LOCUS OF CONTROL AND CUE EXPLICATION: PERCEPTION OF RESPONSIBILITY IN A COLLEGE HOME ECONOMICS ACADEMIC SETTING

by

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CHAPTER I

INTRODUCTION

The acceptance of responsibility seems to play an important role in each individual's life. Ross (1973) has stated that how individuals view themselves depends upon the responsibilities they assume. Likewise, the degree of accountability and the types of things for which persons accept responsibility define how others perceive them.

Johnson (1978) and Stott (1976) have suggested that it is a common assumption that schools should provide students opportunities to acquire a sense of responsibility for their behavior in addition to learning knowledge and skills. In 1977, Wharton proposed that responsibility should become the fourth R of education. However, the concept of helping students to become responsible individuals is not a new one. Power (1970) noted that Thomas Jefferson and Benjamin Franklin had hopes of educating the common man to increase assurance of an enlightened and responsible citizenry and, thus, of promoting the success of the new democracy. Tanner and Tanner (1975) pointed out that in 1918, the Commission on the Reorganization of Secondary Education developed seven Cardinal Principles. The primary objectives of the seven principles for secondary education included health, command of fundamentals, citizenship, worthy use of leisure, vocations, worthy home membership, and ethical character. Achievement of a high

level performance in any of the areas would necessitate individuals taking responsibility for their behavior in that area of life.

Similarily, in 1902, the members of the American Home Economics Association reflected concern for responsible use of resources when they adopted the following definition of home economics:

> Home economics in its most comprehensive sense, is the study of the laws, conditions, principles, and ideals which are concerned on the one hand with man's physical environment and on the other hand with man's nature as a social being, and is the study especially of the relation between these two factors ... (East, 1980, p. 10)

Follender and Plihal (1969) reported that wise uses of physical, temporal, financial, environmental, emotional, intellectual, interpersonal, and social resources have become foci of home economics through the years.

The topic of responsibility seems extremely relevant to consumer and homemaking education, since one of the basic purposes set forth for consumer and homemaking education is as follows:

> To prepare youth and adults for the responsibilities of homemaker and parent through instruction in home economics subjects of child development, clothing and textile, consumer education, family living, food and nutrition, home management, and housing. (Texas Education Agency, 1978, p. 1)

In order to achieve this purpose, various strategies need to be studied regarding their effectiveness in helping students to assume responsibility for their behaviors.

Johnson (1978) has postulated that if individuals are held responsible for tasks or outcomes they tend to be more serious about the tasks or jobs to be accomplished. Gruwald (1971) has stated

that all students, individually and collectively, are responsible for what happens in a classroom. Each student, as well as the teachers, share responsibility for learning. According to Johnson (1978), Gruwald (1971), and Wharton (1977), a responsibility of the teacher is to guide students in comprehending cause-and-effect relationships within an academic setting.

The question remains as to what specific methodologies best facilitate the process of assisting students to accept responsibility for the outcome of academic endeavors. A necessary first step in exploring this area is to begin to understand the effect of various individual differences and environmental contingencies on acknowledged personal responsibility.

Theoretical Background of this Study

Two major theories of personal responsibility are the causal attribution theory and the locus of control personality construct. Heider (1958) introduced the causal attribution theory which delineates four major elements perceived as causal agents. These elements are ability, effort, luck, and task difficulty. The theory is primarily concerned with the perception of responsibility in specific situations. Thus, it focuses on how people interpret the causal relationships associated with a particular phenomenon. One of the inclinations that subjects have demonstrated in empirical research studies is that the attribution of causality is affected by the amount of information available in a given situation. Based on the

results of studies by Frieze (1971), Kun and Weiner (1973), and Sogin and Pallak (1976), it was concluded that the degree to which individuals attribute causality of outcomes to personal elements is negatively related to the ambiguity of contingency factors.

Whereas the causal attribution theory has a situation-specific base, the locus of control construct as developed by Rotter (1954, 1966) purports that individuals possess a generalized perception of causality. Each person perceives a degree of internal or external locus of control over events. Some individuals perceive personal control or internal control over events because they believe that reinforcements are a result of their efforts and abilities. Others perceive external control because they believe that their behavior accounts for part of the reinforcement, but that elements of luck, chance, or fate are also involved. For those perceiving external control, reinforcements are seen as being controlled ultimately by factors other than personal effort and ability.

Rotter (1966) postulated that the generalized perception of locus of control becomes operative across a wide range of endeavors and affects attribution of causality. In several studies (Davis and Davis, 1972; Joe, 1974; Kroveta, 1974; Phares, Wilson, and Klyver, 1971; Rotter, 1966; Ude and Vogler, 1969), it was found that individuals attribute causality for specific outcomes in accordance with their generalized orientation, especially in novel situations.

Furthermore, individuals with an external locus of control orientation have shown tendencies to perform more efficiently when

contingencies for reinforcement are explicit than when contingencies are ambiguous (Bartel, DuCette, and Wolk, 1972; Hardy and Eliot, 1977; Lefcourt, 1967; Pines, 1973; Pines and Julian, 1972; Ude and Vogler, 1969). On the other hand, persons with an internal locus of control orientation are inclined to decipher the cues in ambiguous cue situations and perform in a manner fairly consistent with their performance in explicit cue conditions. In a similar vein, Steger, Simmons, and Lavelle (1973) and Wolfe (1972) found that internals more realistically interpret cues than externals as demonstrated by their accuracy in predicting the outcome of their academic performance.

Statement of the Problem

The main problem of this study was to investigate the effects of locus of control and cue explication upon the tendency to accept personal responsibility for performance outcomes in an academic setting. The secondary problem of this study was to assess the effects of locus of control and cue explication upon accuracy of predicting the outcome of an examination and upon the outcome of an examination. The principle questions to be answered were:

1. Does an internal versus external locus of control orientation influence the attribution of causality in an academic setting?
2. Does the ambiguous versus explicit cue condition influence the attribution of causality in an academic setting?

3. Does the interaction between locus of control and cue explication influence the attribution of causality in an academic setting?
4. Does an internal versus external locus of control orientation influence the accuracy of predicting the outcome of performance on an academic examination?
5. Does the ambiguous versus explicit cue condition influence accuracy of predicting the outcome of performance on an academic examination?
6. Does the interaction between locus of control and cue explication influence the accuracy of predicting the outcome of a performance on an academic examination?
7. Does an internal versus external locus of control orientation influence the performance outcome on an academic examination?
8. Does the ambiguous versus explicit cue condition influence the performance outcome on an academic examination?
9. Does the interaction between locus of control and cue explication influence the performance outcome on an academic examination?

Assumptions of this Study

There were three basic assumptions underlying the hypotheses and methodology of this study. They were as follows:

1. Individuals should assume personal responsibility for the outcome of their behavior.

2. Curriculum should be administered using methods that promote students' acceptance of personal responsibility for performance outcomes.
3. Individual students react differently toward and feel differently about assuming personal responsibility for performance outcomes.

Hypotheses

The study was designed to examine the following hypotheses:

1. Externals when compared to internals attribute performance outcome on an academic examination significantly less to personal responsibility when each of the following causal agents is considered:
   a. ability
   b. effort
   c. luck
   d. task difficulty
2. Subjects in the ambiguous criteria assignment condition when compared to subjects in the explicit criteria assignment condition attribute significantly less to personal responsibility when each of the following causal agents is considered:
   a. ability
   b. effort
   c. luck
   d. task difficulty

3. Externals when compared to internals in the ambiguous criteria assignment condition attribute performance outcome of an academic examination significantly less to personal responsibility, but the difference in attribution to personal responsibility is not significant between externals and internals in the explicit criteria assignment condition when each of the following causal agents is considered:
   a. ability
   b. effort
   c. luck
   d. task difficulty
4. Externals when compared to internals are significantly less accurate in predicting their scores on an academic examination.
5. Subjects in the ambiguous criteria assignment condition when compared to subjects in the explicit criteria assignment condition are significantly less accurate in predicting their scores on an academic examination.
6. Externals when compared to internals are significantly less accurate in predicting their scores in the ambiguous criteria assignment condition, but the difference in accuracy of prediction is not significant in the explicit criteria condition.
7. Externals when compared to internals score significantly lower on the academic examination.

8. Subjects in the ambiguous criteria assignment condition when compared to subjects in the explicit criteria assignment condition score significantly lower on the academic examination.
9. Externals when compared to internals score significantly lower on the academic examination in the ambiguous criteria assignment condition, but the difference between scores of internals and externals is not significant in the explicit criteria condition.

Scope and Limitations

The students enrolled in an introductory course in food and nutrition, Food and Nutrition 131, at Texas Tech University in Lubbock, Texas, during the 1979 fall semester were included in this study. The majority of the students were freshmen and sophomores. The course consisted of two sections. Both sections were taught using a combination of lecture series, laboratory experiences, and individual study assignments. Classes for students in both sections were conducted in a large lecture hall and were taught by the same instructor. Students were free to enroll in the section of their choice.

Definitions of Terms

The following terms were defined in relation to their application to this research study:

Ability -- the perception of possessing sufficient personal power, skill, or talent to accomplish an objective or task. In this study, it specifically refers to the ability to perform successfully on an academic examination.

Academic examination -- a test of cognitive achievement based on specific behavioral objectives and covering subject matter content of a four week portion of Food and Nutrition 131, a college introductory course to food and nutrition.

Accuracy of expectations or accuracy of predictions -- the difference between the outcome that an individual anticipated before an event and what actually transpired.

Ambiguous cue condition or ambiguous criteria assignment condition -- the experimentally controlled situation wherein students received no reference to the specific behavioral objectives from which items on the academic examination were derived.

Behavioral objectives -- statements describing the performances expected of students who have successfully completed a unit/course of instruction. The objectives used in this study were written following the guidelines set forth by Benjamin Bloom (1956).

Causal attribution -- a theory primarily concerned with the ascription of responsibility for the outcome of activities or events. It focuses on how people interpret the causal relationships associated with a particular event. The four most common causal agents cited are ability, effort, luck, and task difficulty (Heider, 1958).

Control group -- subjects in the experimentally controlled situation in which they did not receive specific beahvioral objectives from which items on the academic examination were derived. The subjects in the control group are often referred to as the group operating under the ambiguous cue condition or the ambiguous criteria assignment condition.

Cue explication -- the degree to which the contingencies for successful performance are described. In this study, the explication of cues were manipulated in terms of informing or not informing students of specific behavioral objectives which described the criteria for successful performance on the academic examination.

Discrepancy score -- the absolute numerical value of the difference between the student's predicted score and the actual score made by the student on the academic examination.

Effort -- the perception of the results of an event due to the degree of labor exerted in the accomplishment of a task or an objective. In this study, it refers specifically to preparation for an academic examination.

Expectation -- the anticipated outcome of an event.

Explicit cue condition or explicit criteria assignment condition -- the experimental situation wherein students received specific behavioral objectives from which items on the academic examination were derived, and students were given explanations of the use of the behavioral objectives.

External locus of control -- the generalized expectancy that one's efforts and abilities are not totally responsible for the outcome of an event, but that environmental elements such as luck, task difficulty and powerful others are at least partially responsible for the outcome (Rotter, 1966).

Externality -- the condition of perceiving external locus of control.

Externals -- individuals perceiving external locus of control. In this study, it refers specifically to subjects in Food and Nutrition 131 who scored in the upper third of the distribution of the locus of control scores as measured by the I-E Locus of Control Scale (Rotter, 1966).

Food and Nutrition 131 -- a course of study offered during the fall semester of 1979 in the College of Home Economics, Texas Tech University and described as the study of the "Science of nutrition and food as applied to everyday living" (Richardson, 1979, p. 327).

Internal locus of control or internal control -- the generalized expectancy that one's efforts and abilities are the causal agents for the outcome of events (Rotter, 1966).

Internality -- the condition of perceiving internal locus of control.

Internals -- individuals perceiving internal locus of control. In this study it refers specifically to subjects in Food and Nutrition 131 who scored in the lower third of the distribution of locus of

control scores as measured by the I-E Locus of Control Scale (Rotter, 1966).

Locus of control -- a psychological orientation concerned with the generalized perception or belief that reinforcements are contingent upon one's behavior. Theoretically, the degree of the personality characteristic is distributed along a continuum. At one extremity are those individuals who perceive personal responsibility for outcomes or events. At the other extremity are those individuals who perceive reinforcements as ultimately being contingent upon external/environmental agents (Rotter, 1954, 1966).

Luck -- the perception that chance, fate, or fortune play a part in the outcome of events.

Performance outcome -- the result of an activity. In this study, it specifically refers to the score on an academic examination.

Personal responsibility -- the perception of being accountable for the results of one's actions.

Predicted score -- a numerical score that a student stated prior to an academic examination as the score expected on the examination.

Reinforcement -- the negative or positive effect of an activity or event.

Task difficulty -- the perception of the degree of complexity, strength, or expertise involved in overcoming an obstacle or completing a job.

Treatment group -- subjects in the experimental situation in which they received specific behavioral objectives from which items on the academic examination were derived and were given explanations of the use of behavioral objects. The subjects in the treatment group are often referred to as the group operating under the explicit cue condition or the explicit criteria assignment condition.

CHAPTER II

REVIEW OF LITERATURE

The primary purpose of this study was to determine the influence of locus of control and cue explication upon causal attribution of the outcome of an academic examination. The secondary purpose of this study was to determine the influence of locus of control and cue explication upon accuracy of prediction and performance outcome of an academic examination. The cue manipulated in this study was behavioral objectives.

In this chapter a review of literature related to the purposes of this study is presented. The review is divided into three sections with one section devoted to each of the following: causal attribution, locus of control, and behavioral objectives.

Causal Attribution

The causal attribution theory was introduced by Heider (1958). He frequently referred to it as the naive theory of action, because it addresses the layman's conceptions of causal relationships. He emphasized cognitive processes which intervene between an observed event and the interpretation of that event.

Heider (1958) has identified ability, effort, luck, and task difficulty as the four attributes individuals most frequently perceive as causal agents in goal directed behavior. The four causal

elements form cognitive schemata by which mankind organizes and interprets the relationship between cause and effect. Individuals use the causal schemata to judge past events, to predict future outcomes, and to interpret interpersonal behavior.

Weiner, Heckhauser, Meyer, and Cook (1972) categorized the four causal attributions into the two dimensions of locus of control and stability. The locus of control dimension focuses upon internal or external characteristics. The internal category contains the personal causal elements of ability and effort, whereas the external category contains the environmental elements of task difficulty and luck. The stability dimension also includes two distinct groupings of causal elements. One group is made up of fixed or relatively stable elements of ability and task difficulty. The other group consists of luck and effort which are unstable elements that tend to vary with differing circumstances.

An important aspect of the two dimensions of causal attributions is the perceptions that result from attributing success or failure to either of the dimensions. Weiner et. al. (1972) have postulated that attribution to internal elements of the locus of control dimension results in feelings of personal responsibility that create feelings of pride and shame. If an individual perceives success resulting from effort or ability, feelings of accomplishment are experienced. Conversely, if an individual interprets failure in terms of lack of ability or effort, feelings of shame and guilt are realized. Attribution to the external elements, luck and task dif-

ficulty, deny feelings of personal responsibility. Thus, the individual does not perceive a cause-and-effect relationship between personal behavior and outcome.

One of the most consistent findings in the causal attribution literature is that individuals tend to attribute more internal causes to successful experiences than to failure experiences. Similar results have been found across a wide variety of tasks including dot estimation (Fitch, 1970), signal identification (Lugenbuhl, Crowe, and Kahan, 1975), symbol identification (Megas, 1977), social perception (Wortman, Costanzo, and Witt, 1973), interpersonal sensitivity (Forsyth and Schlenker, 1977), response-matching (Wolosin, Sherman, and Till, 1973), and coin tossing (Langer and Roth, 1975). Larson (1977) paired subjects to work on a cryptogram task. Personal attributions to external causes were significantly lower for the successful group than the failure group.

On the other hand, according to Weiner et. al. (1972), the stability dimension affects expectations for future outcomes. If the difficulty of the task or ability are seen as the causal elements of a successful experience, expectation for future successes will be enhanced or at least maintained. If they are perceived as the reasons for failure, the expectancy for success in similar situations will decrease. Ascribing the cause of an outcome to an unstable element, luck or effort, is not associated with expecting the outcome to reoccur.

The argument that shifts in expectancy are attributed to stable factors (ability and task difficulty) rather than unstable

factors (luck and effort) is supported in the literature. An example is a study by Fontaine (1974). Given information concerning outcome and attribution norms of a reference group, subjects tended to base their own expectations for success according to the difficulty of the task (as perceived by success/failure of others) and upon ability (as judged by the comparability of the reference group with self). Similar results were obtained in a study by Weiner, Heckhausen, Meyer, and Cook (1972). The Weiner et. al. experiment was controlled so that subjects experienced failure. Subjects were asked to identify the cause of the failure and record how well they expected to do the next time they tried to complete the task. Decreases in expectancies following failure were more pronounced when cause had been attributed to stable rather than unstable elements.

From a somewhat different perspective, Feather (1969) and Feather and Simon (1971a, 1971b) investigated the expectation by outcome interaction upon attributions to causality. Subjects in the three studies were requested to solve anagrams under experimentally controlled conditions of success and failure. Results showed that unexpected outcomes were significantly attributed to the unstable external factor, luck. Also, results in two of the studies (Feather, 1969; Feather and Simon, 1971b) demonstrated that expected outcomes were significantly attributed to the stable internal factor, ability.

Moving the experimental setting from a laboratory-type situation to a field situation, Simon and Feather (1973) obtained similar results. Students in first and second year psychology courses during

three academic terms served as subjects. They completed a short questionnaire prior to taking an one hour test at the end of each term. Four questions were asked.: "How do you rate your ability in examinations like the one you are about to take?" "How much effort have you put into preparing for the examination?" "How difficult do you think the examination will be?" and "How confident are you that you will pass this examination?" Subjects responded to each question on an eight point scale by indicating an appropriate magnitude of the effect. Students were mailed another questionnaire approximately two weeks later on which they were requested to indicate what percentage of the outcome (score) was caused by each of the four causal elements. The expectation by outcome interaction was significant for attributions of luck and ability. Both successful and unsuccessful students attributed the outcome to ability or lack of ability when expectations were confirmed and to luck when expectations were disconfirmed. In other words, students tended to accept personal responsibility for outcomes when expectations were realized and deny personal responsibility for unexpected outcomes.

In a study by Sogin and Pallak (1976), subjects worked independently on the construction of a random numbers writing task that was supposedly needed for a project. Some were forewarned that there was a possibility that their work would be rejected on the basis of quality specifications, and others were not forewarned. The experiment was controlled so that all subjects experienced failure. At the conclusion of the experiment, subjects completed two items

measuring causal attribution relating to whether or not their work could or would be used. Subjects responded to each item on a 91 point scale by indicating an appropriate degree of the effect of chance. As predicted, the individuals who had more information about their environmental situation prior to the outcome accepted more responsibility for the failure than uninformed subjects. Similarly, Frieze (1971) and Kun and Weiner (1973) demonstrated that subjects making causal evaluation of situations required more information in unsuccessful conditions than in successful conditions. The results suggest that the causal link between personal elements and outcome is more readily recognized and/or accepted in successful than in unsuccessful situations.

In summary, three general conclusions are supported by empirical evidence resulting from the causal attribution studies reviewed. First, individuals tend to attribute success to internal qualities and failure to environmental factors. Second, achieving expected outcomes result in individuals perceiving more personal responsibility for the outcome than unexpected outcomes. Third, individuals need more information in evaluating causal relationships in failure as opposed to successful outcomes.

Locus of Control

As noted in the previous section, it is postulated in the causal attribution theory that ability, effort, task difficulty, and luck are the four causal elements most frequently perceived by individuals. However, according to the locus of control personality

construct set forth by Rotter (1954, 1966), ability, effort, and luck are the three major causal elements that contribute to a generalized expectancy for control of reinforcements. Considering the differences in the development of the theoretical ideologies, the two theories are remarkably similar. The causal attribution theory was developed by Heider (1958) considering a layman's perspective of specific causal relationships. The social learning theory was derived in a clincial setting and emphasizes the generalized perception of causal relationships.

Rotter's (1954, 1966) internal-external locus of control construct had its origin in the social learning theory and is posited to be operative across many of life's circumstances and situations. The perception of personal or internal control is contingent upon an individual believing that events result from personal action or ability. Conversely, an individual who perceives external control does not believe events are consequences of personal behavior and ability but are ultimately determined by external factors such as luck, fate, chance, the influence of others, and/or other environmental variables.

Rotter (1954, 1966) proposed that people gain knowledge concerning their ability to be causal agents through experiences. In order to develop perceived personal control one must be involved in goal oriented activities and learn to associate ability and perserverance with the success and/or failure in reaching the goal. In the development of an internal control orientation, one learns to

recognize cause-and-effect relationships. In the development of an external control orientation, one fails to make the causal associations between personal effort and ability and the positive or negative reinforcements resulting from the behavior. Most individuals develop a mixture of internal-external beliefs through specific experiences; thus, there may be some areas where an individual expects to exert more control than in other areas. However, a general expectancy is developed which influences the individual's perception of many, if not most, of life's endeavors.

A number of authors, Joe (1971), Lefcourt (1966, 1976), Phares (1976), Procuik and Lussier (1975), Rotter (1966, 1975), and Throop and MacDonald (1971), have reviewed the locus of control literature. In these reviews it is noted that empirical evidence tends to support the assumption that perceived control is operative across a wide variety of events and behaviors. The results of correlational studies have revealed that many positive behaviors tend to correspond with internality (perceived personal control) and many negative behaviors tend to vary with externality (perceived external control). Internals tend to be less anxious, less dogmatic, and more trustful than externals. They are inclined to possess more self-confidence and to be more actively involved in environmental change behaviors than person perceiving external control. Experimental studies have demonstrated that internals exhibit more information-seeking behaviors, are more aware of environmental and interpersonal cues, and process information more effectively than their external counterparts.

Locus of Control and Atrribution to Causality

One of the fundamental hypotheses of the locus of control construct is that individuals explain outcomes in a manner consistent with their generalized expectancy for control. Support for the hypothesis is evident in the literature (Davis and Davis, 1972; Phares, Wilson, and Klyver, 1971; Rotter, 1966; Ude and Vogler, 1969). Joe (1974) divided subjects according to the degree of personal control as measured on a scale using personal nouns and pronouns and patterned after the I-E Locus of Control Scale developed by Rotter (1966). Ambiguous instructions were given as to the skill or chance involved in the task. Subjects predicted the appearance of randomly occurring zeros and ones. The number of correct responses was tallied, and subjects estimated the number of successful predictions that were due to luck and to skill. Subsequently, they completed a 14 item attribution scale. Performance outcomes were classified according to success, intermediate achievement, and failure criteria. Results indicated that as success increased so did attributions to skill. Internals attributed more to skill in success and intermediate achievement situations but less in failure outcomes than externals. No significant differences were found for externals across outcome conditions.

Comparable results were found in a study by Krovetz (1974) who randomly assigned internals and externals, as determined by the I-E Locus of Control Scale, to five reinforcement schedules of 10 percent, 30 percent, 50 percent, 70 percent, and 90 percent. Subjects were

asked to select an African word that most nearly matched an English term. There were seven series each containing 10 matching problems. The subjects estimated the number of correct matches they expected to make for each of the seven series. Even though in reality there were no correct answers, internals attributed success significantly more to internal factors than to external factors in all but the 90 percent reinforcement schedule. In that condition, it was suggested that internals could not realistically attribute such success to skill. The reverse was true for externals who attributed outcome significantly more to luck than to internal elements. In all except the 90 percent reinforcement schedule, internals attributed significantly more to internal factors than did externals. Both internals and externals tended to attribute failure to luck and success to skill. In addition, students evaluated the ambiguous instructions of the task which included some references to skill and some to chance. As predicted, internals were prone to notice the skill-related cues and externals the chance related cues of the instructions. Krovetz concluded that individuals exhibit the tendency to view their world from the "cognitive set" established by their generalized expectancy for control.

Locus of Control and Cue Explication

Since internals and externals tend to interpret events in accordance with their perceived locus of control, the cognitive processes involved in discriminating between relevant and irrelevant cues that promote efficient cue utilization seem to differ for internals

and externals. In a study by Hardy and Elliot (1977), subjects viewed a series of seven slides which had been photographed at different angles around a three-dimensional simulated mountain scene. They were asked to indicate the exact position from which each of the photographs had been taken. Perceptual accuracy was determined by a score computed as the difference between the acutal and perceived location from which the picture was taken. Internals as opposed to externals demonstrated more awareness of cues in the visual perception task. Ude and Vogler (1969) demonstrated that internals were more aware of the contingencies necessary in predicting the pattern of a light flashing task than externals. Thus, it seems that internals exercise more vigilence in evaluating causal relationships from available information.

Similarly, Pines and Julian (1972) employed a serial anticipation task. A memory drum was used to expose a serial list of twelve sequences. Each sequence consisted of one row of seven zeros. An additional zero was randomly placed below one of the zeros in each sequence. Subjects were separated into two groups and assigned to either relevant or irrelevant cue conditions. In the relevant condition, subscripts of one to seven were added in logical order to the first row of zeros in each sequence. In the irrelevant condition, subscripts of one to seven were randomly assigned. Subjects participated in one orientation trial. Data from the first recall trial revealed a locus of control by cue interaction. Internals did significantly better in the relevant cue condition than

the irrelevant cue condition; whereas, externals displayed no significant difference between cue conditions. The differences between personal control orientation and effective cue utilization were not observed over six trials. This seems to indicate that internals pick up on cues more quickly than externals. However, in situations where cues are obvious, externals soon catch up with the internals or learn to function equally well using other cognitive processes.

The cognitive processes concerning cue utilization of internals and externals have also been studied in terms of cognitive organization in visual and audio stimuli conditions. Pines (1973) recorded 22 words on tape six times in six random orders. Subjects listened to the tape and listed the words they recalled during short recall (two-minute) or long recall (three-minute) intertrial intervals. This procedure was followed for each of the six trials. Subjective organization was measured by how the subjects grouped the words while listing them. Results indicated a significant locus of control by trials interaction. Internals' subjective organization scores increased as the trials progressed. However, the subjective organization scores of externals showed little improvement with additional exposure. The mean number of words recalled by internal subjects with three-minute intertrial intervals was significantly greater than in the two-minute intertrial intervals. This did not hold true for externals. It was suggested that internals when compared to externals tended to evaluate the situation using more types of information by organizing the materials into meaningful

relationships and taking advantage of the additional time in the three-minute intertrial interval to do so. Externals, however, seemed to be intent on following the instructions per se. They did not exhibit an inclination to be aware of other possible contingencies relevant to the performance of the task.

Comparable results were obtained by Bartel, DuCette, and Wolk (1972) using visual rather than audio stimuli. Subjects viewed a slide presentation of 25 infrequently used nouns from five different categories including animals, birds, textiles, musical instruments, and vegetables. Subjects participated in nine free recall trials. Each trial consisted of viewing each word for two seconds with a one-second interslide interval. The words were randomly ordered for each trial. Category clustering was measured using the Bousfield (1953) repetition ratio. The correlation between number of words recalled and the clustering ratio was significant over all trials for internals but not during the first three trials for externals. There were no significant differences in the number of words recalled between internals and externals. Therefore, internals demonstrated a tendency to organize stimuli into meaningful categories more quickly than externals.

Additional support is found for the assumption that internals are more involved with cues that are relevant to task performance, while externals are more involved with peripheral elements in the environment. Pines and Julian (1972) manipulated a social influence variable. In the high social influence condition, an experimenter

stood directly behind the subject and carefully observed the subjects' progress. In the low social influence condition, the experimenter left the room. The dependent variable was the score of a serial anticipation task with subjects participating in either a relevant or irrelevant cue condition. Subjects' responses were recorded via audio tape. Internals were uneffected by the social influence manipulation. However, externals performed significantly better in the high social influence condition than in the low influence condition.

Likewise, Pines (1973) manipulated levels of social influence in much the same manner as Pines and Julian (1972). Subjects participated in a subjective organization task with either two or three-minute intertrial intervals. The significant locus of control by social influence interaction revealed that the performance of internals was constant across social manipulated conditions. In contrast, externals performed significantly better than internals in the presence of the observer than in his absence on trials four, five, and six under the two-minute recall condition. During the three-minute recall condition there were no significant effects of social manipulation for internals or externals. The results tend to support the hypothesis that the performance of externals is more effected by peripheral social stimuli than internals, particularly when temporal constraints are operative.

Lefcourt (1967) designed an experiment to test the hypothesis that explication of cues would assist externals in recognizing

contingencies for reinforcements. He administered the I-E Locus of Control Scale and divided subjects into internals and externals based on their scores. The internal and the external groups were further divided into three experimental groups with varying degrees of cue explication. The low-cue explication group was told that the investigator was interested in how adults would perform on the Level of Aspiration Board (Rotter, 1954). The intermediate-cue explication group was given the standard instructions which describe how points were earned and that some motor skills were required. The high-cue explication group received an extended explanation of the standard directions, indicating that motor control skills and insight were required in the task and information about how each part of the task related to total performance. The task required the subjects to predict the scores they expected to make on each trial. The dependent measure was expressed in patterns of shifts and the relationships of the predicted scores to the actual performance score. The patterns that showed a consistent relationship between predictions and performance were categorized as internal behaviors. Those that revealed an inconsistent relationship were categorized as external behaviors. The pattern in shifts did not vary significantly across cue conditions for internals. External control subjects, however, exhibited a significant increase in internal control related behaviors as the cue condition became more explicit. The results supported the hypothesis that in ambiguous situations externals fail to differentiate among cues in regard to the reinforcements available.

Lefcourt suggested that the explication of cues served as a "cognitive link" for externals allowing them to recognize contingency factors and, thus, to function with more personal control.

Furthermore, explication of cues seems to be more important in ascribing personal responsibility for failure than for success. Phares and Wilson (1972) required internals and externals to rate the amount of responsibility of defendants in automobile accidents. Subjects judged the defendants as to their degree of responsibility on a seven point scale (0 = not at all responsible to 6 - very responsible) and decided on the appropriate sentence, penalty, and/or remedial action. Each subject judged eight cases. Four case briefs included explicit explanations of the circumstances in which the accident occurred, and four were ambiguously stated. As predicted, internal subjects rated the defendants significantly more personally responsible than externals. There was a significant locus of control by outcome by ambiguity interaction. In severe outcome cases internals ascribed more personal responsibility in ambiguous cases than externals, but the two groups ascribed responsibility in explicitly stated cases much more similarly. In regard to cases that had less severe outcomes, unexpected results were obtained. Externals attributed more personal responsibility to defendants than internals, but there were no differences in explicit cases. It was suggested that the results might be due to the "innocent until proven guilty" legal aspects of the decision. In general, however, the study showed that in explicit cue conditions internals and externals

interpreted personal causality similarly. In ambiguous situations both internals and externals tended to ascribe less responsibility for outcome than in structured cases with internals generally ascribing more to personal elements than externals. Thus, it is implied that more environmental cues are needed for attributing personal causation in failure conditions than in success conditions.

Locus of Control and Accuracy of Prediction

The tendency for internals to use cues more efficiently than externals has also been observed in academic settings. Wolfe (1972) had 108 upperclassmen and 462 beginning freshmen predict their grade point averages for the semester. The internals in the beginning freshman group predicted their grade point averages significantly more accurately than did the externals. The difference was not significant between the internals and externals in the upperclassman group. Steger, Simmons, and Lavelle (1973) requested 56 male senior engineering students to estimate their grades on an examination over the subject matter covered during the first two months of class. Before estimating their grades students were administered the exam and informed of the mean and standard deviation of the examination scores. Internals predicted their grades significantly more accurately than did externals. Gilmor and Reid (1978) reported no significant differences in the accuracy of predictions on each of three examinations between internals and externals enrolled in a third-year phychology course. The first two studies used the Rotter I-E Locus of Control Scale and Gilmor and Reid used the Reid and Ware (1974) measurement of locus of control.

Locus of Control and Academic Achievement

Rotter (1966) proposed that locus of control would be related to academic achievement. The argument was based on the assumption that if a person believes that one's successes and failures are the result of one's own behavior, the individual would tend to exhibit initiative and tenacity in persuing achievement goals.

The hypothesis that internals perform better than externals in academic endeavors has been supported in studies with college students as subjects. Prociuk and Breen (1975) used the Levenson locus of control scale (1974) to classify subjects as internals and externals. They found that the grade point average of internals was significantly higher than the grade point average of externals. The 170 subjects in the study were enrolled in second and third year psychology courses. Similarily, Prociuk and Breen (1974) found that the Levenson locus of control scale scores were significantly related to the grade point averages of 89 psychology students. Warehime (1972) found that Rotter's I-E Locus of Control Scale scores significantly correlated with measures of academic achievement obtained by college admission officers such as high school rank, grade point average from high school records, and American College Test (ACT) scores.

Allen, Giat, and Cherney (1974) used a sample of 51 females and 37 males enrolled in a personalized instructional program in an abnormal psychology course. They found that internals as measured on Rotter's I-E Locus of Control Scale contracted for and ultimately

earned higher grades, began working more rapidly, and performed significantly higher on a written final examination than their external counterparts.

However, there have been several studies (Sowell and Burgin, 1979; Prociuk and Breen, 1973; Yoch and Nowichi, 1977; and Keller, Goldman and Sutterer, 1978) of college students where the results did not support the hypothesis that the academic achievement of internals is superior to that of externals. Otten (1977) did not find a significant correlation between grade point average and locus of control in a five-year longitudinal study involving doctoral candidates. However, there was a significant positive biserial correlation between internality and completion of a doctorate degree or withdrawal from the program. On the other hand, externals displayed a tendency to still be involved in their doctoral studies at the end of the five year period.

In two studies involving college students, sex differences have been related to the prediction that internals perform better academically than externals. Bass, Ollendick, and Vuchinick (1974) reported that the hypothesis that internals perform better academically than externals was supported for male subjects, but not for female subjects. Scores on the Rotter I-E Locus of Control Scale were significantly related to the grade point averages of 36 male undergraduate students, while the correlation was not significant for the 70 female undergraduates. In a study by Duke and Nowicki (1974) with 22 male and 26 female undergraduate students, it was

found that internality in males was significantly related to high grade point averages. However, their findings revealed a significant relationship between externality in females and high grade point averages. They used the Nowicki-Strickland (Nowicki and Duke, 1974) scale to measure locus of control.

In summary, six relationships have been presented in regard to theoretical assumptions and empirical evidence related to the locus of control construct. First, generalized expectancy for control of reinforcement effects behavior across a wide variety of events. Second, individuals tend to explain outcomes in a manner consistent with their generalized expectancy for control. Third, the generalized perception of locus of control is involved in discriminating between relevant and irrelevant cues and is involved in efficient cue utilization. Fourth, under varying degrees of cue ambiguity the amount attributed to personal responsibility fluctuates more drastically for externals than internals. Fifth, the hypothesis that internals are able to predict the outcome of academic endeavors more accurately than externals has theoretical support, nevertheless there are mixed empirical results. Finally, the hypothesis that internals perform better than externals in academic settings, has theoretical support, even though there are mixed empirical results.

Behavioral Objectives and Their Use as Cue Explicators

According to Bloom (1956) behavioral objectives are statements describing the performance expected of students who have successfully completed a lesson, unit, or course of instruction. Hill (1977) noted that the impetus of attending to observable behaviors was initiated by John Watson in the early 1900's. Tyler (1949) has proposed that careful consideration should be given to what students are expected to perform in relation to the subject matter content presented to them. Mager (1962), Popham (1969), and Walbesser (1970) have advocated that behavioral objectives for educational instructional purposes be stated in behavioral terms and in measurable form. Bloom (1956) has assisted in the development of behavioral objectives based on a hierachy of learning. He developed a taxonomy of cognitive processes. The following six levels of cognitive learning were identified: knowledge, comprehension, application, analysis, synthesis, and evaluation. Knowledge level learning is fundamentally demonstrated by memory recall. Learning at the comprehension level is demonstrated by reorganizing or translating factual materials. Application level learning is achieved by applying a principle to a novel situation. Analysis level learning is demonstrated by examining information and determining hypotheses, conclusions, relationships, themes, fallacies, or other similar elements. Learning at the systhesis level is demonstrated by the reorganization of information into a novel format. Finally, evaluation level learning is demonstrated by deriving judgments or assessing information.

According to Bloom, each of the six levels of learning represents increasingly difficult mental processes as one progresses from the knowledge to the evaluation level.

Based on a review of literature, Duchastel and Merrill (1973) have suggested that the three main purposes of behavioral objectives are to serve as guidelines in the development and implementation of curriculum, to guide in the evaluation processes, and to facilitate learning. The final purpose, to facilitate learning, is particularly relevant to this study and is the topic of the studies reviewed here.

Harrison (1967) demonstrated that graduate students given behavioral objectives performed significantly better on an examination than students given vague objectives. The programmed materials used in the study covered psychological concepts. Olsen (1973) utilized a sample of 306 ninth graders enrolled in physical science classes from two junior high schools. The subject matter related to energy transfer, phases of matter, heat energy, and light energy. Efforts were made to assure that the subject matter content was presented consistently for the subjects in the experimental and control groups. The experimental group received 18 behavioral objectives and 36 assessment tasks, while the control group did not receive the materials. The subjects in the experimental group performed significantly higher on the achievement test than the subjects in the control group.

Anderson, DeMelo, Szabo, and Toth (1975) secured a sample of forty students from a university course in elementary science

methods. Half of the subjects were given a written list of behavioral objectives. The other half received no list of behavioral objectives. The subjects were then shown an inquiry-slide set concerning control of blood sugar. The subjects were administered a retention test. The treatment group members scored significantly higher on the retention test than did the control group members. Similar significant results indicating that behavioral objectives enhance students' performance on academic achievement tests have been reported by Glowatski (1973), Rothkoph and Kaplan (1972), Johnson and Sherman (1975), and Huck and Long (1973).

Contradictory empirical results were found in a study by Stedman (1972). There were 144 subjects selected from 1050 high school biology students and assigned to groups based on their IQ scores and motivational survey scores. Half of the subjects were presented 23 behavioral objectives at the knowledge, comprehension, and analysis levels. The other half of the subjects were presented a list of vague statements of the objectives. Two sets of a 93 frame programmed instructional program had been developed. One set contained explicit behavioral objectives the other contained ambiguous objectives. In both sets the behavioral objectives were placed throughout the programmed materials in relation to the corresponding subject matter. Stedman found no significant difference in the performance of the two groups on an examination. Additional non-significant findings between subjects receiving behavioral objectives and those not receiving behavioral objectives have been reported

by Baker and Hapkiewicz (1979), Yelon and Schmidt (1973, and Chang (1976).

Melton (1978) reviewed a number of studies dealing with behavioral objectives and their effects on achievement. He suggested five conditions under which behavioral objectives might be ineffective. The conditions are as follows:

1. If students ignore the objectives provided, either because they are unaware of them, or because prior experience suggests that it is not important to take note of them.

2. If the objectives are too general, or too ambiguous, to be of particular assistance.

3. If the objectives are of extreme facility or difficulty. (The structure of readability of instructional material may be closely related to this condition.)

4. If the objectives of particular interest are only a small portion of those provided to students.

5. If students are so conscientious, or so highly motivated, that they achieve the objectives regardless of whether or not they are specified. (p. 294)

In summary, the effectiveness of behavioral objectives in assisting students to meet the performance level required of them in a particular academic setting has not been firmly established. However, based on the number of significant findings and under conditions that compensate for the problems pointed out by Melton (1978), it seems that the effect of students' prior knowledge of behavioral objectives may well serve as effective cue explicators in an academic setting.

CHAPTER III

METHODS AND PROCEDURES

The major purpose of this study was to ascertain the influence of locus of control and cue explication upon the attribution of causality for performance outcome of an academic examination. Another purpose was to determine if locus of control and cue explication influence the accuracy of predicted outcome and performance outcome. As defined in Chapter I, cue explication was manipulated in terms of informing or not informing students of specific behavioral objectives which described the criteria for successful performance on an academic examination.

The review of related literature revealed theoretical foundations and empirical evidence pertinent to each of the following primary variables, causal attribution, locus of control, and behavioral objectives. However, little information was located that concerned the interactions of the three concepts. The methods and procedures designed to study the main effects and the interaction effects of the variables have been reported in this chapter.

Selection of Sample

The sample was composed of 103 students enrolled in Food and Nutrition 131, an introductory course, during the 1979 fall semester. The course is offered by the College of Home Economics at Texas Tech

University in Lubbock, Texas. The students in Food and Nutrition 131 were selected for several reasons. First, the instructors were willing to cooperate with the researcher in carrying out the experiment. The instructors were in an experimental stage in redesigning the course and were interested in learning about the impact of their methodology. Second, the behavioral objectives for the course had been systematically developed following Bloom's (1956) guidelines and had been subjected to peer review. Third, the instructional materials were well organized and the content to be covered during each class period was well defined which added assurance to the constancy of material covered between groups. Fourth, all lectures to both groups during the data-collection period were presented by one instructor which assisted in controlling for variance due to personality differences of instructors. Fifth, the course had two sections, each containing approximately 100 students which provided a sufficient number of subjects for statistical analyses. Sixth, the course was an introductory course which assisted in providing a relatively novel situation for the students.

Classes for students in both sections of Food and Nutrition 131 were conducted in a large lecture hall. One section met on Monday and Wednesday mornings from 8:30 a.m. to 9:30 a.m., and the other section met on Tuesday and Thursday mornings from 9:00 a.m. to 10:00 a.m. The sections had enrollments of 134 and 116 students respectively. Students were free to enroll in the section of their choice. There were no significant differences in age (t (180) =

.70, $p>.05$), locus of control (t (181) = .86, $p>.05$), or academic classification ($\chi^2(2) = 5.47$, $p>.05$) between students in the two sections. Therefore, it was assumed that for the purposes of this study the registration process helped to distribute students with various characteristics evenly between groups.

Any students completing all instruments of this study and scoring in the upper and lower thirds of the distribution of the students' I-E Locus of Control Scale scores were included in the sample. All data were collected during three class periods of the first five weeks of the course. Of the 250 students enrolled in the course, 29 enrolled after the first week of classes or failed to attend the first data collection period. Another 38 students failed to attend class on at least one of the other two days that data were collected. Thus, 183 students met the first requirement. The 183 students had a mean I-E Locus of Control Scale score of 10.39 with a standard deviation of 3.70. The distribution of the locus of control scores had a minimum score of two and a maximum score of 21. Fifty-one (27.3%) students with I-E Locus of Control scores above 12 were classified as externals. Fifty-two (30.1%) students scoring below nine on the I-E Locus of Control Scale were classified as internals. Therefore, 103 subjects were included in the sample.

Instrument Selection and Development

Instruments for this study were selected or developed to measure locus of control, causal attribution, performance outcome, accuracy

of prediction, and demographic variables. The measurement tool used for each variable is discussed below.

Instrument for Assessment of Locus of Control

The Rotter (1966) I-E Locus of Control Scale was selected for use in this study. The scale consists of 29 forced choice items. Twenty-three items measure locus of control, and six are filler items. A copy of the scale is included in Appendix A.

Rotter (1966) reported reliability statistics on the I-E Scale. Data from 100 undergraduate students produced reliability coefficients of .73 using the Spearman-Brown Prophecy Formula and the Kuder-Richardson Formula. In addition, the Kuder-Richardson reliability coefficients of .70 and .69 were determined on data from 400 college students and 1000 subjects from a national stratified sample of high school students, respectively. A test-retest reliability coefficient of .72 was found over a one month time interval, and a coefficient of .55 was found over a two month time interval with samples of college students.

Validity statistics were also reported by Rotter (1966). Divergent validity coefficients ranging from -.12 to -.35 were reported when the I-E Locus of Control Scale and the Marlowe-Crowne Social Desirability Scale were compared using college students as subjects. With a sample of 80 prisoners, the divergent validity was -.41. When comparing the I-E Locus of Control Scale with measures of intelligence the divergent validity coefficients ranged

from .03 to -.22. Convergent and construct validities of the Rotter scale have been examined across many areas and have generally been found to correspond with theoretical assumptions (Joe, 1971; Lefcourt, 1966; Prociuk and Lussier, 1975; Rotter, 1966, 1975; Throop and MacDonald, 1971).

Instrument for Assessment of Causal Attribution

The researcher developed a four-item instrument to measure causal attribution. One item was developed to assess each of the following four major causal attributions: ability, effort, luck, and task difficulty. The items were patterned after ones reported by Simon and Feather (1973). In their study subjects responded to four questions. A copy of the questions and their respective response categories has been included in Appendix B.

The items constructed by the researcher reflected each of the four major causal attributions. The response categories of each item consisted of a six-point Likert type format ranging from totally disagree to totally agree. To increase content validity, the items were critiqued by a panel of experts consisting of one educational psychology professor and three doctoral students enrolled in a psychometrics course at Texas Tech University. The items were revised considering the panel members' suggestions concerning clarity. A copy of the questionnaire has been included in Appendix C.

A pilot study was conducted in an effort to establish the discriminating effect of the items. Thirty-seven students from an

introductory undergraduate home economics class and 28 students from two undergraduate educational psychology classes served as subjects. After receiving feedback on a major exam the subjects responded to the questionnaire. Students were then asked if they had any difficulty comprehending the meaning of the items.

In analyzing the pilot study data, items dealing with the task difficulty and luck were reverse scored so that all responses were scored in the direction of personal control. Item discrimination indices were determined for each causal attribution item in relation to the total of the scores on the four items. The item discrimination indices were as follows: .37 for the ability item, .36 for the effort item, .25 for the luck item, and .44 for the task difficulty item. The oral critique of the items by the students indicated that they did not uniformally interpret the task difficulty item. The item was changed from "Your score reflects the difficulty of the test" to "Your score reflects the difficulty or easiness of the test."

Following the pilot study, the items were critiqued by a panel of experts consisting of four home economics education faculty members and one educational psychology faculty member. Items were revised considering their suggestions including changing pronouns from the third person to the first person and improving the consistency of the tense of verbs. A copy of the causal attribution questionnaire has been included in Appendix D.

Instrument for Assessment of Performance Outcome

The numerical score on an academic test covering the subject matter content of a four week portion of Food and Nutrition 131 served as the measure of performance outcome. The parallel forms of the test consisting of 30 multiple-choice items were developed by the instructors of the course. Each form was based on specific behavioral objectives with an equal number of items per objective on each form. A list of the behavioral objectives has been included in Appendix I along with other instructional materials. The content validity and parallel structure of the forms were increased by use of a panel of experts. The panel members checked the test forms against a table of specifications in terms of equal numbers of the items per objective. The panel members also determined that the items on the two tests corresponded to the levels of learning designated by the behavioral objectives. The table of specifications is included in Appendix E. The panel consisted of four food and nutrition professors, one home economics education professor, and the researcher. Items were revised considering the suggestions of the panel members. Copies of the test forms could not be published in this document, since they were to be revised and used again in subsequent semesters.

Instrument for Assessment of Accuracy of Prediction

The accuracy of prediction measure was expressed in terms of discrepancy scores or the absolute numerical value of the difference

between subjects' predicted scores and the actual scores made by the subjects on the academic examination. The subjects stated the numerical scores they expected to make on the test prior to being given the exam. The form on which subjects predicted their grades has been included in Appendix F.

Instrument for Collection of Demographic Data

A questionnaire for securing selected demographic data has been developed by the instructors of the Food and Nutrition 131 course. Since class time was being used to collect data, it was decided to conserve time by using the demographic information that the instructors were collecting for course evaluation purposes. Data pertinent to age, sex, marital status, academic classification, major of academic study, and previous courses taken in home economics were collected utilizing the instrument. The questionnaire has been included in Appendix G.

Instructional Materials

Instructional materials for Food and Nutrition 131 were prepared by Boren and Harden, the instructors of the course. The materials were developed with support from the National Science Foundation through a Local Course Improvement Grant.

Introduction to Modular Learning

The Introduction to Modular Learning contained descriptive information about the materials included in the modules. A copy of the Introduction to Modular Learning is included in Appendix H.

Module I

A module is a unit of study composed of one or more lessons. Each module contains all information needed for that unit including specific references and learning experiences necessary in successfully learning the material.

Module I of the five modular course was selected as the subject matter content to be covered during the time this study was conducted. It was chosen because the researcher wanted the experiment to relate to the first examination of the semester. The unit of study covered a four week period.

Lesson Overviews for Treatment Group

Each of the four lessons within Module I contained a title, rationale, behavioral objectives, learning experiences, and evaluative methods used to assess progress. The titles of the four lessons were "Food Choices," "Basic Facts," "The Body's Need for Energy and Energy Value of Food," and "Weight Control." Copies of the lessons overviews presented to the treatment group are included in Appendix I.

Lesson Overviews for Control Group

The lesson overviews for the control group were identical to those for the treatment group with the exception that the specific behavioral objectives were omitted. Copies of the lesson overviews presented to the control group are included in Appendix J.

Study Guide

The study guide contained highlights of subject matter content and other information pertinent to specific learning experiences for

each lesson. A sample of the materials in the study guide used in this study is included in Appendix K.

Procedures

One hundred three students in two sections of Food and Nutrition 131 served as subjects. One section met on Monday and Wednesday mornings. The subjects in this section served as the control group which is often referred to as the group operating under the ambiguous cue condition or the ambiguous criteria assignment condition. The other section met on Tuesday and Thursday mornings. Subjects from this section served as the treatment group which is also referred to as the group operating under the explicit cue condition or the explicit criteria assignment condition. The difference in the treatment administered to the groups was that the treatment group received specific behavioral objectives from which items on the examination were derived. In addition, subjects in the treatment group were given explanations of the use of the behavioral objectives. Subjects in the control group received neither the behavioral objectives nor the explanations.

On the first day of class, Tuesday, September 4, 1979, the treatment group received a packet of information including an introduction to modular learning and overviews of the four lessons in Module I. The lesson overviews contained specific behavioral objectives. The instructor emphasized the use of behavioral objectives. The description of the behavioral objectives and their use were presented to the class as follows:

> Behavioral objectives are statements of exactly what we expect you to learn from each lesson. There will be from three to five objectives for each lesson. It is very important to look over the objectives prior to beginning a lesson. When you finish the lesson go back over the objectives and ask yourself, "Have I learned that?" ... At exam time, the questions will be related directly to the objectives. In preparation for a test you can go to the objectives and will know exactly what will be on the test. There will be questions for each objective. (Boren, Note 1)

During the next three week period, each lecture to the treatment group contained references to the use of the behavioral objectives. No such references were made in the control group.

On Wednesday, September 5, 1979, the control group or the group not informed of the behavioral objectives received a packet of information similar to that received by the treatment group. However, the introduction to modular learning and the behavioral objectives component of the overviews of the four lessons of Module I were omitted. The introductory remarks made orally by the instructor to the control group were similar to those presented to the experimental group. However, there was no reference to behavioral objectives.

During the class meetings on September 5 and 6, 1979, the students in the control and treatment groups, respectively, were administered the I-E Locus of Control Scale (Rotter, 1966) and the demographic questionnaire. On Wednesday, September 26, 1979, and on Thursday, September 27, 1979, subjects in the treatment group and the control group, respectively, completed the questionnaire requesting them to predict the exact numerical score that they expected

to make on the examination they were about to take. Upon completing and returning the questionnaires, students were administered the examination covering the subject matter in Module I of Food and Nutrition 131. There were two forms of the examination administered because the seats in each row of the lecture hall were adjacent to one another. Therefore, it was possible for students to view the adjacent students' papers. The two forms were distributed in the same fashion for each section with no two students sitting next to each other receiving the same form of the test.

The test was machine scored. During the class on October 3 and 4, 1979, students in the control group and the treatment group, respectively, received feedback on their performances on the examination. The feedback included numerical test scores, the items each student missed on the exam, and a discussion of each item. Students were then requested to complete the causal attribution questionnaire.

Students were assured in writing and orally of the confidentially of the results before they completed each of the data collection devices. The written statement was verbally reinforced regarding the procedure that at no time would the instructors involved in Food and Nutrition 131 be allowed to see an individual student's predicted score or responses to the causal attribution questionnaire. The written confidentiality statements are presented in Appendixes A and D.

Treatment of the Data

Data were key punched on cards for computer processing. All analyses of the data were executed using the Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, and Bent, 1975) at the Computer Center at Texas Tech University. Analyses of the demographic data included frequency counts, means, standard deviations, and percentages. Students in the upper and lower thirds of the distribution of the subjects' I-E Locus of Control Scale scores served as externals and internals respectively. Those students with I-E Locus of Control Scale scores above 12 were classified as externals. Those students scoring below nine were classified as internals.

The two independent variables were locus of control and cue explication. A two-by-two factorial analysis of variance was performed for each of the following dependent variables: attribution to ability, effort, luck, task difficulty; accuracy of prediction; and performance outcome. The significance (α=.05 one tailed test) and directionality of the main effects due to locus of control and cue explication and to the interaction effect of locus of control by cue explication for each of the dependent variables were employed to test the hypotheses.

There was a significant difference in the scores of students administered Form A (M = 71.01) and Form B (M = 66.14) of the academic examination ($t(180) = 2.26$, $p<.05$). Therefore, all analyses pertaining to the hypotheses were performed separately by form of test.

CHAPTER IV

ANALYSES AND INTERPRETATION OF DATA

The primary focus of this study was to determine the influence of locus of control and cue explication upon the attribution of causality for the outcome of an academic examination. The secondary focus was to ascertain if locus of control and cue explication influence accuracy of predicted outcome and performance outcome. Data for this study were collected from a sample of 103 students enrolled in two sections of Food and Nutrition 131, during the 1979 fall semester at Texas Tech University, Lubbock, Texas. This course was offered in the College of Home Economics. All data were collected utilizing the following instruments: a demographic inventory, the I-E Loucs of Control Scale (Rotter, 1966), a causal attribution questionnaire, a prediction questionnaire, and Forms A and B of an academic examination.

Data from the demographic inventory provided information pertinent to age, sex, marital status, ethnic group, academic college classification, academic interests, and educational background. The I-E Locus of Control Scale provided a score representing the total of 23 forced choiced items scored in the direction of externality. A four item scale with a Likert-type format provided the causal

attribution data for each of the following major causal elements: ability, effort, luck, and task difficulty. The scores on the two forms of the academic examination served as the measure of academic performance. There was a significant difference between the mean scores on Forms A and B of the academic examination. Therefore, all analyses were conducted separately by form of test. The absolute values of the differences between the numerical scores that subjects predicted they would make on the academic examination and the scores actually realized on the examination served as discrepancy scores or measures of accuracy of prediction.

The two independent variables of this study were locus of control and cue explication. Locus of control was statistically controlled by assigning students to either the internal or external group based upon their scores on the I-E Locus of Control Scale. Fifty-one students scoring in the upper third of the distribution of I-E Locus of Control scale scores served as externals. Fifty-two students scoring in the lower third of the distribution of scores served as internals. Therefore, 103 subjects were included in the sample. The cue explication conditions were experimentally manipulated in terms of informing or not informing subjects of specific behavioral objectives. The behavioral objectives described the criteria for successful performance on an academic examination. The treatment group, or the group that received the behavioral objectives, is referred to as operating under the explicit criteria assignment condition. The control group, or the group not receiving the

behavioral objectives, is referred to as operating under an ambiguous criteria assignment condition.

A two-by-two factorial analysis of variance was performed to determine if significant differences (α=.05, one-tailed test) existed due to the main effects of locus of control and cue explication and to the interaction effect of the locus of control by cue explication. A separate analysis was performed for each of the following dependent variables: attributions to ability, effort, luck, and task difficulty; accuracy in predicting scores on an academic examination; and scores on the academic examination. As mentioned earlier, all analyses were performed separately for subjects administered the two forms of the academic examination.

The purposes of this chapter are to report the analyses of the data and to interpret the findings of this study. The data obtained are reported in terms of descriptive data and testing of hypotheses.

Descriptive Data

The findings of this study related to selected demographic characteristics derived from a sample of students enrolled in Food and Nutrition 131 in the College of Home Economics at Texas Tech University in Lubbock, Texas. The frequencies of the responses elicited on the demographic questionnaire were tabulated and categorized by total sample and by Forms A and B of the academic examination with subgroups for internals and externals in the treatment and control groups. The frequency data are summarized in Table 1.

TABLE 1

SUMMARY OF DEMOGRAPHIC DATA OF SAMPLE[1]

Variables	Form A of Examination				Form B of Examination				All Subjects N=103	Percent of all Subjects
	Ambiguous Cue Condition		Explicit Cue Condition		Ambiguous Cue Condition		Explicit Cue Condition			
	Internals N=17	Externals N=12	Internals N=10	Externals N=12	Internals N=14	Externals N=16	Internals N=12	Externals N=10		
Sex and Marital Status										
Married Females	1		1	2		1	1		4	4
Single Females	16	12	9	10	14	14	12	10	97	94
Single Males						1			1	1
Age										
17-19 years	10	11	8	9	9	9	10	9	75	73
20-22 years	6	1		3	5	5	1	1	22	21
23-25 years	1				1				2	2
25 years			2			1	1		4	4
Ethnic Background										
Anglo	17	12	9	11	13	15	10	9	96	93
Black				1	1		2		2	2
Hispanic			1			1		1	3	3
Other									2	2
Classification										
Freshman	7	5	7	7	8	9	4	4	46	45
Sophomore	7	6	2	5	4	7	8	4	43	42

TABLE 1--Continued

	Form A of Examination				Form B of Examination					
	Ambiguous Cue Condition		Explicit Cue Condition		Ambiguous Cue Condition		Explicit Cue Condition		All Subjects	Percent of all Subjects
	Internals N=17	Externals N=12	Internals N=10	Externals N=12	Internals N=14	Externals N=16	Internals N=12	Externals N=10	N=103	
Junior	3	1			2	4		1	11	11
Senior			1			1			2	2
Missing Data								1	1	1
College										
Arts and Sciences		2	1		1	1	1	1	7	7
Business Administration					1		1		2	2
Education	1		4	1	2	3	1	1	13	13
Engineering			1						1	1
Home Economics	16	10	4	11	10	12	9	8	80	78
Major Academic Area										
Education	1		4	1	2	3		1	12	12
Home Economics										
Clothing and Textiles	4	6	1	3	5	3	2	4	28	28
Family Management, Housing and Consumer Science	2	1		2	1	2	1		9	9
Food and Nutrition	5		1	2	2	4	3		17	17
General Home Economics				1					1	1
Home and Family Life	3			1	2	2	1	1	10	10
PreNursing	2	2	3		1	1	2	3	14	11

TABLE 1--Continued

	Form A of Examination				Form B of Examination					
	Ambiguous Cue Condition		Explicit Cue Condition		Ambiguous Cue Condition		Explicit Cue Condition		All Subjects	Percent of all Subjects
	Internals	Externals	Internals	Externals	Internals	Externals	Internals	Externals		
Undecided							1		8	8
Other		3	1	2	1	1	2	1	4	4
Home Economics in High School										
0	4	1	1	5	2	4	3	2	22	21
>0<1 years	3	1	3		3	5	2	4	21	20
>1<2 years	5	7	4	2	5	3	3		29	28
>2<3 years	2	2	1	3	3	2	3	2	18	18
>3<4 years	3	1	1	2	1	2	1	2	13	13

[1] These figures were computed using only those students scoring in the upper and lower one-thirds of the distribution of students scores on Rotter's I-E Scale, total N=101.

Single females comprised 94 percent of the sample and a majority in each of the subgroups. The subjects ranged in age from 17 to 32 years. Seventy-three percent of the total subjects, as well as the majority of the various subgroups ranged in age from 17 to 19 years. Ninety-three percent of the subjects were Anglo.

Other demographic data collected were related to academic status and background. Eighty-seven percent of the subjects reported an academic classification of freshman and sophomore. Approximately the same proportion of freshmen and sophomores were represented in each of the subgroups. The subjects were enrolled in five different colleges at Texas Tech University. Seventy-eight percent of the subjects were enrolled in the College of Home Economics, 13 percent in the College of Education, seven percent in the College of Arts and Sciences, two percent in the College of Business Administration, and one percent in the College of Engineering. As would be expected, the subjects enrolled in the College of Home Economics were in the majority in all the subgroups. Twenty-eight percent of the subjects were majoring in Clothing and Textiles, 17 percent in Food and Nutrition, 14 percent in Prenursing, 10 percent in Home and Family Life, nine percent in Family Management, Housing, and Consumer Science, one percent in General Home Economics, 12 percent in Education, four percent in various other fields, and eight percent were undecided as to their major. The subjects majoring in the different fields were distributed throughout the subgroups. Twenty-one percent of the subjects had taken no home economics courses in high school.

Twenty percent had taken one or less years of high school home economics, 28 percent had one to two years, 18 percent had two to three years, and 13 percent had three to four years of high school home economics courses. The subjects with various lengths of experience in high school home economics courses were distributed throughout the subgroups.

Students in the upper and lower thirds of the distribution of the students' I-E Locus of Control Scale scores were selected as subjects for this study. The mean of the locus of control scores was 10.34 for the 183 students from which the sample was selected. The range of scores was from two to 21. The possible range of scores on the scale is zero to 23. A summary of the means and standard deviations of the subjects' I-E Locus of Control Scale scores are reported in Table 2. The externals were students scoring 13 or more points on the scale. The exact point of the cut off for the upper third of the distribution was 12.64; thus, 13 was chosen. Internals were students scoring eight or less points on the scale. The exact point of the cut off for the lower third of the distribution was 8.38; thus, eight was chosen. Internals administered Form A of the academic examination and in the control group had a mean of 5.65 and a standard deviation of 2.00. The internals in the treatment group administered Form A of the academic examination had a mean score of 6.80 with a standard deviation of 1.62. On Form B of the academic examination, internals in the control group recorded a mean of 5.79 and a standard deviation of 1.81 on the I-E Locus of Control

TABLE 2

MEANS AND STANDARD DEVIATIONS OF THE I-E LOCUS OF CONTROL SCALE SCORES OF THE SUBGROUPS OF INTERNALS AND EXTERNALS IN THE SAMPLE[1]

Subgroup	N	Mean	Standard Deviation
Form A of Examination			
Ambiguous Cue Condition			
Internals	17	5.65	2.00
Externals	12	14.08	1.44
Explicit Cue Condition			
Internals	10	6.80	1.62
Externals	12	15.50	2.24
Form B of Examination			
Ambiguous Cue Condition			
Internals	14	5.79	1.81
Externals	16	15.38	1.48
Explicit Cue Condition			
Internals	12	5.75	1.49
Externals	10	14.40	1.43

[1]These figures were computed using only those students in the upper and lower one-thirds of the distribution of students's scores on Rotter's I-E Scale, total N=103.

Scale, while the internals in the treatment group reported a mean of 5.75 and a standard deviation of 1.49. There were no statistically significant differences among the mean I-E Locus of Control Scale scores of the internals in the four subgroups ($F(3,49)=1.02$, $p>.05$).

Externals administered Form A of the examination and in the control group had a mean of 14.08 and a standard deviation of 1.44 on the I-E Locus of Control Scale, while the externals administered Form A and in the treatment group had a mean of 15.50 and a standard deviation of 2.24 on the scale. The externals administered Form B of the examination and in the control group reported a mean of 15.38 and a standard deviation of 1.48 on the I-E Locus of Control Scale. The externals taking Form B of the examination in the treatment group had a mean of 14.40 and a standard deviation of 1.43. There were no statistically significant differences among the mean I-E Locus of Control Scale Scores of the externals in the four subgroups ($F(3,46)=2.34$, $p>.05$).

Testing the Hypotheses

Nine hypotheses were tested in this study. Results of the statistical testing of the hypotheses are presented in this section.

Hypothesis 1

The effect due to locus of control upon the four causal attributions for the outcome of an academic examination was analyzed in terms of the first hypothesis which stated:

Externals when compared to internals attribute performance outcome on an academic examination significantly less to personal responsibility when each of the following causal agents is considered:

a. ability
b. effort
c. luck
d. task difficulty

The possible range of attribution scores was one to six for each of the causal elements. A summary of the internals and externals' mean attribution scores and standard deviations of those scores are reported in Table 3. A series of two-by-two factorial analyses of variance were performed with one of the main effects being locus of control and the dependent variables being the four measurements of causal attribution. A separate analysis was performed for each of the four causal elements by Forms A and B of the academic examination.

Internals' mean attribution to ability scores were not significantly different than those of the mean scores of externals administered Forms A or B of the examination. Thus, Hypothesis 1a was not supported. Table 4 contains the data relative to the F - values of the main effect of locus of control upon the attribution to ability scores for the outcome of the academic examination.

The means and standard deviations of the attribution to effort scores are reported in Table 3. Internals' mean attribution to effort score (M=4.11) was significantly higher than the mean score of externals (M=3.38) on Form A of the academic examination. Likewise on Form B of the examination, the mean attribution to effort score of internals (M = 3.89) was significantly higher than the mean

TABLE 3

MEANS AND STANDARD DEVIATIONS OF INTERNALS AND EXTERNALS FOR THE SCORES OF THE FOUR CAUSAL ATTRIBUTIONS ELEMENTS

Causal Attribution Element	N	Mean	Standard Deviation
Form A of Examination			
Ability			
Internals	27	3.22	1.22
Externals	24	3.29	1.20
Effort			
Internals	27	4.11	1.31
Externals	24	3.38	1.74
Luck			
Internals	27	1.96	.94
Externals	24	2.75	1.26
Task Difficulty			
Internals	27	3.78	.85
Externals	24	3.92	1.28
Form B of Examination			
Ability			
Internals	26	2.81	1.17
Externals	26	3.23	1.07
Effort			
Internals	26	3.89	1.34
Externals	26	3.08	1.29
Luck			
Internals	26	2.23	.95
Externals	26	2.54	1.33
Task Difficulty			
Internals	26	4.00	.85
Externals	26	4.08	1.20

TABLE 4

RESULTS OF ANALYSES OF VARIANCE FOR ATTRIBUTION TO ABILITY FOR OUTCOME ON AN ACADEMIC EXAMINATION

Source of Variance	Mean Square	Degrees of Freedom	*F*-value	Level of Significance
Form A of Examination				
Locus of Control	.00	1	.00	N.S.*
Cue Explication	3.21	1	2.20	N.S.*
Locus of Control X Cue Explication	.06	1	.04	N.S.*
Within Group	1.45	47		
Total	1.43	50		
Form B of Examination				
Locus of Control	2.18	1	1.68	N.S.*
Cue Explication	.32	1	.25	N.S.*
Locus of Control X Cue Explication	.14	1	.11	N.S.*
Within Groups	1.30	48		
Total	1.27	51		

*Not significant at $p \leq .05$, one-tailed test.

score of externals ($M = 3.08$). Thus, Hypothesis 1b was supported. A summary of the data associated with F-values of the main effects due to locus of control upon the attribution to effort scores for outcome of the academic examination are reported in Table 5.

The means and standard deviations of the attribution to luck scores are reported in Table 3. Internals' mean attribution to luck score (M=1.96) was significantly lower than the mean score of externals (M=2.75) on Form A of the academic examination. However, there was no significant difference between the mean attribution to luck scores of internals and externals on Form B of the academic examination. Thus, Hypothesis 1c was partially supported. A summary of the data associated with the F-values of the main effects due to locus of control upon the attribution to luck scores for the outcome of the academic examination are reported in Table 6.

The means and standard deviations of the attribution to task difficulty scores are reported in Table 3. There was no significant difference between the mean attribution to task difficulty scores of internals and externals on Forms A or B of the academic examination. Thus, Hypothesis 1d was not supported. A summary of the data relative to the F-values of the main effect due to locus of control upon the attribution to task difficulty scores for the outcome of the academic examination are reported in Table 7.

Hypothesis 2

The mean scores of the subjects in the ambiguous criteria assignment condition and the subjects in the explicit criteria assignment condition for each of the four causal attributions for the

TABLE 5

RESULTS OF ANALYSES OF VARIANCE FOR ATTRIBUTION TO EFFORT FOR THE OUTCOME ON AN ACADEMIC EXAMINATION

Source of Variance	Mean Square	Degrees of Freedom	F-value	Level of Significance
Form A of Examination				
Locus of Control	8.28	1	3.63	$\leq .05$
Cue Explication	4.44	1	1.95	N.S.*
Locus of Control X Cue Explication	2.73	1	1.20	N.S.*
Within Group	2.28	47		
Total	2.42	50		
Form B of Examination				
Locus of Control	8.35	1	4.80	$\leq .05$
Cue Explication	.03	1	.02	N.S.*
Locus of Control X Cue Explication	2.99	1	1.72	N.S.*
Within Group	1.74	48		
Total	1.86	51		

*Not significant at $p \leq .05$, one-tailed test.

TABLE 6

RESULTS OF ANALYSES OF VARIANCE FOR ATTRIBUTION TO LUCK FOR THE OUTCOME ON AN ACADEMIC EXAMINATION

Source of Variance	Mean Square	Degrees of Freedom	F-value	Level of Significance
Form A of Examination				
Locus of Control	7.25	1	5.89	$\leq .05$
Cue Explication	.46	1	.37	N.S.*
Locus of Control X Cue Explication	1.11	1	.90	N.S.*
Within Group	1.23	47		
Total	1.35	50		
Form B of Examination				
Locus of Control	1.22	1	.88	N.S.*
Cue Explication	.00	1	.00	N.S.*
Locus of Control X Cue Explication	.54	1	.39	N.S.*
Within Group	1.39	48		
Total	1.34	51		

*Not significant at $p \leq .05$, one-tailed test.

TABLE 7

RESULTS OF ANALYSES OF VARIANCE FOR ATTRIBUTION TO TASK DIFFICULTY FOR THE OUTCOME OF AN ACADEMIC EXAMINATION

Source of Variance	Mean Square	Degrees of Freedom	F-value	Level of Significance
Form A of Examination				
Locus of Control	.55	1	.50	N.S.*
Cue Explication	3.74	1	3.36	$\leq$.05
Locus of Control X Cue Explication	.50	1	.50	N.S.*
Within Group	1.11	47		
Total	1.14	50		
Form B of Examination				
Locus of Control	.06	1	.05	N.S.*
Cue Explication	.25	1	.64	N.S.*
Locus of Control X Cue Explication	.26	1	.23	N.S.*
Within Group	1.11	48		
Total	1.00	51		

*Not significant at $p \leq .05$, one-tailed test.

outcome of an academic examination were compared. The analyses were performed to test the second hypothesis which stated.

> Subjects in the ambiguous criteria assignment condition when compared to subjects in the explicit criteria assignment condition attribute significantly less to personal responsibility when each of the following causal agents is considered:
>
> a. ability
> b. effort
> c. luck
> d. task difficulty

The possible range of each of the attribution scores was one to six. The means and standard deviations of the attribution scores for each of the cue explication conditions are summarized in Table 8. A series of two-by-two factorial analyses of variance were performed with one of the main effects being cue explication and the dependent variables being the four measurement of causal attribution. A separate analysis was performed for each of the four causal elements for Forms A and B of the academic examination.

On Form A of the academic examination, the subjects in the ambiguous criteria assignment condition had a significantly higher mean attribution to task difficulty score (M=4.07) than subjects in the explicit criteria condition (M=3.55). The finding was not significant for those subjects administered Form B of the academic examination. No other significant difference was found between the mean scores of the subjects in the two cue conditions in regard to attribution to ability, effort, or luck. Thus, part d of Hypothesis 2 was partially supported and parts a, b, and c were not supported. A summary of the data relative to the F-values of the main effect of

TABLE 8

MEANS AND STANDARD DEVIATIONS OF SCORES OF THE FOUR CAUSAL ATTRIBUTION ELEMENTS FOR SUBJECTS IN THE AMBIGUOUS AND EXPLICIT CUE CONDITIONS

Causal Attribution Element	N	Mean	Standard Deviation
Form A of Examination			
Ability			
Ambiguous Cue Condition	29	3.03	1.09
Explicit Cue Condition	22	3.55	1.30
Effort			
Ambiguous Cue Condition	29	3.55	1.53
Explicit Cue Condition	22	4.05	1.59
Luck			
Ambiguous Cue Condition	29	2.21	1.01
Explicit Cue Condition	22	2.50	1.34
Task Difficulty			
Ambiguous Cue Condition	29	4.07	.84
Explicit Cue Condition	22	3.55	1.26
Form B of Examination			
Ability			
Ambiguous Cue Condition	30	3.10	1.13
Explicit Cue Condition	22	2.91	1.51
Effort			
Ambiguous Cue Condition	30	3.43	1.33
Explicit Cue Condition	22	3.55	1.44
Luck			
Ambiguous Cue Condition	30	2.40	1.25
Explicit Cue Condition	22	3.00	1.05
Task Difficulty			
Ambiguous Cue Condition	30	4.10	1.09
Explicit Cue Condition	22	3.96	.95

cue explication upon the attribution to causality is reported in Tables 4 through 7.

Hypothesis 3

The locus of control by cue explication interactions upon each of the four causal attributions were analyzed in terms of the third hypothesis which stated:

> Externals when compared to internals in the ambiguous criteria assignment condition attribute performance outcome of an academic examination significantly less to personal responsibility, but the difference in attribution to personal responsibility is not significant between externals and internals in the explicit criteria assignment condition when each of the following causal agents is considered:
>
> a. ability
> b. effort
> c. luck
> d. task difficulty

The means and standard deviations for each of the groups involved in the interaction analyses are reported in Table 9. The *F*-values of the interaction effects of the locus of control by cue explication of a two-by-two analysis of variance for each of the four causal attributions were used to test Hypothesis 3. There was no significant *F*-values for any of the interaction effects in regard to attributions to ability, effort, luck, or task difficulty. Thus, Hypothesis 3 was not supported. The data supporting the *F*-values are summarized in Tables 4 through 7.

Hypothesis 4

The main effect of locus of control upon the accuracy with which subjects predicted their scores on an examination was analyzed in terms of the fourth hypothesis which stated:

TABLE 9

MEANS AND STANDARD DEVIATIONS OF CAUSAL ATTRIBUTION SCORES FOR INTERNALS AND EXTERNALS IN THE AMBIGUOUS AND EXPLICIT CUE CONDITIONS FOR EACH FORM OF EXAMINATION

Causal Attribution Element	N	Mean	Standard Deviation
Form A of Examination			
Ability			
Ambiguous Cue Condition			
Internals	17	3.06	1.30
Externals	12	3.00	.74
Explicit Cue Condition			
Internals	10	3.50	1.08
Externals	12	3.58	1.51
Effort			
Ambiguous Cue Condition			
Internals	17	4.06	1.25
Externals	12	2.83	1.64
Explicit Cue Condition			
Internals	10	4.20	1.43
Externals	12	3.92	1.73
Luck			
Ambiguous Cue Condition			
Internals	17	2.00	1.00
Externals	12	2.50	1.00
Explicit Cue Condition			
Internals	10	1.90	.88
Externals	12	3.00	1.48
Task Difficulty			
Ambiguous Cue Condition			
Internals	17	4.06	.56
Externals	12	4.08	1.16
Explicit Cue Condition			
Internals	10	3.30	1.06
Externals	12	3.75	1.42

TABLE 9--Continued

Causal Attribution Element	N	Mean	Standard Deviation
Form B of Examination			
Ability			
Ambiguous Cue Condition			
Internals	14	2.93	1.41
Externals	16	3.25	1.13
Explicit Cue Condition			
Internals	12	2.67	1.23
Externals	10	3.20	1.03
Effort			
Ambiguous Cue Condition			
Internals	14	3.64	1.39
Externals	16	3.25	1.29
Explicit Cue Condition			
Internals	12	4.17	1.27
Externals	10	2.80	1.32
Luck			
Ambiguous Cue Condition			
Internals	14	2.14	.95
Externals	16	2.63	1.46
Explicit Cue Condition			
Internals	12	2.33	.99
Externals	10	2.40	1.17
Task Difficulty			
Ambiguous Cue Condition			
Internals	14	4.00	.88
Externals	16	4.19	1.28
Explicit Cue Condition			
Internals	12	4.00	.85
Externals	10	3.90	1.10

> Externals when compared to internals are significantly less accurate in predicting their scores on an academic examination.

Accuracy of prediction was expressed in discrepancy scores or the absolute value of the difference between the predicted scores and the scores actually earned on the academic examination. The means and standard deviations of the discrepancy scores for internals and externals administered Forms A and B are stated in Table 10. A two-by-two factorial analysis of variance was performed with one of the main effects being locus of control and the dependent variable being the discrepancy scores. The F-value of the locus of control main effect was not significant for subjects administered Form A or Form B of the examination. Thus, Hypothesis 4 was not supported. A summary of data relative to the F-values for internals and externals are summarized in Table 11.

TABLE 10

MEANS AND STANDARD DEVIATIONS OF ACCURACY OF PREDICTION SCORES[1] FOR INTERNALS AND EXTERNALS

Locus of Control	N	Mean	Standard Deviation
Form A of Examination			
Internals	27	11.96	8.69
Externals	24	14.17	10.51
Form B of Examination			
Internals	26	16.23	8.62
Externals	26	16.92	10.30

[1]Accuracy of Prediction expressed in discrepancy scores.

TABLE 11

RESULTS OF ANALYSES OF VARIANCE OF ACCURACY OF PREDICTION[1] OF AN ACADEMIC EXAMINATION

Source of Variance	Mean Square	Degrees of Freedom	F-value	Level of Significance
Form A of Examination				
Locus of Control	101.69	1	1.17	N.S.*
Cue Explication	308.89	1	3.56	$\leq$.05
Locus of Control X Cue Explication	116.61	1	1.34	N.S.*
Within Group	86.74	47		
Total	91.28	50		
Form B of Examination				
Locus of Control	6.30	1	.07	N.S.*
Cue Explication	.08	1	.00	N.S.*
Locus of Control X Cue Explication	5.82	1	.06	N.S.*
Within Group	93.76	48		
Total	88.48	51		

*Not significant at $p \leq .05$, one-tailed test.

[1]Accuracy of Prediction expressed in discrepancy scores.

Hypothesis 5

The effect of cue explication upon accuracy of predicting scores on an academic examination was analyzed in terms of the fifth hypothesis which stated:

> Subjects in the ambiguous criteria assignment condition when compared to subjects in the explicit criteria assignment condition are significantly less accurate in predicting their scores on an academic examination.

The means and standard deviations of the discrepancy scores relative to Hypothesis 5 are displayed in Table 12. A two-by-two factorial analysis of variance was performed separately for subjects administered Form A and Form B of the academic examination. One of the main effects was cue explication and the dependent variable was discrepancy scores. The mean discrepancy scores of subjects administered Form A of the examination and in the explicit criteria assignment condition (M=10.36) was significantly less than the mean discrepancy score of the subjects in the ambiguous criteria assignment condition (M=15.00). The difference was not significant for those administered Form B of the examination. Hypothesis 5 was partially supported. The data associated with the F-values are summarized in Table 11.

Hypothesis 6

The effect of the locus of control by cue explication interaction upon the accuracy of predicting scores on an academic examination was analyzed in terms of the sixth hypothesis which stated:

> Externals when compared to internals are significantly less accurate in predicting their scores in the ambiguous criteria assignment condition, but the difference in accuracy of prediction is not significant in the explicit criteria condition.

TABLE 12

MEANS AND STANDARD DEVIATIONS OF ACCURACY OF PREDICTION[1] SCORES FOR SUBJECTS IN THE AMBIGUOUS AND EXPLICIT CUE CONDITIONS

Cue Condition	N	Mean	Standard Deviation
Form A of Examination			
Ambiguous Cue Condition	29	15.00	9.73
Explicit Cue Condition	22	10.36	8.85
Form B of Examination			
Ambiguous Cue Condition	30	16.57	9.76
Explicit Cue Condition	22	16.59	9.13

[1]Accuracy of Prediction expressed in discrepancy scores.

The means and standard deviations of the groups involved in the interaction analyses are stated in Table 13. The *F*-values of the interaction effect of the two-by-two factorial analysis of variance were not significant for subjects administered Form A or Form B of the academic examination. Hypothesis 6 was not supported. The data relating to the *F*-values are summarized in Table 11.

Hypothesis 7

The main effect of locus of control upon the performance outcome of an academic examination was analyzed in terms of the seventh hypothesis which stated:

> Externals when compared to internals score significantly lower on the academic examination.

TABLE 13

MEANS AND STANDARD DEVIATIONS OF ACCURACY OF PREDICTION SCORES[1] FOR INTERNALS AND EXTERNALS IN THE AMBIGUOUS AND EXPLICIT CUE CONDITIONS

Subgroup	N	Mean	Standard Deviation
Form A of Examination			
Ambiguous Cue Condition			
Internals	17	12.71	8.12
Externasl	12	18.25	11.20
Explicit Cue Condition			
Internals	10	10.70	9.90
Externals	12	10.08	8.31
Form B of Examination			
Ambiguous Cue Condition			
Internals	14	16.50	6.57
Externals	16	16.63	12.11
Explicit Cue Condition			
Internals	12	15.92	10.84
Externals	10	17.40	7.04

[1]Accuracy of Prediction expressed in discrepancy scores.

The means and standard deviations of the academic examination scores are reported in Table 14. A two-by-two factorial analysis of variance was performed with one of the main effects being locus of control and scores on the academic examination as the dependent variable. The *F*-value associated with the main effect was not significant for subjects administered Form A or Form B of the examination. Hypothesis 7 was not supported. A summary of the data associated with the *F*-values is presented in Table 15.

TABLE 14

MEANS AND STANDARD DEVIATIONS OF ACADEMIC EXAMINATION SCORES OF INTERNALS AND EXTERNALS

Locus of Control	N	Mean	Standard Deviation
Form A of Examination			
Internals	27	71.96	12.04
Externals	24	68.92	16.15
Form B of Examination			
Interals	26	66.85	9.68
Externals	26	65.39	15.78

TABLE 15

RESULTS OF ANALYSES OF VARIANCE OF ACADEMIC EXAMINATION SCORES

Source of Variance	Mean Square	Degrees of Freedom	F-value	Level of Significance
Form A of Examination				
Locus of Control	224.68	1	1.22	N.S.*
Cue Explication	1045.26	1	5.68	$\leq .05$
Locus of Control X Cue Explication	70.15	1	.38	N.S.*
Within Group	184.07	47		
Total	197.69	50		
Form B of Examination				
Locus of Control	32.40	1	.19	N.S.*
Cue Explication	31.71	1	.19	N.S.*
Locus of Control X Cue Explication	368.70	1	2.17	N.S.*
Within Group	170.19	48		
Total	168.57	51		

*Not significant at $p \leq .05$, one-tailed test.

Hypothesis 8

The main effect of the cue explication upon the performance outcome on an academic examination was analyzed in terms of the eighth hypothesis which stated:

> Subjects in the ambiguous criteria assignment condition when compared to subjects in the explicit criteria assignment condition score significantly lower on the academic examination.

The means and standard deviations of the academic examination scores are displayed in Table 16. A two-by-two factorial analysis of variance was performed separately for subjects administered Form A and Form B of the examination. The mean academic examination score of subjects in the explicit criteria assignment condition (M=75.46) were significantly higher than the mean score of subjects in the ambiguous criteria assignment condition (M=66.80) for those administered Form A of the test. The difference was not significant for those admininstered Form B of the test. Hypothesis 8 was partially supported. The data associated with the F-values are summarized in Table 15.

Hypothesis 9

The effect of the locus of control by cue explication interaction upon the scores of an academic examination was analyzed in terms of the ninth hypothesis which stated:

> Externals when compared to internals score significantly lower on the academic examination in the ambiguous criteria assignment condition, but the difference between scores of internals and externals is not significant in the explicit criteria condition.

TABLE 16

MEANS AND STANDARD DEVIATIONS OF ACADEMIC EXAMINATION SCORES FOR SUBJECTS IN THE AMBIGUOUS AND EXPLICIT CUE CONDITIONS

Cue Condition	N	Mean	Standard Deviation
Form A of Examination			
Ambiguous Cue Condition	29	66.80	13.49
Explicit Cue Condition	22	75.46	13.54
Form B of Examination			
Ambiguous Cue Condition	30	66.73	12.20
Explicit Cue Condition	22	65.27	14.23

The means and standard deviations of the academic examination scores for the various groups involved in the locus of control by cue explication interaction analyses are listed in Table 17. The *F*-values of the interaction effects upon academic examination scores as determined by a two-by-two factorial analysis of variance were not significant for subjects administered Form A or Form B of the examination. Hypothesis 9 was not supported. The data relative to the *F*-values are summarized in Table 15.

Summary of Hypotheses Testing

In summary, the following were the major findings of the analyses of the hypotheses:

TABLE 17

MEANS AND STANDARD DEVIATIONS OF ACADEMIC EXAMINATION SCORES FOR INTERNALS AND EXTERNALS IN THE AMBIGUOUS AND EXPLICIT CUE CONDITIONS

Cue Condition	N	Mean	Standard Deviation
Form A of Examination			
Ambiguous Cue Condition			
Internals	17	70.17	10.68
Externals	12	63.08	16.48
Explicit Cue Condition			
Internals	10	76.30	13.52
Externals	12	74.75	14.12
Form B of Examination			
Ambiguous Cue Condition			
Internals	14	65.14	9.28
Externals	16	68.13	14.45
Explicit Cue Condition			
Internals	12	68.83	10.16
Externals	10	61.00	17.59

1. There were no significant differences between internals and externals' mean attribution to ability scores on Forms A or B of an academic examination.
2. Internals' mean attribution to effort scores were significantly higher than externals' mean scores on Forms A and B of an academic examination.
3. Internals' mean attribution to luck score was significantly lower than externals' mean attribution to luck score on Form A of an academic examination; however, there was no significant difference between internals and externals' mean attribution to luck scores on Form B of the academic examination.
4. There were no significant differences between internals and externals' mean attribution to task difficulty scores on Form A or Form B of an academic examination.
5. There were no significant differences between internals and externals' mean discrepancy scores, a measure of accuracy of prediction, on Forms A or B of an academic examination.
6. There were no significant differences between internals and externals' mean academic examination scores on Forms A or B of the examination.
7. No significant differences were found between the mean attribution to ability scores of subjects in the ambiguous and explicit criteria assignment condition on Forms A and B of an academic examination.

8. There were no significant differences between the mean attribution to effort scores of subjects in the ambiguous and explicit criteria assignment conditions on Forms A and B of an academic examination.

9. There was no significant difference between the mean attribution to luck scores of subjects in the ambiguous and explicit criteria assignment conditions on Forms A or B of an academic examination.

10. Subjects in the explicit criteria assignment condition had a significantly lower mean discrepancy score, a measure of accuracy of prediction, than subjects in the ambiguous criteria assignment condition on Form A of an academic examination. No such difference was found between the mean scores of subjects administered Form B of the academic examination.

11. The mean academic examination score of subjects in the explicit criteria assignment condition was significantly higher on Form A of an academic examination than subjects in the ambiguous criteria assignment condition. No such difference was found between the means of subjects in the two cue conditions who were administered Form B of the examination.

12. No significant locus of control by cue explication interaction was found for subjects administered Form A or Form B

of an academic examination in regard to any of the following dependent variables: the four causal elements of ability, effort, luck, and task difficulty; accuracy of prediction; and performance outcome on an academic examination.

CHAPTER V

SUMMARY, DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH

The purposes of this chapter are to provide a summary of this study and to state conclusions which seem to be warranted based on the analysis and interpretation of the data. Recommendations for further research are also made.

Summary

The main purpose of this study was to determine the influence of locus of control and cue explication upon attribution of causality for the outcome of an academic examination. The secondary purpose was to assess the influence of locus of control and cue explication upon the accuracy of prediction and performance outcome of an academic examination.

The review of related literature revealed theoretical foundations and empirical evidence pertinent to each of the following primary variables: causal attribution, locus of control, and behavioral objectives which was the cue manipulated in this study. Little information, however, was reviewed that pertained to the interrelatedness of the three concepts.

The sample for this study was selected from students enrolled in two sections of Food and Nutrition 131, an introductory course,

during the 1979 fall semester. The course is offered in the College of Home Economics at Texas Tech University in Lubbock, Texas. Students were free to enroll in the section of their choice. There were no significant differences in age, locus of control, or academic classification between students enrolled in the two sections. Therefore, it was presumed that for the purposes of this study the registration process helped to distribute students with various characteristics evenly between groups.

One hundred three students completing all instruments of this study and scoring in the upper and lower thirds of the distribution of the students' I-E Locus of Control Scale scores were included in the sample. All data were collected during three class periods of the first five weeks of the semester.

The instruments for this study were selected or developed to measure locus of control, causal attribution, performance outcome, accuracy of prediction, and demographic varialbes. The Rotter (1966) I-E Locus of Control Scale was selected for the assessment of locus of control. The researcher developed a four-item instrument to measure causal attribution. One item was developed to assess each of the following major elements of causal attribution: ability, effort, luck, and task difficulty. The accuracy of prediction measure was expressed in terms of discrepancy scores or the absolute numerical values of the differences between subjects' predicted scores and the actual scores made by the subjects on the academic examination. The numerical score on an academic examination covering

the subject matter content of Module I of Food and Nutrition 131 served as a measure of performance outcome. Two parallel forms of the test were developed by the instructors of the course. A questionnaire for securing demographic data was used to collect data pertinent to age, sex, marital status, academic classification, major area of academic study, and previous courses taken in home economics.

Instructional materials had been developed into a module format. Each module contained a number of lessons. Module I, utilized during the course of this study, of the four-module course contained four lessons. The lessons were entitled "Food Choices," "Basic Facts," "The Body's Need for Energy and Energy Value of Food," and "Weight Control." Each of the four lessons within Module I contained a title, rationale, behavioral objectives, learning experiences, and evaluative methods used to assess progress. Module I also contained highlights of subject matter content and other information pertinent to specific learning experiences for each lesson.

The cue explication conditions were experimentally manipulated in terms of informing or not informing subjects of specific behavioral objectives which described the criteria for successful performance on an academic examination. The treatment group, or the group that received the behavioral objectives, is referred to as operating under an explicit cue condition. The control group, or the group not receiving the behavioral objectives, is referred to as operating under an ambiguous cue condition.

The students in the treatment group received packets of information including an introduction to modular learning and overviews of the four lessons in Module I. The instructor emphasized the use of the behavioral objectives. During the next three weeks, each lecture presented to the treatment control group contained references to the use of the behavioral objectives.

The students in the control group received packets of information similar to those received by the treatment group. However, the introduction to modular learning and the behavioral objectives component of the lesson overviews were omitted. There were no references made in the control group to behavioral objectives.

The students were administered the I-E Locus of Control Scale and the demographic questionnaire. During the fourth week of class, the subjects completed the questionnaire requesting them to predict the exact numerical score that they expected to make on the examination covering the subject matter of the four lessons in Module I. Upon completing and returning the questionnaires, students were administered the academic examination. There were two forms of the examination administered because it was possible for students to view the adjacent students' papers. The two forms were distributed in the same fashion for each section with no two students sitting next to each other receiving the same form of the examination.

The students were informed of their examination scores, the items that they answered incorrectly, and the correct responses to the items. The subjects were then administered the causal attribution questionnaire.

The two independent variables were locus of control and cue explication. A two-by-two factorial analysis of variance was performed for each of the following dependent variables: the attribution to ability, effort, luck, and task difficulty; accuracy of prediction; and performance outcome of the academic examination. The significance and directionality of the main effects due to locus of control and cue explication and to the interaction effect of locus of control by cue explication for each of the dependent variables were employed to test the hypotheses. There was a significant difference between the scores of students administered the two forms of the academic examination. Therefore, all analyses pertaining to the hypotheses were performed separately by forms of the examination.

Findings of this Study

The findings from the analyses of the data were as follows:

1. The analyses of the main effect of locus of control upon attribution of causality for the outcome of an academic examination produced mixed results. There were no significant differences between the mean attribution to ability scores of internals and externals on either Form A or Form B of the academic examination. Internals' mean attribution to effort scores were significantly higher than the mean scores of externals administered both Forms A and B of the academic examination. Internals' mean attribution to luck score was significantly lower than the mean attribution to luck

score of externals administered Form A of the academic examination; however, on Form B, the difference between internals and externals' mean attribution to luck scores was not significant. There were no significant differences between the mean attribution to task difficulty scores of internals and externals on either Form A or Form B of the academic examination.

2. The analyses of the main effect due to cue explication upon the attribution to causality produced mixed results. There were no significant differences between subjects in the ambiguous cue condition and the subjects in the explicit cue condition in regard to the mean attribution to ability scores, the mean attribution to effort scores, or the mean attribution to luck scores. This was true for those subjects administered Form A and Form B of the academic examination. The attribution to task difficulty score was significantly higher for subjects administered Form A of the examination in the ambiguous cue condition than for subjects in the explicit cue condition. However, the mean attribution to task difficulty scores were not significantly different between subjects in the two cue conditions who had been administered Form B of the examination.

3. There was no significant locus of control by cue explication interaction effect upon any of the four causal elements for subjects administered Form A or Form B of the academic examination.

4. There was no significant difference in the accuracy of predictions of internals and externals administered either Form A or Form B of the academic examination.

5. The mean discrepancy score, a measure of accuracy of prediction, was significantly lower for subjects in the explicit cue condition than the mean discrepancy score of subjects in the ambiguous cue condition for Form A of the examination. However, there was no significant difference between the mean discrepancy scores of subjects in the two cue conditions who had been administered Form B of the academic examination.

6. There was no significant locus of control by cue explication interaction upon the mean discrepancy scores, a measure of accuracy of prediction.

7. There was no significant difference between the mean academic examination scores of internals and externals on either Form A or Form B of the academic examination.

8. In the explicit criteria assignment condition, the subjects' mean academic examination score on Form A was significantly higher than the mean score of subjects in the ambiguous cue condition. The significant difference was not found between the mean academic examination scores of subjects in the two conditions who had been administered Form B of the examination.

9. There was no significant locus of control by cue explication interaction effect upon the academic examination scores.

Discussion, Conclusions, and Implications of this Study

Data acquired from this study were limited to the 103 subjects selected from 183 students enrolled in two sections of Food and

Nutrition 131 in the College of Home Economics at Texas Tech University in Lubbock, Texas, during the 1979 fall semester. Based upon the analyses of the data and interpretation of the findings, the following conclusions appear to be warranted:

1. There was support for internals attributing more causality to effort than externals, partial support for externals attributing more causality to luck than internals, and no support for the theoretical assumption that internals would attribute more to ability and less to task difficulty than externals. The partial support for the attribution to luck portion of the hypothesis is important because of the strong theoretical implication that externals interpret events from a chance oriented perspective. Thus, it seems that the perceptions of effort and luck might affect the behaviors of internals and externals in an academic setting. Assuming that this is true, teachers might emphasize the effort-related aspects of academic endeavors to assist the external students in recognizing the causal relationships.

It is important to note that Rotter (1966, 1975) pointed out that the locus of control orientation would be most operative under novel situations. Even though Food and Nutrition 131 is an introductory course and the examination was the first one of the semester administered in that course, prior experiences with academic examinations may have taken precedence over the generalized locus of control orientation in this specific situation in relation to the attributions to ability and task difficulty.

2. This study produced mixed results as to the influence of the manipulation of cue conditions upon attribution to task difficulty for the outcome of an examination on Form A but not on Form B. The mixed findings suggest that in some instances the use of behavioral objectives may assist students in knowing what to expect on an examination. Thus, the confirmation of expectancy might reduce the attribution to task difficulty for the outcome.

The effect of the manipulation of the cue conditions was not significant for the dependent measures of attributions to ability, effort, or luck. The findings are contradictory to those of Sogin and Pollak (1976) who found that as cue explication increased so did attribution to personal elements. Thus, it is concluded that the manipulation of behavioral objectives as a cue does not tend to influence the attribution to the personal causal elements of ability and effort or the external element of luck. However, Melton (1978) pointed out that students may not use the objectives because they are not aware of them or because they do not realize their importance. It is suggested that the students preliminary exposures to behavioral objectives may not have an effect upon their causal attributions.

3. There was no significant difference between internals and externals' accuracy of predicting the outcomes of their performance on the academic examination. These results support the results of a study by Gilmore and Reid (1978) but conflict with the results of a study by Steger, Simmons, and Lavelle (1973). The results might be due to the fact that subjects involved in this study had various

lengths of college experience. In a study by Wolfe (1972), it was found that the generalized locus of control orientation was related to the accuracy of prediction of freshmen but not the more experienced upperclassmen. Thus, it is suggested that the mixture of students of different college classifications included in this sample might have confounded the results.

4. The subjects in the explicit cue condition were significantly more accurate than subjects in the ambiguous cue condition in predicting their scores on Form A of the examination but not on Form B. These results seem to support the conclusion that in some circumstances the use of behavioral objectives may tend to assist students in the formulation of more accurate expectations. Therefore, it seems that the use of behavioral objectives can be advocated as beneficial in assisting students to formulate realistic expectations of an academic examination.

5. There was no significant effect of locus of control upon the outcome of the academic examination. This finding supports findings of Sowell and Burgen (1979), Prociuk and Breen (1973), Yoch and Nowicki (1977), Keller, Goldman, and Sulterer (1978), and Otten (1977). The results conflict with the findings of Prociuk and Breen (1973, 1974), Warehime (1972), and Allen, Giat, and Cherney (1974) which showed that internals perform significantly better academically than externals. It seems that there is no consistent pattern in the academic achievement performance of internals and externals.

The sample in this study was comprised mainly of females. In studies by Bass, Ollendick, and Vuchinick (1974) and Duke and Norwicki (1974), it was found that there was no significant difference between the academic achievement of female internals and externals, even though the difference was significant for males. Therefore, it is suggested that the sex variable may have been an intervening variable.

6. In this study, as in studies reviewed in the literature, the results were mixed in relation to the effect of the cue manipulation upon performance outcome. In studies by Harrison (1967), Olsen (1973), Anderson, DeMilo, Szabo, and Toth (1975), Glowatski (1973), Rothkoph and Kaplan (1972), Johnson and Sherman (1975), and Huck and Long (1973), it was demonstrated that students receiving behavioral objectives performed significantly better on academic achievement tests than those not recieving the behavioral objectives. However, in studies by Stedman (1972), Yelon and Schmidt (1973), and Chang (1976), there were no significant differences in achievement between students receiving behavioral objectives and those not receiving the objectives. In this study, subjects with objectives performed significantly higher on Form A of the examination than those without knowledge of the objectives. The results were not duplicated on Form B of the examination. Continued use of behavioral objectives may assist students in learning how to utilize the objectives more effectively.

7. The locus of control by cue explication interaction effects were not significant in regard to any of the following dependent variables: attribution of ability, effort, luck, and task difficulty; the accuracy of prediction; or the performance outcome on an academic examination. It is also concluded that in the case of manipulating the presence or absence of behavioral objectives in the particular unit of Food and Nutrition 131 related to this study did not provide the "cognitive link" (Lefcourt, 1967) necessary for the theoretical interaction to occur. In the Lefcourt study (1967), it was demonstrated that internals performed consistently across cue explication conditions, whereas, externals performed in more uniform patterns under the explicit cue condition than under the ambiguous cue condition. The finding led Lefcourt to suggest that externals do not tend to recognize the contingencies for reinforcement as quickly as internals. Thus, Lefcourt concluded that explication of cues leads the externals to perceive the causal relationships. Even though, Food and Nutrition 131 was selected because of the amount of experimental control it provided, it seems that these results might be due to the structure of the course. The course was well organized with printed highlights of materials, as well as a structured lecture series. Thus, if the externals were striving to interpret other available cues, the behavioral objectives might have lacked the impact in the explication of cues that was intended by this researcher.

Recommendations for Further Research

This study has revealed the need for further research in the areas pertaining to the influences of locus of control and cue explication upon causal attribution, accuracy of prediction, and performance outcome. Recommendations for further research include the following:

1. This study could be replicated using methods of instructions varying in degrees of structure, such as lecture versus individualized learning procedures, or large group lecture versus small group discussion.

2. This study could be replicated using a group of first semester freshmen and a group of upperclassmen as subjects. This would assist in determining if length of experience in college has an effect on the results.

3. Considering that two parallel forms of an examination yielded different results, it seems that a meaningful research area might be concerned with analyzing the relationship between evaluative procedures and causal attribution, accuracy of prediction, and performance outcome.

4. This study could be replicated using different subject matter content which might lend knowledge relating to the generalizability of the findings.

5. This study could be replicated with male and female subjects to determine if there are sex differences.

6. A longitudinal study to assess the impact that repeated exposure to behavioral objectives might have on internals and externals. It appears students may need training in attending to the use of behavioral objectives and learning to trust that the test will be designed according to the objectives.

7. The study could be replicated to determine the level of awareness of behavioral objectives and the level of use of behavioral objectives in preparation for the examination.

This study explored one aspect of the assumption that schools should provide students opportunities to acquire a sense of responsibility for performance outcomes. The results were mixed as to the main effects of locus of control and cue explication upon perception of responsibility and showed no locus of control by cue explication interaction effects. However, it is felt that the methodology employed might be useful in further exploration of the topic.

REFERENCE NOTE

1. Boren, A.R. Food and Nutrition 131 Lecture Notes, College of Home Economics, Texas Tech University, September 4, 1979.

REFERENCES

Allen, G. J., Giat, L., & Cherney, R. J. Locus of control, test anxiety, and student performance in a personalized instruction course. Journal of Educational Psychology, 1974, 66, 968-973.

Anderson, E. J., DeMelo, H. T., Szabo, M., & Toth, G. Behavioral objectives, science processes, and learning from inquiry-oriented instructional materials. Science Education, 1975, 59, 263-271.

Baker, D., & Hapkiewicz, W. G. The effects of behavioral objectives on relevant and incidental learning at two levels of Blooms' taxonomy. Journal of Educational Research, 1979, 72, 334-339.

Bartel, H., DuCette, J., & Wolk, S. Category clustering in free recall and locus of control. Journal of General Psychology, 1972, 87, 251,257.

Bass, B. A., Ollendick, T. H., & Vuchinich, R. E. Study habits as a factor in the locus of control-academic achievement relationship. Psychological Reports, 1974, 34, 906.

Bloom, B. S. (Ed.). Taxonomy of educational objectives: Cognitive domain. New York: David McKay, 1956.

Boren, A. R., & Harden, M. L. Study guide for Food and Nutrition 131. Lubbock, Tx.: Texas Tech Press, 1979, 1-21.

Bousfield, W. A. The occurrence of clustering in the recall of randomly arranged associates. Journal of Genetic Psychology, 1953, 49, 229-240.

Chang, T. S. Effect of instructional objectives on college student achievement. Education, 1976, 97, 179-182.

Davis, W. L., & Davis, D. E. Internal-external control and attribution of responsibility for success and failure. Journal of Personality, 1972, 40, 123-136.

Duchastel, P. C., & Merrill, P. F. The effects of behavioral objectives on learning: A review of empirical studies. Review of Educational Research, 1973, 43, 53-69.

Duke, M. P., & Nowicki, S. Locus of control and achievement: The confirmation of a theoretical expectation. Journal of Psychology, 1974, 87, 263-267.

East, M. Home economics: Past, present, and future. Boston: Allyn and Bacon, 1980.

Feather, N. T. Attribution of responsibility and valence of success and failure in relation to initial confidence and task performance. Journal of Personality and Social Psychology, 1969, 13, 129-144.

Feather, N. T., & Simon, J. G. Attribution of responsibility and valence of outcome in relation to initial confidence and success and failure of self and others. Journal of Personality and Social Psychology, 1971, 18, 173-188(a).

Feather, N. T., & Simon, J. G. Causal attributions for success and failure in relation to expectation of success based upon selective or manipulative control. Journal of Personality, 1971, 39, 527-541(b).

Fitch, G. Effects of self-esteem, perceived performance, and choice on causal attribution. Journal of Personality and Social Psychology, 1970, 16, 311-315.

Follender, A., & Plihal, J. (Eds.). Through the decades with the journal. Journal of Home Economics, 1969, 61, 89-96.

Fontaine, G. Social comparison and some determinants of expected personal control and expected performance in a novel task situation. Journal of Personality and Social Psychology, 1974, 29, 487-496.

Forsyth, D. R., & Schlenker, B. R. Attributing the causes of group performance: Effects of performance quality, task importance, and future testing. Journal of Personality, 1977, 45, 220-236.

Frieze, I. H. Causal attributions and information seeking to explain success and failure. Journal of Research in Personality, 1971, 39, 591-605.

Gilmor, T. M., & Reid, D. W. Locus of control, prediction and performance on university examinations. Journal of Consulting and Clinical Psychology, 1978, 46, 565-566.

Glowastski, E. A. Behavioral objectives for geography facilitate communication and increase test performance. Journal of Geography, 1973, 72, 36-44.

Grunwald, B. Strategies for behavior change in schools. The Counseling Psychologist, 1971, 3, 55-57.

Hardy, R. C., & Eliot, J. Comparison of external and internal individuals ability to perceive viewpoints of others. Perceptual and Motor Skills, 1977, 44, 941-942.

Harrison, G. The instructional value of presenting explicit versus vague objectives. In J. A. R. Wilson (Ed.), California educational research studies, Santa Barbara: University of California, 1967.

Heider, F. The psychology of interpersonal relations. New York: John Wiley and Sons, 1958.

Hill, W. F. Learning: A survey of psychological interpretations, (3rd. ed.). New York: Thomas Y. Crowell, 1977, 30-39.

Huck, S., & Long, J. D. The effect of behavioral objectives on student achievement. Journal of Experimental Education, 1973, 42, 40-41.

Joe, V. C. Review of the internal-external control construct as a personality variable. Psychological Reports, 1971, 28, 619-640.

Joe, V. C. Perceived personal control and attribution of causality. Perceptual and Motor Skills, 1974, 38, 323-329.

Johnson, C. Secondary schools and student responsibility. Phi Delta Kappan, 1978, 59, 338-341.

Johnson, C. C., & Sherman, J. E. Effects of behavioral objectives on student achievement in ISCS. Science Education, 1975, 59, 177-180.

Keller, J. M., Goldman, J. A., & Sutterer, J. R. Locus of control in relation to academic attitudes and performance in a personalized system of instruction course. Journal of Educational Psychology, 1978, 70, 414-421.

Krovetz, M. L. Explaining success or failure as a function of one's locus of control. Journal of Personality, 1974, 42, 179-189.

Kun, A., & Weiner, B. Necessary versus sufficient causal schemata for success and failure. Journal of Research in Personality, 1973, 7, 197-207.

Langer, E. J., & Roth, J. Heads I win, tails its chance: The illusion of control as a function of the sequence of outcomes in a purely change task. Journal of Personality and Social Psychology, 1975, 32, 951-955.

Larson, J. R. Evidence of a self-serving bias in the attribution of causality. Journal of Personality, 1977, 45, 430-441.

Lefcourt, H. M. Internal versus external locus of control of reinforcement: A review. Psychological Bulletin, 1966, 65, 206-220.

Lefcourt, H. M. Effects of cue explication upon persons maintaining external control expectancies. Journal of Personality and Social Psychology, 1967, 5, 372-378.

Lefcourt, H. M. Locus of control: Current trends in theory and research. New York: John Wiley and Sons, 1976.

Levenson, H. Activism and powerful others: Distinctions within the concept of internal-external control. Journal of Personality Assessment, 1974, 38, 377-383.

Lugenbuhl, J. E. R., Crowe, D. H., & Kahan, J. P. Causal attribution for success and failure. Journal of Personality and Social Psychology, 1975, 31, 86-93.

Mager, R. F. Preparing instructional objectives. Palo Alto, Ca.: Fearon, 1962.

Megas, J. D. Cohension, gender, and success or failure. Unpublished doctoral dissertation, Texas Tech University, Lubbock, Texas, 1977.

Melton, R. F. Resolution of conflicting claims concerning the effect of behavioral objectives on student learning. Review of Educational Research, 1978, 48, 291-302.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. SPSS: Statistical package for the social sciences, (2nd. ed.). New York: McGraw-Hill, 1975.

Nowicki, S., & Duke, M. A locus of control scale for college as well as noncollege adults. Journal of Personality Assessment, 1974, 38, 136-137.

Olsen, R. C. A comparative study of the effect of behavioral objectives on class performance and retention in physical science. Journal of Research in Science Teaching, 1973, 10, 271-277.

Otten, M. W. Inventory and expressive measures of locus of control and academic performance: A 5-year outcome study. Journal of Personality Assessment, 1977, 41, 644-649.

Phares, E. J. Locus of control in personality. Morristown, N. J.: General Learning Press, 1976.

Phares, E. J., & Wilson, K. G. Responsibility attribution: Role of outcome severity, situational ambiguity, and internal-external control. Journal of Personality, 1972, 40, 392-406.

Phares, E. J., Wilson, K. G., & Klyver, N. W. Internal-external control and the attribution of blame under neutral and distractive conditions. Journal of Personality and Social Psychology, 1971, 18, 285-288.

Pines, H. A. An attributional analysis of locus of control orientation and sources of informational dependence. Journal of Personality and Social Psychology, 1973, 26, 262-272.

Pines, H. A., & Julian, J. W. Locus of control differences in motivational arousal and predicisional cognitive processing. Journal of Personality, 1972, 40, 407-416.

Popham, J. Objectives and instruction: AERA monographs on curriculum evaluation, (Vol. 3). Chicago: Rand McNally, 1969.

Power, E. J. Main currents in the history of education. New York: McGraw Hill, 1970, 537-583.

Prociuk, T. J., & Breen, L. J. Defensive externality and its relation to academic performance. Journal of Personality and Social Psychology, 1975, 31, 549-559.

Prociuk, T. J., & Breen, L. J. Internal-external control, test anxiety and academic achievement: Additional data. Psychological Reports, 1973, 33, 563-566.

Prociuk, T. J., & Breen, L. J. Locus of control, study habits and attitudes, and college academic performance. Journal of Psychology, 1974, 88, 91-95.

Prociuk, T. J., & Lussier, R. J. Internal-external locus of control: An analysis and bibliography of two years of research (1973-1974). Psychological Reports, 1975, 37, 1323-1337.

Reid, D. W., & Ware, E. E. Multidimensionality of internal versus external control: Addition of a third dimension and nondistinction of self versus other. Canadian Journal of Behavioral Science, 1974, 6, 131-142.

Richardson, G. (Ed.). Under-graduate catalog 1979-1980. Lubbock, Tx.: Bulletin of Texas Tech University, 55, No. 4, 1979.

Ross, S. D. The nature of moral responsibility. Detroit: Wayne State University Press, 1973.

Rothkopf, E. Z., & Kaplan, R. Exploration of the effect of density and sepcificity of instructional objectives on learning from text. Journal of Educational Psychology, 1972, 63, 295-302.

Rotter, J. B. Social learning and clinical psychology. Englewood Cliffs, N. J.: Prentice-Hall, 1954.

Rotter, J. B. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 1966, 80, (1, Whole no. 609).

Rotter, J. B. Some problems and misconceptions related to the construct of internal versus external control of reinforcement. Journal of Consulting and Clinical Psychology, 1975, 43, 56-67.

Simon, J. G., & Feather, N. T. Causal attribution for success and failure at university examination. Journal of Educational Psychology, 1973, 64, 46-56.

Sogin, S. R., & Pallak, M. S. Bad decisions, responsibility, and attitude change: Effects of volition, forseeability, and locus of causality of negative cosequences. Journal of Personality and Social Psychology, 1976, 33, 300-306.

Sowell, V., & Burgin, A. Locus of control in high-achieving and low-achieving junior college males. Texas Tech Journal of Education, 1979, 6, 63-70.

Stedman, C. H. Is providing students with behavioral objectives incorporated into programmed materials efficient? Journal of Experimental Education, 1972, 41, 73-77.

Steger, J. A., Simmons, W. L., & Lavelle, S. Accuracy of prediction of own performance as a function of locus of control. Psychological Reports, 1973, 33, 59-62.

Stott, L. J. Teaching a sense of responsibility. Educational Forum, 1976, 40, 431-438.

Tanner, D., & Tanner, L. N. Curriculum development. New York: MacMillan, 1975.

Texas Education Agency. Vocational homemaking education program standards: Standards for public schools operating programs of occupational education for in-school students, (Rev. ed.). Austin, Tx.: Texas Education Agency, 1978.

Throop, W. F., & MacDonald, A. P. Internal-external locus of control: A bibliography. Psychological Reports, 1971, 28, 175-190.

Tyler, R. Basic principles of curriculum and instruction. Chicago: The University of Chicago Press, 1949.

Ude, L. K., & Vogler, R. E. Internals versus external control of reinforcement and awareness in a conditioning task. Journal of Psychology, 1969, 73, 63-67.

Walbesser, H. H. Constructing behavioral objectives. College Park, Md.: University of Maryland Press, 1970.

Warehime, R. G. Generalized expectancy for locus of control and academic performance. Psychological Reports, 1972, 30, 314.

Weiner, B., Heckhausen, H., Meyer, W. U., & Cook, R. E. Causal ascriptions and achievement behavior: A conceptual analysis of effort and reanalysis of locus of control. Journal of Personality and Social Psychology, 1972, 21, 239-248.

Wharton, L. The fourth R-responsibility education. In A. Aikman & H. G. Miller (Eds.), Responsibility education: Today and tomorrow, Carbondale, Illinois: Southern Illinois University, 1977, 2-9. (ERIC Document Reproduction Service No. ED 142 484)

Wolfe, R. N. Perceived locus of control and prediction of own academic performance. Journal of Consulting and Clinical Psychology, 1972, 38, 80-83.

Wolosin, R. J., Sherman, S. J., & Till, A. Effects of cooperation and competition on responsibility after success and failure. Journal of Experimental Social Psychology, 1973, 9, 220-223.

Wortman, C. B., Costanzo, P. R., & Witt, T. R. Effect of anticipated performance on the attributions of causality to self and others. Journal of Personality and Social Psychology, 1973, 27, 372-381.

Yelon, S. L., & Schmidt, W. H. The effect of objectives and instructions on the learning of a complex task. Journal of Experimental Education, 1973, 41, 91-96.

Yoch, K., & Nowicki, S., Jr. The role of reinforcement value in the prediction of academic achievement. Journal of Genetic Psychology, 1977, 130, 159-160.

APPENDIX

A. I-E LOCUS OF CONTROL SCALE AND ACCOMPANYING INSTRUCTIONS

B. A CAUSAL ATTRIBUTION QUESTIONNAIRE ON WHICH THE CAUSAL ATTRIBUTION QUESTIONNAIRE USED IN THIS STUDY WAS BASED

C. CAUSAL ATTRIBUTION QUESTIONNAIRE USED IN PILOT STUDY

D. CAUSAL ATTRIBUTION QUESTIONNAIRE AND ACCOMPANYING INSTRUCTIONS

E. TABLE OF SPECIFICATIONS

F. PREDICTION QUESTIONNAIRE

G. DEMOGRAPHIC QUESTIONNAIRE

H. INTRODUCTION TO MODULAR LEARNING

I. OVERVIEWS OF LESSONS IN MODULE I PRESENTED TO TREATMENT GROUP

J. OVERVIEWS OF LESSONS IN MODULE I PRESENTED TO CONTROL GROUP

K. SAMPLE OF STUDY GUIDE MATERIAL: LESSON 3 OF MODULE I OF FOOD AND NUTRITION 131

APPENDIX A: I-E LOCUS OF CONTROL SCALE AND ACCOMPANYING INSTRUCTIONS

You are being asked to fill out the enclosed questionnaire in an effort to collect data on characteristics of today's college students. From such information, it is hoped that helpful insight will be gained which will eventually result in improved educational practice.

The information collected is strictly confidential and will be used solely for research purposes. It will not affect your grade in this course. You are being asked to identify yourself only that future data and reports can be matched. As soon as all information is collected, individual names will be removed and be replaced with a numerical code.

Please be careful not to skip or omit any questions. Record all answers on the answer sheet. The only right answer on questions such as these is your honest opinion or true feelings. Please return the packet and answer sheet to your professor when you are finished. You may give your name and mailing address to your professor if you want to receive feedback as to the specific results of this research.

Thank you for your cooperation.

THE I-E LOCUS OF CONTROL SCALE [1]

Instructions: This portion of the questionnaire is to find out the way in which certain important events in our society affect different people. Each item consists of a pair of alternatives lettered "a" or "b". Please select the one statement of each pair (and only one) which you more strongly believe to be the case as far as you're concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true. This is a measure of personal belief; obviously there are no right or wrong answers.

Please answer these items carefully, but do not spend too much time on any one item. Be sure to find an answer for every choice and mark the letter (a or b) on the answer sheet provided.

In some instances you may discover that you believe both statements or neither one. In such cases, be sure to select the one you most strongly believe to be the case as far as you are concerned. Also try to respond to each item independently when making your choice; do not be influences by your previous choices.

1. a. Children get into trouble because their parents punish them too much.
   b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.
   b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
   b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.
   b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.

5. a. The idea that teachers are unfair to students is nonsense.
   b. Most students don't realize the extent to which their grades are influences by accidental happenings.

[1] Rotter, J.D. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 1966, 80, (1, Whole No. 609), pp. 11-12.

6. a. Without the right breaks one cannot be an effective leader.
   b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. a. No matter how hard you try, some people just don't like you.
   b. People who can;t get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality.
   b. It is one's experiences in life which determine what they're like.

9. a. I have often found that what is going to happen will happen.
   b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well-prepared student, there is rarely if ever such a thing as an unfair test.
    b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work; luck has little or nothing to do with it.
    b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

13. a. When I make plans, I am almost certain that I can make them work.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.
    b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
    b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
    b. Getting people to do the right thing depends upon ability; luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
    b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    b. There really is no such thing as "luck".

19. a. One should always be willing to admit mistakes.
    b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.
    b. How many friends you have depends upon how nice a person you are.

21. a. In the long run the bad things that happen to us are balanced by the good ones.
    b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.
    b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.
    b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.
    b. A good leader mades it clear to everybody what their jobs are.

25. a. Many times I feel that I have little influence over the things that happen to me.
    b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.
    b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.
    b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
    b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.
    b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX B: A CAUSAL ATTRIBUTION QUESTIONNAIRE ON WHICH THE CAUSAL ATTRIBUTION QUESTIONNAIRE USED IN THIS STUDY WAS BASED[1]

(a) How do you rate your ability in examinations like the one you are about to take? The rating scale appropriate to this question had the statement "Well below average" at one extreme of the scale, and the statement "Well above average" at the other extreme. The rating was scored 1-8 in the direction of increasing ability.

(b) How much effort have you put into preparing for this examination? The rating scale for this question had the statement "Very little" at one extreme and the statement "A great deal" at the other extreme. This rating was assumed to reflect the subjects' judgment of knowledge on the assumption that more preparation would determine a greater fund of knowledge. This rating was scored 1-8 in the direction of increasing preparation.

(c) How difficult do you think the examination will be? The rating scale for this question had the statement "Very difficult" at one extreme and the statement "Very easy" at the other extreme. Scoring was 1-8 in the direction of decreasing difficulty.

(d) How confident are you that you will pass this examination? This question was answered on a scale with the statement "Not confident at all" at one extreme and the statement "Very confident at the other extreme. Scoring was 1-8 in the direction of increasing confidence.

[1] Simon, J.G. & Feather, N.T. Causal attribution for success and failure at university examination. Journal of Educational Psychology, 1973, 64, 48.

APPENDIX C: CAUSAL ATTRIBUTION QUESTIONNAIRE USED IN PILOT STUDY

Mark each statement to indicate how much you agree or disagree with the statement in regards to the test that has been returned. In the space by each item, write the number which best describes your feelings about the exam. Please give your honest opinions. YOUR INSTRUCTOR WILL NOT SEE YOUR ANSWERS.

Use the following scale to rate each statement.

6 -- Totally agree
5 -- Agree very much
4 -- Tend to agree
3 -- Tend to disagree
2 -- Disagree very much
1 -- Totally disagree

1. Your score reflects your test-taking ability.

2. Your score reflects the amount of effort you spent in preparing for the exam.

3. Your score was affected by luck.

4. Your score reflects the difficulty of the test.

5. Your score is an accurate reflection of your knowledge related to the subject matter covered on the exam.

6. What was your actual score on the exam? _____ points

Check to see that all items are complete.

Comments: _____

_____

Thank you for your cooperation.

APPENDIX D: CAUSAL ATTRIBUTION QUESTIONNAIRE AND ACCOMPANYING INSTRUCTIONS

The questionnaire is being given in the effort to obtain students' attitudes toward academic examinations. The opinions you express will be used for research purposes only. Your answers will NOT affect your grade in any way. The information is STRICTLY CONFIDENTIAL and will at NO time be linked with a specific individual. We will be pleased to report the results of the study to you. Your professors will NOT see your answers.

CAUSAL ATTRIBUTION QUESTIONNAIRE

Part I: Mark each statement to indicate how much you agree or disagree with the statement regarding the test that you took in F&N 131 last week. In the space by each item, write the number which best describes your feelings about the exam. Please give your honest opinions. Your professors will NOT see your answers. PLEASE MARK ALL ITEMS.

Use the following scale to rate each statement.

6 -- Totally Agree
5 -- Agree Very Much
4 -- Tend to Agree
3 -- Tend to Disagree
2 -- Disagree Very Much
1 -- Totally Disagree

_____ 1. My score reflected my test-taking ability.

_____ 2. My score reflected the amount of effort I spent preparing for the exam.

_____ 3. My score was affected by luck.

_____ 4. My score was affected by the difficulty or easiness of the test.

Part II: Complete each item by writing or checking the appropriate response.

5. What was your actual score on the exam? ____ points (numerical score)

6. Have you taken other college courses that contained information similar to that covered on this F&N 131 exam?

____ Yes ____ No

7. Did you study for the exam with anyone enrolled in the other section of F&N 131?

____ Yes ____ No

8. Is this your first semester in college? ____ Yes ____ No

9. What is your Social Security number? _____

THANK YOU FOR YOUR COOPERATION.

APPENDIX E: TABLE OF SPECIFICATIONS

Objective[1]	Level of Objective	Number of questions at appropriate difficulty on examination	
		Form A	Form B
1A	Comprehension	1	1
1B	Comprehension	1	1
1C	Analysis	1	1
2A	Knowledge	3	3
2B	Application	3	3
3A	Knowledge	1	1
	Application	3	3
3B	Knowledge	1	1
	Comprehension	2	2
	Comprehension	2	2
3C	Application	3	3
4A	Analysis	3	3
4B	Application	3	3
4C	Application	5	5
	Total	30	30

[1]The behavioral objectives are stated in Appendix I. In this Appendix the objectives are noted in terms of the Lesson number and the specific objective within that lesson. Example: Behavioral objective 1C means the third objective of Lesson 1.

APPENDIX F: PREDICTION QUESTIONNAIRE

Part I: Mark each statement to indicate how much you agree or disagree with the statement regarding the test you are about to take. In the space by each item, write the number which best describes your feelings about the exam. Please give your honest opinions. Your professors will NOT see your answers. PLEASE MARK ALL ITEMS.

Use the following scale to rate each statement.

6 -- Totally Agree
5 -- Agree Very Much
4 -- Tend to Agree
3 -- Tend to Disagree
2 -- Disagree Very Much
1 -- Totally Disagree

_____ 1. My score will reflect my test-taking ability.

_____ 2. My score will reflect the amount of effort I spent preparing for the exam.

_____ 3. My score will be affected by luck.

_____ 4. My score will be affected by the difficulty or easiness of the test.

Part II: Complete each item by writing the appropriate response.

5. A perfect score on the exam will equal 100 points. What do you think your score will be?

_____ points (numerical score)

6. What is your Social Security number? _____

THANK YOU FOR YOUR COOPERATION.

APPENDIX G: DEMOGRAPHIC QUESTIONNAIRE

Instructions: Please fill out the following information and turn this page in with your answer sheet. BE SURE THAT YOUR NAME IS ALSO ON YOUR ANSWER SHEET.

1. Name _____

2. Soc. Sec. # _____

3. F&N 131 Section _____

4. Sex (circle one)
   - Single Male
   - Married Male
   - Single Female
   - Married Female

5. Age _____

6. Ethnic Group (circle one)
   - White, non-Hispanic
   - Black, non-Hispanic
   - Hispanic
   - Asian or Pacific Islander
   - American Indian or Alaskan native
   - Nonresident alien or foreign national

7. Classification (circle One)
   - Freshman
   - Junior
   - Sophomore
   - Senior

8. College of School (circle one)
   - Agricultural Sciences
   - Arts and Sciences
   - Business Administration
   - Engineering
   - Home Economics
   - Education

9. Major (circle one)

   Home Economics
   - Clothing and Textiles
   - Food and Nutrition
   - General Home Economics
   - Home Economics Education
   - Home and Family Life
   - Child Development
   - Family Relations
   - Home Management
   - Prenursing
   - Undecided

   Education
   - Education
   - Elementary Education
   - Secondary Education
   - Special Education
   - Other (specify) _____

10. Number of units of high home-making courses taken (circle one)

    0 ½ 1 1½ 2 2½ 3 3½

11. Number of units of high school science courses taken (circle one)

    0 ½ 1 1½ 2 2½ 3 3½

12. Number of semesters of college sciences courses taken (circle one)

    0 ½ 1 1½ 2 2½ 3 3½

APPENDIX H: INTRODUCTION TO MODULAR LEARNING

The Modular Instructional Strategy offers the student the advantage of having "in hand" all materials needed to complete the course successfully. These include the text, the Study Guide, and various audiovisuals in the Learning Center (Room 306). Additional advantages are, some freedom of studying at your own convenience and the challenge of taking the responsibility for learning.

The information covered in this course is divided into five modules. A module consists of one or more lessons. Each lesson is carefully described in the Study Guide which includes what you should learn from the lesson, what learning experiences you should complete to achieve the objectives of the lesson, and how your learning will be evaluated. Please look at Lesson 1 of Module 1 on Page 1 of the Study Guide. As you read the page, please refer to the list of Key Words below which describe the different parts of the lesson.

KEY WORDS IN MODULAR LEARNING

Module	is a learning packet covering one unit or area of study and is composed of one or more lessons.
Title	is a descriptive name for the material to be covered in the lesson.
Rationale	is the reason why the module or lesson is worthwhile to study.
Behavioral Objectives	describe specifically what the student will learn in the lesson.
Learning Experiences	are activities designed to help the student accomplish the objectives. The objective(s) are "number coded" to correspond to the learning experiences.
Evaluation	is the method by which the student will prove the objectives have been accomplished.

APPENDIX I: OVERVIEWS OF LESSONS IN MODULE I PRESENTED TO TREATMENT GROUP

MODULE I

LESSON 1: FOOD CHOICES

RATIONALE: People accept and enjoy certain foods and not others for many reasons. These reasons often are based more on the feeling of the person than on the qualities of the food itself. Food habits are developed at an early age and may affect food choices and health throughout life. Although difficult, it is possible to change undesirable food habits when one recognizes this as a personal responsibility.

BEHAVIORAL OBJECTIVES:

A. Describe sociological factors contributing to the development of food habits. (2,4)

B. Determine ways that food may contribute to fulfillment of psychological needs. (2,4)

C. Analyze the significance of food to an individual, a nation, and the world. (1,2,3,4)

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 1, Controversy 8, pp. 175-81.

2. Read "The Functions of Food" from Principles of Nutrition, Wilson, Fisher, and Fuqua, 1967. Learning Center.

3. Read Highlights, "A Perspective on Food Patterns" by Margaret Mead.

4. Participate in Laboratory Experiences.

EVALUATION:

Module I Test (See Course Syllabus)

MODULE I

LESSON 2: BASIC FACTS

RATIONALE: Learning to select foods to supply the right amounts of nutrients and energy is the primary objective of this course. This lesson will help to answer questions such as what are "nutrients", how are they measured, how much does one need, and what foods should one eat to obtain these nutrients?

BEHAVIORAL OBJECTIVES:

A. Define nutrients, essential nutrient, energy nutrient, indicator nutrients, Recommended Dietary Allowances (RDA). (1)

B. Relate criteria for diet planning (adequacy, balance, appropriate Kcalorie level, variety) to Food Group System, Exchanges, and Dietary Goals. (1,2,3)

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 2, Glossary and Controversy 1, pp. 48-51, inside front cover.

2. Participate in Laboratory Experience

3. Participate in Dietary Study

EVALUATION:

Module I Test (See Course Syllabus)

MODULE I

LESSON 3: THE BODY'S NEED FOR ENERGY AND ENERGY VALUE OF FOOD

RATIONALE: Various factors influence the body's need for energy. In energy balance, the energy intake equals the energy output. Energy value of foods depends upon the amounts present of the energy nutrients, i.e., carbohydrate, lipid, protein, or alcohol. A knowledge of food energy values will assist one in food selection.

BEHAVIORAL OBJECTIVES:

A. Identify factors which affect basal metabolic rate (BMR). Calculate the BMR from a given body weight and sex category. (1,2,3,4)

B. Define the terms calorimetry and energy; identify the similarities and differences between the measurements Calorie, Kilocalorie, and Kilojoule. (1,4)

C. Compute the Kcaloric density of a food by using the physiological fuel values for carbohydrate, lipid, protein and alcohol. (1,3,4)

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 6 and Glossary.

2. View videocassettes, "Food, Energy and You". Learning Center

3. View slide set, "Energy: Our Foods and Our Needs. Part I". Learning Center

4. Review Highlights: Energy Needs of the Body and Energy Value of Food.

5. Participate in Laboratory Experiences.

EVALUATION:

Module I Test (See Course Syllabus)

MODULE I

LESSON 4: WEIGHT CONTROL

RATIONALE: Ideal weight is desirable since either obesity or underweight may cause health risks.

BEHAVIORAL OBJECTIVES:

A. Identify factors which may cause obesity and recognize the relationship which exists between the state of obesity (20% above desirable weight) to current health problems of U.S. citizens. (1,2)

B. Given different dietary patterns, identify characteristics of a plan for weight reduction. (3)

C. Given various levels of food intake, calculate the effect of increased or decreased kilocalories on body weight. (3)

Remember: The effect of increasing and decreasing activity and that 3500 kilocalories can be equated with one pound of body fat. A deficit of 500 kilocalories per day results in loss ob body fat at about 1 pound per week.

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 7, and Glossary.

2. View videocassette, "For Tomorrow We Shall Diet". Learning Center

3. View slide set, "Energy: Our Foods and Peer Needs", Part II. Learning Center

4. Optional experience - listen to tape, "A Behavior Treatment Program for the Overweight". Learning Center

5. Participate in Laboratory Experiences.

EVALUATION:

Module I Test (See Course Syllabus)

APPENDIX J: OVERVIEWS OF LESSONS IN MODULE I PRESENTED TO CONTROL GROUP

LESSON 1: FOOD CHOICES

RATIONALE: People accept and enjoy certain foods and not others for many reasons. These reasons often are based more on the feelings of the person than on the qualities of the food itself. Food habits are developed at an early age and may affect food choices and health throughout life. Although difficult, it is possible to change undesirable food habits when one recognizes this as a personal responsibility.

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 1, Controversy 8, pp. 175-81.

2. Read "The Functions of Food" from Principles of Nutrition, Wilson, Fisher, and Fuqua, 1967. Learning Center.

3. Read Highlights, "A Perspective on Food Patterns" by Margaret Mead.

4. Participate in Laboratory Experiences.

EVALUATION:

Module I Test (See Course Syllabus)

MODULE I

LESSON 2: BASIC FACTS

RATIONALE: Learning to select foods to supply the right amounts of nutrients and energy is the primary objective of this course. This lesson will help to answer questions such as what are "nutrients", how are they measured, how much does one need, and what foods should one eat to obtain these nutrients?

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 2, Glossary and Controversy 1. pp. 48-51, inside front cover.

2. Participate in Laboratory Experience

3. Participate in Dietary Study

EVALUATION:

Module I Test (See Course Syllabus)

MODULE I

LESSON 3: THE BODY'S NEED FOR ENERGY AND ENERGY VALUE OF FOOD

RATIONALE: Various factors influence the body's need for energy. In energy balance, the energy intake equals the energy output. Energy value of foods depends upon the amounts present of the energy nutrients, i.e., carbohydrate, lipid, protein, or alcohol. A knowledge of food energy values will assist one in food selection.

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 6 and Glossary.

2. View videocassettes, "Food, Energy and You". Learning Center.

3. View slide set, "Energy: Our Foods and Our Needs. Part I". Learning Center.

4. Review Highlights: Energy Needs of the Body and Energy Value of Food.

5. Participate in Laboratory Experiences.

EVALUATION:

Module I Test (See Course Syllabus)

MODULE I

LESSON 4: WEIGHT CONTROL

RATIONALE: Ideal weight is desirable since either obesity or underweight may cause health risks.

LEARNING EXPERIENCES:

1. Read Hamilton and Whitney, Chapter 7, and Glossary.

2. View videocassette, "For Tomorrow We Shall Diet". Learning Center

3. View slide set, "Energy: Our Foods and Peer Needs", Part II. Learning Center

4. Optional experience - listen to tape, "A Behavior Treatment Program for the Overweight". Learning Center

5. Participate in Laboratory Experiences.

EVALUATION:

Module I Test (See Course Syllabus)

APPENDIX K: SAMPLE OF STUDY GUIDE MATERIAL: LESSON 3 OF MODULE 1 OF FOOD AND NUTRITION 131[1]

HIGHLIGHTS - ENERGY NEEDS OF THE BODY

1. Energy needs of an individual are determined by adding together the Kcalories needed for basal metabolism, physical activity, and specific dynamic effect of food.

   A. Basal Metabolism Rate (BMR) is the minimum amount of energy needed to carry on the vital processes of the body, such as breathing, heart beat, etc.

      1. Conditions for measuring BMR are: post absorptive state of the body, lying down in a comfortable position, mentally and physically relaxed.

      2. Factors which affect basal metabolism

         a. body size and surface area
         b. body composition
         c. age (after full grown - BMR decreases with age)
         d. climate
         e. status of health (fever, malnutrition, semistarvation)
         f. secretion of ductless glands - thyroid (hypothyroidism vs. hyperthyroidism)
         g. growth, stress

      3. Factorial determination of BMR:

         Female: .9 Kcal per kg of body weight per hour - Estimated BMR
         Example: 110 lb healthy female
         110 lb ÷ 2.2 = 50 kg
         .9 Kcal x 50 kg x 24 hr = 1080 Kcal Estimated BMR

         Male: 1 Kcal per kg of body weight per hour - Estimated BMR
         Example: 165 lb ÷ 2.2 = 75 kg
         1 Kcal x 75 kg x 24 hr = 1800 Kcal Estimated BMR

[1] Boren, A.R. and Harden, M.L. Study Guide for Food and Nutrition 131. Lubbock, Texas: Texas Tech Press, 1979, pp. 12-19. (Used with permission of authors.)

B. Physical Activity: Energy expenditures vary for each individual. It is directly related to work done, to body size, and to the intensity of the activity.

C. Specific Dynamic Effect (SDE) is the energy needed to metabolize food.

ENERGY VALUE OF FOOD

I. Food consists of all solid and liquid materials taken into the digestive tract, both organic and inorganic compounds.

A. Organic compounds are those which contain protein, fat, carbohydrates, and some vitamins. The energy nutrients combust or burn to release energy. (C,H,O,N, etc.)

B. Inorganic compounds - water, minerals (calcium, phosphorus, sodium, sulfur, potassium, chlorine, iron, copper, etc.)

II. Energy can be potential or kenetic. Matter is neither created nor destroyed but only changes form.

III. Energy value of food (carbohydrates, fat, and protein) is the potential chemical energy which may be released upon combustion.

A. Kilocalorie is a unit of heat or the energy value of food; the amount of heat necessary to raise the temperature of 1 kg. (2.2 pounds) of water 1° Centigrade. (one kilogram of water measures about 1 qt. plus 1/4 cup.)

B. Calorimetry is a method which measures heat energy. Methods of determining the kcalorie content of the diet are:

1. Direct Calorimetry using a Bomb Calorimeter: Food is placed in an enclosed "bomb" apparatus, oxygen is introduced, an electric current ignites the food; as the food burns, a change in the temperature of water surrounding the bomb is measured. By this method, kilocalorie values are:
   1 g carbohydrate produces 4.10 kcalories
   1 g fat produces 9.45 kcalories
   1 g protein produces 5.65 kcalories

2. Indirect Calorimetry using an Oxycalorimeter: As food is burned the amount of oxygen used and carbon dioxide produced are measured to determine the kcalorie value of food.

3. Factorial Calorimetry using Physiological Fuel Values: The animal body does not obtain as much energy from foods as the mechanical calorimetry methods. Some nutrients are not completely digested; for example, only 95% of fats and 92% of proteins are utilized. Therefore, physiological fuel values (energy of use to the human body based on the average American Diet) are:

1 g carbohydrate	yields 4 kcalories
1 g fat	yields 9 kcalories
1 g protein	yields 4 kcalories
1 g alcohol	yields 7 kcalories

IV. Factorial method of computing kcalorie density of a food: The kilocaloric density of a food can be determined when the amount of CHO, fat and protein are known. Multiply the volume of each energy nutrient by the physiological fuel value to get the Kcaloric density of a food.

Example:

1 cup of whole milk contains 12 g CHO, 9 g fat, and 9 g protein

12 g CHO x 4	= 48
9 g fat x 9	= 81
9 g protein x 4	= 36
	160 Kcal.

MODULE I

LABORATORY EXPERIENCE 3: THE BODY'S NEED FOR ENERGY AND ENERGY VALUE OF FOOD

1. Anthropometric Evaluation of Nutritional Status

For this experience, a classmate will take certain measurements for you and record them in Table 1. Follow instructions below and in the display. Ask lab instructor for help if needed.

Table 1. Summary of Anthropometric Measurements

1. Weight _____ lb
2. Height _____ ft _____in (add 2" for female, 1" for male)
3. Wrist Circumference _____in
4. Body Frame Size _____
5. Ideal Body Weight _____lb
6. Average Triceps Skinfold _____mm
7. Triceps Skinfold Percentile _____

A. Weight: Ideally, weight should be taken in the morning before breakfast and after emptying the bladder. However, this will not be possible in all cases. Weight should be taken in light clothing; sweaters, shoes, etc. should be removed.

1) Step onto scale and stand very still while lab partner determines weight.
2) Record weight in Table 1.

B. Height:

1) Continue to stand on scale while lab partner pulls up measuring rod for height. If necessary, lab partner should stand on stool or chair in order to be able to see over the head. The lever at the end of the measuring rod should rest on the head comfortably.

2) Convert the measurement into feet and inches. Record in Table 1.

C. Wrist Circumference: Wrist circumference is used to estimate body frame size for use with height and weight tables. The Ross Inser-Tape should be threaded through slots starting from beneath buckle so "midpoint measure" appears on interior side of loop. See display, Figure 1.

1) Place looped measuring tape around smallest part of the right wrist and tighten snugly, but not to tightly as to pinch. Measurement should be noted on buckle end of tape between indicators (X). Record measurement in inches in Table 1. See display, Figure 2.
2) Using wrist circumference and height, determine body frame type. See display, Figure 3. Record frame type in Table 1.

D. Triceps Skinfold: This measure is used to estimate the amount of body fat. The base right arm is used for the measurement.

1) Bend the arm at a 90° (right) angle with palm up.
2) Measurement is taken at the midpoint at the back of the upper right arm between the eldow and shoulder. To locate the midpoint, place Ross Inser-Tape on arm with "Midpoint Measure" side visible. The tape should be adjusted vertically along arm until the same number appears at the bony protrusion on upper shoulder (acromial process of the scapula) and at the bony point of the elbow (olecrannon process). The point at which the midpoint indicator ( ) appears is marked on the back of the arm with a pen. See display, Figure 1.
3) Relax arm at the side. Pick up a lengthwise (vertical) double fold (pinch) of skin and fat with the thumb and forefinger of the left hand about 1/2 inch above the mark. The skinfold should be gently pulled away from underlying muscle tissue and held firmly. If in doubt, have subject contract and relax the arm muscles to insure that no muscle is included in the pinch. See display, Figure 5.
4) The jaws of the adipometer skinfold caliper is placed over the skinfold at the midpoint mark while maintaining grasp of skinfold.
5) Exert force with thumb and forefinger until the lines on adipometer are aligned.
6) Read to the nearest 1.0 millimeter 2 or 3 seconds after aligning the lines. Do not apply excessive pressure or delay taking reading. Remove calipers and reapply to ob-

tain three readings. Record the readings, then average. Record the average in Table 1.

1st reading _____
2nd reading _____
3rd reading _____
average _____

E. Refer to display, Figure 4, Standards for Triceps Skinfold Percentile. Record percentile in Table 1.

F. "Ideal" Weight Determination: To find "ideal" weight, use the appropriate table on the inside back cover of Hamilton and Whitney. Find "ideal" weight on the chart depending on your frame size. Record "ideal" weight in Table 1.

2. Basal Metabolic Energy Needs

A. Method 1:

1) Refer to Hamilton and Whitney, p. 587 and p. 162. Convert your ideal weight in pounds to kilograms.
_____ lb ÷ 2.2 = _____ kg.
2) As indicated in Hamilton and Whitney, p. 162, multiply your ideal weight in kilograms by the BMR factor for women (0.9 kcalories) or for men (1.0 kcalories).
_____ kg x _____ kcal _____ kcal per hr.
3) Multiply the kcalories used in one hour by the hours in a day. This represents the estimated number of kcalories needed for BMR. _____ kcal per hr. x 24 hr. = _____ kcal per day for BMR.

B. Method 2:

1) On the chart for determination of surface area in Hamilton and Whitney, p. 167, mark with a point, your ideal weight and height in the appropriate columns. Draw a line between the two points. The point at which the line crosses the center column represents your surface area in square meters.
2) Using the BMR table on p. 168, find the factor for your sex and age, and multiply your surface area by this factor.
3) Multiply the product in 2 above by 24 hours per day to find your estimated BMR needs per day.
_____ sq. m. surface area x _____ BMR factor per hr. x 24 hr. = _____ BMR.

B. Specific Dynamic Effect: Multiply the kcalories for each method obtained in 1 above by 10 percent.

Method 1 BMR _____ x 10% SDE = _____kcal for SDE.
Method 2 BMR _____ x 10% SDE = _____kcal for SDE.

	Method 1	Method 2
Kcal for BMR		
Kcal for Activity		
Kcal for SDE		
Total Energy Needs	Kcal	Kcal

4. Conclusions

Compare your actual weight with "ideal" weight, Triceps skinfold percentile relative to body fat content, and both methods of estimating the total kcalorie needs with the RDA for kcalories (Inside front cover of Hamilton and Whitney). Discuss conclusions with the lab instructor.

A. Actual weight differs from ideal weight ± _____ lb.

B. Triceps skinfold of _____percentile indicates _____/

C. Total energy needs _____kcal (Method 1) and _____kcal (Method 2) compared with _____kcal in RDA indicates _____.

5. Energy value or caloric density of food may be determined by mechanical or factorial means.

A. View the display of the oxycalorimeter. Note how the apparatus operates and how it differs from a bomb calorimeter.

B. Using the physiological fuel values, Hamilton and Whitney p. 25 or 163, compute the caloric density of:

1. One medium banana which weighs about 175 g and contains 26 g CHO, 1 g Protein, and no fat. To compute caloric density complete this formula:

CHO	26 g x 4 kcal per g	= _____	kcal CHO
Protein	1 g x 4 kcal per g	= _____	kcal Protein
Fat	0 g x 4 kcal per g	= _____	kcal Fat
		_____	Total kcal in banana

2. One 6 inch tortilla which weighs 30 grams and contains 13.5 g CHO, 1.5 g Protein, .6 g Fat. The caloric density is computed by:

CHO	13.5 g x 4 kcal per g	= _____	kcal CHO
Protein	1.5 g x 4 kcal per g	= _____	kcal Protein
Fat	.6 g x 9 kcal per g	= _____	kcal Fat
		_____	Total kcal in tortilla