hereinafter referred to as "Current Research.")

simulation's potential for improving instruction.

Cherryholmes succinctly reports:

Simulation does produce more student motivation and interest, but there are no consistent or significant differences in learning, retention, critical thinking, or attitude change. It should be noted, however, that conclusions on two hypotheses (retention and critical thinking) were based upon one study only.⁸

He summarizes the research literature in his assumption that simulation's effectiveness lies in the social-psychological interaction among the participants. Ogunniyi has provided the classroom teacher with an excellent taxonomy of the simulation field, but he fails to give any insight into the subjective feeling of the users of simulation.⁹ In order to develop games which are usable by the classroom teacher and to design games which are acceptable to students and teachers, data are needed concerning the teacher and student reaction to the new simulation materials. Thus, the major problem identified for study is the assessment of feelings of teachers and students who use simulation games in comparison to their feelings about lecture-discussion activities in social studies instruction.

⁸Ibid.

⁹Omoyosho Ogunniyi, "The Methodology of Educational Simulation and Design of a Simulated Instructional Model for Occupational Education" (unpublished Doctoral dissertation, Michigan State University, 1969). (Hereinafter referred to as "Methodology.")

There are three questions relevant to an analysis of simulation acceptance.

First, do simulation games have a personality? Motivational research has recognized that some products (in this case instructional materials) are described as "friendly," "cold," "conservative," "casual," or other personifying adjectives. Bennett points out that a product is thought of in much the same way as one might think about a human being.¹⁰ He states, "knowing something about people's impressions of a product's personality enables us to investigate the origins of the more intense pleasant and unpleasant aspects of the personality impression."¹¹

Second, what are the personal reactions of students who play simulation games? Recognition of user attitudes is important if students are to develop a more positive attitude toward themselves. Bennett states: " . . . knowledge of such positive and negative feelings may direct the attention of the design analyst to the parts of the product's design that are its emotional assets or liabilities."¹²

Third, what are the personal reactions of teachers who participate in a simulation game. Teachers develop

¹⁰Edward Bennett, "Product and Design Evaluation Through Multiple Forced Choice Ranking of Subjective Feelings," in Human Factors in Technology, ed. by Edward Bennett (New York: McGraw Hill, 1963), p. 522. (Hereinafter referred to as "Product and Design Evaluation.")

¹¹Ibid.

¹²Ibid., p. 523.

impressions about methods of instructors and it is these impressions which count for him.

In keeping with Bennett's contention, this study will be an assessment of the subjective feelings of high school students and teachers toward simulation materials.

Importance of the Study

There are a relatively small number of studies that have attempted to evaluate the new social studies game material produced for the secondary school. Conclusions regarding the effectiveness of games for social studies instruction are tentative at best. Shirts states:

If one were forced to make a judgment on the basis of the results obtained from research conducted to date, he would have to conclude that games have not met even the more modest expectations of their developers.¹³

There is a need to provide teachers with data about how students feel about the new materials, not only to prevent students from having an artificial outlook toward the world but so they can be helped in integrating simulation methodology into their instruction. It is important that the characteristics of new instructional techniques be established so that past conditions, trends, and mistakes can be understood. With this understanding, we can profit from where we have been in order to establish relevant, sensible, and useful methods of instruction,

¹³Gerry Shirts, "Games Students Play," Saturday Review, May 16, 1970, p. 81.

which would help prevent students from dropping out of the system.

When a teaching strategy as new as simulation games strikes the classroom, it is expected that teachers and students will have some equally new and intense feelings about it. Many of these feelings will not be rational or intellectual but their impact on social behavior will be no less impressive.

There is still little empirical evidence of the sociological and psychological impact of simulation. Perhaps this void can be attributed to the newness of the materials or perhaps to the relative lack of research.

The present study is concerned with assessing some of these feelings which students have when confronted by simulation in their social studies instruction and comparing these feelings with reactions to the more traditional teaching strategy of lecture-discussion.

Success in such an effort will help in establishing guidelines for the use of simulation materials and will be most useful for designing materials which improve our present methods of social studies instruction.

Objectives

The general purpose of this study is to analyze the idiosyncratic feelings of teachers and students who have played selected simulation games. The aim of the study is to find answers to such questions as:

1. What are the factors of personality within a game?
2. What are the personal reactions of students who have played simulation games?
3. What are the differences in student feelings toward simulation when compared with the more traditional method of lecture-discussion?

This study also indirectly aims to provide answers to such questions as:

1. What do teachers see as the general acceptability of a simulation game?
2. What rationale for the use of simulation games are suggested by an analysis of the personality traits of teacher, student, and instructional simulation materials?
3. What curricular modifications are possible in the elementary and secondary schools because of simulation games?

Hypotheses

The hypotheses for this study are stated as:

- H₁ Teachers participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity on the standardized index of polydiagnostic association

sets¹⁴) than toward lecture-discussions. $U_d > 0$

H_0 $U_d = 0$ Let $\alpha = .01$

H_2 Teachers participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than teachers who have not participated in a simulation game. $U_1 > U_c$

H_0 $U_t = U_c$ Let $\alpha = .01$

H_3 High school students participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than toward lecture-discussion. $U_d > 0$

H_0 $U_d = 0$ Let $\alpha = .01$

H_4 Students participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than students who have not participated in simulation games. (H_0 is false)

H_0 $X_t = X_c$ Let $\alpha = .01$

$U_1 = U_2 = U_3 = U_4 \cdots U_8$

Assumptions

In order to give coherence and meaning to the evaluation procedures used in this study the following

¹⁴Edward M. Bennett and D. K. Kemler, "Forced-Choice Rankings as a Method for Evaluating Psychophysiological Feelings," USAF WADC Tech Report, June 20, 1958, pp. 58-310.

assumptions are made: (1) An instructional theory must be expressed in terms of individualization, (i.e., each individual differs from every other and thus, each must be taught in a unique way); (2) most learning takes place outside the school in an unstructured way without the conscious effort of training; (3) the learning environment must be adaptable to allow for change of content, pace, sequence, style of the learner; (4) a teacher's subjective feeling toward instructional materials influences his acceptance of the materials and his use of the materials; (5) the student's feelings about materials influences his learning from the materials; (6) the pleasure or displeasure of instructional materials influences the acceptance of the instructional materials; (7) each person experiences product satisfaction in his own way since he has his own needs to satisfy; and (8) the successful design of simulation games depends upon the ability of the designer to gain dependable insights into the subjective feelings of teachers and students who use the materials.

Definition of Terms

Recent developments in the simulation field have resulted in a number of new descriptive terms. Their usage has not been precise and their meaning has been vague. For the sake of clarity the following terms have been defined.

Simulation.--Simulation as it is used throughout this study has been defined as a technique by which the essential features of some object or process are abstracted from real life and re-combined in a model which represents the functions of the original and can be manipulated for the purpose of study or instruction. The model takes the form of three elements: (a) a situation in which a stimulus is provided, (b) action which is the immediate reaction to the stimulus or the manipulation of the object or the interaction among learners, and (c) positive or negative feedback as a consequence to the learner's action.¹⁵

Simulation Game.--Simulation game is defined as a social, political, economic or international model or exercise having the properties of simulation and the essential properties of games in general. The model itself is oriented toward specific educational objectives.

¹⁵ There are many definitions of the term simulation. All writers are in agreement that simulation is a representation of a system or of real life. Because many writers have reviewed the definitions of simulation, it is not necessary to review this effort in this study. Beck and Monroe's review offers a precise definition. It means a procedure in which a model of, or an analog to, a real situation is created for the purpose of instruction or testing. In all cases relevant conditions and presented assumptions, hypotheses, or courses of action are fed into the system, and the consequences are observable. Isobel H. Beck and Bruce Monroe, "Some Dimensions of Simulation," Educational Technology (October, 1969), p. 45. Sackman is another writer who has given a precise definition of simulation. He says "Simulation is the differential representation of objects and events in my position of a referent."

The basic elements are: (1) players or actors, each striving to achieve a goal; (2) rules which limit the range and define the nature of legitimate actions of the players. The rules establish the basic order, sequence and structure within which actions take place; (3) action or play which is the time dimensions which may analogize the "real time" or "real life"; (4) feedback which is spontaneously received for actions taken, and through which the players are able to feel the consequences of their decisions as their actions affect other students in the game; and (5) competition between players or between the player and the model or other players. In the end someone wins.¹⁶ Not all games are simulations. Cherryholmes stated "A game becomes a simulation when it attempts to model a referrent system."¹⁷ For example, games of chance such as Monopoly, slot machines, or card games are not a valid form of simulation because they are not oriented toward specific instructional objectives. It is the instructive objectives of the game and specifically

¹⁶Some writers attempt to make clear distinctions between gaming simulation and other related operations; others treat simulation and gaming as roughly synonymous. An informative analysis is made by Dawson in "Simulation."

¹⁷Cleo H. Cherryholmes, "Simulating International Relations in the Classroom," in International Dimensions in Social Science, ed. by Becker and Mehluzen (Washington, D.C.: 38 Yearbook, National Council for Social Studies, 1968), p. 176.

of the model, that distinguish educational games from parlor games. Shubik's analysis of games and simulation takes the position that the definition is determined by the application of method. He suggests:

Gaming is an experimental, operational, or training technique which may or may not make use of a simulated environment but is invariably concerned with studying human behavior or teaching individuals. In simulation, the behavior of the components is taken as given. The actual presence of individuals is not necessary to a simulation, but it is to a gaming exercise.¹⁸

Eric Berne in the best seller, Games People Play, takes a similar approach. He indicates that gaming is a contest whereby players fulfill a conscious or unconscious objective. Games may be pleasurable or painful or both, depending upon the weapons and the prize. A game may be defined "as a kind of caricature of social life. It is a magnification of some aspect of social interaction from its social context and giving it a special context of its own."¹⁹

Thus, a simulation game is a technique which places the learner in a role-playing situation in which he assumes a decision-making role, but where he must follow procedures and rules to achieve specific objectives. In this environment he discovers a basis for his actions and

¹⁸ Martin Shubik, ed., Game Theory and Related Approaches to Social Behavior (New York: John Wiley and Sons, 1964), p. 71.

¹⁹ James S. Coleman, "Introduction: In Defense of Games," American Behavioral Scientist (October 16, 1966), 3.

he is led to conceptualize about the practical consequences of his courses of action.²⁰

The Kamehameha Schools.--The term The Kamehameha Schools has been used in the study as the accepted title of a private school which is supported by the Bernice P. Bishop Estate, and is located in Honolulu, Hawaii. There are four separate schools within this private school system--the Kamehameha School for Girls, the Kamehameha School for Boys, the Kamehameha Schools' Preparatory Department Elementary Division, and the Kamehameha Schools' Preparatory Department Intermediate Division. The secondary division of the schools for boys and girls enrolls students from grades nine through twelve. Since 1965, students enrolled in the two upper schools have had co-educational classes. The elementary division enrolls students in grades kindergarten through grade six. The intermediate division enrolls students in grades seven and eight. The total enrollment in all four schools in 1970 was 3,976.²¹

Procedure of the Study

The procedure for this study is based on the assumption that simulation games produce intense emotional

²⁰ Arthur J. Hogan, "Simulation: An Annotated Bibliography," Social Education, XXXII (March, 1968), 242.

²¹ The Kamehameha Schools, Accreditation Report, Form B, The Kamehameha Schools, Honolulu, Hawaii, June, 1970.

experiences for students and teachers, perhaps differing only in kind and extent from the emotional experiences associated with any new and impressive cultural phenomenon. In one way or another, each student must decide exactly what the structure, function and meaning of each experience is to be for him personally. The motivational nature underlying simulation games can be explained through an analysis of the patterns of association held by differing individuals who have participated in a simulation game.

Therefore, to gain an empirical picture of the associations held by students and teachers who have played a simulation game, the Polydiagnostic Method of social research was used. The method was designed to reduce the student's ability to distort his responses when dealing with emotionally loaded material.

The historical method of research was used to determine the general status of simulation practices, and the functional criteria for the selection and administration of the simulation game treatment. This included an extensive and critical review of literature on educational simulation. Primary sources of data pertaining to the use of simulation games in education included recent dissertations, studies supported by the U.S. Department of Health, Education, and Welfare, studies made by Air Force and Army Personnel Training Research Center, and studies reported by key investigators to the National Council for the Social Studies. Secondary sources included books and



articles pertaining to the use and development of simulation games and their potential in education.

The data were organized and analyzed in the following ways. First, an analysis was made to determine the effectiveness of simulation in social studies instruction. Second, an analysis was made to determine which simulation games were available for the study. Next, a summary of its uses and functional criteria were described.

Six high school social studies simulation games, described below, were selected for the study. They were:

1. Western Behavioral Science Institute's Crisis Game²² which was designed for students in grades 9-12, and simulates an international crisis among six hypothetical nations.
2. The Foreign Policy Publishing Association's Dangerous Parallel Game²³ which was designed for students in grades 9-12, and simulates an international crisis similar to the Korean conflict.
3. Science Research Association's Inter-Nations Simulation²⁴ which was designed for students in grades 9-12 and for university students.

²²Western Behavioral Sciences Institute, 1121 Torrey Pines Boulevard, La Jolla, California.

²³The Dangerous Parallel Game (Glenview, Ill.: Scott Foresman and Co., 1969).

²⁴The Inter-Nation Simulation (Chicago: Science Research Association, 1970).



4. Western Publishing Company's Ghetto Game²⁵ which was designed for students in grades 8-12 and simulates problems felt by minority groups living in the ghetto.
5. Interact's Sunshine Game²⁶ which was designed for students in grades 8-12 and simulates various urban problems faced by different races in a mythical city.
6. Psychology Today's Blacks and Whites²⁷ which was designed for students in grades 9-12 and simulates racial problems in American cities.

Interviews for the selection of schools and teachers were scheduled during the week of December 18, 1969, and January 5, 1970.

The results of these interviews indicated that eight public high schools and two private high schools in Hawaii were interested in participating in the study. The following experimental procedures were used:

²⁵The Ghetto Game (New York: Western Publishing Co., 1970).

²⁶The Sunshine Game (Lakeside, Calif.: Interact Publishing Company, 1970).

²⁷Blacks and Whites (Clinton, Iowa: Psychology Today Publication Company, 1970).



1. The Post-Test only control group design suggested by Campbell and Stanley was used. (See Chapter III for a discussion of the design.)
2. Twenty-five teachers volunteered to play a simulation game (experimental group). These teachers had no previous experience with simulation games. Immediately following the game, a post-test was given to evaluate their feelings.
3. Each school would randomly select twenty-five students in grades 9-12 to play the simulation game ($N = 225$). Social studies teachers would volunteer to use the selected simulation game with students who had never participated in the game.
4. Controls placed upon the teachers in their use of the simulation game were that they would introduce the game as a regular part of their social studies instruction and would follow instructions provided by the publisher.

Two conference sessions were held with each teacher who used the materials. During the first session, teachers chose the games and the time for their use. During the second session, teachers were introduced to the post-test and given instructions on the evaluation procedure (polydiagnostic method).

Population

Two samples were selected for the study. A sample of fifty high school teachers who had never used simulation games, and a sample of 225 high school students from public and private high schools in Hawaii, who had not participated in a simulation game. Characteristics of the samples are found in Chapter III. The subjects were pre-selected as having met one major criterion--they had never participated in, or used a simulation game as part of their social studies instruction.

Evaluation

Conclusions on the subjective feelings of students and teachers who participated in a simulation game were based on the analysis of data gathered through the use of the polydiagnostic method. Related research on simulation provided guidelines in establishing criteria for this study. Specific criteria used in the selection of simulation games were:

1. Does the simulation game present adequate introductory materials relevant to the real life model in a manner that will motivate the student?
2. Does the simulation game provide for heterogeneity of students?



3. Does the simulation game present concepts, skills, and situations which involve the learner and provoke his participation?
4. Does the simulation game reinforce and extend previous knowledge, attitudes, and motivation?
5. Does the simulation game provide a stimulus, a response situation, and feedback as a consequence to the response?

Criteria for the polydiagnostic method of assessing emotional feelings of teachers and students in this study were:

1. Evaluation must be a standardized technique for eliciting patterns of association in quantitative form.
2. The method should assess the subjects' attitudes as they relate to a variety of objects, situations, or conditions.
3. Test items have a level of common familiarity as evidenced by their high word frequency.

Limitations and Scope

This study has been limited to the assessment of feelings of students and teachers who have participated in a simulation game. The sources of data used are limited to six simulation games used without follow-up discussion for social studies instruction.

This study does not have as its purpose the development of a simulation game, although implications for the design of simulation games will be presented from the data.

The development of a general plan for inservice training for social studies teachers, through extensive workshops, was considered a separate but related area for future evaluation and study. However, the writer anticipates the need for this additional study of utilizational procedures. The writer's intention is to carry out such a study based upon the study reported herein.

Overview of the Study

A study of the related research and a general review of the methodology of simulation in social studies education is reported in Chapter II. Because of the recent impact of simulation games and the problem of evaluating the instructional variables in the simulation technique, a review of the research on "Transfer effects of the instructional medium" is made in the review section.

In Chapter III, a discussion of the procedures, the design of the study and the instruments used for the collection of data is reported. Emphasis is placed on the polydiagnostic method of social research, which is still relatively unpublicized.

Findings from the study are reported in Chapter IV. Conclusions, implications, and a summary of the research are discussed in Chapter V.



In the next section the major concern is the general status of the simulation game methodology and conclusions that can be drawn concerning the effectiveness of the technique for social studies teachers.

CHAPTER II

REVIEW OF THE LITERATURE

This review of the research will focus on four areas: (1) critiques both favorable and unfavorable on the use of educational simulations; (2) the rationale for using educational simulating games in social studies instruction; (3) the effectiveness of educational simulation games on motivation and learning in social studies education; and (4) a review of research on the value of high realism in the development of educational simulation.

Critiques on the Effectiveness of Simulation

Some of the best known simulations historically have been military training devices such as the Link Trainer, the Flight Simulator Trainer, and engineering devices such as wind tunnels for testing scale models. Paul Twelker estimated that there were over three thousand different types of simulators used by the United States military.

He stated:

In the military, simulation applications range from the exceedingly simple to the exceedingly complex. At one end of the continuum, a simulator may cost as little as ten cents, while on the other end of the continuum, one single simulator may cost as much as 11 million dollars.¹

Military studies provided evidence that simulation is effective in teaching identification skills,² operational procedures,³ and discrimination skills.⁴

Military research has centered on the flight simulator which Adams defined as "a complex electronic device designed to reproduce, with considerable realism, the physical features of controls and instruments, the aerodynamic response of instruments under various conditions of flight and operator response, switches, warning lights,

¹Paul A. Twelker, "Simulation: Status of the Field" (paper presented at the Simulation for Learning Conference sponsored by the Commission for Educational Media Association, N.E.A., Boston, Massachusetts, October, 1968), p. 3. (Hereinafter referred to as "Status of the Field.")

²F. J. McQuigan and E. F. MacCaslin, "Whole and Part Methods in Learning a Perceptual Motor Skill," American Journal of Psychology, LXVIII (March, 1955), 658-61.

³R. M. Gagne and E. A. Bilodeau, "The Effects of Target Size Variation on Skill Acquisition," in Research Bulletin AF-PTRC-TR-54-5 (Air Force Personnel and Training Research Center, April, 1955), 257.

⁴J. A. Adams, C. A. Garrett, and J. G. Robertson, "Measurement of F-860 Student Pilot Ability in Radar-Scope Interpretation," in Technical Memorandum IPRL-TM-55-3 (Tyndall Air Force Base, Florida, Interceptor Pilot Research Laboratory, Air Force Personnel and Training Research Center, June, 1955).

radio and navigational aids, and sometimes, auditory stimuli."⁵ Adams also reported that "the flight simulator was valuable for training pilots to cope with dangerous situations."⁶ He stated:

Certain emergencies may occur only once in a pilot's flight career, but when they occur, the pilot must act with accuracy and speed if he is to complete the mission, not to mention that it is valuable to familiarize a pilot with the operational procedures and characteristics of an aircraft to which he is newly assigned.⁷

Other reasons cited for the use of simulators in the Armed Forces include: (1) they have low operating cost; (2) they are suitable to teach procedures which are impossible to teach in the air, especially the continuous psychomotor skills required by the aircraft; and (3) simulator training reduces a pilot's trial-and-error responses on his initial flights.

The training importance of simulators in the military has secured their position in training programs and the trend is clearly toward more extensive and elaborate uses of them. For example, Kristy described a futuristic computer-controlled training of Air Force electronics technicians. The system, he said, "would cost approximately 130 million dollars but would reduce training

⁵J. A. Adams, "Some Considerations in the Design and Use of Dynamic Flight Simulators," Research Report AFPTR-TN-57-51 (Randolph Air Force Base, Operator Laboratory, Air Force Personnel and Training Research Center, April, 1957). (Hereinafter referred to as "Dynamic Flight Simulators.")

⁶Ibid., p. 2.

⁷Ibid.



time by two-thirds and would represent a savings to the Air Force in training costs up to 75 million dollars per year."⁸

Simulators used for military training include: Shipboard Universal Radar Land Mass Simulators, Sonar Simulators, Submarine Simulators, Talos System Shipboard Simulation Equipment, Target Generators, Three Dimensional, Airborne Simulator, Helicopter Flight Simulator, Height Finder Target Simulation, Fire Control and Launcher Simulation, and the FIU-1 Operational Flight Simulator Trainer.⁹

The military also developed the use of the war game as a form of simulation. Adams defined the war game as "the means for simulating the play of a systematic strategy or a tactical operation of opposing forces including two-sided maneuvers, board games, tactical games or strategic war games."¹⁰ The objective of using "war games" is to see how systems operate in practice without becoming involved in the risk, expense and time of the real situation. War games have been used to refine, plan and increase the efficiency of military decision-making.

⁸Norton J. Kristy, "The Simu-tech Trainer for Technical and Vocational Training," in Inventing Education for the Future, ed. by Werner Z. Hersch, et al. (San Francisco: Chandler Publishing Co., 1967), pp. 114-22.

⁹Ibid., p. 116.

¹⁰Adams, "Dynamic Flight Simulators," p. 3.



Although the war game has been in existence for many centuries, its exact origin is unknown.¹¹ Raser reported that "in 1798, 'nev Kriegspiel' a true war game, was developed at Schlesurg which, instead of using a board, the game used a map divided into 3,600 squares, each with distinctive topographical features in which game pieces were moved."¹²

To date, Rand has continued to use war games as political-military exercises to test strategies and planning.¹³ Other attempts at war-gaming include the United States Joint Chief of Staff Joint War Games Agency's TEMPER, and exercises developed at Massachusetts Institute of Technology.¹⁴

One current example of the war game is the military-political game "Cold War" developed by the Rand Corporation.¹⁵

¹¹John R. Raser, Simulation and Society: An Exploration of Scientific Gaming (Boston: Allyn and Bacon, Inc., 1969), p. 46. (Hereinafter referred to as Simulation and Society.)

¹²Ibid.

¹³Richard E. Barringer and Barton Whaley, "The M.I.T. Political-Military Gaming Experience," Orbis, IX, 2 (June, 1965), 437.

¹⁴Robert D. Specht, War Games (Santa Monica, Calif.: Rand Corporation, March, 1957), pp. 7-10.

¹⁵J. M. Goldsen, "The Political Exercise, An Assessment of the Fourth Round" (Washington, D.C.: The Rand Corporation, D-3640 RC, May 30, 1956). (Mimeographed.)



Another impetus for simulation in social studies instruction came from the experimentation in the social psychology of groups.

Raser stated:

The basic principles of group interaction are included in modern simulation game efforts. These principles include: the efficiency and reliability of different kinds of communication nets, the development of group loyalty, or ethnocentrism, the cohesion of groups as a function of outside threat, and the impact of shared responsibilities for a decision on the kind of decision that will be made.¹⁶

Business and industry are using these principles in their simulation game materials to develop skills and roles needed for executives in the business community. Business organizations have used the in-basket simulation to train administrators. The in-basket simulation is usually an individual decision-making exercise centering on situations that represent the daily work of an administrator's "in-basket." Every few minutes the trainee is presented with situations which require him to make decisions. The in-basket is concerned primarily with overall performance of the student and of the ramification of decisions the student made.¹⁷

¹⁶Raser, Simulation and Society, p. 50.

¹⁷Ogunniyi, "Methodology," p. 62.



The main elements of in-basket design have been studied by Frederiksen, Saunders, and Ward.¹⁸ Their study revealed that more research was needed to guide the development, design, and evaluation of the in-basket simulation. They suggested that the best way to design in-basket materials was to classify the model by situation, and by function. Frederiksen stated:

The situational problems must involve interactive behavior and the functions of the in-basket must include: (1) routinized functions, (2) flexible function, requiring adaptability and willingness to innovate, and (3) foresight requiring resourceful anticipation and data evaluation requiring judgments about what is needed and what is not.¹⁹

Ogunniyi explored the theoretical principles of role theory in the in-basket simulation form in his study at Michigan State University. He found:

The roles must be proved before they can represent those of the model. The relevant substantive elements of the environment need to be represented in the simulation design in order to give effect to active and interactive responses of the model. The simulation must involve life-like activities which provide practice of the roles, so that the reward and punishment constraints of real life can be brought to play. Rules and constraints must be stipulated to condition the role behavior of the learner.²⁰

¹⁸N. Frederiksen, D. R. Saunders, and Barbara Ward, "In-Basket Tests," Psychological Monographs, VII, 9 (June, 1957), 22.

¹⁹Ibid., pp. 2-5.

²⁰Ogunniyi, "Methodology," pp. 88-89.



It was clear that his analysis of simulation assumed high-fidelity conditions that replicate the operational model in real life.

Simulation games have been used in many American universities to teach basic concepts of marketing, finance, production, and overall management. The American Management Association developed the Top Management Decision game in 1956.²¹ Other games designed to teach business concepts include "Play One"²² and the "Integrated Simulation."²³

There has been disagreement on the value of business games for instruction in American universities. Goetz's critique of business games revealed that they are too time-consuming and costly.²⁴ While Klasson's study pointed out that in ninety undergraduate and graduate schools, eighty-two users felt business games had definite value.²⁵ Vance's study also supported the contention that

²¹Joel M. Kibbee, Clifford J. Craft, and Burt Nanus, Management Games (New York: Reinhold, 1961).

²²E. R. Adlinger, "Business Games-Play One," Harvard Business Review (March-April, 1958), 32-35.

²³W. N. Smith, E. E. Estey, and E. F. Vines, Integrated Simulation (Cincinnati: Southwestern Publishing Company, 1968).

²⁴B. Goetz, "A Critique of Business Games," Academy of Management Journal, X, 5 (December, 1959).

²⁵R. Klasson, "Business Gaming: A Progress Report," Academy of Management Journal, XIX, 4 (September, 1967).



business games have value. His data revealed that business students and managers who did well in his game had high correlations between game performance and attributes that are found in successful managers; namely, self-assurance, decision-making ability, perceived occupational level, and initiative.²⁶

More recently, Hodgetts at the University of Nebraska concluded "that the design of management games should be easy to understand and it must emphasize the basic concepts of management."²⁷

Another educational use of simulation has been to test theories of learning in schools of education. Fergenbaum designed the Elementary Perceiver and Memorizer Model to simulate verbal learning.²⁸ In evaluating the model, Paul Kjeldergaard stated:

If one inquires about the extent to which simulation of cognition and learning has contributed to the psychological theory of behavior, one is forced to conclude very little. The emphasis thus far has been upon creating models which produce an adequate match

²⁶S. Vance, "Use of a Performance Evaluation Model of Research in Business Gaming," Academy of Management Journal (March, 1967), 30-35.

²⁷Richard Hodgetts, "Management Gaming for Didactic Purposes: A New Look," Simulation and Games, I, 1 (March, 1970), 53.

²⁸E. Fergenbaum, The Simulation of Verbal Behavior (Washington, D.C.: Sparton Books, 1961), pp.121-22.



of the human counterpart. . . . New constructs have revealed behavioral phenomena previously unobserved.²⁹

A seemingly significant observation by Hallworth on computer simulation of cognitive processes was that "we may use what is known about computer simulation of learning to write programs for student-teachers."³⁰

This observation has been true of the simulators now being used to confront student-teachers with the problems of the classroom. Bert Kersh developed a classroom simulator which presents to student-teachers a filmed sequence of typical discipline problems which they are expected to face. In his model a filmed simulated situation was presented to the student who was required to respond by determining a course of action. Feedback was then provided to the student by the computer.³¹ Other notable efforts in teacher-oriented simulation include those of Cruickshank who developed simulated procedures

²⁹Paul M. Kjeldergaard, "Simulation of Cognition and Learning: The Role of Individual Differences," in Learning and Individual Differences, ed. by Rogert M. Gagne (Columbus, Ohio: Charles E. Merrill Books, 1967), pp. 218-20.

³⁰Herbert J. Hallworth, "Computer Simulation of Cognitive Processes," Educational Technology, IX, 10 (October, 1969), 62.

³¹Bert V. Kersh, Classroom Simulation: A New Dimension in Teacher Education (Monmouth: Teaching Research Division, Oregon State System of Higher Education, U.S. Office of Education, NDEA Title VII Project No. 866, June, 1963), p. 111.



for training teachers to teach in the inner-city,³² and those of Beaird and Standish who are using simulation to train counselors.³³ A rationale for teacher-oriented simulation has been provided by Twelker who stated:

Classroom simulation in higher education is based on the supposition that exposition of educational methods or principles could be expected to help the teacher talk about teaching, but only classroom experience can train the teacher to teach.³⁴

Cruickshank and Broadbent investigated the effects of simulation training on student teaching behavior. They reported that:

Simulation learning when tested under the most stringent conditions was an unqualified success as a teaching device that motivates and involves students and that although simulation was only partially successful in changing the student-teaching.³⁵

It is important to note, however, that in this study neither the student-teaching nor simulation and

³²Donald E. Cruickshank, "Simulation: New Directions in Teacher Preparation," Phi Delta Kappan, XLVIII (September, 1966), 23-24.

³³James H. Beaird and John T. Standish, Audio Simulation in Counselor Training (Monmouth: Teaching Research Division, Oregon State System of Higher Education, U.S. Office of Education, NDEA Title VII Project No. 1245, 1964), p. 45.

³⁴Twelker, "Status of the Field," pp. 5-16.

³⁵Donald R. Cruickshank and Frank W. Broadbent, The Simulation and Analysis of Problems of Beginning Teachers (University of Tennessee and State University College at Brockport, U.S. Office of Education Cooperative Research Project 5-0798, 1968), p. 54.



student-teaching combined resulted in significant change as measured by the Minnesota Teacher Attitude Inventory.³⁶

Instructional games, the newest form of simulation, is widely used in the college and university courses. Some operate entirely by computer; others involve only people and still others use both men and machines. The purpose of the simulation game has been to increase the student's understanding of the "real life" or reference system. Flook stated:

A simulation game allows students to study at a safe distance, contrived models of systems which normally cannot--or must not--be tampered with directly; such as international conflict, social conflict, social mobility or sensitivity areas of personality. What is important about a game is not the imitation, but that through imitation, the game reveals the essence of what is simulated. Simulation games are simplified working models of processes and existing or hypothetical systems constructed to give insight into the behavior of the system.³⁷

Northwestern University, Michigan State University, and Stanford have used the Inter-nation simulation game developed by Harold Guetzkow to teach international relations and for research on the development and testing of hypotheses and theory in international relations.³⁸

³⁶ Ibid.

³⁷ Alfred Flook, "Simulation Studies of International Conflict," Simulation, XIV, 4 (April, 1970).

³⁸ Harold Guetzkow, et al., Simulation in International Relations: Developments for Research and Teaching (Englewood Cliffs, N.J.: Prentice Hall, 1963), p. 35.



Guetzkow reviewed twenty-four international conflict studies which involved fifty-five different comparisons. He rated the similarity of the INS to real-world data as either "much" or "some" in two-thirds of the cases. He concluded that "this is merely an encouraging start as the evidence available is too fragmentary to warrant firm conclusions."³⁹

College student testimony has implied that the inter-nation simulation provided practical experience in the study of international relations. Guetzkow stated:

Many virtues have been claimed for the INS model, but skeptics have questioned whether or not INS teaches the subtleties of what actually goes on in negotiations, and whether or not the lack of real-life responsibilities and pain robs the method of what matters most. It depends, of course, on the objective of the game.⁴⁰

Although the literature reports that simulation games on international conflict are exciting for students to take part in, much research avoids the question of validity. Hermann stated:

Full validation involved a sequence of validating processes which include: face validity, which is the fidelity of the game which has motivational value; internal validity, which is reliability; event validity, in which the outcomes of a game are checked against past, present, and future events in the real world; hypothesis validity which involves the listing of hypothesized relationships both in real-world data

³⁹ H. Guetzkow, "Some Correspondence Between Simulations and 'Realities' in International Relations," in New Approaches to International Relations, ed. by M. Kaplan (New York: St. Martin's Press, 1968), p. 42.

⁴⁰ Ibid.



and in simulation runs; and variable and parameter validity which is a detailed comparison of the inputs built into the Model with their counterparts in the international system. Its importance is in identifying the key components and focusing on faulty ones for later improvement.⁴¹

However, Flook indicated that Hermann's model was not appropriate when a simulation game has the heuristic purpose of producing many alternative outcomes. He stated:

The most interesting thing about these important excursions into unexplored territory is the questions they provoke about the notion of goodness of fit which has animated them. To insist on complete isomorphism, perfect one-to-one correspondence, would only defeat simulation's object of gaining enlightenment through simplification.⁴²

Moreover, Churchman pointed out that it was possible for the output of a simulation to contain more of reality than the empirical data used as validity criteria for those data are themselves only approximations to reality based on interviews, content analysis, etc.⁴³

From this point of view, simulations are vehicles for testing experimental hypothesis; for example, Richard Brody used the inter-nation simulation to test predictions

⁴¹C. F. Hermann, "Simulation: Political Process," in International Encyclopedia of the Social Sciences (New York: Macmillan and Free Press, 1968), p. 37.

⁴²Ibid.

⁴³C. W. Churchman, "An Analysis of the Concept of Simulation: Symposium on Simulation Models," in Methodology and Applications to the Behavioral Sciences, ed. by A. C. Hoggatt and F. G. Balderson (Cincinnati: Southwestern Publishing, 1963), p. 57.



regarding the spread of nuclear weapons to dependent nations in a cold war situation with results that have been substantially confirmed by later events in the real world.⁴⁴ Raser and Crow used the same model to study the impact of nuclear vulnerability.⁴⁵

Recently, the INS Model has been modified and improved. Raser reported that "it has become a computer simulation called International Processes Simulation which provides the player a variety of activities ranging from propaganda manipulation of dissident internal minorities to international business competition." He stated that "Systems Development Corporation in Santa Monica, California has made an ambitious attempt to simulate the entire nation state system of the world incorporating some 130 nations and 4,000 variables in an elaborate program."⁴⁶

Recently, there has been a simulation game materials publishing explosion for the secondary school. Almost every publishing company now markets materials. Western Publishing Company developed the Consumer Game,

⁴⁴Richard A. Brody, "Some Systemic Effects of Nuclear Weapons Technology: A Study Through Simulation of a Multi-Nuclear Future," Journal of Conflict Resolution, VII, 4 (September, 1963), 663-753.

⁴⁵John R. Raser and Wayman J. Crow, Winsate II: An International Simulation Study of Deterrence Postures Embodying Capacity for Delay Response (La Jolla: Calif.: Western Behavioral Sciences Institute, July, 1964), p. 15.

⁴⁶Raser, Simulation and Society, p. 15.



model of the consumer buying process which involves the problems related to installment buying; Economic Systems Game which deals with a comparative analysis of economic matters; Parent Child Game which simulates the relationship between a parent and an adolescent; Life Career Game which is a simulation involving some of the important decisions a student must make in life; Disaster Game which simulates a community hit by a natural disaster; and Ghetto Game which simulates the problems felt by minority groups. These games were designed to give students an opportunity to experience, in low reality forms, the various roles they will have to play when they enter society. Students assume a hypothetical role and compete for certain objectives according to specified procedures or rules.

Other groups which have developed games aimed at the elementary and secondary levels include Western Behavioral Sciences Institute, The Foreign Policy Publishing Association, The High School Geography Project, and the American Sociological Project. Western Behavioral Sciences Institute has produced game simulations such as Crisis which simulated an international crisis among six hypothetical countries; Plans which simulates situations involving hypothetical interest and pressure groups; and Napoli which simulates the functions of political parties. Abt Associates has produced a variety of educational games. The best known is the Educational Systems Planning Game which simulates educational planning. The Foreign



Policy Association has produced the Dangerous Parallel Game in which students simulate foreign policy decision-making by role playing as ministers of six fictitious countries facing a situation much like the one which led to the Korean Conflict.⁴⁷ The American Sociological Association supported by the National Science Foundation, has produced instructional materials which simulate social conflict.⁴⁸ The High School Geography Project supported by the Association of American Geographers is now in the process of field-testing simulation materials in twenty-two states.⁴⁹

The National Games Center at Nova University was established in 1965 to encourage the development of simulation materials. The key function of the Nova Game Center was to provide in-service training in the use of games to teachers of member districts.⁵⁰ Games are available in the form of computer-assisted instruction from the Graphic Controls Time-Sharing Computer Center, Buffalo, New York

⁴⁷"Bright Future Seen for Educational Games," Education U.S.A. (Washington, D.C.: February 17, 1969), p. 133.

⁴⁸Instructors Guide: Simulating Social Conflict--Experimental Version (project of the American Sociological Association, supported by the National Science Foundation, Center for Research on Conflict Resolution, University of Michigan, Ann Arbor, Michigan, 1969).

⁴⁹Ogunniyi, "Methodology," p. 3.

⁵⁰"Games for the Classroom," Scholastic Teacher (November 9, 1967), p. 12.



where over fifty games are already programmed. They range from College Hall Craps Table to Three Dimensional Tic-Tac-Toe.⁵¹ Thus, a wide range of simulation materials are now or will soon be available to elementary and secondary teachers.

The Rationale for the Use of Simulation Games

The rationale for simulation games in Social studies instruction has been based on the assumption that the technique is good because it emphasizes learning by discovery and through active participation. It stems from John Dewey who argued that "play and game provide fresh and deeper meaning to the usual activities of life."⁵² Recent writers mirror Dewey's philosophy. For example, Marjorie Boocock reviewed the history of serious thought on games and plan from a philosophic point of view. She stated:

Viewing the literature on games in its historical sequence then suggests a gradual process of recognition of the potential learning functions of games from the initial recognition of their inherent attractiveness and their ability to capture interest and commitment; to recognition of the way in which favorite games mirror their surrounding environment or society; to recognition of the socialization function of games; and finally to recognition of the way in which certain

⁵¹Program Print Out Games (Buffalo, N.Y.: Graphic Controls Time-Sharing Computer, July, 1969).

⁵²John Dewey, Human Nature and Conduct (New Haven: Harry Holt, 1922), pp. 160-62.



games are particularly appropriate at particular stages in children's development.⁵³

Clark Abt, an educational game designer, has provided a number of excellent analysis on the use and rationale of games. He argued that children are naturally motivated toward play and that through mimetic process, they organize much adult behavior which when reinforced by their peers are incorporated as habits.

He stated:

There are three kinds of learning that go in educational games. On one level there is the learning of the facts of the situation. The second level of learning in educational games is of the cause and effect relationship, the processes in any complex interactive situation. In this respect the games are relatively unique in being able to present a complex interaction simulating the problem that isn't really well done in either written or spoken material. The third level of learning in educational games is that of the comparison of alternate costs and benefits, risks, and opportunities following different courses of action.⁵⁴

Abt gave suggestions on how to improve simulation exercises to communicate more effectively with students. He stated:

The model must be translated into a social drama that involves the student's interest and enables him to experiment actively with the consequences of various "moves" or changes in the system under study . . . to achieve an effective balance between analytical truth

⁵³ Sarane S. Boocock and James S. Coleman, eds., Simulating Games in Learning (Beverly Hills, Calif.: Sage Publishing, Inc., 1968), p. 61.

⁵⁴ Clark C. Abt, "Games and Simulation" (paper presented at the Abington Conference 1967 on "New Directions in Individualizing Instruction," April, 1967), pp. 4-5.

and dramatic communication some degree of simplification is needed to form the basic "plot" of the game.⁵⁵

Coleman also emphasized Dewey's philosophy in his rationale for simulation games. He argued that games offer students the opportunities to act out life-like, decision-making roles in realistic settings. He stated:

There are apparently certain aspects of games that especially facilitate learning, such as their ability to focus attention, their requirement for action rather than merely passive observation, their abstraction of simple elements from the complex confusion of reality, and the intrinsic rewards they hold for mastery. By the combination of these properties that games provide they show remarkable consequences as devices for learning.⁵⁶

There appears to be at least two problems with the philosophical rationale for using simulation games in social studies instruction. First, learning through participating in a game is not kept separate from the learning (in the sense of theory testing) derived from observing human players in a particular environment. Second, the interface between a simulated environment and a learning is unclear. Arguing that simulation games are derived from philosophical rules without specifically indicating the nature

⁵⁵Clark C. Abt, "Games for Learning" (Cambridge, Mass.: Social Studies Curriculum Programs, Educational Development Center, 1966), pp. 66-69. (Mimeographed.)

⁵⁶James S. Coleman, "Social Processes and Social Simulation Games," in Simulation Games in Learning, ed. by S. S. Boocock and E. O. Schild (Beverly Hills, Calif.: Sage Publications, Inc., 1968). p. 29.



f the theory and the phenomenon it tests does not say
uch.

The evidence underlying the rationale for simulation games heuristically suggests: that the objective of simulation games is to motivate students by presenting relevant and realistic problems to induce more efficient and active understanding of information; that simulation games need to provide opportunities for adequate practice so students can develop abilities to attain stated objectives; that simulation games can provide students more sophisticated and relevant inquiry; that perhaps the important learning is what happens after the simulation is over, when students ask about the "model" which determined some of the elements of the simulation about real world analogues to events and factors in the game; that simulation helps students learn decision-making skills, resource allocation skills, and communication skills; that simulation provides students with explicit, experimental, but level references about ideas, concepts and words used to describe human behavior; and that the main importance of a simulation game is the effect on the social setting in which learning takes place.

Effectiveness of Simulation Games

Research studies on simulation games consisted predominantly of single studies on particular games, each with its own battery of tests to measure different sets of



possibly relevant dependent and independent variables. Fletcher argued that the simulation field had no consistent terminology, no adequate measures for evaluation. He stated, "the degree to which findings on one game are generalizable to other simulation games is simply unknown."⁵⁷

Existing research evidence to date indicated that the major advantage of a simulation game was that it promotes more interest than is evident in the conventional classroom.⁵⁸

Boocock compared the "Campaign Game" and "Legislative Game" simulations, and reported that student motivation and interest were clearly increased by the games.⁵⁹ In this study Boocock randomly assigned subjects to the two games and used one game group as the control for the other. Lengthy questionnaires for each game were given as pre-tests and post-tests. They were factor analyzed and the clusters interpreted. The method of construction of the instruments was not made explicit. For each game there was a set of questions which related

⁵⁷ Jerry L. Fletcher, "Simulation Review," in Simulation and Games, an International Journal of Theory, Design, and Research, I, 2 (June, 1970), 220.

⁵⁸ Cherryholmes, "Current Research," p. 6.

⁵⁹ Sarane S. Boocock, "An Experimental Study of the Learning Effects of Two Games With Simulated Environments," American Behavioral Scientist, X (October, 1966), 8. Hereinafter referred to as "An Experimental Study.")



actually to its content. It was not immediately clear whether after factor analysis, the separate clusters for the two different games could be compared. She encountered several problems in using one game as a control for another when the content of the games was so vastly different. If all of the questions asked pertained uniquely to the content of one game or the other, but not both, one is virtually guaranteed that there will be no significant change in the control group. She concluded that games do effect changes in players especially attitude change with respect to the roles played in the life-career games and substantial sex differences in the direction of change; that factual learning occurred in both games toward more "realistic" or accurate perceptions; and that games improved the feelings of efficacy of some of the players.⁶⁰

Research findings by Anderson,⁶¹ Boocock,⁶² Boocock and Coleman,⁶³ Cherryholmes,⁶⁴ and Robinson, Anderson,

⁶⁰ Ibid.

⁶¹ Lee F. Anderson, Combining Simulation and Case Studies in the Teaching of American Foreign Policy (Evanston, Ill.: Northwestern University, 1964), p. 23.

⁶² Sarane S. Boocock, Effects of Election Campaign Game in Four High School Classes (Baltimore: The Johns Hopkins University, Report No. 1, Research Program in the Effects of Games with Simulated Environments in Secondary Education, 1963), p. 39. (Hereinafter referred to as Effects of Election Campaign.)

⁶³ Boocock, "An Experimental Study," p. 8.

⁶⁴ Cleo H. Cherryholmes, "Developments in Simulation of International Relations for High School Teaching"

ummann, and Synder,⁶⁵ revealed that students showed more interest in simulation activities than in more conventional activities. Robinson and his associates reported conflicting data on interest among undergraduates at North-eastern. When students were asked their preference between International simulation and case studies as a learning method, case studies received more favorable comments. When data in student behavior were collected, such as amount of reading from books, class attendance, and talks with the professor, students in the simulation participated in a significantly higher rate.⁶⁶ Anderson's study supported the hypothesis that simulation and case studies used together generated more interest than simulation or case studies used singly. An additional finding revealed that simulation produced more interest when compared with case studies, but did not create greater interest in either further study of foreign policy or political science.⁶⁷

unpublished Master's thesis, Kansas State Teachers College, Emporia, 1963). (Hereinafter referred to as Developments in Simulation.")

⁶⁵James A. Robinson, Lee F. Anderson, Margaret G. Snyder, and Richard C. Snyder, "Teaching with Inter-Nation Simulation and Case Studies," The American Political Science Review, LX (1966), pp. 53-66. (Hereinafter referred to as "Inter-Nation Simulation.")

⁶⁶Ibid., pp. 58-61.

⁶⁷Ibid.



Boocock 1963, Boocock and Coleman 1965, and Cherryholmes 1963 were unanimous in their findings which reported that students evidence a high degree of interest and react very positively to simulations.

In a current study on the use of four games--"City Council Game," "Ghetto Game," "Community Organization Game," and "Disaster Game" in two college courses, Boocock concluded that students became adept at identifying game strategies and that games may be intrinsically limited in their effects, that they may, in Bruner's terms, induce "active" and iconic learning but not lead the player to "symbolic" representation or learning without some kind of supplementary activity.⁶⁸

Another study by Boocock concluded that the poor showing of game results in learning effectiveness studies may be attributed to the fact that we have not designed ways to measure different kind of games relative to their unique contributions to learning.⁶⁹ A seemingly significant observation in this study was that much of the reported simulation game research does not compare the amount of learning by students in a game experience with

⁶⁸ Sarane S. Boocock, "Use Simulation Games in College Courses," Simulation and Games, I, 1 (September, 1970), 67.

⁶⁹ Sarane S. Boocock, "The Life Career Game," Personnel and Guidance Journal, LXII (December, 1968), 328-34.



learning by students who are taught the same information by another method.⁷⁰

Cherryholmes found little positive evidence in his review of game research on the question of what is learned through participation in a simulation game. He found no significant evidence of learning facts or principles, no significant evidence on the retention of learning, no significant gain in problem-solving ability, and no significant gain in attitude change.⁷¹

Garvey and Seiler in their study of the question, "Do students in a simulation game learn more facts or principles than they would by studying in a more conventional manner?" found that the control group scored higher on post-experiment testing than the simulation group. This was interpreted, however, as an effect of their experimental design and sampling error. However, the subjective evaluation by the experimentors and their cooperating teachers suggested that the students in the simulation group enjoyed their classroom experiences more and became more involved in their course of study. Garvey and Seiler also collected retention data. Testing eight weeks after control and experimental group treatments found the simulation group to be slightly but not

⁷⁰Ibid., p. 329.

⁷¹Cherryholmes, "Current Research," p. 6.



significantly superior to the control group in retaining facts and principles learned during the experiment.⁷²

Raymond Anderson studied the effectiveness of the simulation game--"Consumer Game"--in teaching three specifically defined behaviors in contrast to the effectiveness of learning the same three defined behaviors through conventional classroom techniques. He also attempted to determine whether there was a relationship between the effectiveness of the simulation learning game method and the students' IQ, sex, and major program of study. Although his study was fixed to 280 high school seniors in a single school, he found "that learning to answer factual questions related to the use of installment credit (the first defined behavior) is accomplished as effectively by the simulation learning game as by the conventional classroom approach, that the simulation game is the more effective classroom technique for teaching males the behavior of comparing available sources of credit before selecting one source and that the students whose major is business education or general education learn this behavior to a greater extent through participation in a

⁷²Dale M. Garvey and William H. Seiler, A Study of Effectiveness of Different Methods of Teaching International Relations to High School Students (Emporia: Kansas State Teacher's College, 1966), p. 32. (Hereinafter referred to as Study of Effectiveness.)



simulation learning game than through the conventional classroom approach.⁷³

In the Ford Foundation's final report of a conference on business games, many of the conference participants mentioned motivation of students and orientation toward subject matter as explicit purposes of gaming. Many applications of gaming were described as having as one of their purposes the building of interest in subject matter by demonstrating it in concrete form. Motivation of teachers, as well as of students, was mentioned in the report.⁷⁴

Boocock, Cherryholmes and Garvey, and Seiler studied the effect of simulation games on attitude change. Boocock notes that playing the election game produced realistic attitudes about politics. After the election game, players as opposed to students in the control group, were less likely to "expect our representative to vote according to their convictions," and more likely to say that "the best way to run elections is to study the voters and then take stands on issues that will be consistent

⁷³Raymond Anderson, "An Experiment on Behavioral Learning in a Consumer Credit Game," Simulation and Games, an International Journal of Theory, Design, and Research, I, 11 (September, 1970), 43-56.

⁷⁴William R. Dill, James R. Jackson, and James W. Sweeney, eds., Proceedings of the Conference on Business Games (New Orleans: Tulane University, April 26-28, 1961), pp. 9-11.



with the voters' opinion."⁷⁵ Cherryholmes commented that "recent political research demonstrates that this is, in fact, the way congressmen operate." He continues to say that "in the area of foreign affairs it has been shown that no relationship exists between congressional voting and the attitudes of the home district."⁷⁶ Cherryholmes also found that students acquired realistic attitudes after playing the Inter-Nation Simulation Game.⁷⁷ However, Garvey and Seiler used a modified version of the same attitude inventory and did not find a significant difference between the simulation and the control group; both the simulation and a conventional teaching unit produced more realistic political attitudes.⁷⁸

Raser stated that evidence gathered by the Project SIMILE in San Diego County high schools showed that even though student involvement and learning motivation increased during the play of a game, they dropped to pre-game levels a few days later.⁷⁹

⁷⁵Boocock, Effects of Election Campaign, p. 33.

⁷⁶Cherryholmes, "Current Research," p. 7.

⁷⁷Cherryholmes, "Developments in Simulation," p. 72.

⁷⁸Garvey and Seiler, Study of Effectiveness, p. 32.

⁷⁹Raser, Simulation and Society, p. 129.



Another study which dealt with the question, "Can simulation games change attitudes?" was conducted by Paul Dekock. He used the game "Sunshine" with 398 high school students and administered pre-tests and post-tests on racial attitudes of the students. He concluded that the students' attitudes toward race changed as a result of the game. This result would be expected on the basis of simple learning theory: attitude change is directly and positively related to information intake. It is difficult to understand how he arrived at such an optimistic conclusion when the study had no control group to compare with the experimental group receiving the treatment.⁸⁰

Garvey and Seiler reported findings on the effects of simulation on critical thinking. Using the Watson-Glaser Critical Thinking Appraisals and the Cornell Critical Thinking Tests, they found that students did not gain critical thinking and problem-solving skills in a simulation game in relation to more conventional teaching methods.⁸¹

Although the literature on simulation games is most positive, there are, however, negative assessments. Robert Davis argues that the emotional overtones

⁸⁰ John Dekock, "Simulation and Changes in Racial Attitude," Social Education, Journal of the National Council for the Social Studies, XXXIII, 2 (February, 1968), 181.

⁸¹ Garvey and Seiler, "Study of Effectiveness, p. 181.



characterizing such events as crises can seldom, if ever, be simulated because the students in fact, do not have to live with the consequences of their decisions.⁸² Bernard Cohen who used an international relations game for teaching undergraduates at the University of Wisconsin, reports that even though high interest was generated there was no real evidence that the students gained any particular insights or that their interest was maintained after the experience was over.⁸³ Richard Wing found in his analysis of the learning effects of two computer games that "no claim to superiority can be made either by the computer game technique or by the conventional classroom method of instruction."⁸⁴

Research on the Fidelity of Simulation Games

One must consider the validity or reality issue pertaining to simulation games. The effectiveness of a game could be in the assumptions, implicit and explicit, that the game makes about reality. The military research on simulation did not specify when exact physical duplication of the real life situation (Realism) is necessary

⁸²Robert Davis, "The International Influence Process: How Relevant is the Contribution of Psychologists?" American Psychologist, VII, 3 (October, 1966), 240-41.

⁸³Bernard C. Cohen, "Political Gaming in the Classroom," Journal of Politics, XXIV (July, 1962), 367-80.

⁸⁴Wing, Use of Technical Media.



to guarantee maximum transfer in the real life situation. Current research does not have a precise answer to this question. Studies in transfer of training indicate that the more similar the two situations are, the more transfer will occur from the first to the second situation.⁸⁵

Townsend's research on the Link ME-1 Basic Flight Trainer in 1956 concentrated on the determination of realism needed for the ME-1 to provide for effective practice in the learning of inexperienced pilots. He concluded that the Link ME-1 does not simulate enough of the aircrew job complex and that certain dimensions of flight simulations for training purposes can be systematically degraded without reducing the amount of positive transfer.⁸⁶

Military research in the past ten years has concentrated on the effectiveness of "hardware" to provide proficiency in tasks needed for the Armed Services considerable attention has been directed to the problem of

⁸⁵ John C. Townsend, Evaluation of the Link, ME-1, Basic Instrument Flight Trainer Development Report, AFPTRC-TN 56-84 (Randolph Air Force Base, Texas: Air Force Personnel and Training Research Center, Air Research and Development Command, June, 1956), p. 111.

⁸⁶ Robert S. French, Norman A. Crowder, and Joseph A. Tucker, The K-System MacI Trouble-Shooting Trainer: Effectiveness in an Experimental Training Course Development Report AFPTAC-TN-56-120 (Lowry Air Force Base, Colorado: Maintenance Laboratory, Air Force Personnel and Training Research Center, Air Research and Development Command, October, 1956), p. 52.



fidelity of simulation, i.e., how accurately must aspects of the operational task be reproduced to secure maximum positive transfer.⁸⁷

Two schools of thought exist in the military literature on the fidelity needed for simulation. One school is conservative and argues for exact precision and fidelity. Their contention is that the realism of a high-fidelity simulator enhances learner motivation and that the learner consequently gains greater transfer benefits from the simulation. The other school contends that the conservative position is partially warranted but that there is evidence to support low fidelity as not seriously influencing positive transfer of learning.

In studying the reaction of a pursuit tracking task, Morin found that the size of the target in training had no negative effect in the transfer trials when subjects were required to track either a more difficult, smaller target or an easier, larger target. Transfer was positive and 100 per cent complete, indicating that the precision of response required in training was of no consequence in determining the amount of transfer.⁸⁸

⁸⁷ Ibid.

⁸⁸ R. E. Morin, "Transfer of Training Between Motor Tasks Varying in Precision of Movement Required to Score," American Psychology (June, 1951), 6.390.



Green employed the same task and procedures but extended Morin's work by increasing the range of the target sizes. Again, transfer was positive and complete (100 per cent) with response precision in the training trials exercising no influence on performance in the transfer trials.⁸⁹

In general, experiments on response precision show that high-fidelity simulation of this variable is not necessary for high positive transfer.

Does it follow, then, that a simulation game should be rejected for classroom use of its propositions about reality do not stack up against the evidence? Sidney Verba pointed out that "the social model in the simulation need not look in all respects like the real world, but only in those aspects relevant to the study at hand."⁹⁰

Summary

The research reviewed in this chapter is summarized in Table 1. The review found: (1) the application of educational simulation in military, university, teacher training, and secondary education; (2) the favorable and

⁸⁹R. F. Green, "Transfer of Skill on a Following-Tracking Task as a Function of Task Difficulty (Target Size)," Journal of Psychology, XII, 5 (August, 1955), 355-70.

⁹⁰Sidney Verba, "Simulation, Reality and Theory in International Relations," World Politics, XVI, 3 (April, 1964), 490-521.



TABLE 1.--Summary of the major educational simulation studies.

Study	Simulation Type	Results or Generalization
<u>Military</u>		
T. J. McQuigan J. A. Adams	Simulators: Flight Simulators Radar Scope Training	effective in teaching identification skills, operational procedures, discrimination skills, and psycho-motor skills
John C. Townsend	Link, ME-1 Basic Instrument Flight Trainer	high realism is necessary to guarantee maximum transfer in the real life situation: the more similar the two situations are, the more transfer will occur from the first to the second situation
R. E. Morin	Pursuit Tracking Simulator	no relationship between high realism and transfer of learning
Richard E. Barringer Robert D. Specht	War Games	used to refine, plan and increase the efficiency of decision-making
<u>Business and Industry</u>	In-Basket Simulations	used for the development and application of vocational skills and the accumulation of realistic experience in role performance
N. Frederickson D. R. Saunders Barbara Ward		



TABLE 1.-- (Cont'd.)

Study	Simulation Type	Results or Generalization
J. M. Kibbee C. J. Craft	Top Management Decision Game	teaches basic concepts of marketing, finance, and management
C. R. Klasson	Business Gaming	games improve self-assurance, decision-making ability
<u>Teacher Training</u> E. Fergenbaum Paul Kjeldergaard	Elementary Perceiver and Memorizer Model	used to test theoretical assumptions in models of learning
Bert Kersh Donald E. Cruickshank James Beaird John T. Standish	Classroom Simulators	used to motivate teachers and counselors in teaching; was at least effective as an equal amount of student-teaching
<u>Instructional Games</u> <u>University</u> Harold Guetzkow	International Simulation	used for the development and testing of hypotheses and theory in international relations
C. F. Hermann Alfred Flook	International Simulation	neuristic purpose of producing many alternative outcomes
John R. Raser Wayman J. Crow	International Simulation	used to test predictions and theories concerning international events in the real world



TABLE 1.-- (Con'td).

Study	Simulation Type	Results or Generalization
Lee Anderson	Internation Simu- lation	games produce student motivation and interest among university undergraduates
Cleo H. Cherryholmes	Internation Simu- lation	games promote more interest and motivation in high school teaching
Sarane S. Boocock	Legislative Game Campaign Game	student interest and moti- vation promoted
Sarane S. Boocock	City Council Game Ghetto Game Disaster Game Community Organization Life Career Game	game induces iconic learning and produces motivation and interest
Dale M. Garvey William H. Seiler	Internation Simu- lation	games produce more motivation and interest
John Raser	Project SIMILE	produces more initial student involvement and motivation during the play of a game but drops to pre-game levels after a few days
Paul Dekock	Sunshine Game	attitude change is directly related to information intake

unfavorable aspects of educational simulation; (3) the effectiveness of simulation on motivation, learning retention, and critical thinking in high school social studies teaching; and (4) a discussion of a rationale for using simulation games.

It can be concluded that simulations developed by the Armed Forces are effective in teaching identification skills, operational skills, and psycho-motor skills. The military studies indicated that as much learning takes place when a simulator is used as in traditional teaching methods. Advantages cited by the military include: cost-effectiveness, low operation cost, its use in high risk situations, a savings of time and cost of instruction.

The military simulation designers have been unable to specify the degree of realism necessary to guarantee maximum learning transfer. The literature has no precise answer to this question.

The results of using "in-basket" simulation in business revealed that there are no significant differences between in-basket simulation as compared with conventional techniques of instruction. Basically, this form of simulation has been used to gain insight into business roles, problems, and decision-making. The major conclusion reached by investigations was that more student-motivation and interest resulted from the "in-basket" technique of simulation.



Hundreds of simulation games are being used by teachers in many high schools and universities. The effectiveness of simulation games is uncertain. Cherry-holmes, in his review of six investigations, concluded that simulation produced increased student-interest. Some studies indicate that as much content learning takes place in the game as in traditional classroom experiences. The conclusion reached is that simulation games produce more student-motivation and interest but there are no consistent or significant differences in learning retention, critical thinking, or attitude change.

Advantages of using simulation games in social studies instruction include: (1) simulation can provide experiences in effective learnings as well as cognitive learning; with a simulation there may be greater transfer from the game to the real life situation; (2) simulation provides the students with a responsive environment, giving them a greater role in involvement; (3) simulation can provide experiences in a low cost model of a high cost environment (military simulation); medical intern can make a "fatal" mistake without loss of life; (4) simulation can provide short term experience in long term processes; simulation allows practice in decision-making in a timeless environment; and (5) simulation can provide for the development of theories and the testing of theories.

The disadvantages of simulation as a method of instruction include: (1) it is difficult to design the



fidelity to the real situation in the variables relevant for transfer in the life situation; (2) most simulation programs are not validated; and (3) there are no guiding principles for their use in classroom.

In summary, there is evidence to suggest that simulation games are powerful learning experiences for students and that students have certain feelings about games which have largely been ignored by the research and their educational effectiveness. Moreover, the problem is even more complicated if what one wants to test is a hunch that what is learned by simulation games is not so much the content as it is the process of integrating information, the interpersonal communication and decision-making.



CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

Included in this chapter are discussions of the methodological aspects of the research, including the hypotheses, research design, experimental procedure, instrumentation, data analyses, procedure and a summary of methodology.

The specific hypotheses tested in the study were:

H_1 Teachers participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity on the standardized index of polydiagnostic association sets) than toward lecture-discussion.

$$U_d > 0$$

H_0 $U_d = 0$ Let $\alpha = .01$

H_2 Teachers participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than teachers who have not participated in a simulation game. $U_t > U_c$

H_0 $U_t = U_c$ Let $\alpha = .01$

H_3 High school students participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean



score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than toward lecture-discussions.

$$U_d > 0$$

$$H_0 \quad U_d = 0 \quad \text{Let } \alpha = .01$$

H_4 Students participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than students who have not participated in simulation games. $H_1 : H_0$ is false

$$H_0 \quad U_1 = U_2 \dots U_8 \quad \text{Let } \alpha = .01$$

Research Design

Eight small groups of high school students were formed randomly from eight selected high schools in Hawaii. Six groups were treated experimentally in that each group participated in a simulation game. The other two groups served as control groups. Differences in attitude between students in the experimental groups and students in the control group were measured by the polydiagnostic method of forced ranked scores on selected sets of the polydiagnostic index. Two groups of twenty-four Hawaii high school teachers were randomly selected from a listing of social studies teachers in the Hawaii Council for Social Studies. One group was treated experimentally by participating in a selected simulation game. The other group served as a control group. Differences in attitudes between teachers in the experimental group and teachers in the control group were measured by the polydiagnostic



method of forced ranked scores on selected sets of the polydiagnostic index (Appendix A).

The experimental design was adapted from D. I. Campbell and J. C. Stanley's "Design 6--The Post-Test only Control Group Design," 1963. This procedure was selected because of the unique mode of teaching with simulation games in which a pre-test was not available, and because the large number of groups available required that the post-test be delivered to students as a single natural package. Stanley indicated:

The pre-test is a concept deeply embedded in the thinking of research workers in education and psychology. It is not actually essential to true experimental designs.¹

He suggested that the most adequate assurance of lack of initial biases between groups is randomization. "Randomization can suffice without the pre-test."² He indicated that the design is particularly useful when experimenting with "methods for the initial introduction of new subject matter, for which pre-tests in the ordinary sense are impossible, just as pre-tests on believed guilt or innocence would be inappropriate in a study of the effects of lawyers' briefs upon a jury."³

¹Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago: Rand McNally and Company, 1963), p. 25.

²Ibid.

³Ibid., p. 31.



The design controls for most other important variables include the effects of maturation, history, instrumentation, regression, selection, and mortality. However, it does not control the interaction of selection and treatment.

Included in the design was a testing for effects extended in time, that is the post-tests were administered to the subjects over one month, two months, and three months after the experimental treatment. The rationale for the time extension to the design exists in studies of attitudinal change by Howland and his associates. Stanley stated: "They have repeatedly found that long term effects are not only quantitatively different but also qualitatively different."⁴

The disadvantage introduced by adding the "time effects" feature to Design 6 was the introduction of an interaction between the treatment and the specific events occurring between post-tests.

Specifically the design of this experiment followed the paradigm:

		Time ₁	Time ₂	Time ₃
R	X _{Teacher Control}	0 ₁		
R	X _{Teacher Experimental Crisis Game}	0 ₂		

⁴Ibid., p. 32.



	Time ₁	Time ₂	Time ₃
R X _{No Treatment}	0 ₃		
R X _{INS}	0 ₄		
R X _{DP}	0 ₅		
R X _{Crisis Game}		0 ₆	
R X _{Western Ghetto Game}		0 ₇	
R X _{Lecture Discussion}		0 ₈	
R X _{Black/White}			0 ₉
R X _{Sunshine}			0 ₁₀

The deviations from Campbell and Stanley's "Design 6" were the inclusion of a time extension feature, the non-treatment control section in which students participated only in the post-test and the use of the polydiagnostic method which is a standardized technique for eliciting patterns of associations in quantitative form.

The seven experimental sections included one group of teachers and six groups of students. The three control sections included two student control groups and one teacher control group. All groups were randomly selected (R) and post-tested (O) using the polydiagnostic method of forced ranked scores on five sets of the polydiagnostic index.



The teacher experimental group (X-Crisis Game) received the treatment of the simulation game and the teacher control group received no treatment.

Six of the eight student groups served as experimental sections (X--INS, X--Dangerous Parallel, X--Crisis Game, X--Ghetto Game, X--Black/White, and X--Sunshine Game). Each of the experimental groups participated in a Simulation Game while the remaining two student groups served as control sections. One group (X--No treatment) received no treatment while the other (X--Lecture-Discussion) received a lecture-discussion activity.

After receiving the treatments each group was asked to respond to the Polydiagnostic Inventory which operates with a fixed set of stimulus materials and the subject's responses are a function of how he chooses and orders them.⁵

Bennett stated that "the Polydiagnostic Index was originally developed for the assessment of thought and personality as they relate to psychologic diagnosis for clinical and educational purposes" and that "it has recently been applied to public opinion, attitude and mood analysis, consumer motivation studies, and small group research."⁶

⁵Edward M. Bennett, "The Polydiagnostic Method: A Technique for Multi-variate Social and Clinical Research," The Journal of Psychology, XLII (1956), 207. (Hereinafter referred to as "Polydiagnostic Method.")

⁶Edward M. Bennett, "Communications Through Limited-Response Questioning," Public Opinion Quarterly, XXVIII (1954), 303.



He described the method as a psychophysical method which obtains objective information relevant to subjective experience.⁷

He stated:

The object or objects to be studied are specified. Then one or more sets of qualities are devised to include all those qualities assumed to characterize in significant ways the object in question. The person whose subjective feelings are to be assessed is presented with each set of qualities in turn and uses them to judge a given object. Just as there may be more than one set of qualities used, there may be more than one object judged during each evaluation. In general, the number of items, let us say n , in a set must be divisible by h , the number of steps or degrees of sensitivity desired in the final rating scale. The quotient of this division, q , is the number of items that the subject chooses at one time in his effort to describe the object under investigation. From the set of n qualities before him, the person under study is asked to select those of which he feels meet some standard established for him. Then, from the remaining $n-q$ qualities he again chooses q according to the same standard. From the then remaining $n-zq$ he once again selects q . Then he selects q from $n-3q$, and so on, until only the last q qualities remain unchosen. Each of the qualities chosen in the first set of q is given a cardinal score of $q-1$. The next chosen q qualities are scored $q-2$. This continues until the final unchosen q qualities are scored $q-q$ or zero.⁸

In other words, the procedure calls for presenting a student with a standardized set of fifteen descriptive adjectives. He is asked the question, "How do you feel about XXX?" He makes his judgment and chooses three terms and the instructions are repeated, using the twelve

⁷Bennett, "Product and Design Evaluation," p. 523.

⁸Ibid., p. 525.



remaining terms and the student again selects three. He has nine words and is instructed to select three terms from the remaining nine. And finally, he selects three from six, leaving three terms.⁹

In this way the student structures his thinking about the referent under consideration and forms a unique pattern of the fifteen terms in the standardized set.

Experimental Procedures

The study was divided into two phases: (1) an assessment of the subjective feelings of teachers who have never used simulation games, and (2) an assessment of the subjective feelings of students who have never participated in a simulation game in comparison with the more traditional method of lecture-discussion in social studies instruction.

The following procedures were used in the study: First, fifty social studies teachers in Hawaii were randomly selected from a list of social studies teachers who were members of the Hawaii Council for the Social Studies. Each teacher was selected on the criterion that he or she had never participated in or used a simulation game in their instruction.

⁹Edward M. Bennett, Larry R. Cohen, and Dorothy Kemler, "Preliminary Standardization of the Polydiagnostic Index," The Journal of Psychology, XLIII (1957), 307. (Hereinafter referred to as "Preliminary Standardization.")



Forty-eight teachers agreed to participate in the study which was conducted on January 10, 1970 at the Hawaii Social Studies Council Meeting. A summary of the characteristics of the teacher treatment group is described in Table 2; the number of years teaching experience is found in Table 3. A summary of the characteristics of the teacher control group is described in Table 4 and the number of years teaching experience for the control group in Table 5. The social studies teachers were randomly assigned into an experimental group which participated in the game and the control group which received no treatment. The number in each group was twenty-four. Immediately following the treatment, each group was given an identical post-test using the polydiagnostic Index.

In phase II of the study, eight teachers volunteered to select randomly twenty-four students from their respective schools for the assessment of student feelings toward simulation games. The schools listed in Table 6 participated in the study.

Each teacher selected a sample of twenty-four students on the criterion that the student had never played a simulation game. The sample was selected by taking every third name from an alphabetical list, after throwing a die to determine the starting point.

The selected students from the ten high schools were divided according to a table of random numbers into the six experimental sections ($N = 144$) and two control



TABLE 2.--Summary of the characteristics of treatment teacher sample: Male and female.

Age	Number	
	Male	Female
20-25	4	3
25-30	4	5
30-35	2	1
35-40	1	0
40-45	1	1
45-50	2	0
Total	14	10

TABLE 3.--Number of years teaching experience of teachers in the treatment group.

Years of Experience	Number
1-5	11
5-10	8
10-15	5
Total	24



TABLE 4.--Summary of the characteristics of control teacher sample: Male and female.

Age	Number	
	Male	Female
20-25	2	4
25-30	3	3
30-35	4	2
35-40	2	1
40-45	0	3
45-50	0	0
Total	11	13

TABLE 5.--Number of years teaching experience of teachers in the control group.

Years of Experience	Number
1-5	9
5-10	11
10-15	3
15-20	1
Total	24



TABLE 6.--Summary of schools participating in the study.

Name	Location	Public or Private
Kohala High School	Big Island, Hawaii	Public
Maui High School	Maui, Hawaii	Public
Baldwin High School	Maui, Hawaii	Public
Kapaa High School	Kauai, Hawaii	Public
Kamehameha Schools	Honolulu, Hawaii	Private
Kalani High School	Honolulu, Hawaii	Public
Farrington High School	Honolulu, Hawaii	Public
Waipahu High School	Waipahu, Hawaii	Public

sections ($N = 24$). The experimental subject students were then placed, following a table of random numbers into six groups of twenty-four with an instructor who was familiar with the materials. The six selected games were assigned randomly to the six experimental groups. The experimental groups were instructed by written communication identical for all, regarding the group's purpose and guideline for operation; the groups were given the appropriate simulation game materials without a rigid structure and played accordingly.

In a meeting prior to the beginning of the experimental session, all participating social studies teachers were oriented to roles expected in the study. They could



discuss the rules of the simulation game with students and interact with them. They were asked not to lecture.

The experimental groups were scheduled to meet and play the game until closure. The study began on February 16, 17, and 18, 1970 for the control group (X--no treatment) with twenty-four Kalani High School students, the Farrington High School students played the International Simulation (X--INS) and the Kamehameha High School students playing the (X--DP) Dangerous Parallel Simulation.

Three groups were post-tested immediately after their participation of the simulation game (X--no treatment, X--INS, and X--DP).

The experimental groups (X--Ghetto, X--lecture-discussion, X--Black/White, and X--Sunshine) were administered the treatment on the following consecutive weeks. The Kohala High School sample on the Big Island participated in the Ghetto game; Baldwin High School sample played the Black and White game; and Waipahu High School sample played the Sunshine game. Each of the groups were given the post-test after a month delay.

The control students in Section I (lecture-discussion) and the control students (no treatment group) were similarly placed by a table of random numbers into two groups.

These groups received written guidelines identical to those of the experimental groups. They were essentially identical to the six experimental groups except for the

materials used. The control group section I, Kapaa High School sample, was given a 15-minute lecture on American Foreign Policy and were encouraged to fully discuss any matters relating to the lecture.

The students in the "no treatment" control group, Maui High School sample, were told nothing about the materials.

At the end of the treatment period all experimental and control subjects were post-tested using the poly-diagnostic index.

The results of the randomly selected sets of adjectives were analyzed according to procedure described in the instrumentation section of this chapter.

Instrumentation

The polydiagnostic method is a forced-choice procedure designed to elicit patterns of associations in a quantitative form. The procedure calls for presenting the student with a standardized set of fifteen descriptive adjectives. There are twenty such sets each of known reliability and standardized. The polydiagnostic index, according to Bennett, "is restricted to the areas of (1) self-concept, (2) motives, (3) values, and (4) concept of the social environment."¹⁰ Thus, this instrument was selected because it is specifically designed to

¹⁰ Bennett, "Preliminary Standardization," p. 310.



measure the subjective feelings of teachers and students in a rigorous and quantitative form. If one would merely ask students, in a general fashion to tell us what they think about something or how they feel about something, the result of the inquiry would be of little value.

The twenty sets of adjectives vary as to social connotation. Some are positive, others are negative or bi-modal. The positive sets are selected on evidence of being socially acceptable and encouraged qualities of thinking, feeling, or being. The negative sets are opposite in nature and considered to have socially unacceptable qualities. The bi-modal sets contain words which depend to a very large extent on the person or situation for their connotative direction.¹¹

The words also vary in level of abstraction. Some lists are highly specific; others more general. There is also variability in level of reality. Five sets of fifteen terms each were selected from the polydiagnostic index. The lists of adjectives are presented in Table 7.

In both phases of the research, the post-test was identical for teachers and students. They were presented with the post-test (Appendix A) which listed the first set of terms and asked: "From the set of words below choose three words which you think most describe the way students

¹¹Bennett, "Polydiagnostic Method," p. 210.

TABLE 7.--Polydiagnostic association sets.

cold	bold	clever	angry	anxious
cunning	conservative	critical	ashamed	bitter
dependent	definite	delicate	cheap	cruel
distant	different	direct	evil	false
hard	formal	funny	fearful	fierce
innocent	humble	independent	foolish	guilty
modern	liberal	mental	hasty	helpless
old-fashioned	mysterious	natural	jealous	lazy
progressive	particular	passionate	loud	lying
remote	proud	quiet	nervous	reckless
severe	restless	sensitive	rough	rude
shy	sharp	shrewd	savage	shallow
soft	simple	smooth	silly	slow
strict	solemn	stern	vain	weary
youthful	suspicious	sweet	wicked	wild

feel about simulation games in their social studies instruction." The subjects made their choices and the three terms were crossed out of the set leaving twelve terms. The administration continued, "Again, choose the three words which you think now most describes the way students, in general, feel about simulation games in their social studies instruction." Again, three words were selected and crossed out. The administration continued with the subject selecting three more words until three residual words were left. In this manner the subject progressed through the five lists of fifteen associations each.

Each of the fifteen items within a set is assigned a score on the basis of when it was chosen. Each characteristic is scored +4 if it is chosen within the first choice; +3 if it is chosen second; +2 if it is chosen third; +1 if it is chosen fourth; and 0 if it is one of the three words left over.

The same procedure was used for each subject in respect to lecture-discussion activity, except that in the instructions, the word "lecture-discussion" was substituted for the word "Simulation game." Both the word sets and the instructions were alternated in order of presentation. The words within each set, however, were left in their standardized form.

In summarizing the validity of the instrument, three reservations are noted. First, Bennett's data do

not discuss the socio-economic level of subjects used in the standardization group. Second, the population used were chosen from the urban northeast; and third, the distributions were skewed with respect to age. Bennett states:

As cases are added to the standardization pool to increase the total size of the group and as the geographical and socio-economic distributions are increased, precision may then be possible.¹²

He suggests when using the index in a normative analysis of individual patterns to accept only association patterns which are above the seventy-fifth or below the twenty-fifth percentiles.

Data Analysis Procedures

Several dimensions of data analysis were carried out in this research. In reviewing these procedures, it would be useful to first summarize the data collected as part of the experiment. There are for each student and teacher participant of a simulation game a post-test of rank-ordered scores on five selected sets of words from the polydiagnostic index. Two scores for each subject for each of the seventy-five characteristics were calculated. One score was associated with simulation games, the second with the lecture-discussion. Mean scores were calculated for each of the seventy-five characteristics for simulation

¹²Ibid., p. 311.

games and for lecture-discussion. Theoretically, 4.0 is the highest possible mean and reflects maximum closeness of association of the term and the method of instruction. A mean of 0 reflects maximum distance of association between the term and the mode of instruction. A mean greater than 2.47 or less than 1.53 is significantly different from that expected on the basis of chance at the 1 per cent level of confidence.

The first hypothesis, $H_1: U_d > 0$ was tested using the test for mean differences. The statistic $t = \frac{(\bar{D} - \mu_d)}{S_{\bar{D}}}$ is recommended by William Cochran for self-pairing in which a single individual is measured for differences in the effects of two treatments or procedures.¹³ In the analysis, the deviations $D_1 - D_2$ are assumed to be normally and independently distributed with population mean zero. The value of μ_d is seldom known, but the sample furnishes an estimate:

$$S_D = \sqrt{\frac{\sum (D_1 - D_2)^2}{n-1}}$$

The statistic follows students' t distribution with (n-1) d.f., where n is the number of self-pairs.

The second hypothesis, $H_2: U_t > U_c$ was tested using the test for comparison of the means of two

¹³William G. Cochran and George W. Snedecor, Statistical Methods (Ames, Iowa: Iowa State University Press, 1967), p. 272.

independent samples. The test of significance was again based on the t distribution where t had the value:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (U_1 - U_2)}{S_{\bar{X}_1 - \bar{X}_2}}$$

The H_3 was tested using the t-test for mean differences in the same manner as used in testing the H_1 .

The fourth hypothesis was tested using the procedure described for Snedecor and Cochran for the one way analysis of variance.¹⁴ The quantity: $F = \frac{MS_W}{MS_B}$ was the criterion for testing the null hypothesis that the population means are the same in all treatments. Once the f-test was completed, an analysis of the difference between pairs of means of the eight groups were analyzed. The tests for differences used was the Studentized Range:

$$Q = \frac{(\bar{X}_{\max} - \bar{X}_{\min})}{S_{\bar{X}}}$$

The Q method has the property that if we test some or all of the differences between pairs of means, the probability that no erroneous claim of significance will be made is ≥ 0.95 .

¹⁴Ibid.

Summary

It is hypothesized that students and teachers who participate in a simulation game would have a more positive attitude toward simulation as a method of instruction than students who were not exposed to such contact.

The student and teacher participants were randomly selected from eight public and private high schools in Hawaii and were post-tested using the polydiagnostic index. The test for mean differences was applied to the post-test scores to examine the experimental vs. control group differences on each significant association. Follow-up interviews were held with participants to assess their responses to the project, as a source of supplementary descriptive data.

A detailed analysis of the project data is reported in Chapter IV.

CHAPTER IV

ANALYSIS OF RESULTS

Included in this chapter are the results from the data gathered through the use of the polydiagnostic inventory on the feelings of teachers and students toward simulation games compared to their feelings toward lecture-discussion as a method of social studies instruction.

The hypotheses examined in this study were:

H_1 Teachers participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity on the standardized index of polydiagnostic association sets than toward lecture-discussion).
 $U_d > 0$

H_0 $U_d = 0$ Let $\alpha = .01$

H_2 Teachers participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets than teachers who have not participated in a simulation game). $U_d > X_c$

H_0 $U_d = X_c$ Let $\alpha = .01$

H_3 High school students participating in a simulation game will have a more positive attitude toward

simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than toward lecture-discussion. $U_d > 0$

$$H_0 \quad U_d = 0 \quad \text{Let } \alpha = .01$$

H_4 Students participating in a simulation game will have a more positive attitude toward simulation (a significantly higher mean score of intensity association on sets of qualities on the standardized index of polydiagnostic association sets) than students who have not participated in simulation games. (H_0 is false)

$$H_0 \quad X_t = X_c \quad \text{Let } \alpha = .01$$

$$U_1 = U_2 = U_3 = U_4 = U_5 = U_6 = U_7 = U_8$$

In phase one of the study two scores for each of forty-eight teachers on each of the seventy-five characteristics were obtained. One score was associated with the simulation game used in the treatment group and the second toward their feelings toward the conventional lecture-discussion method of Social Studies instruction.

In phase two of the study, two scores for each of 192 students participating in the study for each of the seventy-five characteristics were obtained. One score was associated with the simulation game used in the six experimental treatments sections and the second with the students' feelings toward conventional lecture-discussion methods.

Mean scores were calculated for each of the seventy-five characteristics for simulation games and for lecture-discussion for both teachers and students in the

treatment groups and in the control groups. The highest possible mean for the characteristic is 4.00 and reflects maximum closeness of association of the term and the method of instruction. A mean of zero reflects the maximum distance of association between the term and the mode of instruction. A mean score greater than 2.47 or less than 1.53 is significantly different from that expected on the basis of chance at the .01 level of confidence. The .01 level of confidence was used to establish cutting lines for the seventy-five characteristics. The scores were divided into three groups those of significant high intensity, those not significantly different from chance expectancy, and those of significant low intensity.

A breakdown excluding the terms not significantly different from chance expectancy for the teacher treatment sample of the study are presented in Table 8. The significantly high intensity associations for teachers who participated in the simulation game included the terms: shrewd, clever, independent, progressive, different, bold, dependent, and critical while the terms not associated to simulation games included cold, solemn, quiet, youthful, innocent, funny, old-fashioned, humble, simple, soft, and shy.

The emotional associations toward lecture-discussion by the teacher treatment group are presented in Table 9. The significantly high intensity associations

TABLE 8.--Emotional associations of teacher treatment group toward simulation games as a method of instruction.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Shrewd	3.41
Clever	3.25
Independent	3.12
Progressive	2.95
Different	2.87
Bold	2.87
Dependent	2.85
Critical	2.83
<u>Significantly Low Intensity Associations</u>	
Cold	1.50
Solemn	1.45
Quiet	1.41
Youthful	1.37
Innocent	1.33
Funny	1.33
Old-fashioned	.91
Humble	.79
Simple	.75
Soft	.70
Shy	.66

TABLE 9.--Emotional associations of teacher treatment group toward lecture discussion as a method of instruction.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Critical	3.00
Direct	2.83
Independent	2.83
Restless	2.58
<u>Significantly Low Intensity Associations</u>	
Mysterious	1.50
Old-fashioned	1.45
Strict	1.41
Formal	1.41
Smooth	1.41
Shy	1.25
Soft	1.04
Mental	1.00
Sweet	.41
Passionate	.33

included the terms critical, direct, independent, restless, while the terms not associated toward lecture-discussion included the terms mysterious, old fashioned, strict, formal, smooth, shy, soft, mental, sweet, and passionate.

The emotional associations for the teacher control group which received no treatment are reported in Table 10. The significantly high intensity associations toward simulation games included the terms progressive, dependent, clever, and modern. Terms not associated to simulation games included strict, quiet, restless, stern, natural, cold, youthful, sharp, proud, simple, sensitive, formal, mental, old fashioned.

The teacher control group's associations toward lecture-discussion are presented in Table 11. Significantly high intensity associates included the terms sever, formal, humble, shy, natural, bold, innocent, smooth, mental, simple, old fashioned, dependent, delicate, progressive, mysterious, modern, youthful, proud, and quiet.

The significant mean scores of high intensity association for teachers were analyzed using the self-pairing method for mean differences. Table 12 presents the mean differences for teacher feelings toward simulation games and for lecture-discussion. From these data, the t-test mean difference was:

TABLE 10.--Emotional associations of teachers in control group toward simulation games as a method of instruction.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Progressive	2.95
Dependent	2.70
Clever	2.66
Modern	2.54
<u>Significantly Low Intensity Associations</u>	
Strict	1.51
Quiet	1.51
Restless	1.51
Stern	1.51
Natural	1.45
Cold	1.41
Youthful	1.41
Sharp	1.41
Proud	1.25
Simple	1.20
Sensitive	1.20
Formal	1.08
Mental	1.04
Old-fashioned	.95
Shy	.85

TABLE 11.--Emotional associations of teachers in control group toward lecture discussion as a method of instruction.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity of Associations</u>	
Distant	2.58
Cold	2.58
Restless	2.58
<u>Significantly Low Intensity of Associations</u>	
Severe	1.50
Formal	1.50
Humble	1.41
Shy	1.41
Natural	1.41
Bold	1.41
Innocent	1.37
Smooth	1.37
Mental	1.33
Simple	1.33
Old-fashioned	1.29
Dependent	1.29
Delicate	1.25
Progressive	1.20
Mysterious	1.20
Modern	1.16
Youthful	1.04
Proud	.85
Quiet	.62

TABLE 12.--Mean differences of teacher attitudes toward simulation games and lecture discussion on the standardized index of polydiagnostic association sets.

Association	Simulation		Lecture Discussion		Difference		Difference Minus the Mean	
	X		Y		X-Y	Squared	d-D	
Shrewd	3.41		1.95		1.46	2.1316	.835	
Clever	3.25		2.29		.96	.9216	.335	
Independent	3.12		2.83		.29	.0841	-.335	
Progressive	2.95		2.25		.70	.4900	.075	
Dependent	2.85		2.25		.60	.3600	-.025	
Critical	2.82		3.00		-.17	.0289	.795	
Different	2.70		2.25		.45	.2025	-.175	
Bold	2.66		1.95		.71	.5041	.085	
Total	23.77		18.77		5.00	4.7228	1.590	

$$D = \frac{ED}{n} = .625$$

$$Sd^2 = n \frac{(ED_1^2) - (ED_1)^2}{n(n-1)} = .228$$

$$H_0: \mu_D = 0$$

$$H_a: \mu_D > 0$$

$$t = \frac{\bar{D} - \mu_d}{S_d/n} = 1.836 \quad \alpha = .01$$

$$t = \frac{\bar{D} - \mu_d}{\hat{S}_d/\sqrt{n}} = 1.836$$

where the standard error of difference of mean was:

$$S_d^2 = \frac{n(\sum D_1^2) - (\sum D_1)^2}{n(n-1)} = .228$$

A one-tailed test using the decision rule reject H_0 $t > 2.998$ with the d.f. = 8 was used. The null hypothesis $H_0: U_d = 0$ could not be rejected at the .01 per cent level of confidence. It can be concluded that Social Studies teachers who participated in a simulation game did not have a more positive attitude toward simulation games than toward lecture-discussion on sets of qualities on the standardized index of polydiagnostic association sets ($U_d = 0$).

The significant mean scores of intensity for the teacher treatment group and teacher control group were analyzed into mean differences presented in Table 13. From this data the t for mean difference was:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{S_p^2 \left(\frac{1}{n} + \frac{1}{n} \right)}}$$

where the pooled estimate of variance was:

$$S_p^2 = \frac{(n_1 - 1)\hat{S}_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2} = 2.527$$

TABLE 13.--Mean scores of teachers who participated in a simulation game compared to teachers who did not participate in a simulation game.

Association	Simulation Treatment		No Treatment	
	X_1	X_2	Y_2	Y_2
Shrewd	3.41	11.63	1.91	3.65
Clever	3.25	10.56	1.83	3.35
Independent	3.12	9.73	1.66	2.76
Progressive	2.95	8.70	2.95	8.70
Different	2.87	8.24	2.08	4.33
Bold	2.87	8.24	1.41	1.99
Dependent	2.85	8.12	2.70	7.29
Critical	2.83	8.01	2.29	5.25
Total	24.15	73.23	16.83	37.31

$$\bar{X}_1 = 3.01$$

$$\bar{Y}_2 = 2.10$$

$$\hat{S}_1 = .089$$

$$\hat{S}_2 = .272$$

$$s_p^2 = 2.527$$

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2 \left(\frac{1}{n} + \frac{1}{n} \right)}} = 1.158$$

A one-tailed test using the decision rule reject H_0 if $t > 1.345$ with d.f. = 14.

The null hypothesis $H_0: U_t = U_c$ could not be rejected at the .01 per cent level of confidence. It can be concluded that there were no significant differences between teachers who participated in a simulation game and teachers who did not participate in a simulation game on index of polydiagnostic association sets ($U_t = U_c$).

The analysis of data for student attitudes toward simulation and lecture-discussion followed the same procedures used for the teacher sample. First, two scores on each of the seventy-five characteristics were obtained using the polydiagnostic test. One score was associated with the simulation game used in the treatment group and the second toward the student's feeling toward lecture-discussion as a method of instruction. The mean scores for each student sample are divided into three groups those of significant high intensity, those not significantly different from chance expectance and those of significant low intensity. A mean score greater than 2.47 or less than 1.53 is significantly different from that expected on the basis of chance at the .01 level of confidence.

A breakdown of associations excluding the terms that were not significantly different from chance expectation for each student group is presented in Table 14 through Table 29.

Significant associations toward simulation for students participating in the simulation "Ghetto" are presented in Table 14; for students participating in the "Internation" simulation, Table 15; for students participating in the "Crisis" game, Table 16; for students participating in the "Black and White" game, Table 17; for students participating in the "Sunshine" game, Table 18; for students participating in the "Dangerous Parallel" game, Table 19; for the student control group who played no simulation game but participated in a lecture-discussion activity, Table 20; and for the student control group which received no treatment, Table 21.

The emotional associations for student feelings toward lecture-discussion excluding terms that were not significantly different from change expectation for students participating in the "Ghetto" game are presented in Table 22; for students participating in the "Internation" simulation, Table 23; for students participating in the "Crisis" game, Table 24; for students participating in the "Black and White" game, Table 25; for students participating in the "Sunshine" game, Table 26; for students participating in the "Dangerous Parallel" game, Table 27; for students participating in a control treatment of lecture-discussion, Table 28; and for students participating in a no-treatment control group, Table 29.

The significant mean scores for each of the six student treatment group were analyzed using the self-pairing

TABLE 14.--Emotional associations toward simulation of the student treatment group participating in the ghetto game simulation.

Characteristics	Mean Intensity of Association
-----------------	----------------------------------

Significantly High Intensity Associations

Clever	3.25
Cunning	3.25
Bold	2.87
Independent	2.79
Progressive	2.70
Sharp	2.66
Critical	2.66
Shrewd	2.62

Significantly Low Intensity Associations

Youthful	1.50
Funny	1.50
Innocent	1.41
Passionate	1.41
Formal	1.20
Quiet	1.20
Humble	1.16
Mysterious	1.16
Mental	1.16
Solemn	1.12
Simple	1.04
Direct	1.04
Old-fashioned	1.00
Soft	.91
Shy	.85
Sweet	.45

TABLE 15.--Emotional associations toward simulation of the student treatment group participating in the international simulation.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Clever	4.00
Independent	4.00
Progressive	4.00
Bold	3.95
Shrewd	3.75
Cunning	3.54
Modern	3.50
Liberal	3.33
Different	3.12
Hard	3.08
Critical	3.08
Dependent	3.04
Sharp	3.04
Direct	3.04
Proud	2.66
<u>Significantly Low Intensity Associations</u>	
Restless	1.45
Mysterious	1.37
Solemn	1.33
Quiet	1.29
Innocent	1.12
Humble	1.08
Simple	.95
Delicate	.95
Soft	.91
Mental	.91
Passionate	.91
Old-fashioned	.75
Shy	.70
Sweet	.45

TABLE 16.--Emotional associations toward simulation of student treatment group participating in the crisis simulation.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Clever	3.77
Progressive	3.66
Bold	3.58
Cunning	3.50
Independent	3.45
Shrewd	3.04
Sharp	2.95
Modern	2.87
Direct	2.83
Dependent	2.70
Stern	2.70
Suspicious	2.66
Proud	2.66
Youthful	2.58
Liberal	2.58
Hard	2.54
<u>Significantly Low Intensity Associations</u>	
Funny	1.50
Formal	1.37
Delicate	1.25
Mental	1.20
Soft	1.12
Shy	1.04
Solemn	1.04
Passionate	.95
Humble	.95
Simple	.85
Old-fashioned	.79
Sweet	.45

TABLE 17.--Emotional associations toward simulation of student treatment group participating in the black and white game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Cunning	4.00
Progressive	3.83
Modern	3.75
Clever	3.37
Different	3.12
Distant	3.00
Independent	3.00
Natural	2.83
Critical	2.79
Liberal	2.54
Stern	2.54
<u>Significantly Low Intensity Associations</u>	
Simple	1.45
Mental	1.45
Humble	1.33
Formal	1.25
Solemn	1.25
Cold	1.00
Passionate	1.00
Sweet	.95
Old-fashioned	.54

TABLE 18.--Emotional associations toward simulation of the student treatment group participating in the sunshine game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Clever	4.00
Cunning	3.87
Shrewd	3.77
Progressive	3.75
Independent	3.65
Bold	3.54
Modern	3.50
Liberal	3.25
Different	3.12
Direct	3.12
Critical	3.12
Dependent	2.83
Suspicious	2.83
Hard	2.79
<u>Significantly Low Intensity Associations</u>	
Innocent	1.50
Passionate	1.50
Solemn	1.45
Youthful	1.41
Restless	1.20
Simple	1.12
Shy	1.08
Delicate	1.04
Old-fashioned	.95
Soft	.70
Sweet	.66

TABLE 19.--Emotional associations toward simulation of the student treatment group participating in the dangerous parallel game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Clever	3.66
Progressive	3.54
Cunning	3.25
Independent	3.20
Bold	3.12
Modern	3.04
Different	3.04
Critical	3.00
Shrewd	2.87
Sharp	2.70
Stern	2.58
<u>Significantly Low Intensity Associations</u>	
Mysterious	1.45
Remote	1.41
Smooth	1.41
Delicate	1.37
Solemn	1.33
Simple	1.20
Humble	1.12
Soft	1.08
Shy	1.00
Passionate	.85
Mental	.85
Old-fashioned	.75
Sensitive	.70
Sweet	.58



TABLE 20.--Emotional associations toward simulation of the student control group participating in lecture discussion activity.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Clever	2.79
Progressive	2.70
<u>Significantly Low Intensity Associations</u>	
Formal	1.37
Mental	1.37
Severe	1.29
Funny	1.25
Smooth	1.20
Restless	1.16
Mysterious	1.08
Quiet	1.04
Simple	1.00
Delicate	.85
Youthful	.81
Solemn	.81
Innocent	.79
Sensitive	.79
Old-fashioned	.75
Passionate	.66
Soft	.50
Humble	.50
Sweet	.50
Shy	.50

TABLE 21.--Emotional associations toward simulation of the student control group receiving no treatment.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Modern	3.41
Progressive	3.12
Different	3.04
Cunning	2.91
Clever	2.87
Dependent	2.70
Hard	2.66
Shrewd	2.58
<u>Significantly Low Intensity Associations</u>	
Strict	1.41
Humble	1.41
Solemn	1.41
Formal	1.37
Mysterious	1.25
Delicate	1.25
Mental	1.25
Cold	1.20
Quiet	1.20
Innocent	.95
Old-fashioned	.95
Soft	.95
Funny	.91
Shy	.70
Passionate	.70
Sweet	.45

TABLE 22.--Emotional associations toward lecture discussion of student treatment group participating in the ghetto game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Critical	3.25
Distant	3.20
Remote	2.83
Cold	2.83
Restless	2.66
Different	2.66
<u>Significantly Low Intensity Associations</u>	
Severe	1.41
Liberal	1.29
Simple	1.20
Delicate	1.20
Shy	1.20
Innocent	1.16
Modern	1.12
Soft	1.12
Passionate	1.08
Proud	1.04
Youthful	1.04
Smooth	.85
Sweet	.37

TABLE 23.--Emotional associations toward lecture discussion of student treatment group participating in the international simulation.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Critical	4.00
Direct	3.58
Remote	3.52
Restless	3.33
Conservative	3.20
Distant	3.12
Definite	3.04
Dependent	3.00
Cold	2.81
Formal	2.79
Stern	2.70
Particular	2.70
Natural	2.62
Hard	2.58
<u>Significantly Low Intensity Associations</u>	
Innocent	1.41
Solemn	1.41
Delicate	1.25
Mysterious	1.20
Funny	1.16
Soft	1.12
Mental	1.05
Passionate	.91
Sweet	.66

TABLE 24.--Emotional associations toward lecture discussion of the student treatment group participating in the crisis game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Distant	4.00
Shy	3.75
Critical	3.54
Remote	3.29
Restless	3.08
Dependent	2.87
Different	2.79
Direct	2.70
Independent	2.66
Shrewd	2.62
Sensitive	2.54
<u>Significantly Low Intensity Associations</u>	
Soft	1.41
Proud	1.41
Cunning	1.33
Mental	1.25
Modern	1.16
Sweet	.95
Passionate	.75

TABLE 25.--Emotional associations toward lecture discussion of the student treatment group participating in the black and white game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Critical	3.87
Restless	3.58
Distant	3.41
Cold	2.79
Hard	2.79
Old-fashioned	2.79
Formal	2.79
Direct	2.70
Quiet	2.54
<u>Significantly Low Intensity Associations</u>	
Progressive	1.41
Bold	1.41
Smooth	1.37
Cunning	1.25
Modern	1.00
Proud	.91
Sweet	.81
Passionate	.54

TABLE 26.--Emotional associations toward lecture discussion of the student treatment group participating in the sunshine game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Distant	3.77
Conservative	3.29
Cold	3.12
Different	3.12
Remote	3.08
Hard	3.04
Restless	3.00
Independent	3.00
Dependent	3.00
Quiet	2.95
Direct	2.95
Critical	2.91
Stern	2.87
Natural	2.70

TABLE 27.--Emotional associations toward lecture discussion of the student treatment group participating in the dangerous parallel game.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Critical	3.25
Restless	3.04
Direct	2.95
Stern	2.83
Distant	2.83
Hard	2.62
Old-fashioned	2.54
<u>Significantly Low Intensity Associations</u>	
Shrewd	1.45
Mental	1.45
Delicate	1.45
Humble	1.45
Cunning	1.33
Bold	1.29
Innocent	1.25
Youthful	1.08
Clever	1.04
Mysterious	1.04
Sweet	.85
Proud	.66
Passionate	.45

TABLE 28.--Emotional associations toward lecture discussion of the student control group participating in a lecture discussion activity.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Distant	4.00
Restless	2.66
<u>Significantly Low Intensity Associations</u>	
Shrewd	1.50
Stern	1.45
Sharp	1.41
Progressive	1.41
Different	1.37
Clever	1.25
Modern	1.25
Simple	1.20
Sensitive	1.20
Bold	1.16
Humble	1.16
Youthful	1.16
Mysterious	1.12
Suspicious	1.12
Formal	1.08
Proud	1.08
Innocent	.95
Cunning	.95
Mental	.85
Passionate	.85
Smooth	.85
Delicate	.79
Funny	.79
Soft	.79
Sweet	.33

TABLE 29.--Emotional associations toward lecture discussion of the student control group receiving no treatment.

Characteristics	Mean Intensity of Association
<u>Significantly High Intensity Associations</u>	
Restless	3.20
Critical	3.04
Direct	2.62
Different	2.54
<u>Significantly Low Intensity Associations</u>	
Cunning	1.45
Modern	1.45
Humble	1.41
Simple	1.33
Innocent	1.29
Soft	1.29
Old-fashioned	1.25
Shy	1.25
Conservative	1.20
Delicate	1.16
Mysterious	1.12
Sensitive	1.12
Funny	1.04
Proud	.79
Sweet	.70
Passionate	.54

method for mean differences. Table 30 presents the mean differences for student attitudes toward simulation games and toward lecture-discussion for the treatment of the "Ghetto" game. From these data the t-test for mean difference was:

$$t = \frac{\bar{D} - \mu_d}{\hat{S}_d/n} = 1.2144$$

where the standard error of differences was .53. A one-tailed test using the decision rule to reject H_0 if $t > 2.998$ with the d.f. = 8 was used. The null hypothesis $U_d = 0$ was rejected at the .01 per cent level of confidence. It can be concluded that students who participate in the "Ghetto" game have more positive attitudes toward simulation games than toward lecture-discussion as a method of instruction on sets of qualities on the standardized index of polydiagnostic association sets.

Table 31 presents the mean differences for students who participated in the "Internation" game toward simulation games and toward lecture-discussion. From these data, the t-test for mean differences was $t = \frac{\bar{D} - \mu_d}{\hat{S}_d/n} = 1.2144$ where the standard error of difference = 9.625. A one-tailed test using the decision rule to reject H_0 : $U_d = 0$ if $t > 2.718$ with the d.f. = 15 was used. The null hypothesis $U_d = 0$ could not be rejected at the .01 per cent level of confidence. It can be concluded that there are no significant differences of students who participated in the "Internation" game toward simulation as a method



TABLE 30.--Mean score differences toward simulation and lecture discussion of students who participated in the ghetto game.

Association	Simulation		Lecture- Discussion		Differences		Differences Squared	
	$\bar{X}_1$		$\bar{X}_2$		d		d^2	
Clever	3.25		2.45		.80		.64	
Cunning	3.25		1.66		1.59		2.53	
Bold	2.87		2.04		.83		.69	
Independent	2.79		1.62		1.17		1.37	
Progressive	2.70		1.54		1.16		1.35	
Sharp	2.66		1.87		.79		.62	
Critical	2.66		3.25		-.59		.35	
Shrewd	2.62		2.37		.25		.63	
Total	22.80		16.80		6.00		8.18	

$$\bar{D} = .75$$

$$\hat{S}_d = .53$$

$$t = \frac{D - \mu_d}{S_d/n} = 8.131$$

$$H_0: \mu_d = 0$$

$$H_1: \mu_d > 0$$

Reject H_0 if t with 8 d.f. > 2.998

TABLE 31.--Mean score differences toward simulation and lecture discussion of students who participated in the interation simulation.

Association	Simulation X_1	Lecture- Discussion X_2	Differences d	Differences Squared d^2
Clever	4.00	2.50	1.50	2.25
Independent	4.00	2.25	1.75	3.06
Progressive	4.00	1.91	2.09	4.37
Bold	3.93	2.12	1.81	3.28
Shrewd	3.75	2.50	1.25	1.56
Cunnint	3.54	2.00	1.54	2.37
Modern	3.50	1.62	1.88	3.53
Liberal	3.33	2.08	1.25	1.56
Different	3.12	2.37	.75	.56
Hard	3.08	2.58	.50	.25
Critical	3.08	4.00	-.92	.85
Dependent	3.04	3.00	.04	.16
Sharp	3.04	2.37	.67	.45
Direct	3.04	3.58	-.54	.29
Proud	2.66	1.62	1.04	1.08
Total	51.11	36.50	14.61	25.62

$$\bar{D} = .974$$

$$\hat{S}_d = 93.44$$

$$t = \frac{D - \mu_d}{S_d/n} = 1.2144$$

$$H_0: \mu_d = 0$$

$$H_1: \mu_d > 0$$

Reject H_0 if t with 15 d.f.
is greater than 2.718

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of instruction than toward lecture-discussion on sets of qualities on the standardized index of polydiagnostic associations sets.

Table 32 presents the mean score differences of students who participated in the "Crisis" game toward simulation games as a method of instruction and toward lecture-discussion. From these data the t-test for mean differences was $t = \frac{\bar{D} - \mu_d}{s_{d/n}} = 18.514$ where the standard error of difference was .78. A one-tailed test using the decision rule to reject H_0 if $t > 2.583$ with d.f. = 15 was used. The null hypothesis $U_d = 0$ was rejected at the .01 per cent level of confidence. It can be concluded that students who participate in the "Crisis" game have a more positive attitude toward simulation games than toward lecture-discussion in sets of qualities on the standardized index of polydiagnostic association sets.

Table 33 present the mean differences for students who participated in the "Black and White" game for their feelings toward simulation games and for their feelings toward lecture-discussion. From these data, the t-test for mean differences was $t = \frac{\bar{D} - \mu_d}{s_{d/n}} = 10.384$ where the standard error of difference was 1.296. A one-tailed test using the decision rule to reject H_0 if $t > 2.821$ with d.f. = 9 was used. The null hypothesis $U_d = 0$ was rejected at the .01 per cent level of confidence. It can be concluded that students who participated in the "Black and

TABLE 32.--Mean score differences toward simulation and lecture discussion of students who participated in the crisis game.

Association	Simulation		Discussion		Differences		Differences Squared		Difference Minus the Mean	
	x_1	x_2	d		d^2		$d-d$		$d-d$	
Clever	3.77	2.16	1.61		2.59		.72			
Progressive	3.66	2.04	1.61		2.92		.82			
Bold	3.58	1.95	1.63		2.65		.74			
Cunning	3.50	1.33	2.17		4.70		1.28			
Independent	3.45	2.66	.79		.62		-.10			
Shrewd	3.04	2.62	.42		.18		-.47			
Sharp	2.95	1.66	1.29		1.66		.40			
Modern	2.87	1.16	1.71		2.92		.82			
Direct	2.83	2.70	.13		.16		-.76			
Dependent	2.70	2.87	-.17		.29		1.06			
Stern	2.70	1.87	.83		.69		-.06			
Suspicious	2.66	2.41	.25		.63		-.64			
Proud	2.66	1.41	.25		.63		-.64			
Youthful	2.58	1.87	.71		.50		-.18			
Liberal	2.58	1.83	.75		.56		-.14			
Hard	2.54	2.37	.17		.29		1.06			
Total	48.07	32.91	14.25		21.99		3.91			

$$\bar{D} = .89$$

$$S_d^2 = .620$$

$$S_d = .78$$

$$\text{reject } H_0 \text{ if } t_{n-1} \text{ d.f. } > 2.583$$

$$H_0: \mu_d = 0$$

$$H_1: \mu_d = 0$$

$$t = \frac{D - \mu_d}{S_d/n} = 18.514$$



TABLE 33.--Mean score differences toward simulation and lecture discussion of students who participated in the black and white game.

Association	Simulation		Lecture Discussion		Differences		Differences Squared	
	$\bar{x}_1$		$\bar{x}_2$		$\bar{d}$		$\bar{d}^2$	
Cunning	4.00		1.25		3.75		14.06	
Progressive	3.83		1.44		2.39		5.71	
Modern	3.75		1.00		2.75		7.56	
Clever	3.37		1.62		1.75		3.06	
Different	3.12		2.37		.75		.56	
Distant	3.00		3.41		-.41		.19	
Independent	3.00		2.20		.80		.64	
Natural	2.79		1.87		.92		.85	
Liberal	2.54		1.91		.63		.39	
Stern	2.54		2.41		.13		.17	
Total	31.94		19.48		13.46		33.19	

$$\bar{D} = 1.346$$

$$H_0: \mu_d = 0$$

$$S_d^2 = 1.681$$

$$H_1: \mu_d > 0$$

$$S_d = 1.296$$

$$\text{Reject } H_0 \text{ if } t_{n-1} \text{ d.f. } \geq 2.821$$

$$t = \frac{\bar{D} - \mu_d}{S_d/\sqrt{n}} = 10.384$$

White" game have a more positive attitude toward simulation games as a method of instruction than toward lecture-discussion on sets of qualities on the standardized index of polydiagnostic association sets.

Table 34 presents the mean differences for students who participated in the "Sunshine" game. Emotional feelings toward simulation games were compared toward emotional feelings toward lecture-discussion. From these data, the t-test for mean differences was $t = \frac{\bar{D} - \mu_d}{s_{d/n}} = 17.456$ where the standard error of differences was .560. A one-tailed test using the decision rule reject H_0 if $t > 2.718$ with d.f. = 11 was used. The null hypothesis $U_d = 0$ was rejected at the .01 per cent level of confidence. It can be concluded that students who participate in the "Black and White" game have a more positive attitude toward simulation games than toward lecture-discussion as a method of instruction on sets of qualities on the standardized index of polydiagnostic association sets.

Table 35 presents the mean differences for students who participated in the "Dangerous Parallel" game for their feelings toward simulation games as a method of social studies instruction and toward lecture-discussion. From these data, the t-test for mean differences was $t = \frac{\bar{D} - \mu_d}{s_{d/n}} = 15.118$ where the standard error of differences was .921. A one-tailed test using the decision rule to reject H_0 if $t > 1.372$ with d.f. = 11 was

TABLE 34.--Mean score differences toward simulation and lecture discussion of students who participated in the sunshine game.

Association	Simulation		Lecture Discussion		Difference		Difference Squared	
	$\bar{X}_1$		$\bar{X}_2$		d		d^2	
Clever	4.00		2.29		1.71		2.92	
Cunning	3.87		2.29		1.58		2.50	
Shrewd	3.77		2.41		1.36		1.84	
Progressive	3.75		2.33		1.42		2.02	
Independent	3.65		3.00		.65		.42	
Bold	3.54		1.95		1.59		2.53	
Modern	3.50		2.25		1.25		1.56	
Different	3.12		3.12		. .		. .	
Critical	3.12		2.91		.21		.44	
Dependent	2.83		3.00		-.17		.28	
Suspicious	2.83		2.54		.29		.84	
Hard	2.79		3.04		-.25		.62	
Total	40.77		31.13		9.64		15.97	

$$\bar{D} = .803$$

$$S_d^2 = .748$$

$$S_d = .560$$

$$t = \frac{\bar{D} - \mu_d}{S_d/n} = 17.456$$

$$H_0: \mu_d = 0$$

$$H_1: \mu_d > 0$$

$$\text{Reject } H_0 \text{ if } t_{n-1} \text{ d.f.} > 2.718$$



TABLE 35.--Mean score differences toward simulation and lecture discussion of students who participated in the dangerous parallel game.

Association	Simulation X_1	Lecture Discussion X_2	Difference d	Difference Squared d^2	Difference Minus the Mean $d-d$
Clever	3.66	1.04	2.62	6.86	1.35
Progressive	3.54	1.62	1.92	3.69	.65
Cunning	3.25	1.33	1.92	3.69	.65
Independent	3.20	2.33	.87	.75	-.40
Bold	3.12	1.29	1.83	3.35	.56
Modern	3.04	1.08	1.96	3.84	.69
Different	3.04	2.25	.79	.62	-.48
Critical	3.00	3.25	-.25	.63	1.52
Shrewd	2.87	1.45	1.42	2.02	.15
Sharp	2.70	1.58	1.12	1.25	-.15
Stern	2.58	2.83	-.25	.63	1.52
Total	34.00	20.05	13.95	27.33	6.06

$$\bar{D} = 1.27$$

$$S_d^2 = .960$$

$$S_d = .921$$

$$t = \frac{D - \mu_d}{S_d/n} = 15.118$$

$$H_0: \mu_d = 0$$

$$H_1: \mu_d > 0$$

$$\text{Reject } H_0 \text{ if } t_{n-1} \text{ d.f. } \geq 1.372$$

Point est. of μ_d and interval is
given by $1.27 \pm .115$

used. The null hypothesis $U_d = 0$ was rejected at the .01 per cent level of confidence. It can be concluded that students who participate in the "Dangerous Parallel" game have a more positive attitude toward simulation games as a method of instruction than toward lecture-discussion on sets of qualities on the standardized index of poly-diagnostic association sets.

A one-way analysis of variance was used to analyze the mean scores of the eight treatments. Table 36 presents the mean scores of the eight treatments. The sums of the squares are presented in Table 37. From these data, the F-test was 5.32. The decision rule to reject H_0 if $F = \frac{MS_B}{MS_w} = 3.12$. The null hypothesis $H_0: U_1 = U_2 = U_3 \dots U_8$ was rejected at the .01 per cent level of confidence. It can be concluded that there are differences between the means of the eight treatments.

The Studentized Range Test $Q = \frac{(\bar{X}_{\max} - \bar{X}_{\min})}{S_{\bar{X}}}$ was used to test the differences when F ratio is significant. The criterion was $Q = .888$ such that any difference of $\pm .89$ or more is significant at the $P = .05$ level. Table 38 presents all pair-wise differences between means in the eight treatment groups.

Using the Studentized Range Test criterion, it can be concluded that significant differences exist between the mean of the control group which received no treatment and the means of all other treatment groups; that significant differences exist between the mean of the

TABLE 36.--Mean score differences for the eight student treatment groups.

Character- istic Association	T ₁		T ₂		T ₃		T ₄		T ₅		T ₆		T ₇		T ₈	
	Student Control No Treatment	X ²	Student Control Lec. Discussion	X	Student Simulation Crisis	X ²	Student D.P.	X	Ghetto	X ²	Internation Simulation	X	Sunshine	X ²	Black & White	X ²
Modern	3.41	11.63	2.08	4.33	2.87	8.24	3.04	9.24	2.20	4.84	3.50	12.25	3.50	12.25	3.75	14.06
Progressive	3.12	9.73	2.12	4.49	3.66	13.40	3.25	10.56	2.70	7.29	4.00	16.00	3.75	14.06	3.83	14.67
Different	3.04	9.24	2.08	4.34	3.77	14.21	3.04	9.24	2.25	5.06	3.12	9.73	3.12	9.73	3.12	9.73
Cunning	2.91	8.47	2.29	5.24	3.50	12.25	3.25	10.56	3.25	10.56	3.54	12.53	3.87	14.98	4.00	16.00
Clever	2.87	8.24	2.79	7.78	3.77	14.21	3.66	13.40	3.25	10.56	4.00	16.00	4.00	16.00	3.37	11.36
Dependent	2.70	7.29	1.79	3.20	2.70	13.69	2.41	5.80	2.29	5.24	3.04	9.18	2.83	8.01	3.00	9.00
Hard	2.66	7.08	1.58	2.50	2.54	6.45	2.37	5.62	2.45	6.00	3.08	9.49	2.79	7.78	2.20	4.84
Shrewd	2.58	6.66	2.12	4.49	3.04	9.24	2.87	8.24	2.62	6.86	3.75	14.06	3.77	14.21	2.00	4.00
	23.36		16.85		25.85		23.89		21.01		28.03		27.63		25.27	
		68.34		36.37		91.69		72.66		56.41		99.24		97.02		83.66

$$H_0: 1 = 2 = 3 = 4 = 5 = 6 = 7 = 8 \quad \alpha = .001$$

$$H_1: H_0 \text{ is false}$$

TABLE 37.--Analysis of variance table (ANOVA) for the eight treatments.

Source	Sums of Squares	Degrees of Freedom	Mean	F
Between Treatments	12.14	7	1.73	5.32
Within Treatments	18.18	56	0.325	
Total	30.32	63	2.055	

lecture-discussion treatment and the mean of "Crisis" game treatment, the mean of "Dangerous Parallel," the mean of the "Internation" game treatment, the mean of the "Sunshine" game treatment, and the mean of the "Black and White" game treatment. The major exception was that there were no significant differences between lecture-discussion and the "Ghetto" game.

Thus, it can be concluded that students who participate in a simulation game have a more positive attitude toward simulation than students who have not participated in a simulation game.

In sum, teacher and student mean scores of intensity association toward simulation and lecture-discussion on sets of qualities on the standardized index of polydiagnostic association sets were analyzed. Table 39 summarizes the hypotheses tested, the test statistics, the significance level, and a statement of rejection or acceptance of the null hypothesis.

TABLE 38.--Pair-wise differences between means of the eight treatment groups.

Mean Groups Scores	Mean Groups Scores						
	II	III	IV	V	VI	VII	VIII
	2.10	3.23	2.98	2.62	3.50	3.45	3.15
No Treatment I	= 4.92	2.18	1.69	1.94	2.30	1.42	1.47
Lecture Discussion II	= 2.10	1.13	-.88	-.52	-1.40	-1.35	-1.05
Crisis Game III	= 3.23		.25	.61	.73	.22	.68
Dangerous Parallel IV	= 2.98			.36	-.52	-.47	-.17
Ghetto Game V	= 2.62				-.88	-.83	.53
Internation Game VI	= 3.50					-.05	-.35
Sunshine VII	= 3.45						.30
Black and White	= 3.15						0

TABLE 39.--Summary of tested hypotheses.

Hypothesis	Method, Test Results, and Decision Rule	Significance Level and Statement of Rejection or Acceptance
1. $H_1: \mu_d > 0$ $H_0: \mu_d = 0$ Teachers participating in a simulation game will have a more positive attitude toward simulation than toward lecture-discussion. A higher mean score on sets of qualities in the Standardized Index of Polydiagnostic Association sets.	Self-pairing method for testing mean difference: $t\text{-test} = 1.837$ Decision rule: reject H_0 if t_{n-1} $d.f. > 2.998$	$P = .01$ if $t > 2.998$ The H_0 could not be rejected. $H_0: \mu_d = 0$ was accepted
2. $H_1: \mu_t = \mu_c$ $H_0: \mu_t = \mu_c$ Teachers participating in a simulation game will have a more positive attitude toward simulation as a method of instruction than teachers who did not participate in a simulation game. (A higher mean score on sets of qualities in the Polydiagnostic Association sets.)	Test for comparing two independent sample means: $t\text{-test using pooling variance } t = 1.158$ Reject H_0 if $t_{n/2-2}$ $d.f. = 1.345$	$P = .01$ if $t > 1.158$ The H_0 could not be rejected and the $H_0: \mu_d = 0$ was accepted
3. $H_1: \mu_d > 0$ $H_0: \mu_d = 0$ High school students participating in a simulation game will have a more positive attitude toward simulation than toward lecture-discussion as a method of instruction. (A higher mean score on sets of qualities on the Standardized Index of Polydiagnostic Association sets.)	Self-pairing method for testing mean differences: $t\text{-test for each group}$	
a. Students participation in the Ghetto Game	$t = 8.837$ Decision rule: reject H_0 if t_{n-1} d.f. = 2.998	The null hypothesis was rejected at the .01 per cent level of significance.
b. Students participating in the Internation Game.	$t = 1.2144$ Decision rule: reject H_0 if $t_{n-1} = 2.718$	Failed to reject the H_0 at the .01 per cent level of significance.
c. Students participating in the Crisis Game	$t = 18.514$ Decision rule: reject H_0 if t_{n-1} d.f. = 2.583	The null hypothesis was rejected at the .01 per cent level of significance
d. Students participating in the Black and White Game	$t = 10.384$ Decision rule: reject H_0 if t_{n-1} d.f. = 2.821	The null hypothesis was rejected at the .01 per cent level of significance.
e. Students participating in the Sunshine Game.	$t = 17.456$ Decision rule: reject H_0 if t_{n-1} d.f. = 2.718	The null hypothesis was rejected at the .01 per cent level of significance
f. Students participating in the Dangerous Parallel Game.	$t = 15.118$ Decision rule: reject H_0 if t_{n-1} d.f. = 1.372	The null hypothesis was rejected at the .01 per cent level of significance.
4. High school students participating in a simulation game will have a more positive attitude toward simulation than students who have not participated in a simulation game. (A higher mean score on sets of qualities in the Standardized Index of Polydiagnostic Association sets.)	Analysis of variance: $F\text{-test}$ $F = 5.32$ Decision rule: reject $F_{1, 46} (01)$ if equal to 3.12 Studentized Range Test (Q)	The H_0 was rejected at the .01 per cent level of significance. Significant differences exist between the means of the control group which received no treatment and all the game treatments.
$H_0: \mu_1 = \mu_2 = \dots = 8$ $H_1: H_0$ is false Pair differences of all means were tested	Decision rule: any difference of $\pm .89$ or more is significant at the $P = .05$ level.	

The analysis of results showed that teachers who participated in a simulation game felt that simulation as a method of instruction was "shrewd, clever, independent, progressive, different, bold, dependent, and critical," while lecture-discussion was "critical, direct, independent, and restless." Students who participated in a simulation game felt that simulation as a method of instruction was "clever, cunning, bold, independent, progressive, sharp, shrewd, modern, liberal, proud, youthful, and hard," while students felt that lecture-discussion was "critical, direct, remote, restless, conservative, distant, cold, formal, stern, hard, old-fashioned, quiet, and natural."

When the teachers' feelings toward simulation were compared to their feelings toward lecture-discussion method the analysis of data showed no significant differences in feelings due to a simulation game treatment.

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

Summary of the Study

This study was an assessment of the feelings of high school teachers and students from eight public and private high schools in Hawaii toward simulation games in comparison to their feelings toward lecture-discussion methods in social studies instruction. It attempted to provide teachers with data about how students feel about the new simulation game materials so that Hawaii's Social Studies teachers would begin to integrate simulation methodology into their instruction.

Specifically, the study was concerned with: (1) the personal reaction of students who participated in a simulation game compared to students who have not participated in a simulation game; (2) the differences in student feeling toward simulation as a method of instruction compared to lecture-discussion as a method of instruction; (3) the personal reaction of teachers who participated in simulation games compared to teachers who have not participated in simulation games; and (4) the

differences in teacher feeling toward simulation games compared to their feeling toward lecture-discussion as a method of instruction.

The procedure of research included an extensive review and critical analysis of the research on the value of simulation games.

The literature on educational simulation revealed that the military has successfully used simulation to teach identification skills, operational skills, and psycho-motor skills; that studies on the use of "in-basket simulation" compared with conventional techniques of instruction has shown no significant differences and that studies on the effectiveness of simulation games at both the university and high school levels is uncertain. The conclusion reached was that simulation games produce more student-motivation, but that there were no consistent or significant differences in learning retention, critical thinking, or attitude change.

Experimental Procedures

Experimental procedures were used to investigate the differences in student and teacher feelings toward simulation games compared to lecture-discussion as a method of social studies instruction. One-hundred and ninety-two students from eight selected high schools in Hawaii were randomly selected and assigned to six experimental treatment groups and two control groups. The



experimental groups participated in a selected simulation game and one control group received no treatment. The other control group participated in a lecture-discussion activity. Forty-eight high school teachers in Hawaii were randomly selected from a list of social studies teachers who are members of the Hawaii Council for the Social Studies. They were randomly assigned to an experimental section and a control section. The experimental treatment was the participation in a simulation game; the control section received no treatment. Both student and teacher groups were selected on the criterion that they had never participated in a simulation game. All subjects were administered the post-test consisting of sets of adjectives from the Standardized Polydiagnostic Index. Data collected as part of the study included rank-ordered scores on five selected sets of characteristics from the Polydiagnostic Index. Two scores for each subject for each of the seventy-five characteristics were calculated. One score was associated with simulation games; the second, associated with the lecture-discussion method of instruction. Mean score differences in the effects of the treatment for the teacher group and for the six experimental student treatment groups were analyzed using the t-test for mean differences, one-way analysis of variance, and the Studentized Range Test.



Conclusions

Several conclusions are supported on the basis of analysis of data gathered for this study.

1. Teachers selected from the Hawaii Council for the Social Studies and who participated in a simulation game, associated simulation with innovation. Significant terms of high intensity included the words: shrewd, clever, progressive, and modern as indicated in Table 7 and are most popularly related to simulation game method of instruction, while the association least related to simulation games included cold, solemn, quiet, youthful, old-fashioned, simple, shy, sweet, and passionate. The teacher feeling toward lecture-discussion included the terms: critical, direct, independent, restless.
2. Teachers who did not participate in a simulation game also associated the terms: progressive, dependent, clever, and modern. The same was true of the low intensity associations toward simulation which included the words: strict, quiet, restless, stern, natural, cold, youthful, sharp, and proud as indicated in Table 9. Their feeling toward lecture-discussion was similar in that they

associated the terms: distant, cold, and restless toward lecture-discussion as a method of instruction.

3. High school students in Hawaii who participated in the six selected simulation games also had high opinions even after delay of up to two months in the testing of their associations. They felt in all six treatments that simulation is associated to clever, cunning, bold, independent, progressive, sharp, critical, and shrewd as indicated in Table 13 and modern, different, liberal, and proud as indicated in Table 14. Terms least associated to simulation included youthful, funny, passionate, formal, humble, quiet, mental, simple, old-fashioned, soft, and sweet.
4. High school students in Hawaii who did not participate in any simulation games did not have as many intense associations toward simulation games. Students who participated in the no-treatment group felt simulation games were innovative by associating the words clever and progressive.
5. The feelings of Hawaii high school students toward lecture-discussion also had a negative connotation. Highly associated terms included critical, distant, remote, cold, restless, different as indicated in Table 21. Terms such as

conservative, formal, stern, hard, sensitive, and shy were significantly associated. In each student group all students felt that lecture-discussion was distant and remote and cold; thus, giving a feeling of impersonalization to lecture-discussion methods. Yet, for students the terms associated to simulation all related more to personalization of instruction.

6. Hawaii Social Studies teachers who participated in a simulation game did not have a more positive attitude toward simulation games than toward lecture-discussion.
7. There were no significant differences in the feelings toward simulation games between Hawaii Social Studies teachers who participated in a simulation game and Hawaii Social Studies teachers who did not participate in a simulation game.
8. High school students in Hawaii who participated in the Ghetto game had a more positive attitude toward simulation than toward lecture-discussion as a method of instruction.
9. High school students in Hawaii who participated in the Internation simulation did not have a more positive attitude toward simulation than toward lecture-discussion as a method of instruction.



10. High school students in Hawaii who participated in the Crisis game had a more positive attitude toward simulation games than toward lecture-discussion.
11. High school students in Hawaii who participated in the Black and White game had a more positive attitude toward simulation games than toward lecture-discussion.
12. High school students who participated in the Sunshine game had a more positive attitude toward simulation games than toward lecture-discussion.
13. High school students in Hawaii who participated in the Dangerous Parallel game had a more positive attitude toward simulation than toward lecture-discussion.
14. High school students in Hawaii who participated in five of the six selected simulation games had a more positive attitude toward simulation than students who did not participate in a simulation game.

Implications of the Study

John Dewey observed that the key to serious learning in education is now "how much involvement" but "how to involve." The finding of this study certainly supports that view.



The experimental treatment involved the participation of a group of teachers and six groups of students participating in six selected simulation games. The groups were given only minimal instructions and the rules of the game; no specific objective, no follow-up of the game, and essentially no structure except the simulation materials and three-hour meeting schedule. The assumption implicit in the discussion was that a simulation game would produce a more positive attitude toward simulation as a method of instruction than toward lecture-discussion. To the degree one may legitimately generalize from the results of this research, the implication for secondary social studies teachers seen clear:

1. High school students seek learning experience in terms of their perception of the ways in which they are involved. They look for techniques which break the passive reaction to learning that occurs under conventional methods of instruction.
2. Much research is needed on the application of simulation materials to the area of teacher-student inter-personal relations in secondary education. For example, what structure for teacher behavior in this project might have produced other specific changes.



3. The real impact of the simulation game was in the human interaction which took place in the small group. Thus, some type of follow-up study on the participants in this project should be made after one year, three years, or five to assess such factors as attitudes of more able students, average ability, and remedial students toward simulation.
4. The research carried out in this study was based on available constructed games for a single session. More research is needed on a continuous use of simulation gaming in the classroom versus other methods or, in fact, a study based on students who design, play, and re-design their own stimulations.
5. The study implied a wide spread enthusiasm for games as an educational method, but no attempt was made to measure what games teach. Research is needed on the effect simulation games have for the learning of concepts and relationships.

Recommendations

In the course of working with social studies teachers in Hawaii and analyzing the data presented in this study, ideas for further study became apparent. These ideas are presented as recommendations:

1. The effects of simulation games upon the personalities of students and teachers should be studied. The design would use the omnibus personality inventory which assess selected attitudes, values, and interests.
2. There is a need to study the psychological factors affecting the design and use of simulation games. For example, what is the realism necessary in a simulation game for adults compared to high school students or for students from different socio-economic backgrounds.
3. The role of the teacher in using simulation games should be studied. Are there different strategies for using games in high school classrooms? A utilization study is needed to determine the differences among teachers who are currently using simulation games in their classrooms.

General Conclusion

The importance of teacher and student feelings toward new instructional materials and method cannot be over-emphasized. Simulation games are motivating for students and teachers who participate in and who use them in the classroom. The evidence of this study heuristically suggests that the objective of simulation games is to motivate students by presenting relevant and realistic

problems and perhaps the most important learning is what happens after the simulation is over and the effect that the simulation game has on the social setting in which learning takes place.



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APPENDIX

POLYDIAGNOSTIC ASSOCIATION TEST

5. How do you think students in general feel about simulation games in Social Studies instruction? From the set of words below choose the three words which you think most describe the way students in general feel toward simulation games in Social Studies instruction. Mark these words with the letter "A".

bold _____
conservative _____
definite _____
different _____
formal _____
humble _____
liberal _____
mysterious _____
particular _____
proud _____
restless _____
sharp _____
simple _____
solemn _____
suspicious _____

6. Again from the remaining words choose the three words which you think most describes the way students in general feel about simulation games in Social Studies instruction. Mark these words with the letter "B".
7. Again from the remaining nine words choose three words which you think most describes the way students in general feel about simulation games in Social Studies instruction. Mark these words with the letter "C".
8. Again from the remaining six words choose three words which you think most describes the way students in general feel about simulation games in Social Studies instruction. Mark these words with the letter "D".

9. From the set of words below choose the three words which you think most describe the way students feel about simulation games in Social Studies instruction. Mark these words with the letter "A".

clever _____
critical _____
delicate _____
direct _____
funny _____
independent _____
mental _____
natural _____
passionate _____
quiet _____
sensitive _____
shrewd _____
smooth _____
stern _____
sweet _____

10. Again from the remaining words choose the three words which you think most describe the way students in general feel about simulation games in Social Studies instruction. Mark these words with the letter "B".
11. Again from the remaining nine words choose three words which you think most describe the way students in general feel about simulation games in Social Studies instruction. Mark these words with the letter "C".
12. Again from the remaining six words choose three words which you think most describe the way students in general feel about simulation games in Social Studies instruction. Mark these words with the letter "D".

13. How do you think students in general feel about lecture discussion activities in their Social Studies instruction? From the set of words below choose the three words which you think most describe the way students feel about lecture-discussion activities in Social Studies instruction. Mark these words with the letter "A".

cold _____
 cunning _____
 dependent _____
 distant _____
 hard _____
 innocent _____
 modern _____
 old-fashioned _____
 progressive _____
 remote _____
 severe _____
 shy _____
 soft _____
 strict _____
 youthful _____

14. Again from the remaining words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "B".
15. Again from the remaining nine words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "C".
16. Again from the remaining six words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "D".



17. From the set of words below choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "A".

bold _____
conservative _____
definite _____
different _____
formal _____
humble _____
liberal _____
mysterious _____
particular _____
proud _____
restless _____
sharp _____
simple _____
solemn _____
suspicious _____

18. Again from the remaining words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "B".
19. Again from the remaining nine words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "C".
20. Again from the remaining six words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "D".



21. From the set of words below choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "A".

clever _____
 critical _____
 delicate _____
 direct _____
 funny _____
 independent _____
 mental _____
 natural _____
 passionate _____
 quiet _____
 sensitive _____
 shrewd _____
 smooth _____
 stern _____
 sweet _____

22. Again from the remaining words choose three words which you think most describe the way students in general feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "B".
23. Again from the remaining nine words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "C".
24. Again from the remaining six words choose three words which you think most describe the way students feel about lecture-discussion activities in their Social Studies instruction. Mark these words with the letter "D".

25. How do you think students in general feel about simulation games in their Social Studies instruction? From the set of words below choose the three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "A".

anxious _____
 bitter _____
 cruel _____
 false _____
 fierce _____
 guilty _____
 helpless _____
 lazy _____
 lying _____
 reckless _____
 rude _____
 shallow _____
 slow _____
 weary _____
 wild _____

26. Again from the remaining words choose three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "B".
27. Again from the remaining nine words choose three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "C".
28. Again from the remaining six words choose three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "D".

29. From the set of words below choose three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "A".

angry _____
ashamed _____
cheap _____
evil _____
fearful _____
foolish _____
hasty _____
jealous _____
loud _____
nervous _____
rough _____
savage _____
silly _____
vain _____
wicked _____

30. Again from the remaining words select three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "B".
31. Again from the remaining nine words choose three words which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "C".
32. Again from the remaining six words choose three which you think least describe the way students feel about simulation games in their Social Studies instruction. Mark these words with the letter "D".





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