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The Development of a Nutrition Education Game for the Expanded Nutrition Program in Black Hawk County, Iowa

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THE DEVELOPMENT OF A NUTRITION EDUCATION GAME FOR THE EXPANDED NUTRITION PROGRAM IN BLACK HAWK COUNTY, IOWA

Abstract

of a Thesis

Submitted

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

Linda Foster Benedict

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ABSTRACT

The problem of the study was the lack of entertaining and effective ways to teach nutrition in the youth phase of the Expanded Nutrition Program in Black Hawk County, Iowa. The question of the study was can a game be developed which will teach the participants in the youth phase certain nutritional concepts and be appealing to the youth. The author developed a game for the population in the study which was effective in teaching certain cognitive information about nutrition and appeared to be appealing to them. The development of the game included three main steps--review of commercial games, designing a game, evaluating the game. The designing of the game involved playing it with people and revising it.

The objective of the game is for players to learn the names of the twelve key nutrients--riboflavin, niacin, thiamin, iron, calcium, water, protein, carbohydrate, fat, Vitamins A, C and D--their functions in the body, and in what foods they are found.

The game is a board game at which two to four players of the ages ten on up can play. The board consists of three concentric circles divided into eighty-four sections with four "alleyways" equidistant apart. Thirty-six of the sections indicate a need for one of the twelve nutrients, such as "Need Vitamin A." On four of the squares are the words "Any Food Free." Six of the sections indicate that the player who lands on them is to lose 50 cents for cookies, popcorn, potato chips, gum, candy or cookies. The four outer sections along the

alleyways are marked, "Start." Players move plastic tokens around the board according to the number of moves indicated by a throw of dice. The object is to land on a nutrient square on the board. This gives the player the chance to buy a food card from the grocery store with his three dollar fund of play money. Hopefully, the food card will have listed on the back the nutrient on which he landed. If the food does contain the nutrient, the player gets a chance to earn an extra play quarter by selecting the correct function of that nutrient in the body. If he buys a food that does not contain the correct nutrient, he forfeits the money he paid for the food and he forfeits the food card. The food cards are used to cover the nutrient squares on the nutritious person card each player has. The first player to cover all twelve squares is the winner of the game.

The method of evaluation included a one-group pre-test post-test of the game's cognitive effectiveness. A related t test of the pre-test and post-test revealed a significant difference at the .05 level with a score of 4.615. The evaluation also included a rating scale of the appeal of the game administered after the game was played. The average score on the rating scale was 4.4. The scale went from one to five with five being the indication of the greatest appeal.

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This Study by: Linda Foster Benedict

Entitled: The Development of a Nutrition Education Game for the Expanded Nutrition Program in Black Hawk County, Iowa

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To Forest

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CHAPTER I

THE PROBLEM

Statement of the Problem

The problem of this study was the lack of stimulating, entertaining and effective ways to teach nutrition to participants in the youth phase of the Expanded Nutrition Program (ENP) in Black Hawk County, Iowa.

Importance and Background of the Problem

The purpose of nutrition education is to promote optimum health through food and thus contribute to an individual's potential for achieving his goals in life. Every person should have information about nutrition to enable him, throughout his life, to make wise decisions about food choices. Bayley stated that today, more than ever before, there are more opportunities to make poor food choices because of the broad array of new foods available.[1] The age group that will benefit most from nutrition education is the youth while their bodies are still growing and their minds have not yet established hard-to-change food habits.

While people of every age and income should have access to knowledge about nutrition, low-income people are particularly in need since they have fewer resources to work with in selecting their diets.

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[1]"Nutrition Education for Youth," Journal of Home Economics, Vol. 64, No. 2 (February, 1972), p. 34.

It is particularly important for low-income people to know the nutritive value of foods in order to get the most nutrition for their money.

Food programs, such as food stamps and supplementary foods from the U.S. Department of Agriculture, make it possible for low-income persons to obtain food more easily. If low-income people do not have the knowledge to select the most nutritious foods from the grocery stores or to recognize the importance of finding ways to get the supplementary foods into their diets, the purpose of these programs will not be realized.

In the report of the White House Conference on Food, Nutrition and Health, nutrition education was stressed as one means of combating malnutrition. According to the report, "Every American should have access to knowledge of nutrition and its relation to health as well as to the purchasing power to secure food to meet his nutritional requirements."[2] It was also stated in the report that "the need for effective community nutrition education (out-of-school) has never been more critical for all people. With the increasing scope of programs to provide access to food for low-income families, this need is intensified. There must be provided basic information on food and its effect on how we live, grow and keep healthy, if people are to make wise food choices."[3]

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[2]U. S. Superintendent of Documents, White House Conference on Food, Nutrition and Health: Final Report (Washington, D.C.: U.S. Government Printing Office, 1970), p. 170.

[3]Ibid., pp. 173-174.

The purpose of the Expanded Nutrition Program of the Cooperative Extension Service is to bring nutrition education to the people in areas of the country where there is a large concentration of low-income persons. The program has two phases, the adult phase and the youth phase. Since field implementation in January, 1969, its operation has been expanded to reach families in more than 1,000 counties, independent cities and Indian reservations. It is operating in all fifty states, the District of Columbia, Puerto Rico and the Virgin Islands.[4]

In the adult phase of the Expanded Nutrition Program, family food aides are hired to go into low-income homes and work on a one-to-one basis with the homemaker trying to upgrade her knowledge of nutrition. These family food aides are either residents of depressed areas of the country or have a special empathy for and understanding of the people in these depressed areas. Family food aides work under the supervision of an extension home economist.

In the youth phase a professional person is hired to organize cooking and recreation classes for youth. Through these classes, for which food is provided free of charge, it is hoped some nutrition education can be transmitted to the youth. The program is organized nation-wide to be vaguely similar to the 4-H program for youth development in that groups of youth are brought together under the leadership of a volunteer.

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[4]Robert E. Fry, "The Expanded Food and Nutrition Education Program," text of a talk for the Marketing Division at the 1971 National Agricultural Outlook Conference, Washington, D. C., February 24, 1971, p. 1.

Black Hawk County, Iowa, with its largest city Waterloo, was chosen to receive funds for both phases of the Expanded Nutrition Program because of the high percentage of low-income persons living in the county. In 1968 when the initial seven counties were selected for the program, Black Hawk ranked sixth in the state in numbers of low-income persons. Of the 119,367 people in Black Hawk, 13,200 were considered poor, according to the 1960 census report. One of the other statistics looked at was the number of public assistance cases. In 1968 Black Hawk ranked third in the state with 1,751 cases.[5]

Extension personnel agree that the youth phase of the Expanded Nutrition Program (ENP) is difficult to implement because nutrition is a subject not intrinsically interesting to youth. Many youth come to the classes on a voluntary basis to have fun and get some free food. It is the opinion of extension staff that youth would probably not attend activities sponsored by the ENP if they were set up like a school classroom with textbook assignments and lectures. The volunteer leaders of these classes describe some of the participants as below average students at school. Thus, cooking and recreation classes must be entertaining enough to lure the youth. An entertaining and stimulating nutrition education game that children could play at these classes might possibly help the classes better fulfill their purposes.

The following factors were considered when determining the need for a nutrition education game:

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[5]Letter from Margaret K. Yoder, Associate State Leader, Home Economics Program, Cooperative Extension Service, Iowa State University, April 13, 1972.

1. Volunteers in many cases do not have adequate knowledge about nutrition.

2. Volunteers need tools to help them communicate the information to the participants in their classes.

3. Children need to be actively involved during the classes.

4. While the food is cooking, the children play games in many cases anyway. Some of the class locations have games.

At two national conferences ways of teaching nutrition were discussed. At the White House Conference on Food, Nutrition and Health, one of the key ways listed to take nutrition education to the people mentioned was: "Use of games for developing skills in selecting foods which provide the greatest returns in nutrition and family satisfaction for the money spent."[6] At the national Nutrition Education Conference held in Washington, D. C., November 2 to 4, 1971, innovative nutrition teaching techniques were stressed. The participants concluded that nutrition education materials need to be more inviting and fun.[7]

There were no nutrition education games mentioned in Zuckerman's Guide to Simulation Games for Education and Training.[8] However, nutrition education games have been developed for the youth phase of

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[6] White House Conference, p. 173.

[7] "Nutrition Education for Youth," p. 36.

[8] David W. Zuckerman and Robert E. Horn, The Guide to Simulation Games for Education and Training (Cambridge, Mass.: Information Resources, 1971).

the Expanded Nutrition Program.[9] But none of the games developed so far deal with concepts beyond the basic four food groups--meat, milk, fruits and vegetables and breads and cereals. Dr. Jean Mayer, professor of nutrition at Harvard University and chairman of the 1969 White House Conference on Food, Nutrition and Health, pointed out that many of the new foods that are being marketed today do not fall into traditional food categories.[10] It is important for people to know more about nutrition than the four food groups. Therefore, there was a need for another nutrition education game.

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[9]Carol Fenster, "Nutrition Games and Activities for Youth," Cooperative Extension Service, Expanded Nutrition Program, Fargo, N.D. (Mimeographed.)

[10]"Labels That Tell You Something," Journal of Home Economics, Vol. 64, No. 4 (April, 1972), p. 28.

CHAPTER II

THE STUDY

Purpose of the Study

The purpose of the study was to develop a nutrition education game and explore its effectiveness for use in the youth phase of the Expanded Nutrition Program in Black Hawk County, Iowa. It was intended that the game will appeal to the children and teach them basic nutritional concepts. The question of the study was: Can a game be developed which will teach the participants certain nutritional concepts and be appealing to them?

Definitions of Terms

Expanded Nutrition Program (ENP)--This program operates in all fifty states through the Cooperative Extension Service. Its primary goal is to teach low-income people about nutrition.

Youth involved in the Expanded Nutrition Program (ENP)--The ages of these children vary between nine and seventeen. The children are from predominantly low-income areas of Waterloo and Cedar Falls, Iowa. They attend cooking and recreation classes sponsored by the ENP in Black Hawk County. Their involvement in these classes is only short-term and voluntary.

Game--Gordon's definition of a game has been adopted: "A game may be defined as any simulated contest (play) among adversaries

(players) operation under constraints (rules) for an objective (winning.)"[1]

Nutrition education game--This is the game in this study. It is a game for learning the twelve key nutrients--their names, their functions, and the foods in which they are found. Two to five players can play at one time. Player age range is from about ten on up. The game includes a playing board, dice, play money, grocery food cards, and function envelopes with the correct nutrient written on a slip of paper inside. In addition, each player has a nutritious person board. The twelve key nutrient squares on this board must be covered with a food containing each nutrient.

Twelve key nutrients--The twelve key nutrients in this study are riboflavin, niacin, thiamin, water, iron, calcium, protein, carbohydrate, fat, and Vitamins A, C and D.

Basic nutritional concepts--The concepts are from the Basic Concepts of Nutrition Education. They are:

> Food is made up of different nutrients needed for growth and health. All nutrients needed by the body are available in food. Many kinds and combinations of food can lead to a well-balanced diet. No food, by itself, has all the nutrients needed for full growth and health. Each nutrient has specific uses in the body. Most nutrients do their best work in the body when teamed with other nutrients.[2]

Design

Because the purpose of the study was to develop a creative, usable game, the author determined a developmental rather than an

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[1]Alice Kaplan Gordon, Games for Growth (Palo Alto, Calif.: Science Research Associates, 1970), p. 8.

[2]Interagency Committee on Nutrition Education, "Basic Concepts on Nutrition Education," (Mimeographed.)

evaluative design for the study. The design had three steps—review of commercial games, development of a nutrition education game, and evaluation of the game.

For the review of games, the author examined eight commercial games, geared for the ages of the youth in the Expanded Nutrition Program, for gaming techniques and intrinsic and extrinsic motivators to play these games. All of the games reviewed were some type of board game. Other features included play money; tokens, which are small plastic objects used to move around the board; chance cards; dice and a spinner, both used to determine the number of moves around the board. The overall intrinsic motivator of the games was, of course, to win. In a few of the games, this was the only intrinsic motivator. The other intrinsic motivators depended upon the type of game. For example, in Let's Drive by Milton Bradley, an intrinsic motivator was to be considered a safe driver. Extrinsic motivators included money, dice and lucky breaks through chance cards.

The author decided the game she would design would be a board game for two reasons. First, many of the class locations do not provide enough space for games that require much physical activity. A board game can be played while sitting down at a table or on the floor. Secondly, the author wanted to relate three factors of nutrition education--the nutrients, the foods that contain these nutrients and the functions of these nutrients in the body. A board game can be designed with many movable parts including dice, money, and chance cards, that might be needed to relate various factors.

The development of the game had three steps--determination of objectives, development, and evaluation. The basic objectives of the

game the author wanted to develop were as follows:

--To teach nutritional concepts and generalizations in an entertaining way.

--To aid the volunteer leaders who are trying to teach this information.

--To stimulate the students to think about nutrition while attending the classes.

--To provide the students with a game that fits in with the theme of the classes while the food is cooking anyway.

--To instill in the youth the attitude that good nutrition is significant to their well-being.

The actual development involved designing a game, playing it with people, and revising it. This was done several times with friends and neighbors until the author determined the game was at the stage in development to play with children similar to those in the sample. This was done with eight such children. The game was also played with two classes of seventh grade students at a Waterloo junior high school to see how the game would work with a group of children. The author also tried the game with a group in an informal, non-school environment--the twelve family food aides of Black Hawk County during in-service training. From there final revisions were made before the pilot study and study.

During the development of the game an Extension Nutritionist at Iowa State University was consulted. She made sure the concepts and generalizations about nutrition were being presented as they should be. Three nutrition authorities at University of Northern Iowa also verified the nutrition information in the game. They were two

nutrition professors from the Department of Home Economics and the University head dietitian.

The final game was a board game simulating the act of going to the grocery store and buying food to meet the nutritional needs of the body. The dice determined the number of moves to make on the board. The board contained the nutritional needs, the nutrients, that had to be satisfied. Play money was used to buy foods from the grocery store, which consists of fifty-six food cards with the food name, amount and price on one side. The nutrients in large amounts in the foods are on the reverse side of the cards.

The functions of the nutrients was a feature added to emphasize the importance of trying to eat the most nutritious foods. The function was written on the outside of the envelope with the correct nutrient written on a slip of paper inside the envelope. The player then has to choose an envelope and look inside at the nutrient slip to see if he has chosen the correct one.

Each player has an individual board with a "nutritious person" on it. Surrounding this figure of a person are twelve squares with the names of the twelve key nutrients on them. Each of these squares must be covered with a food card containing the appropriate nutrient to win the game. This feature is to emphasize that all twelve nutrients are needed for good nutrition.

Because of the variables in this developmental study, the author did not choose an elaborate method of evaluation. The children were evaluated for the knowledge they gained from the game through the one-group pre-test post-test design. A related t-test was used to compare the results of the two tests. The .05 level of significance

was chosen because it is the most commonly used. Stanley and Campbell justify the one-group pre-test post-test design only when nothing better can be done because of the extraneous variables that can jeopardize internal validity of a study with this design.[3] The variables in the study involve the nature of the classes. In the first place, attendance at the classes is voluntary and cannot be controlled. No one is ever sure who will attend the classes from week to week. In the second place, there is little discipline in the classes. The children must help with preparation and clean-up in order to eat the free food. The volunteer leaders have little control over their other activities during the class sessions.

The instruments developed for the study include a test of cognitive learning to be used as the pre-test and post-test and a rating scale to measure the children's feelings for the game. The test also asked for the youth's name, age and sex. The scale asked only name. The test was determined from the game's behavioral objectives, which were derived from the basic concepts of nutrition education previously mentioned. (See page 8.) The behavioral objectives are as follows:

After playing the game, the children

1) will be able to recognize the names of the twelve key nutrients.

2) will be able to name a nutrient in a given food.

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[3]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago: Rand McNally & Company, 1963), p. 7.

3) will be able to identify a function of the twelve key nutrients.

4) will say all twelve nutrients are available in food.

5) will say no food by itself has all the nutrients needed for good nutrition.

6) when given a choice between two foods, will select the one with more nutritional value.

7) when given a choice between two foods, will select the one that is the least expensive source of a given nutrient.

The validity of the test was checked and approved by the three nutrition authorities at University of Northern Iowa who checked the accuracy of the nutrition information of the game. The reliability was determined through the test-retest method. The test was administered to two girls 4-H clubs at the beginning of their club meeting. The author then collected the test papers and the club carried on its regular activities. At the end of the club meeting, the author then re-administered the test. No significant differences were found between the pre-test and post-test at the .05 level.

The rating scale simply asked two questions: Did you like the game? Do you want to play the game again? The youth were to rate the first question either strongly dislike, dislike, don't know, like, strongly like. They were to rate the second question very much so, perhaps, don't care, don't think so, or not at all.

Boocock stated that it is better if the game is administered by the teachers who will be using it rather than by the inventors

themselves.[4] However, doing it this way would mean lesser control over variables such as how the game is introduced and administered. Since the author wanted the game introduced and administered in a consistent manner, she conducted the study herself. Since the population at the time of the study was so small, the author foresaw no time difficulty in conducting the study herself. Also, no funds were available for persons to be hired to conduct the study.

The Population and the Sample

Most of the cooking and recreation classes created by the youth phase of the Expanded Nutrition Program are set up on a weekly basis for a duration of from four to eight weeks for about ten to fifteen students. The factors that determine the duration, meeting schedule and attendance of the classes are as follows:

--The availability of a volunteer leader.

--The availability of a meeting location. Most of the classes are held at neighborhood centers funded by the Office of Economic Opportunity in low-income neighborhoods or at churches in low-income neighborhoods.

--The whims of the youths themselves. If the children attending the classes decide they do not want to come anymore, they simply don't.

The population of the study was all the youths who were participating in the Expanded Nutrition Program at the time of the study. Because of the fluctuating nature of the program, the

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[4]Sarane S. Boocock and E. O. Schild, eds., Simulation Games in Learning (Beverly Hills, Calif.: Sage Publications, Inc., 1968), p. 21.

population changes from week to week.

General characteristics of the population are as follows:

--The children range in ages from nine to seventeen.

--They are from low-income neighborhoods of Waterloo and Cedar Falls. No record is kept of the income levels of the parents of these children. However, the neighborhoods at which the classes are located are considered low-income by the local Office of Economic Opportunity.

--The majority of the children are black. Most of the classes are located in black neighborhoods.

--The majority of the children are girls. The cooking and recreation classes of the Expanded Nutrition Program seem to attract more girls than boys.

The sample are those students who attended an Expanded Nutrition Program class at the time of the study. The author decided not to work with more than eight children--four per game--at a time because of the lack of discipline at these classes. She also decided arbitrarily not to play the game with children below ten years of age because of the amount of reading in the pre-test and post-test. The author wanted to spend as short a time as possible taking the tests. She did not want to have the older children have to wait on the younger ones who might have difficulty reading.

Limitations of the Study

No attempt was made to take a random sampling for this study. It would have been impossible since the population fluctuates from week to week, and there is no way of controlling which children attend

classes. The design for this study was chosen because it was the only design which fit into the structure of the Expanded Nutrition Program. Therefore, the results cannot be applied to any other group. Whether the same results could be duplicated with other populations or with a different sample within the same population will have to be determined.

The game cannot be used by itself as a means of teaching nutrition education. The game teaches only a few of the many concepts a child should know before growing into adulthood. The nutrition classes sponsored by the Expanded Nutrition Program will have to use other methods of teaching nutrition in addition to this one.

Summary

The purpose of the study was to develop a nutrition education game for use with the youth phase of the Expanded Nutrition Program in Black Hawk County, Iowa. The question of the study was: Can a game be developed which will teach the youth nutritional information and be appealing to them? The design of the developmental study had three major parts--review of games, development of game, evaluation of game. For the review the author analyzed eight commercial games for design ideas. The actual development involved determining objectives, designing a game, playing it with people, and revising it. The evaluation of the effectivenss of the game included the administering of a test before and after playing the game and administering a rating scale of the game's appeal after playing the game. The population was all the children involved in the Expanded Nutrition Program. The sample was those children in attendance at the cooking classes at the time of the study.

CHAPTER III

REVIEW OF LITERATURE

Definition of Games

Games have been defined in several ways. Coleman said a game "is a kind of caricature of social life. It is a magnification of some aspect of social interaction, excluding all else, tearing this aspect of social interaction from its social context and giving it a special context of its own."[1] Gordon said, "a game is essentially a simplified slice of reality."[2] She also defined a game "as any simulated contest (play) among adversaries (players) operating under constraints (rules) for an objective (winning.)"[3] These are also the words used by Abt to define games.[4] Gordon went on to say that serious games are usually characterized by two features. First of all, they usually simulate real-life situations. Secondly, there is usally not just one winner with everybody else losing. Usually the effort is more cooperative, as in real life.[5]

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[1]James S. Coleman, "Introduction: In Defense of Games," American Behavioral Scientist, Vol. 10, No. 2 (October, 1966), p. 3.

[2]Gordon, Games for Growth, p. 9.

[3]Ibid., p. 8.

[4]Clark C. Abt, "Games for Learning," in Sarane S. Boocock and E. O. Schild, ed., Simulation Games in Learning (Beverly Hills, Calif.: Sage Publications, Inc., 1968), p. 67.

[5]Gordon, Games for Growth, p. 8.

Some authors define games different from simulations. Gordon said, "all games are simulations; not all simulations are games." In a game there is usually a winner; in a simulation, there need not be one.[6] Casseres stated that some authors treat the terms "simulation" and "games" or "gaming exercises" as they are also called as equivalent concepts. She stated they consider gaming to be a particular kind of simulation in which human decision-makers participate within the simulated system, generally in a competitive situation.[7]

Uses of Games

Simulated games have two major uses: 1) as research tools for the study of the process simulated, and 2) as teaching devices.[8] Gordon further broke down the uses of games into four categories. First, games are used in research as a way of figuring out why people act as they do. Of course, the accuracy of the findings depends on the soundness of the data built into the games. Second, games are used in planning to help a planner weigh relative benefits of alternatives. Third, games are used in training to help trainees simulate what is expected of them after the training period. And, lastly, games are used in education.[9]

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[6] Ibid., p. 12.

[7] Virginia Lattes-Casseres, Teaching Home Management Through Simulation and Other Methods: An Experimental Study, (unpublished Ph.D. dissertation, Michigan State University, 1968), p. 12.

[8] Boocock, Simulation Games in Learning, p. 13.

[9] Gordon, Games for Growth, pp. 14-15.

Games have been readily accepted as a teaching technique and Gordon predicted they will continue to be used more.[10] Boocock pointed out how remarkable it is that games have been so well received without hard evidence of their effectiveness.[11] There is a need for more games in education, according to Raser, because of the widespread disillusionment with traditional teaching methods.[12] Spitze has recommended that the "tell 'em and test 'em" routine of teaching be abandoned in favor of more exciting, more meaningful, more participatory, more certain to involve learners techniques such as games.[13]

Games can be used to motivate and to teach complex problems. They can also be used for problem-solving and decision-making and for practice. One of the most promising hunches about the use of educational games is that they can influence and alter the attitudes of students. They can change the attitude toward what the game is about. They can improve the attitude toward learning in the school system. And they can influence the child's attitude about himself. He can succeed at something which may be a feeling he has never had before.[14] However, Gordon cautioned that games are not meant to be used alone.

They are to be used "along with other media, not as a

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[10] Ibid., p. 134.

[11] Sarane S. Boocock, "An Experimental Study of the Learning Effects of Two Games with Simulated Environments," American Behavioral Scientist, Vol. 10, No. 2 (October, 1966), p. 8.

[12] John R. Raser, Simulation and Society: An Exploration of Scientific Gaming (Boston: Allyn & Bacon, Inc., 1969), p. 114.

[13] Hazel Taylor Spitze, "Games That Teach," Journal of Home Economics, Vol. 64, No. 4 (April, 1972), p. 9.

[14] Gordon, Games for Growth, p. 166.

supplement, but as an integral part."[15] She also said they should not be used to teach facts. Textbooks and lectures are better suited to this purpose, she said.[16]

Justification for the Use of Games in Education

As educators have attempted to make curriculum more relevant and to use innovative teaching techniques, educational games have come into being. By playing educational games, students can learn by doing and also have fun.

Zeiler cited the following advantages of educational games:

1) Motivation--As a result of the promise of pleasurable experiences, games generate high levels of interest which are sustained throughout the game.

2) Increased attention span--As a result of motivation created by the game, the pupil is frequently able to lengthen the time that he can profitably spend on a particular activity.

3) Sharpened powers of concentration--Another effect of the increased motivation is the greater concentration that appears to be generated by participation in a game.

4) Active learning--Student participation in a game may be described as learning by doing, the goal of most classroom activities. No student is merely a spectator; each child plays an active role in the game to which another student responds or which has a direct influence on the gaming process.

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[15] Ibid., p. 16.

[16] Ibid., p. 134.

5) Self-directed learning--Games are characterized as self-learning and self-judging techniques since there is a minimum of teacher instruction and decision-making.[17]

According to Gordon the major justification for games is motivation: "If educational games did nothing more than motivate students, that would be sufficient justification for playing them." She stated further that learning is a by-product of a game. But motivation for further study of the topic frequently results.[18]

Schild believes games teach as well as motivate.

> Games may induce learning in at least two distinct ways. One, by generating a high level of motivation and interest and by focusing the attention of the player; in this way learning of facts or beliefs presented to the players should be facilitated. Two, by establishing a series of contingencies, where reinforcements--success in the game--is contingent upon specific behaviors ('good play'); in this way strategies and skills conducive to winning the game should be learned.
>
> These two teaching properties of games are clearly related. Only if sufficient motivation to win is general will success in the game be an effective reinforcer. At the same time these two ways of learning will produce different contents of learning. When the game is seen as a series of contingencies, the expected learning is simply that of strategies and other behaviors directly relevant to success. Only if the game also has generally motivating properties may we expect the players to learn other contents, facts, insights associated with the game.[19]

Wagner also stated that motivation was perhaps the greatest value which can be claimed for instructional games.

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[17]Richard Zieler, Games for School Use (Westchester County, N.Y.: Center for Educational Services and Research, Board of Cooperative Education Services, First Supervisory District, revised March, 1969 by Irene Strum), p. 1.

[18]Gordon, Games for Growth, p. 19.

[19]E. O. Schild, "The Shaping of Strategies," American Behavioral Scientist, Vol. 10, No. 3 (November, 1966), p. 1.

> This opinion is supported by the point of view that 'hard things are compassed oft by easy means' as suggested by Philip Massinger in his 17th century play 'A New Way to Pay Old Debts.' Children, of course, need to learn to work. They need to develop the attitude that oftentimes effort must precede interest. But they also need to learn how to play, especially when a game will result not only in personal pleasure but in important learnings. And experience shows that games often will speed up as well as strengthen learning in the fundamental skills.[20]

Through games children can make things happen. They have that power. They have a feeling of control over their environment. "The sense of efficacy that games permit and encourage is not only an underlying reason for their motivational power, but an important educational benefit. In a world so large and complex, few individuals feel capable of affecting their environment. A sense of powerlessness leads to apathy and general malaise, a condition that reinforces its source. Students quickly learn that the complex school environment in which they operate is beyond their control. They retreat. A host of defense mechanisms is deployed, and the defeatist attitude persists beyond the school years."[21]

Miller stated since games seem to have the capacity to develop in the player a sense that he can affect his own future, games appear to have value for the disadvantaged pupil.[22] Gordon emphasized the advantages to slow learners:

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[20]Guy Wagner, Max Hosier and Mildred Blackman, Listening Games: Building Listening Skills with Instructional Games (Darien, Conn.: Teachers Publishing Corp., 9th printing, 1960), p. 10.

[21]Gordon, Games for Growth, p. 20.

[22]Nancy Huser Miller, "Simulation Game: Evaluation of Effectiveness of Selected Cognitive and Affective Pupil Behaviors" (unpublished Master's thesis, Cornell University, 1969), p. 25.

> Games offer the most promising benefits for slow learners. Many of these children have had unpleasant experiences in classroom situations. They tend to be withdrawn or apathetic. They have short attention spans. Generally, they receive little reward for little achievement. Their relationship to the teacher and most likely to all adult authority figures has been unsatisfactory. Often their facility with written materials is poor, and motivation is definitely a problem. For these students games can literally work wonders. It is a medium they understand and participate in outside school. They interact with peers in a situation where the teacher is either a participant or a referee, not a threat.[23]

If slow students have difficulty reading, then reading material can be limited in a game and it can be made critical to the game so that students are motivated to read it.[24]

Abt concluded that:

> . . . students with culturally impoverished home backgrounds seem to be at less of a disadvantage in educational games than they are in conventional classroom situations. The poorest children can play games and play them well. Although conclusions may be premature, we have noticed a certain differentially greater improvement in the poorest students when learning with games.[25]

Farran studied the effects of three simulation games on eighth grade boys at the North Carolina Advancement School. This is where boys are sent upon recommendation of their principals because they are underachievers. The three games he used were three developed at Johns Hopkins University--Life Career, Consumer, and Legislative. He concluded that games were "a step in the direction of solving the core problems of underachievement." There are problems with their use. Groups can't be larger than fifteen because the players need individual attention. Mechanical problems must be worked out so the games move

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[23]Gordon, Games for Growth, p. 45.

[24]Ibid., p. 46.

[25]Abt, "Games for Learning," p. 81.

along fast and smooth. The underachiever must be immediately involved. He found, however, that the games helped the boys with strategic decision-making, relational thinking and planning.[26]

Gordon also stated games can be a stimulating experience for gifted students. These students have already mastered other skills. Games given them something new. They have to use decision-making abilities which they may not be so good at as they are learning facts.[27] Thus, games can have an egalitarian effect on a classroom. Because decision-making skills are a key factor in winning games, those students who do not excel in grades, have a chance to excel in games.[28]

Besides a sense of efficacy, games can have other features which motivate, according to Gordon. They can give students immediate feedback, important in learning. They have goal-direction and closure. "Because the activity is highly structured and the objectives clear, motivation is enhanced. A natural by-product of intense involvement in goal-directed activity is the extension of attention span."[29] They have uncertainty which lends them an air of drama. They have open-endedness. There is no wrong or right in games, which tends to permit children to feel free to experiment. They have reality, relevance and role imitation. Games can bring the real world into the classroom. Games can give children a chance to role-play, which they love to do

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[26]Dale C. Farran, "Competition and Learning for Underachievers," in Boocock and Schild, eds., Simulation Games in Learning, p. 203.

[27]Gordon, Games for Growth, p. 46.

[28]Ibid., p. 45.

[29]Ibid., p. 22

anyway. They allow for social interaction and peer learning. "In few other classroom activities is peer interaction encouraged. In fact, this natural channel for learning is often viewed as disruptive (talking in class) or dishonest (cheating), and is frowned on. In games, peer interaction is harnessed for specific educational goals."[30] They can channel competition for educational purposes. Cooperation is almost essential in game playing. Through games children may enter the world of make-believe. "The inclination to play is a natural urge, one that should be exploited by the teacher who is seeking to stimulate his students' desire to learn."[31]

Gordon clarified that games are no panacea for educational problems.[32] Wagner stated:

> Games will never be a substitute for adequate planning and lesson preparation nor for the lack of professional competency on the part of the teacher. In fact, games are not a substitute for any other type of learning activities, instead, they are an integral part of the teaching and learning process and should be used appropriately as they are needed to further specific educational goals. In other words, games are one approach to learning and should be used judiciously as an important member of the instructional materials team.[33]

Limitations of Games

Authors agree that games will not solve all the problems of teachers and teaching. However, Strum stated the negative psychological

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[30] Ibid., P. 24.

[31] Ibid., p. 26.

[32] Ibid., p. 18.

[33] Guy Wagner, Mildred Alexander and Max Hosier, Strengthening Fundamental Skills with Instructional Games (Cedar Falls, Ia.: J. S. Latta & Son, 1959), p. 88.

effects of games have been disregarded in research. "For example, the effect of losing a game on student morale, motivation and concentration span is, as yet, undetermined. They may prove to be a critical area for the emotionally disturbed child."[34]

Other criticisms of gaming concern game construction, she pointed out:

> Some games can be won through dishonesty (cheating) which may make students cynical. In addition, in order to win many games where success is measured by the accumulation of tokens or markers, the student may amass a fortune in goods and money thus reflecting an overwhelming emphasis on materialism. A third criticism points to the oversimplification and possible distortion of the subject matter; complexities of the life situation being simulated may be omitted in the attempt to provide a manageable game and the environment may become relatively mechanistic.[35]

Gordon agreed that oversimplification could be a problem. However, she believed this could be made up for through post-game discussion.[36] She indicated three other possible problems with games. First, their overuse or misuse. Second, they may be too motivating. There's the chance students could get too wrapped up in the game. Games may tend to make the student angry or frustrated. However, Gordon stated perhaps having students experience anger at being treated unfairly can increase their empathy with people in similar real-world situations. Third, they could teach the wrong values because players could be cast into roles society does not condone. In her opinion, this is not a problem. She stated games are value-free.[37]

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[34]Strum, Games for School Use, p. 4.

[35]Ibid., p. 4.

[36]Gordon, Games for Growth, p. 33.

[37]Ibid., p. 34.

Other limitations pointed out by Casseres are as follows:

--In most simulation games, players start out with the same amount of resources while in real life this is not true. Thus, games could be unrealistic to students.

--In most games the rules are known by the players. In real life the rules are not necessarily fixed and not necessarily known by the players.

--In many games there is only one winner. In real life cooperation is needed to be successful.[38]

Nutrition Education Games Already Developed

At the time of this study, the author knew of over fifty nutrition education games. Forty-five of these games had been developed for the Expanded Nutrition Program. Forty-three of these ENP games were in a booklet, "Nutrition Games and Activities for Youth," compiled by Carol Fenster, Communications Coordinator of ENP.[39] Two games were "Menu Rummy," a card game, and "Food-O," a game similar to Bingo, then available through the Cooperative Extension Service. Seven games were created during a summer workshop on the teaching of nutrition at the University of Illinois. Sixteen teachers participated in the workshop under the direction of Dr. Esther Brown during the summer of 1970.[40] Hazel Taylor Spitze had developed several

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[38]Casseres, Teaching Home Management, p. 29.

[39]Fenster, "Nutrition Games and Activities for Youth."

[40]"Exciting New Techniques for Teaching Nutrition," Illinois Teacher for Contemporary Roles, Vol. XIV, No. 1 (Sept. - Oct., 1970), pp. 17-45.

nutrition education games.[41]

Selected Research on Educational Games

Casseres (1968) did not develop a game but evaluated the effectiveness of the Life Career Game developed at Johns Hopkins University. Using eighteen senior high school home economics classes, she compared the effectiveness of that simulation game combined with lectures and discussion with a traditional classroom lecture-discussion method for teaching home management decision-making concepts. No significant differences were found between treatment and control classes in knowledge, comprehension and application of decision-making concepts and principles either before or after exposure to the treatment. As a result Casseres concluded that the experimental method was as effective as the control. However, she did find indication that the method involving the simulation game was more effective with twelfth grade students at the application level while for tenth and eleventh grade students the control method was better at the knowledge level. Casseres had hypothesized that the experimental students would have a greater increase in positive effective learning than the control students. However, the findings of the study did not support this hypothesis. There were found to be no significant differences in interest, enjoyment or perception of the relevance that the decision-making unit had for the student's own needs and problems.[42]

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[41]Spitze, Games that Teach, pp. 8-12.

[42]Casseres, Teaching Home Management.

Miller (1969) developed a simulation budgeting game as an integral part of the curriculum package. "Preparation for a Dual Role: Homemaker-Wage Earner," developed by Ruth Hughes at Cornell University in 1969. The game served as an introduction to the subsection on budgeting of the money management unit. The study was done using the post-test only control group experimental design with twelve pairs of home economics classes. The simulation game was the treatment and the control was the case study. Her game was a board game simulation of a young couple who had gotten married soon after high school. Her hypotheses that the learning of facts and principles, attitude and retention would be greater for the experimental group were rejected. She concluded that the experimental method was therefore as good as the control. However, she did find a significant difference in interest in subject matter. Specifically, students participating in the game revealed more interest than students participating in the case study. A trend appeared in the correlation coefficients between IQ and instrument score as the correlation was slightly less between IQ and the particular measure for the experimental students than it was for the control students. This finding suggested to her that an educational innovation such as a simulation game is of benefit to the academically poorer student since the correlation seemed to imply that high IQ was less important among the students participating in the simulation game than in the case study in gaining the higher scores on the measures.[43]

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[43]Miller, "Simulation Game."

Cherryholmes (1966) reviewed six studies in which simulation games were tested for their effectiveness. He found that these games were effective only at stimulating interest in subject matter. They were not effective in learning facts and principles, in helping students retain information, and in helping students gain critical thinking and problem-solving skills relative to more conventional teaching methods. He tentatively rejected the hypothesis that students in simulation acquire realistic attitudes about the referent system, but so do some students using more conventional materials. "Student interest and motivation were clearly increased by the games.[44]

Boocock (1964) investigated the learning effects of two games with simulated environments--Life Career and Legislative--using teenagers (13 - 20 years old) in a non-school related situation in which both the experimental and control groups were exposed to games. She found that after exposure the experimental players for both games expressed a better general feeling for the situation simulated than they had felt prior to their participation; one, the Legislative Game, produced some feelings of greater efficacy or sense of being able to understand and control the world around themselves than had been previously held. Only a limited amount of learning took place in both groups. She pointed out the weaknesses in her design. She didn't compare the games with other learning tools. The group of students used were atypical since they were outstanding 4-H members gathered for

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[44]Cleo H. Cherryholmes, "Some Current Research on Effectiveness of Educational Simulations: Implications for Alternative Strategies," American Behavioral Scientist, Vol. 10, No. 2 (October, 1966), pp. 4-7.

a national conference.[45]

Inbar (1966) used 220 4-H club members who played a single game (Community Disaster) once. The participants were divided into twenty-three groups of eight to eleven players. He studied the nature of the game's differential impact on the players. The players served as controls for each other as the study was concerned with within sample differences. Before and after questionnaires were given to all players. The before questionnaire was used to assess background characteristics of the players, predisposition, and original level of knowledge on the learning variables. The after questionnaire measured the impact of the game on learning and enjoyment. Factor analysis of the questionnaire items generated "enjoyment" as the major dependent variable relating to the impact of the game. Analyses of the independent variables, background, predisposition and game experience (understanding of rules, interest and active participation in the game) were found to account for only 40 per cent of the total variance of enjoyment. However, an analysis of variance showed that enjoyment was significantly conditioned by group membership. Further analysis in the study gave evidence that the amount of learning was different between members of high and low enjoyment groups. Inbar then postulated that group membership was a crucial dimension in understanding the differential impact of simulation activities on players. He noted that except for learning motivation, once the group level of learning had been considered, the individual player's enjoyment was of no importance What was being dealt with was not a psychological process of the

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[45]Boocock, "An Experimental Study," pp. 8-16.

individual alone where his "fun" made him learn, but that the process of learning is mediated by the general atmosphere in the group; favorable group atmosphere induces general high enjoyment--as well as high individual learning. After the group effect had been eliminated, the players' predispositions became the most important variable in explaining the variance of enjoyment and learning.[46]

In Farran's study simulation games were used with under-achieving pupils at a residential school set up to provide intensive remedial instruction and educational enrichment for eighth grade boys of average or above intelligence. One major concern of the study was to test the hypothesis that learning would be increased due to inter-group competition whereas intragroup competition should have no effect. The three games used were Life Career, Consumer and Legislative. In the study 123 students were randomly assigned to eight groups, four which played games in a competitive situation and four which played the games competing individually. They were tested for learning upon completion of the game sessions. Results of the tests contradicted the hypothesis since the students who competed individually had higher scores than those who were in intergroup competition. Farran attributed the results primarily to two possibilities. First, he said the hypothesis did not apply to learning in games. It may be that the motivating forces in a game are different enough from those of the ordinary classroom situation that the hypothesis rationale is irrelevant. Second, "in the condition with individual competition,

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[46]Michael Inbar, "The Differential Impact of a Game Simulating a Community Disaster," American Behavioral Scientist, Vol. 10, No. 2 (October, 1966), pp. 18-27.

success in the game gave status directly and immediately (given the high motivation of students to succeed in the game); and as success in the game is--at least in part--contingent on learning, the status rewards did induce learning insofar as game knowledge and understanding is concerned.[47] The second possibility appears to be in direct opposition to the findings of Inbar who accounted for the differential impact of games on learners as being a result of group membership.

The second area with which the Farran study dealt was the sense of failure and disinterest in the educational process which typify many underachievers. Observations from classroom experience with the games were used as bases for postulates of the special function of simulation techniques for the underachiever. Simulation was seen to present the underachiever with a situation which enables him to experience content directly; and to "serve as a frame of reference to unite various separate ideas students have learned prior to encountering the games."[48]

Other functions for which simulation techniques were postulated to have value in the Farran study were: strategic decision-making, rational thinking and planning. In the area of strategic decision-making, the simulation gives the student opportunities to develop problem-solving abilities by being presented with an interesting and understandable problem which demands a solution, experience success in reaching a solution, and see that planning leads to a proportionate

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[47]Farran, "Competition and Learning," p. 196.

[48]Ibid., p. 198.

amount of control over the situation. Rational thinking is imparted by the students being involved in observing the result of an action and in directing the cause and effect.

The last major function which Farran attributed to a simulation activity is that of planning. He stated that "learning to make a strategic decision, to see relationships between events in time, to understand cause and effect, and to piece ideas together all lead to ability to formulate and carry through a plan or strategy.[49] The student therefore could begin to develop a sense of control over his environment and awareness of his relationship to it.[50]

Business management simulation games were used in McKenney's and Dill's study (1966). In the study 650 graduate students in business were divided into seven groups of ninety. The participants filled out questionnaires before, after and during the play to measure attitudes and understanding of the simulation. McKenney and Dill concluded that there needs to be a variety of ability on a team. Different ability groups cannot compete with each other. Personnel of varied ability need to be together and not pitted homogeneously against each other.[51]

Summary and Discussion of Review

Educational games certainly are no panacea to educational

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[49]Farran, "Competition and Learning," p. 201.

[50]Ibid., pp. 191-203.

[51]James L. McKenney and William R. Dill, "Influences on Learning in Simulation Games," American Behavioral Scientist, Vo. 10, No. 2 (October, 1966), pp. 28-32.

problems. However, their use does seem to offer advantages over other teaching techniques in certain situations. The situation that the author is interested in is non-school with youth who can be described as disadvantaged due to their family's income level. The volunteer leaders describe some of the youths as underachievers or slow in school work. Boocock and Inbar both obtained favorable results from the use of games in non-school environments. Miller and Farran found games effective for use with slow and underachieving students, respectively. Abt also emphasized the advantages of games for disadvantaged; Gordon stressed advantages to the slow students.

In Boocock's study she found that games can give youth a better general feeling toward the situation simulated. One of the purposes of the Expanded Nutrition Program involves creating better feelings towards the importance of nutrition. She also found that games can give the players a greater feeling of efficacy, which is important to consider when working with the low-income since they are generally characterized by feeling a lack of control over their environments.

Casseres found no significant differences between using games and the lecture discussion method of teaching sucject matter. However, in the ENP there is no opportunity for teaching through lecture-discussion. Other means for teaching nutrition must be found.

Gordon stated educational games should not be used to teach facts but rather processes. Facts could more efficiently be taught through lectures and textbooks. There are no textbooks in use for the Expanded Nutrition Program either.

The major advantage of using educational games is they can motivate and interest students in a certain subject matter.

Cherryholmes found games to be effective at stimulating interest and motivation. The subject of nutrition is not intrinsically interesting. Methods of teaching it need to be motivating, especially in the non-school situation with which the author is concerned. She needs the game to be considered fun and entertaining in order that the youths in the program will take the time to play it. Inbar found that the most significant variable to the learning in a game is the enjoyment of the students.

There is a lack of nutrition education games available for programs, such as the Expanded Nutrition Program, and to classroom teachers. The games known to the author at the time of the study were not simulations of any type of activity. They were merely games to teach the basic four food groups.

CHAPTER IV

THE GAME

The author developed a nutrition education game to alleviate the problem of a lack of stimulating, entertaining, and effective ways to teach nutrition to the participants in the youth phase of the Expanded Nutrition Program. The development process consisted of three steps--review of commercially prepared games, developing game, and evaluating game. Before beginning the development, the author determined certain basic objectives of the game. They are as follows:

--To teach nutritional concepts and generalizations in an entertaining way.

--To aid the volunteer leaders who are trying to teach this information.

--To stimulate the students to think about nutrition while attending classes.

--To provide the students with a game that fits in with the theme of the classes. Several of the locations where the classes are held provide boxed games which the children play while they are waiting for food to cook.

--To instill in the youth the attitude that good nutrition is significant to their well-being.

Review of Games

The first step was to examine and analyze commercial games.

The author used the following criteria in choosing the games to review. First, the games had to be meant for children within the age range of the Expanded Nutrition Program--about nine to seventeen. Second, the games had to be varied as to their purpose. Some had to be purely for entertainment; some for classroom use. Others had to be a combination of entertainment and education. Third, the game had to be one in which players sit down at a board and maneuver various objects. The author determined a board game would be the most appropriate for her objectives for two reasons. First, many of the class locations do not provide enough space for games that require much physical activity. A board game can be played while sitting down at a table or on the floor. Second, the author wanted to relate three factors of nutrition education--the nutrients, the foods that contain these nutrients and the functions of these nutrients in the body. A board game can be designed with many movable parts, including dice, money, and chance cards, that might be needed to relate various factors. Lastly, the games examined had to be available from the Cooperative Extension Service and the University of Northern Iowa. No funds were available to the author to purchase games.

The following games were analyzed for gaming techniques and motivators, both extrinsic and intrinsic. The games were "Monopoly," "It's a Small World," and "Jungle Book Game" by Parker Brothers; "Let's Drive" and "Pirate and Traveler Game" by Milton Bradley; "Stocks and Bonds" by 3M; "Life Career Game" by Academic Games Associates; and "Countdown" by Whitman. (See Table 1.)

"Life Career Game," "Countdown," and "Let's Drive" are primarily educational. They are entertaining, also. "Life Career Game" was

TABLE 1

GAMES REVIEWED FOR GAMING FORMAT IDEAS AND MOTIVATOR IDEAS

Name	Age range	Publisher	Gaming Format	Motivators
Countdown	8-12	Whitman	board game with dice, cards and tokens	Moving along the board escaping the obstacles Quickness with mathematical problems
It's a Small World	5-10	Parker Brothers	board with one die and people cards	--
Jungle Book Game	6-12	Parker Brothers	board with die, spinner	--
Let's Drive	7-adult	Milton Bradley	board with spinners, play money, chance cards, award for driving performance	Acquisition of money Satisfaction of not having to pay fines Being considered a good driver Catching others at their mistakes
Life Career Game	high school and college age	Academic Games Associates	board to write on with grease pencil, chance cards and spinners	To help someone have a satisfying life Scoring the highest number of points
Monopoly	(no age range given)	Parker Brothers	board game with chance cards, money	Acquisition of money and power

TABLE 1 (continued)

Name	Age range	Publisher	Gaming Format	Motivators
Pirate and Traveler Game	7-12	Milton Bradley	board with die and descritive cards	Acquisition of money Playing a game of pirates and stealing from others
Stocks and Bonds	teen through adult	3M	dice, board with crayon, calculator, stocks and bonds, records of transactions, and spectator cards	Acquisition of money Learning about the stock market Gambling against unpredictable odds

designed for classroom use. An entire class of high school through college age youths can play it. Players divide into teams of two to four. They read the profile of either a boy or girl close to graduating from high school. As a team they try to make wise decisions for this person to help him or her lead a satisfying life. The object of the game is to develop decision-making abilities. In "Countdown" the players have to use mathematics skills to play the game. Playing the game helps develop sharpness at working addition, subtraction, multiplication, and division problems. The game is meant for two to four players between the ages of about eight to twelve. To win "Let's Drive" a player must be knowledgeable of driving rules and regulations. Two to six players can use this game at one time. The age range is from seven through adult age.

"Monopoly," on the other hand, is a game to be played purely for entertainment, as is "Stocks and Bonds." A player can, however, gain some insight into the world of real estate in "Monopoly" as he can into the stock market world in "Stocks and Bonds." Both games are for about two to eight players teen through adult age.

The remaining three games were designed primarily for entertainment. However, playing "Pirate and Traveler Game" helps one learn some geography and particularly the large cities of the world. This game is for two to four players seven to twelve years of age. The author had difficulty finding "Jungle Book Game" and "It's a Small World" entertaining because they were so elementary. Both are for two to four players. "Jungle Book Game" is for players six through twelve. "It's a Small World" is for players five through ten.

The gaming techniques include using tokens to move around a

game board, throwing dice to determine the number of moves on a board, spinning spinners to determine the number of moves on a board, drawing chance cards, and exchanging play money. These were the techniques the author thought promising for the nutrition education game.

In four of the games the extrinsic motivator is money. These games are "Monopoly," "Stocks and Bonds," "Pirate and Traveler Game," and "Let's Drive." In the "Life Career Game" the extrinsic motivator is scoring the highest number of points. In "Countdown," "Jungle Book," and "It's a Small World," it is to reach the destination first.

The intrinsic motivator in all the games is to win. In "Let's Drive" another intrinsic motivator is to be considered a good driver. An award for the best driver is given at the conclusion of the game. In the "Life Career Game" the players can get involved with the lives of the characters in the game. They want to see that these characters have satisfying lives. In "Countdown" it is motivating to be able to solve mathematical problems quickly. The "Stocks and Bonds" game provides a way of learning some basic facts about the stock market. In addition, there is the motivator of gambling against unpredictable odds. In "Monopoly" it is motivating to keep getting richer, and, thus, more powerful. In the "Pirate and Traveler Game" it is motivating to play a game of pirates. It is also fun to be able to steal valuable treasures from someone else without serious consequences.

Development of Nutrition Education Game

Determination of the type of nutrition information to be presented in the game went hand in hand with determination of the design of the game. With the advice of an Extension Nutritionist, the author used the Basic Concepts of Nutrition Education as determined by

the Interagency Committe on Nutrition Education, as her basis for the nutrition information to be presented in the game.

> 1. Nutrition is the food you eat, and how the body uses it. We eat food to live, to grow, to keep healthy and well, and to get energy for work and play.
> 2. Food is made up of different nutrients needed for growth and health. All nutrients needed by the body are available through food. Many kinds of combinations of food can lead to a well-balanced diet. No food, by itself, has all the nutrients needed for full growth and health. Each nutrient has specific uses in the body. Most nutrients do their best work in the body when teamed with other nutrients.
> 3. All persons, throughout life, have need for the same nutrients, but in varying amounts. The amounts of nutrients needed are influenced by age, sex, size, activity and state of health. Suggestions for the kinds and amounts of food needed are made by trained scientists.
> 4. The way food is handled influences the amount of nutrients in foods, its safety, appearance and taste. Handling means everything that happens to food while it is being grown, processed, stored and prepared for eating.[1]

The games already developed for the Expanded Nutrition Program are concerned with teaching the basic four food group concept of nutrition education. However, because of the changing food patterns in our society, use of more convenience foods, and probability of nutrient labeling on foods, children need to grow up knowing more than the basic four food groups. Dr. Ruth Huenemann stated the approach to nutrition education needs to be changed because of the changing patterns of life and diet.

> 1) We must be aware of a far wider range of nutrients than the traditional eight or nine. The so-called 'lesser' nutrients will not 'take care of themselves' in a manufactured product as they do in natural foods . . . 2) We must obviously teach in nutrient terms. Food groupings will not do. 3) We must be more intent than ever on insisting on proper labeling and then teaching teenagers to read and interpret them . . . 4) The consumer dare no longer be

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[1] Interagency Committee on Nutrition Education, "Basic Concepts of Nutrition Education," (Mimeographed.)

> the only target for nutrition education. We must learn to communicate with food technologists, food manufacturers and processors, advertisers, and legislators in order to influence teenage nutrition.[2]

She went on to say how nutrition education must go beyond the four food groups. She stressed the four food groups "are not an infallible guide to nutrient adequacy. They may serve a useful purpose in teaching beginning nutrition."[3]

The determination of the format of the game was a matter of designing a format, trying it out on people, and revising it. Miller's developmental steps served somewhat as a guideline. They are: 1) scope defined; 2) players' objectives outlined; 3) players' resources designated; 4) interaction sequence among players planned; 5) criteria on basis with which players decide what action to take; 6) external constraints on actions stated; 7) scoring rules and winning criteria determined; 8) form of presentation and manipulation (game board) decided.[4] However, the author found the developmental steps so closely interrelated, they were almost inseparable.

The author originally thought to design the game similar to "Monopoly" in which the players would keep going around a board buying the appropriate foods to have a good diet. Buying the correct foods and thus having a good diet would help them avoid illness. Doctor bills would have to be paid for inadequate food purchases.

However, this design idea was abandoned as the author could not

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[2]"Nutrition Education for Youth," p. 36.

[3]Ibid., p. 37.

[4]Miller, "Simulation Game," p. 27.

work out the money differences between the costs of food and the costs of doctor bills. The author could also not work out a way of earning money in the game to sustain the playing.

Another way of playing a game on a board is to follow a winding track as in "Let's Drive," "Jungle Book Game," and "Countdown." But, the final way determined was to have a circular track that players move around by a throw of a die as in "It's a Small World." Players try to land on certain squares of the wheel to obtain the people cards needed to win the game.

The author decided a way to learn the importance of the nutritients was to learn the deficiency diseases that resulted from a lack of them. For example, scurvy is a deficiency of Vitamin C, beri-beri is a deficiency of thiamin, and pellagra is a deficiency of niacin. Where diseases did not exist, body conditions due to deficiencies would be named. For example, night blindness is a body condition resulting from a lack of Vitamin A. The players would move around a track by rolling a die trying to buy all the foods they needed to avoid a deficiency in any one of the twelve key nutrients. Players could move each other on to a deficiency square if they landed on the same square. However, after discussing the approach with an Extension Nutritionist, the author decided to not use it. The nutritionist explained that the deficiency diseases are so rare in the United States now that they are not emphasized as a way of teaching nutrition.

Because the game experts seem to agree that a game that is a simulation is an effective and relevant way to teach subject matter, the author decided to make her game a simulation of a realistic occurrence. The occurrence is the act of going to the grocery store

and buying foods to meet the nutritional needs of the body. At the advice of a UNI game authority, the author added the extrinsic motivator of play money to the game because the subject of nutrition is not generally intrinsically motivating. Also, two dice are used and not one die because of the better feel and greater ease in rolling two dice rather than one die.

An integral part of the development of the game was the trying out on people and the revising. Friends and neighbors were used until the final game was decided upon. From here the author played the game with five black girls, all twelve years of age; three black boys, ten, twelve and fifteen; and two seventh grade home economics classes. The seventh grade classes were integrated between black and white, girl and boy, and low-income and high-income. The teacher was so satisfied with the results of using the game that she decided to employ it regularly in her nutrition unit.

Twelve family food aides, who are all middle-aged women, also played the game as part of their in-service training. The results showed a significant difference between the pre-test and post-test at the .05 level. The related t value was 3.371. (See Table 2.)

Minor revisions were made in the rules and gaming equipment. More food cards were added to the simulated grocery store so that there would be enough of every nutrient available through the duration of the game. Pictures were drawn on some of the function envelopes to make them easier to identify. The function envelopes originally were designed to be kept by the players if they guessed the correct function. However, the players seemed to learn the functions better if they didn't keep the envelopes but rather passed them all around from

TABLE 2

TEST RESULTS OF TWELVE FAMILY FOOD AIDES BEFORE AND AFTER PLAYING GAME

Subject	Pre-test	Post-test	Difference	Related t value
1	26	36	10	
2	31	35	4	
3	12	22	10	
4	32	39	7	
5	25	21	-4	
6	33	33	0	
7	17	25	8	
8	35	36	1	
9	31	33	2	
10	16	30	14	
11	28	31	3	
12	27	31	4	
			59	3.371*

* Significant at the .05 level

player to player.

The game takes from a half hour to one hour to play. The test takes about fifteen minutes. The rating scale can be filled out in a matter of seconds. The game can be played by two to four players from the ages of about ten on up. A fifth player can also play. However, he is in charge of the grocery store and does not have a token to move around the board.

The Description of the Game

The behavioral objectives decided upon for the game are:

After playing the game, the children

1) will be able to recognize the names of the twelve key nutrients.

2) will be able to name a nutrient in a given food.

3) will be able to identify a function of the twelve key nutrients.

4) will say all twelve nutrients are available in food.

5) will say no food by itself has all the nutrients needed for good nutrition.

6) when given a choice between two foods, will select the one with more nutritional value.

7) when given a choice between two foods, will select the one that is the least expensive source of a given nutrient.

A description of the game follows: (See Appendix A.)

A. Parts of the game

1. Board

The board is of circular design. It contains three concentric circles of one inch deep and one inch apart fifteen and a

half inches in diameter, thirteen and a half and eleven and a half. The circles are connected by four "alleyways" equidistant apart. The circles and alleyways are divided into eighty-four sections. Thirty-six of these indicate a need for one of the twelve key nutrients, such as "Need Vitamin A" or "Need Calcium." Each of the nutrients is in three different locations on the board. On four of the squares are the words "Any Food Free." Six of the sections indicate that the player who lands on them is to lose 50 cents for cookies, popcorn, potato chips, gum, candy or cookies. The four outer sections along the alleyways are marked "Start." The tokens of the players are initially placed on these sections. Players can move right or left, up or down during their turns. However, they have to keep going the same direction during one turn.

2. Dice

The number of moves a player gets to make during his turn is determined by the number he rolls with the dice.

3. Grocery store

The grocery store consists of cards one and three-fourths inches by one and one-fourth inches. On the front side is the name of a food and its price. Some have pictures of the food, also. On the back side are the nutrients present in large quantities.

4. Play money

Each player is given twelve paper quarters at the beginning of the game with which to buy his food.

5. Tokens

Each player has a token with which he moves around the game board.

6. Function envelopes

On the outside of these envelopes is written a function of one of the nutrients. Some envelopes are illustrated. On the inside on a slip of paper is the name of the correct nutrient.

7. Nutritious person

Each player gets a board with a "nutritious person" drawn on it. Around the person are squares approximately the same size as the grocery store cards. On each of the squares is the name of one of the key nutrients.

B. Rules of the game

1. Object

The object of the game is to cover all the nutrient squares on the nutritious person. The first player who covers them all wins the game.

2. Step One

The players roll the dice to see who gets the highest number. The one with the highest number starts the game.

3. Step Two

The players try to land on all twelve nutrients on the board or the "Any Food Free" squares. The squares that require the loss of money are to be avoided. The players have the option of moving the number of places indicated on the dice or of staying in the same spot.

4. Step Three

The next step is to go to the grocery store and select the food that contains the nutrient on which the player landed. After selecting the food, the player must pay the grocery store keeper for

it. If there are four players playing, one of the players must also be the grocery store keeper. If there are five players, then the extra player is exclusively in charge of the grocery store. If the nutrient the player needs is not listed on the back, he must give the food back to the keeper. However, he does not regain his money. If he had landed on "Any Food Free," then he could select any food without paying for it and place it over any of the squares of the nutrients listed on the back.

5. Step Four

If the correct food is selected from the grocery store, then the player has a chance to earn an extra quarter. He has to look through the function envelopes. If he can select the correct function of that particular nutrient in the body, then he earns a quarter. Landing on "Any Food Free" and covering up a nutrient on the nutritious person also allows a person to select a function envelope. Even though he paid nothing for the food, he still earns a quarter if he selects the correct envelope.

Evaluation of the Game

Two instruments were developed for the study--a test, which was used as both the pre-test and post-test, and a rating scale (see Appendix B). The test was a measure of the cognitive learning anticipated from playing the game. It also asked for the youth's name, age, and sex. The test was determined from the behavioral objectives, which were derived from the basic concepts of nutrition education previously mentioned. Its validity was checked and approved by the three nutrition authorities at University of Northern Iowa who checked the

accuracy of the nutrition information of the game. The reliability was determined through the test-retest method. The test was administered to two girls 4-H clubs at the beginning of their club meeting. The author then collected the test papers and the club carried on its regular activities. At the end of the club meeting, the author re-administered the test. No significant differences were found between the pre-test and post-test at the .05 level. (See Table 3.)

The rating scale was an attempt to measure their feelings toward the game. Two questions were mentioned on the half sheet of paper: Did you like the game? Do you want to play the game again? The youth were to rate the first questions either strongly dislike, dislike, don't know, like, strongly like. They were to rate the second questions very much so, perhaps, don't care, don't think so, or not at all. The answers to the first question were given the numbers 1, 2, 3, 4, and 5, respectively. The answers to the second question were given the numbers 5, 4, 3, 2, and 1, respectively.

For the pilot study the author visited a teenage cooking class of both boys and girls with no prior announcement of her visit. The cooking class met at an Office of Economic Opportunity neighborhood center in Cedar Falls, Iowa. Twelve of the youths played the game in three groups of four each. All the youths were white and between the ages of thirteen and seventeen. Results of the pre-tests and post-tests showed no significant differences at the .05 level. (See Table 4.) The author did not administer the rating scale because it was not developed at the time of the pilot study. However, from her observations the students reacted more favorably toward the game than unfavorably. One group stopped playing the game before it was over because of

TABLE 3

TEST-RETEST FOR RELIABILITY OF EVALUATION INSTRUMENT

Subject	Pre-test	Post-test	Difference	Related t value
1	34	33	-1	
2	24	24	0	
3	26	22	-4	
4	27	25	-2	
5	30	25	-5	
6	26	22	-4	
7	25	28	3	
8	20	23	3	
9	18	20	2	
10	32	35	3	
11	31	31	0	
12	27	33	6	
13	33	36	3	
14	33	30	-3	
15	36	33	-3	
16	36	37	1	
17	35	35	0	
18	29	30	1	
19	25	25	0	
20	37	35	-2	
21	33	33	0	
22	33	37	4	
23	39	40	1	
24	30	31	1	
25	34	36	2	
26	37	41	4	
27	35	33	-2	
28	26	29	3	
29	37	31	-6	
30	37	38	1	
			3	.3700*

* Not significant at any level

TABLE 4

PRE-TEST POST-TEST SCORES OF TWELVE SUBJECTS IN PILOT STUDY

Subject	Age	Sex	Pre-test	Post-test	Difference	Related t value
1	16	M	30	38	8	
2	17	M	22	24	2	
3	15	F	34	36	2	
4	15	M	31	32	1	
5	17	F	28	30	2	
6	13	F	35	35	0	
7	**	F	30	32	2	
8	15	M	26	31	5	
9	13	F	36	37	1	
10	14	M	32	36	4	
11	14	F	38	38	0	
12	13	F	38	35	-3	
					24	2.507*

* Significant at the .05 level

** Did not write age

the negative reaction of one girl to it. The other groups played competitively and talked about the nutrients while playing the game. There were more youths who wanted to play the game, but the author was unable to administer it to more than twelve students. The center, which was a former home, was divided into six small rooms. Each game group was in a separate room. The author could not physically administer the game in more than three rooms.

For the actual study the author visited the other three cooking classes in session at that time along with one class that was about to be started as soon as a volunteer leader could be located. Her visits were unknown to the participants except for the visit to the potential class at Midtown Center, a neighborhood center operated by the Office of Economic Opportunity, which was arranged by the center manager. The volunteer leaders of the classes knew of the visit of the author.

The author played the game with the youths that showed up at the classes at the time of her visit. However, because of the lack of discipline in the classes, the author arbitrarily decided not to work with more than two groups of four. Because of the amount of reading involved in the pre-test and post-test, she arbitrarily decided to limit the age minimum to eleven for playing the game.

The locations for the study, besides the Midtown Center, included the Jesse Cosby Neighborhood Center, operated by the Office of Economic Opportunity; the Calvary United Methodist Church in a predominantly black neighborhood of Waterloo; and Logandale, a low-income housing complex of both black and white persons.

Twenty of the youths in the study were black while one girl at Logandale was white. Their age range was ten through seventeen. There

were seventeen girls and four boys. Not all of the youths who started out playing the game finished it. Two of the players at Logandale became distracted and dropped out before finishing. One of the players at Cosby left the game before it was completed because of lack of interest. Four of the eight boys who played the game at Cosby's Chef's Cooking Class could not complete the game because the bus arrived to take them home before they were through.

The author had no data on the income levels of the youths because no data was taken from them for the Expanded Nutrition Program. The author assumed they were all from low-income families because of the locations of the classes.

The dates of the study were within a two-week period in 1972--February 19, Midtown; February 23, Calvary Church; February 24, Logandale; February 26, Jesse Cosby; and March 1, Jesse Cosby.

The results of the pre-test and post-test scores showed a significatnt difference at the .05 level using a related t test. (See Table 5.) On the rating scale they indicated they liked the game with an average score of 4.4. Five was the highest score. They indicated they wanted to play the game again with an average score of 4.4. Again, five was the highest score. (See Table 6.)

TABLE 5

PRE-TEST POST-TEST SCORES OF TWENTY-ONE SUBJECTS IN STUDY

Group*	Subject	Age	Sex	Pre-test	Post-test	Difference	Related t value
A	1	11	F	21	19	-2	
	2	12	F	17	20	3	
	3	12	F	19	20	1	
B	4	11	F	27	26	-1	
	5	12	F	16	27	11	
C	6	11	F	21	25	4	
	7	13	F	24	32	8	
	8	11	F	22	28	6	
	9	12	F	26	32	6	
	10	10	F	15	27	12	
D	11	16	M	31	36	5	
	12	13	M	24	21	-3	
	13	15	M	31	32	1	
	14	16	M	33	41	8	

TABLE 5 (continued)

Group*	Subject	Age	Sex	Pre-test	Post-test	Difference	Related t value
E	15	15	F	38	39	1	
	16	14	F	18	26	8	
	17	14	F	23	31	8	
	18	17	F	25	35	10	
	19	17	F	40	39	-1	
	20	15	F	29	35	6	
	21	16	F	24	26	2	
						93	4.615**

* Class locations: A - Calvary United Methodist Church
B - Logandale Housing Project
C - Jesse Cosby Neighborhood Center
D - Jesse Cosby Neighborhood Center
E - Midtown Neighborhood Center

** Significant at the .05 level

TABLE 6

SCORES OF TWENTY-ONE SUBJECTS ON RATING SCALE IN STUDY

Group*	Subject	Like	Play again
A	1	4	5
	2	4	3
	3	4	3
B	4	4	4
	5	4	4
C	6	4	3
	7	5	5
	8	5	5
	9	5	5
	10	5	5
D	11	5	5
	12	4	3
	13	4	4
	14	4	4
E	15	5	5
	16	5	5
	17	4	4
	18	4	4
	19	4	5
	20	4	5
	21	5	5
		4.4**	4.4**

* Class locations: A - Calvary United Methodist Church
B - Logandale Housing Project
C - Jesse Cosby Neighborhood Center
D - Jesse Cosby Neighborhood Center
E - Midtown Neighborhood Center

** Average score

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary

The problem of the study was the lack of interesting and entertaining ways to teach nutrition in the youth phase of the Expanded Nutrition Program in Black Hawk County, Iowa. The question of the study was can a game be developed which will teach the participants in the youth phase certain nutritional concepts and be appealing to the youth. The author developed a game for the population in the study which was effective in teaching certain cognitive information about nutrition and appeared to be appealing to them. The development of the game included three main steps--review of commercial games, designing a game, evaluating the game. The designing of the game involved playing it with people and revising it.

The behavioral objectives for the game are: After playing the game, the children 1) will be able to recognize the names of the twelve key nutrients; 2) will be able to name a nutrient in a given food; 3) will be able to identify a function of the twelve key nutrients; 4) will say all twelve nutrients are available in food; 5) will say no food by itself has all the nutrients needed for good nutrition; 6) when given a choice between two foods, will select the one with more nutritional value; 7) when given a choice between two foods, will select the one that is the least expensive source of a given nutrient.

The game is a board game at which two to four players of the ages ten on up can play. A fifth player may play. However, he does not move a token around the board as the other players do. He is in charge of the grocery store. The board consists of three concentric circles one inch deep and one inch apart fifteen and one-half inches in diameter, thirteen and one-half inches and eleven and one-half inches, respectively. The circles are connected by four "alleyways" equidistant apart. The circles and alleyways are divided into ninety-eight sections. Thirty-six of these indicate a need for one of the twelve key nutrients, such as "Need Vitamin A" or "Need Calcium." Each of the nutrients is in three different locations on the board. On four of the squares are the words "Any Food Free." Six of the sections indicate that the player who lands on them is to lose 50 cents for cookies, popcorn, potato chips, gum, candy or cookies. The four outer sections along the alleyways are marked, "Start." Players move small plastic tokens around the board according to the number of moves indicated by a throw of dice. The object is to land on a nutrient square on the board. This gives the player the chance to buy a food card from the grocery store with his three dollar fund of play money. Hopefully, the food card will have listed on the back the nutrient on which he landed. If the food does contain the nutrient, the player gets a chance to earn an extra play quarter by selecting the correct function of that nutrient in the body. If he buys a food that does not contain the correct nutrient, he forfeits the money he paid for the food and he forfeits the food card itself. The food cards are used to cover the nutrient squares on the nutritious person card each player has. The first player to cover all twelve nutrient squares, one for each of the twelve

key nutrients, is the winner of the game.

The method of evaluation included a one-group pre-test post-test of the game's cognitive effectiveness. A related t test of the pre-test and post-test revealed a significant difference at the .05 level with a score of 4.615. The evaluation also included a rating scale of the appeal of the game administered after the game was played. The average score on the rating scale was 4.4. The scale went from one to five with five being the indication of the greatest appeal.

Conclusions

A game was developed which was effective in teaching nutritional information to participants in the youth phase of the Expanded Nutrition Program. The children enjoyed playing the game and would play it again, according to the scores on the rating scale. However, because of the limitations of the study, it is unknown whether these results could be obtained from other groups of youth playing the game. The evaluation of the game was not conducted on a random sampling from the population. It would have been impossible since the population fluctuates from week to week, and there is no way of controlling which children attend classes.

Implications

The exploratory nature of the study lends itself to further evaluative research. Replication of the study is desirable to discover whether the same results would be obtained with a different sample from the same population. Because of the favorable response to the game in the seventh grade classes in Waterloo, Iowa, evaluating the game's usefulness in a school classroom is desirable. Also, the game could

be evaluated with non-school groups involved with education, such as 4-H clubs.

Further studies could be conducted to assess the retention of the information learned from playing the game. In this study the knowledge was tested immediately after playing the game while the nutrition information was fresh in the children's minds.

In this study the game was played only once by the sample. Hypothesized relationships could be explored in which the game was played more than one time.

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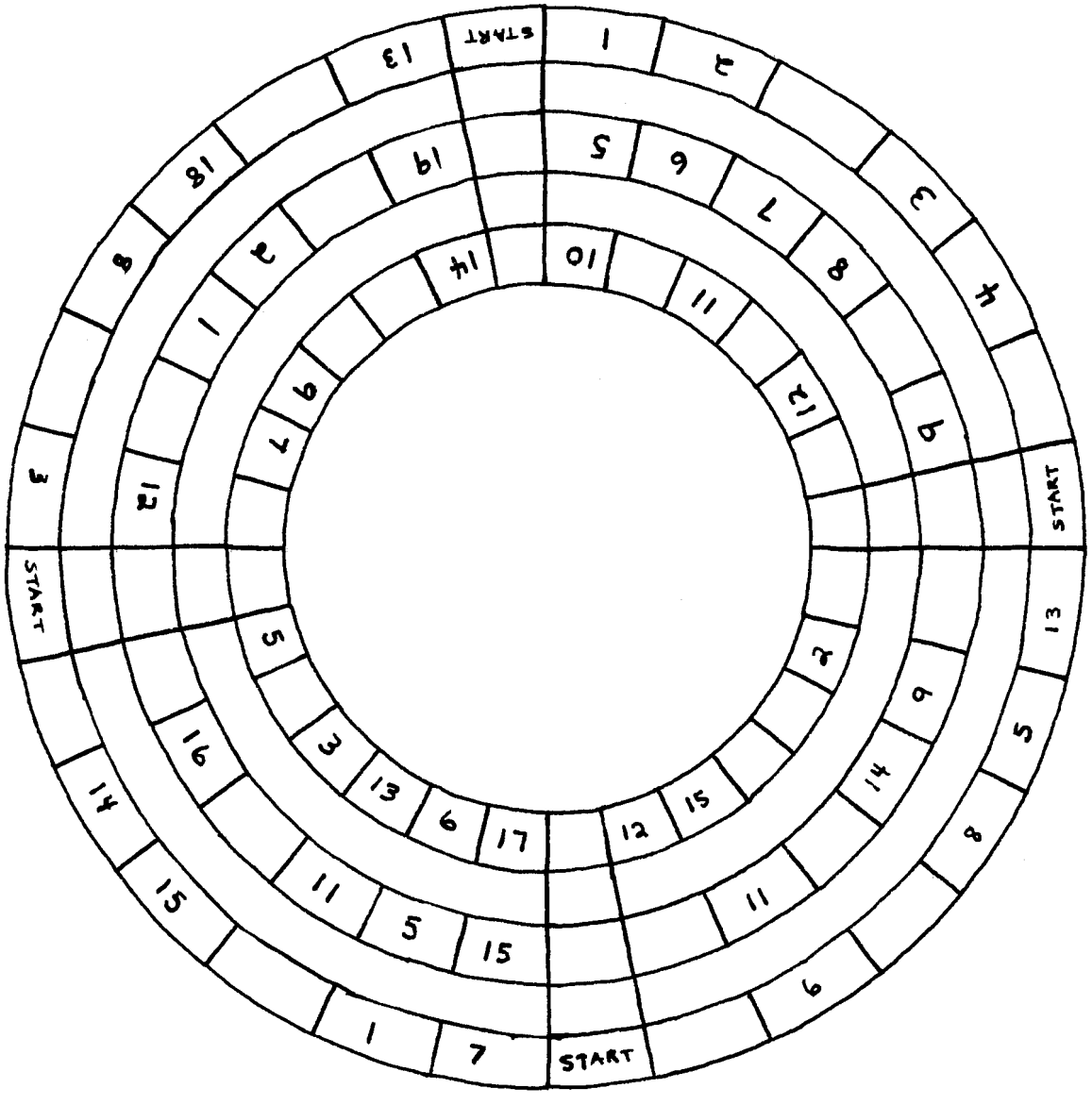
APPENDIX A

THE GAME

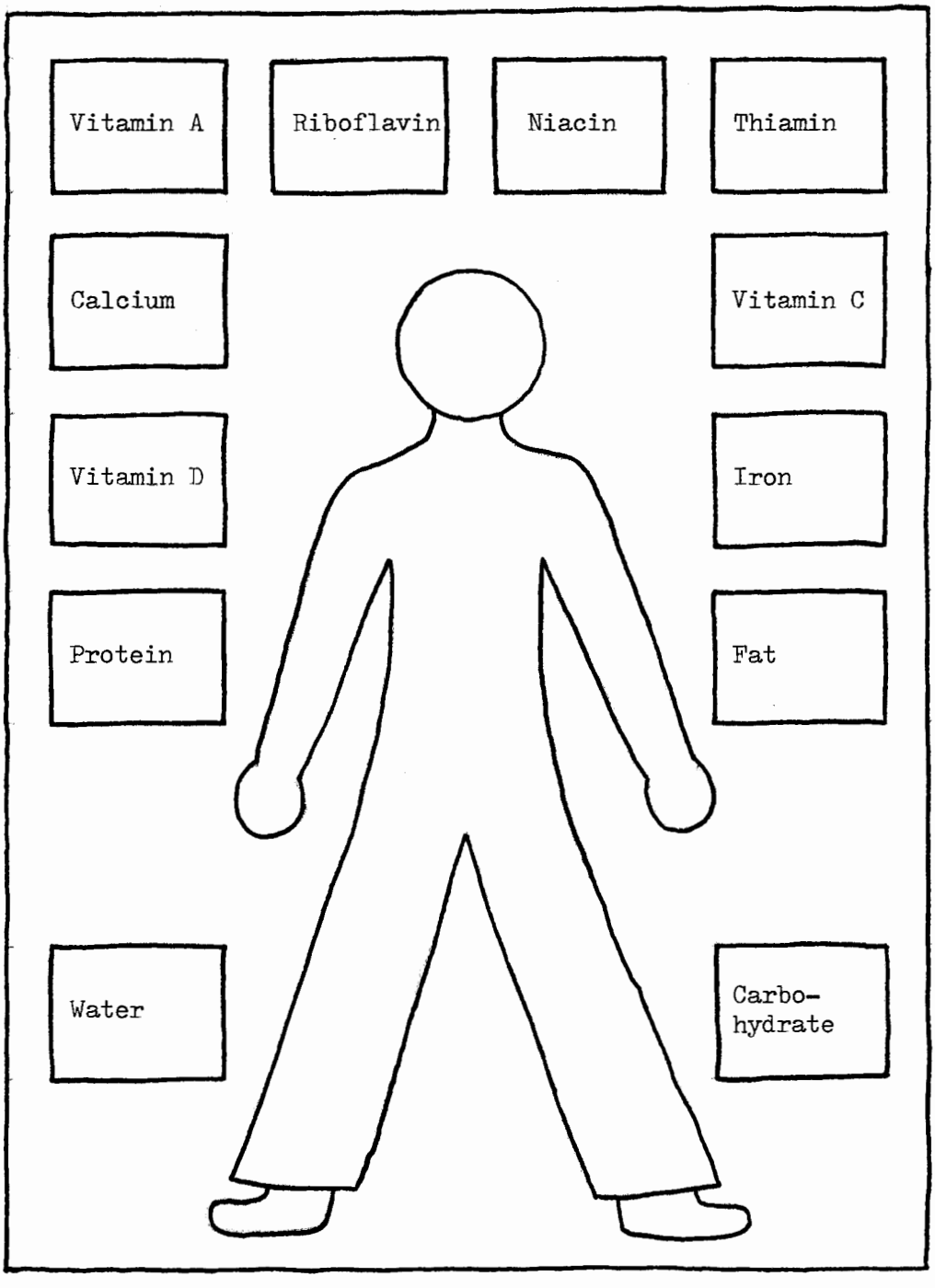
THE GAME BOARD

(Explanation of numbers on next page)



Number	Explanation
1	Need Niacin
2	Need Vitamin A
3	Need Carbohydrate (CHO)
4	Lose 50¢ for Popcorn
5	Any Food Free
6	Need Vitamin C
7	Need Water
8	Need Thiamin
9	Need Protein
10	Lose 50¢ for Cookies
11	Need Riboflavin
12	Need Calcium
13	Need Vitamin D
14	Need Iron
15	Need Fat
16	Lose 50¢ for Pop
17	Lose 50¢ for Candy
18	Lose 50¢ for Gum
19	Lose 50¢ for Potato Chips

THE NUTRITIOUS PERSON BOARD



FUNCTION ENVELOPES

Function (Outside of Envelope)	Nutrient (Slip of Paper Inside)
Supplies energy	Carbohydrate
Helps hold body cells together and helps prevent bruising Helps in healing wounds Helps resist infection Helps prevent pink toothbrush (Bleeding gums)	Vitamin C
Helps cells use oxygen Helps keep eyes, skin, tongue, and lips healthy Helps prevent scaly, greasy skin around nose and mouth	Riboflavin
Helps eyes adjust to dim light Helps keep skin smooth Promotes growth	Vitamin A
Supplies energy Carries certain vitamins and supplies fatty acids	Fat
Helps build bones and teeth Helps blood clot	Calcium
Builds and repairs tissues Can supply energy, too	Protein
Helps calcium do its thing	Vitamin D
Helps promote appetite Helps prevent being irritable Helps keep nervous system healthy	Thiamin
Helps make good red blood Keeps us from being weak and tired	Iron
Helps keep nervous system healthy Helps keep skin, mouth, tongue and digestive tract in healthy condition Helps cells use other nutrients	Niacin
Carrier of nutrients to and wastes from cells in the body Aids in digestion Helps regulate body temperature	Water

GROCERY STORE FOOD CARDS

Front Side	Reverse Side	No. in Game
Meat $1/lb.	Protein, Iron, Thiamin, Niacin, Riboflavin	2
Fish 75¢/lb.	Protein, Iron, Thiamin, Niacin, Riboflavin	1
Poultry 50¢/lb.	Protein, Iron, Thiamin, Niacin, Riboflavin	1
Liver 50¢/lb.	Protein, Iron, Vitamin A, Thiamin, Riboflavin	2
Eggs 50¢/doz.	Protein, Iron, Vitamin A, Thiamin, Riboflavin	3
Milk 50¢/½ gal.	Protein, Calcium, Vitamin A, Vitamin D, Riboflavin	4
Cottage Cheese 50¢/carton	Protein, Calcium	1
Cheese 50¢/½ lb.	Protein, Calcium, Riboflavin, Vitamins A and D, Fat	2
Ice Cream 50¢/½ gal.	Fat, Calcium, Riboflavin	2
Dried Beans and Peas 25¢/lb.	Protein, Carbohydrate, Iron, Thiamin	3
Peanut Butter 25¢/½ lb.	Protein, Fat, Niacin	3
Enriched Bread 25¢/loaf	Carbohydrate, Thiamin, Iron, Riboflavin, Niacin	3
Enriched Cereal 25¢/pkg.	Carbohydrate, Thiamin, Iron, Riboflavin, Niacin	3
Butter 75¢/lb.	Fat, Vitamin A, Vitamin D	2
Margarine 25¢/lb.	Fat, Vitamin A, Vitamin D	2

Front Side	Reverse Side	No. in Game
Green Leafy Vegetables 25¢/pkg.	Iron, Vitamin A, Vitamin C	4
Water Free	Water	4
Cantaloupe 50¢/one	Vitamin A, Vitamin C	1
Carrots 25¢/pkg.	Vitamin A	1
Strawberries 50¢/qt.	Vitamin C	1
Tomatoes 25¢/one	Vitamin C	1
Oranges 50¢/pkg.	Vitamin C	1
Grapefruit 50¢/pkg.	Vitamin C	1
Sunshine Free	Vitamin D	4
Raisins 50¢/pkg.	Iron	1
Squash 25¢/one	Vitamin A	1
Potatoes 25¢/3 lb.	Vitamin C and Carbohydrate	1
Sweet Potatoes 25¢/can	Vitamin A	1

APPENDIX B

THE INSTRUMENTS

PRE-TEST AND POST-TEST

Name _____ Sex ____ Age ____

I. Circle T for True and F for False.

T F We can get all the nutrients we need for good nutrition from the food we eat.

T F Milk contains all the nutrients we need for good nutrition.

T F We need a variety of foods in our diets.

T F All 12 nutrients are needed in our diets for good nutrition.

II. Fill in the blank with the name of a food or other substance which is a good source of the nutrients.

protein _____

carbohydrate _____

fat _____

iron _____

riboflavin _____

niacin _____

thiamin _____

Vitamin D _____

Vitamin A _____

Vitamin C _____

calcium _____

water _____

III. Circle the food which is least expensive in each line:

1) 1 lb. butter or 1 lb. margarine

2) serving of beef or serving of dry beans and peas

IV. Circle the food in each line which is most nutritious:

1) peanut butter or jelly

2) candy or cheese

3) potatoes or potato chips

4) ice cream or gum

5) milk or pop

6) popcorn or enriched bread

V. Name a nutrient present in large quantities in each of the following foods:

Leafy green vegetables _____ Grapefruit _____

Enriched bread _____ Carrots _____

Liver _____ Oranges _____

Cantaloupe _____ Meat _____

VI. Draw a line between the nutrient and its most important function in the body.

Helps make a good red blood to help us from getting weak.	Thiamin
Helps promote normal appetite and digestion, keep nervous system healthy and prevent being irritable.	Carbohydrate
Builds and repairs all tissues.	Iron
Supplies energy.	Protein
Helps calcium do its thing.	Vitamin A
Helps eyes adjust to dim light and helps keep the skin smooth.	Vitamin D
Helps hold body cells together, heal wounds, resist infection, and prevent pink toothbrush.	Calcium
Helps build bones and teeth and helps the blood clot.	Vitamin C

Helps cells use oxygen, keeps eyes, skin, tongue and lips healthy and prevents scaly, greasy skin around mouth and nose.	Fat
Carries other nutrients to and wastes from the cells of the body and also helps regulate body temperature.	Riboflavin
Helps keep the nervous system healthy and keep skin, mouth, tongue and digestive tract in good condition.	Water
Supplies energy and fatty acids and carries certain vitamins.	Niacin

RATING SCALE

Name _____

Circle the answer that best explains your feelings:

1. Did you like the game?

   Strongly dislike Dislike Don't know Like Strongly like

2. Do you want to play the game again?

   Very much so Perhaps Don't care Don't think so Not at all