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By

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ABSTRACT

THE EFFICIENCY OF TUTORED VERSUS NONTUTORED INDIVIDUALIZED INSTRUCTION

By

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This study investigated the possible interaction between independence and dependence (as measured by a subscale of the California Psychological Inventory) and individualized instruction with and without tutorials. The dependent variables considered were learning efficiency (a combined score including rate of learning and achievement) and student attitude. The subjects were twenty-four undergraduate business majors studying a course of intermediate microeconomics spanning five weeks.

A two-way Analysis of Variance was conducted using personality characteristics as the blocking variable. The results of the study show that no interaction between treatments and personality characteristics exists. Also, the treatment main effect was not significant. However, the characteristics main effect was estimated to be significant at the .001 level.

Serious limitations of this study were its small sample size and the resulting lack of a clear discrimination between dependent and independent learners. In order to also partition out that amount of variation in the learning efficiency score due to prior achievement, it might be suggested for future research to employ analysis of covariance using pre-test scores as the covariate.

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CHAPTER I

INTRODUCTION

Need for the Study

The traditional approach to instruction in most parts of the western world--that of lecture, class discussion and laboratory exercise--assumes that students who work hard are capable of achieving the instructional goals. However, the assumption that some students will achieve better than others may lead to the neglect of the needs of those who don't do well. Educators recognize that programs that employ traditional instructional methods may often fail to meet individual needs. Thus, in extreme situations, such programs may often prevent academic success for the low achiever who learns practically nothing while the superior student learns little that he does not already know. Therefore, if learning success is the primary goal of instruction, the focal point of the instructional design used in any structured learning environment must be the learner.[1]

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[1]W. James Popham and Eva L. Baker, Planning the Instructional Sequences (Englewood Cliffs, N. J.: Prentice-Hall Inc., 1970), p. 1.

The individual learner may be characterized by numerous aptitudes, experiences, attitudes and behaviors that differentiate him from other learners. It would seem that when the design of instruction accounts for these variables that learning may become most effective. Therefore, the identification of individual characteristics becomes necessary and the matching of such characteristics with the properties of instructional approaches is required. There is a need not only for more knowledge about which individual characteristics favor one instructional procedure over another, but also for a taxonomy of existing instructional methods regarding their properties for individual learner types.

Many noted psychologists, for example, Bloom,[2] Cronbach,[3,4] Gagné,[5] Glaser,[6] and Jensen[7,8] have suggested

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[2]B. S. Bloom, "Learning for Mastery," Evaluation Comment 1 (UCLA: Center for the Study of Evaluation of Instructional Programs, May 1968).

[3]L. J. Cronbach, "The Two Disciplines of Scientific Psychology," The American Psychologist 12 (1957): 671-684.

[4]L. J. Cronbach, "How Can Instruction be Adapted to Individual Differences?" in Learning and Individual Differences, ed. R. M. Gagné (Columbus, Ohio: Merrill Books, 1967).

[5]R. M. Gagné, "Instruction and the Conditions of Learning," in Some Contemporary Viewpoints, ed. S. L. Siegel (San Francisco: Chandler Publishing Company).

[6]R. Glaser, "Some Implications of Previous Work on Learning and Individuals," in Learning and Individual

that no single instructional approach provides optimal learning for all students. Even though instructional research has long focused upon investigating the effectiveness of instructional methods, Hilgard observed that:

> It is surprising that, after all these years . . . we know so very little about effective teaching. The payoff of careful studies . . . is very slight indeed. It is surprising that studies of class size, discussion vs. lecture, and teaching aids such as motion pictures and television point to so few differences in the effectiveness of teaching. These studies, therefore, give us little guidance.
>
> . . . they fail . . . to understand the subtle differences made by kind of student, kind of teaching setting, and kind of long-range goals that are operative.[9]

Not enough is known about individual learning styles and how they interact with various methods. The

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Differences, ed. R. M. Gagné (Columbus, Ohio: Merrill Books, 1967).

[7]A. R. Jensen, "Varieties of Individual Differences in Learning," in Learning and Individual Differences, ed. R. M. Gagné (Columbus, Ohio: Merrill Books, 1967).

[8]A. R. Jensen, "Social Class, Race and Genetics: Implications for Education," Educational Research Journal 5 (1968): 1-42.

[9]E. R. Hilgard, "The Human Dimension in Teaching," Association for Higher Education College and University Bulletin (March 16, 1955): 3.

investigation of the interactions between learner characteristics and instructional methods might lead to the identification of the most relevant learner characteristics for certain instructional methods.

Such investigations require replicable experiments including objective data from a large number of learners in all varieties of structured educational environments in conjunction with a gamut of instructional methods. Replicable interaction experiments would bring about possible solutions to the problem of matching instructional method with individual learner type.

Such experiments may show which treatments serve the largest number of students best. Not only would such knowledge contribute to the development of instructional theory but also to that of the experimental theory of learning. As Snow argues:

> The use of aptitude variables to represent the psychological and biological history of the organism may be the best and in many cases the only way to gain access to . . . mental events mediating between observed stimuli and overt responses.

He concludes that:

> Ultimately what is needed is a grand Darwinian matrix of organisms by environments where both can be characterized by many dimensions and partitioned to show the particular types of treatments in which particular types of learners thrive.[10]

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[10] R. E. Snow, "Research on Media and Aptitudes," in Commentaries on Research in Instructional Media: An Examination of Conceptual Schemes. Viewpoints. Bulletin of the Indiana University School of Education, eds. G. Salomon and R. Snow, 46 (1970): 67-68.

Purpose of This Study

In order to respond to the need for more specific knowledge of the Aptitude by Treatment interaction, (ATI),[11] this study was designed to focus on the properties of mastery instruction and tutoring and on some student characteristics. It was hypothesized that a learner with a dependent personality might be affected differently by mastery learning than an independent learner. There have been similar studies. In one ATI study the researcher found that the degree of instructional guidance, direction and feedback an extroverted student receives is positively related to his learning success.[12] One might reasonably inquire as to whether such might be the case for a dependent learner; one who has been found to prefer highly structured and directed stimulus environments. Further, one might ask if tutorials with mastery instruction constitute a more preferable alternative to mastery instruction without a tutorial.

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[11]This term will appear abbreviated as ATI from here on.

[12]W. D. Furneaux, "The Psychologists and the University Quarterly" 17 (December 1962): 33-47; also George Thompson and Clarence W. Hunnicutt, "The Effect of Repeated Praise or Blame in the Work Achievement of 'Introverts' and 'Extroverts'," Journal of Educational Psychology 35 (May 1944): 257-266.

Thus, the first purpose of this study is to investigate one personality characteristic of learners which may relate to being able to benefit from mastery instruction. The second purpose of this study is to investigate whether achievement via mastery learning without tutorials is greater for individuals with "predominantly independent learning behaviors" than for those with "predominantly dependent learning behaviors." A third purpose is to examine whether tutoring as an aspect of the mastery model is of more benefit to dependent learners than to independent ones.

Ultimately, this study will contribute to instructional theory by identifying the degree of interaction of mastery learning and tutoring and a particular personality characteristic of learners and will thereby lead to more specific knowledge about these variables in the instructional process.

It is hypothesized that both instructional methods will affect the two personality types differentially and therefore an Aptitude by Treatment interaction is expected, the analysis of which lends itself to an analysis of variance based on the multiplicative model.

The research question of major interest, therefore, is the one that will produce evidence regarding the interaction between learner characteristics and instructional treatments. Provided that a significant

interaction can be found, this question will be further analyzed in a posthoc group comparison.

The hypotheses for the latter analysis are reflected in the following section and are concerned with the following questions:

A. Whether characteristics and treatments interact on student achievement;

1. whether independent learners benefit more from nontutored mastery learning than do dependent learners; and

2. whether dependent learners benefit more from tutored mastery learning than do independent learners.

Of additional interest and relevance to the research hypothesis is the question as to whether tutorials benefit both learner types more than does mastery instruction without tutorials.

An investigation of the attitude of both personality types toward the two instructional methods under consideration will follow the same analytical procedure that has been described above for their academic achievement. The major research hypothesis, the hypotheses for a posthoc group comparison and the research question concerning the treatment effect on the attitude of both personality types are dealt with in the next section analogously.

Statement of Research Questions and Hypotheses[13]

In this section general research questions are being answered as a result of this study:

A. Is there an interaction between characteristics and treatments on the efficiency score?

First, will students identified as independent learners score higher on nontutored mastery learning than students identified as more dependent personality types?

Second, will students identified as more dependent personality types score higher on tutored mastery learning than those identified as independent personality types?

Third, will students identified as dependent and independent learners score the same on tutored mastery learning as on nontutored mastery learning?

B. Is there an interaction between characteristics and treatments on the attitude score?

Fourth, will students identified as more dependent personality types like mastery learning with tutorials more than those identified as independent personality types?

Fifth, will students identified as more dependent personality types like mastery learning with tutorials

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[13]These hypotheses are restated in testable form in Chapter 3.

more than those identified as independent personality types?

And sixth, will students identified as dependent and independent learners participating in tutored instruction like mastery learning as well as students with these characteristics who do not participate in tutored instruction?

Definition of Important Terms

The following definitions for key terms used in the study provide a common basis for understanding.

1. Student--A subject in the experiment. Students are divided into two groups with respect to the treatments and into two further subgroups with respect to personality type identified as independent or more dependent achievers.

2. Criterion-Referenced Testing--The evaluation of the learner's performance that is based on the internalization of instructional materials demonstrating a one-to-one match between objectives, learning materials and evaluation criteria. Such evaluation is primarily designed to orient the student towards his progress with respect to the mastery of learning tasks.

3. Dependence--A personality characteristic of an individual that may be expected to achieve best in a structured learning environment. The individual exhibits

the following behaviors: anxiety, cautiousness, submissiveness and compliance before authority, lack of self-insight and self-understanding. Such an individual would typically consider the following statement to be true:

> Item 116: It is annoying to listen to a lecturer who cannot seem to make up his mind as to what he really believes.[14]

The estimate of the individual's dependence will be determined by scores on the subscale of the California Psychological Inventory called "Achievement Via Independence." Specifically, that half of the group falling below the median score will be designated as dependent learners.

4. Independence--A personality characteristic of an individual that may be expected to achieve best in an unstructured learning environment. The individual exhibits the following behaviors: forcefulness, strength, dominance, foresightedness and self-reliance. Such an individual would typically consider the following statement to be true:

> Item 50: I seem to be about as capable and smart as most others around me.[15]

The estimate of the individual's independence will be determined by scores on the subscale of the California

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[14]Harrison G. Gough, Manual for the California Psychological Inventory (Palo Alto: Consulting Psychologists Press, 1964), p. 11.

[15]Ibid.

Psychological Inventory called "Achievement Via Independence." Specifically, that half of the group falling above the median score will be designated as independent learners.

5. Individualized Instruction--The instruction that adapts to individual needs within a group (e.g., self-pacing is a feature of individualized instruction that allows each learner to move along at his own pace).

6. Mastery Learning--An instructional mode that provides for mastery by objectives, formative evaluation, alternative test forms, self-pacing, tutorials and pre-set mastery levels.

7. Mastery Task--A learning objective to be internalized with respect to the relevant criterion-referenced material and to be mastered via its criterion measure.

8. Tutoring--Instructional guidance of the individual learner that is provided as help and clarification of subject matter content which may not adequately be dealt with in the self-instructional materials so as to suit each and every individual well.

Plan for the Study

The next chapter consists of a review of the relevant ATI literature.

In Chapter 3 the design of the study including the materials and procedures are discussed. Also, a brief description of the design, purpose and conduct of the pilot study are given.

The treatment and analysis of the data and the results of this study are reported in Chapter 4.

A discussion of the results and their interpretation in the framework of the empirical underpinnings of ATI research follow in Chapter 5 which concludes with recommendations for future research in this area.

CHAPTER II

REVIEW OF THE LITERATURE

During the past decade the concern for insight into the differential effects that instructional treatments have on learner characteristics has grown considerably. The goal of such research is that of finding disordinal interactions between personality variables and those alternative instructional programs which indicate the treatment most effective for a student with a specified aptitude.

Since Cronbach[1] encouraged interactional studies, some fairly comprehensive surveys of such studies within the main stream of instructional research have been conducted.[2,3,4,5] Added information on this type of research and recommendations for strengthening its

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[1]L. J. Cronbach, "The Two Disciplines of Scientific Psychology," American Psychologist 12 (1957): 671-684.

[2]Glenn H. Bracht, "Experimental Factors Related to Aptitude-Treatment Interactions," Review of Educational Research 40 (December 1970): 627-745.

[3]Richard E. Snow, Research on Media and Aptitudes," Bulletin of the Indiana University School of Education 46 (1970): 63-91.

[4]David C. Berliner and Leonard S. Cahen, "Trait-Treatment Interaction and Learning,"

inferential power through carefully planned and executed experiments has contributed to its development. Among the many studies conducted in ATI research, very few have produced evidence of significant interaction effects. However, the review of such studies reveals in many cases flaws in their internal and/or external validity.

In the following paragraphs a review of prior studies will be given with respect to personality variables, achievement, and individualized instruction. Each of these three variables is of major concern for ATI theory. They provide the basis for the research that has been carried out in this area and will thus be examined in the ATI studies reviewed in this chapter. Some of these studies employed the ATI hypothesis marginally, but most used it directly and reported significant interactions. The studies reviewed in each of the three sections are organized so that the most recent ones are followed by the less recent ones. First, those studies will be presented which highlight personality variables as they relate to instructional treatments in current ATI research. Second are those studies focusing on achievement under ATI conditions. Third are studies that

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Review of Research in Education 1 (1973): 58-94.

[5]H. A. Witkin, et al., "Field-Dependent and Field-Independent Cognitive Styles and Their Educational Implications," Review of Educational Research 47 (1977): 1-64.

employed individualized instruction as the treatment variable and various personality characteristics as the aptitude variable present the most relevant research upon which the present study was based.

Basic Studies in ATI Research

Personality Variables

Among the many personality variables that might relate to instructional treatments in some way, only those that produced significant interaction effects are reported here in order to limit their review to workable size. They attempt to answer the general question: In what way do the findings concerning these personality variables support or weaken the employment of yet another personality variable such as the one used in this study?

The study by Stasz, Shavelson, et al., explored the correspondence between content structure of instructional treatment and the personality variable of field-dependence or independence. This variable relates to individual consistencies in modes of perception. For example, field-independent individuals tend to experience their environment in a differentiated fashion, whereas field-dependent subjects see their environment more globally. It was hypothesized that FI individuals may show greater correspondence between content structure and their own psychological structure in that they seem to

impose, through their mediational processing, more organization on content in learning. High school students aged fourteen to sixteen years interacted with social studies teachers in a minicourse on "The Development of Mayan Civilization." The content of this course had been analyzed in terms of its conceptual structure (which was used in this study as criterion-measure for individual content assimilation). That is, the individual's identification of conceptual structure served in the analysis as the dependent variable. The researchers found that

> The FI subjects have fewer concepts per cluster in posttest configurations, indicating a refinement of perceived relationships as a result of instruction. Furthermore, FI subjects' configurations are nearly identical to the a priori model. For FD subjects, however, greater overlap among concepts indicates a less differentiated view of the concepts.[6]

Parent, Forward, Canter, and Mohling[7] examined the interactive effects of class discipline condition and students' subjective level of locus of control. This

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[6]C. Stasz, R. J. Shavelson, et al., "Field Independence and the Structuring of Knowledge in a Social Studies Minicourse," Journal of Educational Psychology 68 (1976): 555.

[7]Joseph Parent, John Forward, Rachelle Canter, and Judith Mohling, "Interactive Effects on Teaching Strategy and Personal Locus of Control on Student Performance and Satisfaction," Journal of Educational Psychology 67 (1975): 764-769.

variable is defined by Rotter[8] as classifying more internally-oriented individuals as those who are more strongly relying on their own resourcefulness, and more externally oriented ones as those who believe that their lives are determined by fate or "powerful others."

The researchers hypothesized that subjects with low internalized discipline would perform better under high external discipline conditions, and Ss with high internalized discipline would do better under low external discipline conditions. A two hour-long minicourse in computer programming was taught to college students under both conditions. The high discipline condition was characterized by a number of rules that Ss were advised to follow while they worked on the individualized learning materials so that instructional tasks were carried out as a group. The low discipline condition permitted Ss to work through the material at their own pace without supervision. The experimenters found that the aptitude by treatment interaction was significant at the .05 level and concluded that

> Performance is shown to be . . . a function of the fit between the maturational learning skills represented by the personal control I-E subscale

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[8]Oscar Krisen Buros, ed., Personality (Highland Park, N. J.: Gryphon Press, 1970) [472].

> and the external conditions of teaching method or class discipline.[9]

These findings, of course, strengthen the prospect of ATI research. Yet, the outcomes of this study need to be understood as tentative in that the treatment lasted no more than two hours.

The personality variable "locus of control" has also been investigated by Lintner and Ducette. This variable and the variable of responsiveness to praise were explored in relation to academic failure. Internal locus of control was expected to contribute to better academic achievement. Third, fifth, and seventh grade students were considered failures on the basis of number of F's received on their last two years' grade records. Successful students were those with no F's on their records. Students completed a coding task which was sensitive to individual effort and not academically demanding. They also participated in a reading assignment including the cloze-technique with ascending degrees of cognitive difficulty. The researchers found the interaction effect of locus of control by praise significant at the .01 level and disordinal for the coding task. But this interaction effect was not significant for the reading task. The authors concluded that praise may have a positive effect

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[9]Parent, Forward, Canter, and Mohling, op. cit., p. 769.

on underachievers as well as achievers that are internal students if the task is academically not too demanding. But lack of praise more positively affects students' performance on such tasks if they are more externally controlled. The authors observed regarding the nature of instructional tasks that are of ascending cognitive difficulty that

> It seems evident that when a task by itself makes such strong demands on an individual that there is little variance in how he perceives the task of how he can respond to it, personality variables will not be predictive.[10]

In making this statement, the authors suggest that task perception may be linked to the impact personality variables have on achievement.

In the instruction of Navy males who were identified as demonstrating either high or low scientific interest, Tallmadge and Shearer found that the inductive method proved significantly more effective on an overall basis than did the deductive method. They used the inductive method for a course in Transportation Technique. It proved to be best suited for students with low scientific interest whereas the deductive method used in Aircraft Recognition subject-matter evidenced greater effects on the high scientific-interest students.

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[10]Alfred C. Lintner and Joseph Ducette, "The Effects of Locus of Control Academic Failure and Task Dimensions on a Student's Responsiveness to Praise," American Educational Research Journal 2 (Summer 1974): 237.

The deductive and inductive methods were planned to vary with respect to instructional rules: the deductive method was geared toward problem-solving without specifying any concepts and principles whereas the inductive method employed meaningful rules in a guided discovery type of approach. Yet the authors summarize their findings:

> This difference between meaningful rules and arbitrary rules is only one of many differences which existed between Transportation Technique and Aircraft Recognition subject-matter areas. Any of these differences could have been responsible for the reversal of the relationships between learner characteristics and instructional methods.[11]

The number of uncontrolled variables entering this experimental condition may, of couse, be quite large. The researchers admit in a report[12] on a replication of this study that different instructors were conducting the two courses. They controlled for this source of confounding in the later study by having the same instructor teach both courses. Among the twenty-eight personality measures which they took of the subjects in this experiment, they found anxiety most strongly interacting with both methods.

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[11]G. K. Tallmadge and J. W. Shearer, "Relationships Among Learning Styles Instructional Methods and the Nature of Learning Experiences," Journal of Educational Psychology 60 (1969): 228.

[12]G. K. Tallmadge, "Interactive Relationships Among Learner Characteristics, Types of Learning, Instructional Methods, and Subject Matter Variables," Journal of Educational Psychology 62 (1971): 31-38.

A disordinal interactive relationship between subjects' anxiety and instructional method was present such that high anxiety subjects performed better with the inductive method and low anxiety subjects performed better with the deductive method. This interaction, conducted with an unweighted means analysis of variance was significant at the .01 level.

Kight and Sassenrath investigated the relation of achievement motivation and test anxiety to the performance in programmed instruction of undergraduate students in educational psychology. The experimenters expected that high achievement-motivated Ss will perform better than low achievement-motivated ones and that high test anxiety affects performance on programmed instruction favorably. The analysis of variance confirmed this prediction and yielded a significant interaction effect between achievement motivation and text anxiety on the dependent measure of minutes taken to complete the tasks. The same analysis done later with short-term retention scores did not indicate a significant effect for this hypothesis. The authors concede with respect to the significant interaction that it "adds further scepticism and doubt regarding the overall effects of any motive."[13]

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[13]Howard A. Kight and Julius M. Sassenrath, "Relation of Achievement Motivation and Test Anxiety to Performance in Programmed Instruction," Journal of Educational Psychology 57 (1966): 17.

By "motive," the authors mean achievement motivation as well an anxiety motive. They hint at the need for regression analysis of these variables.

In Campeau's study the hypothesis of major importance was that when high and low test anxiety students complete programmed instruction under feedback and no feedback condition, their achievement is affected differentially. The researcher conducted this experiment with fifth graders for one and a half days taking a measure of delayed retention nineteen days after the post-test. For girls only the analysis of covariance for adjusted gain scores yielded an Anxiety by Feedback interaction effect significant at the .025 level. This was confirmed with the delayed retention measure analysis at the same significance level. She concluded that high anxiety females did better under the feedback condition and low anxiety females did better under the no feedback condition. She suggested "that programming procedures be adapted to individual differences in test-anxiety level and sex."[14] She allows, though, that since the feedback treatment was similar to taking a series of practice quizzes in preparing for the criterion test, this might have produced the feeling of being prepared for the criterion test and thus

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[14]Peggie L. Campeau, "Test Anxiety and Feedback in Programmed Instruction," Journal of Educational Psychology 59 (March 1968): 162.

"could then have functioned to reduce disruptive effects of anxiety during the retention tests"[15] for girls. This raises the question: What difference in the procedure for high anxiety boys might be responsible for their not perceiving these practice quizzes as anxiety reducing?

Atkinson and Reitman examined college students performance in arithmetic as a function of motive strength and expectancy of goal-attainment. Regarding motive strength, they hypothesized that motivation employed in student performance may be categorized as either achievement motivation or affiliation motivation and may account for achievement success under different treatment conditions. A group of psychology students was exposed to a performance condition wherein the experimenter constantly made his approval or disapproval and his control of student performance known to them. Another group of students was assigned to small test rooms without supervision and was instructed to carry out the same hour-long task in arithmetic with the information that "your work will be taken as the full measure of your ability."[16] The researchers found that the achievement-orientation condition produced significantly higher achievement in the

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[15]Ibid., p. 162.

[16]J. W. Atkinson and W. R. Reitman, "Performance as a Function of Motive Strength and Expectancy of Goal-Attainment," Journal of Abnormal and Social Psychology 53 (1956): 362.

high achievement motivated student (.01) than in the low achievement-motivated one. The affiliation condition did not produce the expected better achievement in affiliation-motivated students over achievement motivated students. The researchers allow that ". . . the relationship between achievement motive and arithmetic performance was eliminated by systematically engaging other motives in the same performance."[17] They explained that there was a fault in the method for the affiliation-oriented condition. "When E called out 'skip' at the end of each minute, Ss had to stop working on partially solved problems and move immediately to the next one."[18] This not only posed data analysis problems for constructing the achievement score, but also confounded the affiliation orientation by emphasizing the achievement orientation as well.

Although the studies mentioned above produced significant interaction effects, they are among the very few ATI studies with this result. The overwhelming majority of ATI studies do not support the ATI hypothesis.

One might infer from these studies that personality variables such as field-independence, locus of control, anxiety, affiliation, and achievement motivation

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[17]Ibid., p. 363.

[18]Ibid., p. 364.

significantly influence the performance on specific instructional tasks under specified conditions. These studies appear to support the hypotheses that field-independent individuals conceptualize better; that individuals with internal control do better with low external discipline conditions and under additional praise; that high anxiety individuals prefer the inductive method and are more successful on programmed instruction, especially, if they receive additional feedback; and that individuals with a high degree of achievement motivation seem to depreciate approval and/or disapproval. It may be likely that individuals who demonstrate independent learning behaviors prefer individualized learning conditions if, in fact, this personality variable reveals affinity with any of the variables mentioned above.

Achievement Under ATI Conditions

An investigation of the relationship between personality variables and treatment conditions must necessarily be geared towards the improvement of learning outcomes. Therefore, a focal question for this study is whether achievement can be significantly improved for a certain personality type in using a specific treatment condition. The following studies have been reviewed with respect to this question.

An interesting finding is presented by Fitzgerald et al.[19] These investigators analyzed the relationship of student preference for and need for support by instructional media. Also curiosity, playfulness, and aggressiveness were the variables under investigation as they relate to final grades of dental students participating in a ten-week course in Oral Histology. Subjects were invited during regular class meetings to make use of curriculum-supporting slide/tape materials and CAI programs whenever they wanted to study for the course. Of these students, 30 percent chose to use both the CAI program and the slide/tape materials; 50 percent used either of the media; and 20 percent used neither. The researchers found aggressiveness to be positively related to final grades of students who did not use the media and negatively related to those of students who used both media. Also, curiosity and playfulness were positively related to preference for individualized instruction.

Kress and Gropper investigated the effects of two different televised programmed instruction treatments (one involved added "response prompting" for the reduction of errors occurring because of one tempo only, and the

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[19]William F. Fitzgerald, et al., "Personality Correlates of Student-Selected Individualized Instruction," unpublished paper, ERIC ED 110 053.

other differed in tempo) in typical "linear" style on eighth grade students matched for IQ and characteristic work rate. The experiment lasted one day. The analysis of the outcomes of the program administered to Ss at four different fixed-paced conditions split on fast and slow work rate showed an interactive trend to be present. When the dependent measures were compared under the two fastest and two slowest tempo conditions a cross-over effect characteristic of a disordinal interaction effect was found. Slower learners were more successful under the slower tempos, faster learners did better under the faster tempos. Though "it was not possible to assess the statistical significance of these interactions because of the stratification [one replication per cell] built into the randomized block design,"[20] the authors point to the need to conduct ATI research using appropriate designs and analyses.

Lublin studied the effects of reinforcement types in programmed instruction on student achievement in introductory psychology. The students were measured on autonomy and achievement. They participated in one of four

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[20]G. C. Kress Jr. and G. L. Gropper, "A Comparison of Two Strategies for Individualizing Fixed-Paced Program Instruction," American Educational Research Journal 3 (1966): 276.

programmed instruction treatments: without reinforcement; with continuous reinforcement; with 50 percent reinforcement in a random fashion; or with 50 percent reinforcement every other frame. An analysis of covariance was conducted with the criterion test measure as dependent variable and the high, medium, and low degree of autonomy need as covariate, as measured with the Edwards Personal Preference Schedule. The experimental data indicated statistically significant differences between the criterion-test scores for the four reinforcement groups. The differences in mean achievement for the three levels of autonomy were also significant: contrary to the researcher's expectation, the low autonomy group scored higher. And though an interaction effect was present, it did not reach the required significance level. Lublin admits to the confounding which may have been created by time spent on tasks. On the average, the no-reinforcement group spent more time on tasks than did any of the other groups, but reached significantly higher criterion scores. The author states that ". . . many factors may have been operating during the extra time spent on the sets . . . for example . . ., the number of times the subjects read each frame."[21] These influences point to differences in

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[21]Shirley Curran Lublin, "Reinforcement Schedules Scholastic Aptitudes Autonomy Need and Achievement in a Programmed Course," Journal of Educational Psychology 16 (December 1965): 299.

the outcomes due to problems with the experimental design and seriously threaten the internal validity of the experiment.

High achievement motivation has long been regarded as one necessary condition for the successful achievement in programmed instruction. Doty and Doty hypothesized that "subjects who lack achievement motivation but who are motivated by needs for social recognition and approval might perform less well in the programmed learning situation."[22] They explored whether degree of social need, as determined from scores on the Guilford-Zimmerman Sociability scale, would be significantly correlated with achievement on programmed instruction tasks. They found achievement negatively correlated with social need for both male and female college students at the .01 level ($r = -.43$). Yet, the students' achievement motivation, as measured by the Edward's Personal Preference Schedule was also negatively correlated ($r = -.05$) but not significant. The researchers explained that ". . . the programmed learning situation does not tap achievement need as other learning situations apparently do."[23] This finding,

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[22]B. A. Doty and L. A. Doty, "Programmed Instructional Effectiveness in Relation to Certain Student Characteristics," Journal of Educational Psychology 55 (1964): 334.

[23]Ibid., p. 337.

though, does not find support in other studies that report on this relationship. Hence, the finding might be due either to methodological failures in the administration of the scale or to the low degree of reliability and/or validity of the instrument. The manual does not present any evidence.

Marshall taught interesting and uninteresting games to children who had been classified according to the degree to which educational influences were present in their social class. She found that the Educational Environment based on social class by Interesting Task interaction effect was significant at the .05 level. That is, subjects with a low degree of educational environment learned the high-interest game as quickly as did subjects with a high degree of educational environment; subjects with a low degree of educational environment also learned the low-interest game more quickly than did subjects with a high degree of educational environment. But she allows that

> The poor performance of the high EE children on the high interest task may have been because the game-like quality of the task was more apparent to these game-indulged children or the mechanisms aroused their curiosity thereby distracting them from the task.[24]

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[24]H. H. Marshall, "Learning as a Function of Task Interest, Reinforcement, and Social Class Variables." Journal of Educational Psychology 60 (1969): 135.

This indicates that the experimental condition may have been confounded with prior game experience.

Amidon and Flanders[25] hypothesized that dependent-prone subjects' concern with the teacher interaction can either inhibit or enhance learning progress. They exposed two groups of eighth graders who were classified as dependent-prone to direct teacher influence in geometry instruction. The other two groups experienced indirect teacher influence. In an analysis of the comparison of the post achievement scores between the groups exposed to direct and to indirect influence, the means of the groups achieving under indirect influence were significantly higher than those of the groups achieving under the direct influence (.01). The major difference between both treatments was that the direct influence was exerted with more lecturing, questioning and criticizing. The indirect influence embodied more praise, encouragement, and clarification of subject matter for the subjects.

Again, the preceding ATI studies are among the very few in this line of research that support the ATI hypothesis. One might conclude from the studies discussed in this section that lack of aggressiveness, low

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[25]E. Amidon and N. A. Flanders, "The Effect of Direct and Indirect Teacher Influence on Dependent-prone Students Learning Geometry," Journal of Educational Psychology 52 (1961): 286-291.

educational background, slow learning, low autonomy and dependent-proneness in individuals signify less favorable dispositions toward achievement. Dependent learning behavior as investigated in this study may be expected to hamper achievement similarly. If one can infer from the studies that have been reviewed in this section that it is possible to compensate for a lack of aggressiveness in students (as regards achievement) by presenting a variety of individualized instruction modes; that students with low educational background improve if presented with high interest tasks; that slow learners of televised programmed instruction improve significantly if taught in a slow tempo; that low autonomy individuals do well if they use programmed instruction; and that dependent-prone students are better achievers if teacher influence is of an indirect nature; would it be likely that a dependent learner's achievement can significantly improve if he is given supplementary tutorials?

Individualized Instruction Under ATI Conditions

The studies which are reviewed in this section concern themselves with individualized instruction as one treatment condition. They focus on the question as to whether individualized instruction interacts significantly with certain personality characteristics and whether those

characteristics are comparable to the personality variable used in this study.

Crist-Whitzel and Hawley-Winne conducted a study administering individually prescribed instruction, objectives-referenced instruction and traditional instruction in mathematics to sixth graders who had been tested with respect to their self-concept, locus of control, and field-dependence. To test for Aptitide by Treatment interactions, bivariate and multi-variate regression analyses were carried out. The experimenters found that highly field-independent students tended to perform better in IPI especially if they were low achieving students. But this was not true for any of the other two instructional conditions. With respect to field-dependence the authors found that this variable was a significant predictor in all equations. Yet, they point out a threat to the internal validity of their experiment in that there could be various other reasons for their results: "The different curricula utilized may give different amounts of emphasis to the various arithmetic skills tested. Standardized tests . . . may not adequately test the skills taught in IPI."[26] Different curricula used for each one

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[26]Janet L. Crist-Whitzel and Barbara J. Hawley-Winne, "Individual Differences and Mathematics Achievement: An Investigation of Aptitude-Treatment Interactions in an Evaluation of Three Instructional Approaches," (U. S. Educational Resources Information Center, ERIC Document ED 129 868, San Francisco, California, April 19-23, 1976), p. 34.

of the treatments and incongruence between objectives taught and those tested may have confounded the data.

In order to investigate characteristics of successful and less successful students with respect to individualized instruction, Littlefield and Gatta conducted a study comparing "high," "expected," and "low" achievers in a high school biology program in relation to their degree of obedience/assertiveness and their attitude toward science. They found that the "high" achievers had lowest mean scores on the obedient vs. assertive scale. That is, "high" achievers seemed to score as more obedient. The relationship between this personality characteristic and type of achievement on individualized instruction was found to be significant at the .01 level using Wilk's lambda and Rao's V. The authors state that "This can be interpreted to characterize the 'high' achievers as being more accommodating and submissive while the 'expected,' and 'low' achievers are more competitive."[27] They conclude that obedience and positive attitude are the factors which determine success in individualized instruction and not knowledge. This conclusion is puzzling, and in that no performance criteria were reported, it raises the

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[27]David L. Littlefield and Louis A. Gatta, An Evaluation of Student Characteristics as Related to Cognitive Achievement in an Individualized High School Biology Program (U. S. Educational Resources Information Center, ERIC Document ED 106 111, Los Angeles, California, March 1975), p. 16.

question as to whether the scores were constructed mostly on the basis of successful interactions with the instructors or on the basis of time spent on tasks with respect to achievement.

An experiment conducted with graduate students in educational psychology was reported by Reynolds and Gentile.[28] They hypothesized that subjects with an internal locus of control would prefer an assessment system based on mastery learning because the subjects would have a greater degree of feeling in control with respect to "doing well." Subjects with an external locus of control, though, would do better under traditional assessment conditions. Contrary to their expectations, the researchers found the Aptitude by Treatment interaction opposite in direction (.06) and suggest that the I-E Scale constructed by Rotter[29] may be less suitable for the assessment of learning style than of ideological style (such as being conservative or liberal). Therefore, the internal subjects would be interpretable as more conservative and would prefer traditional instruction, the experimenters concluded.

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[28]Carl H. Reynolds and J. Ronald Gentile, "Performance Under Traditional and Mastery Assessment Procedures in Relation to Students' Locus of Control: A Possible Aptitude by Treatment Interaction," unpublished paper, ERIC ED 103 357.

[29]Rotter, loc. cit.

Papay, Costello, et al.,[30] compared the effects of trait anxiety (i.e., prevailing level of anxiety in the individual in comparison to state anxiety which is a more temporary experience of anxiety) on first and second graders' performance when interacting with a multiage individualized program and a traditional instructional program in mathematics. For second graders a significant interaction (.01) on abstract tasks was present. Because a significant interaction could not be established for first graders on either abstract or concrete tasks they found ". . . the prediction that the IMP program would be more beneficial for A-trait children, for whom . . . increased performance was expected, was only partially supported."[31] That is, on the abstract task, low A-trait second graders performed better under the traditional condition than high A-trait ones; whereas high A-trait second-graders did better in the multiage individualized program than did low A-trait ones. This result, though supporting the findings of other studies of this hypothesis, raises the question as to why no comparable interaction was found among first graders. The authors'

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[30]James P. Papay et al., "Effects of Trait and State Anxiety on the Performance of Elementary School Children in Traditional and Individualized Multiage Classrooms," Journal of Educational Psychology 67 (December 1975): 840-846.

[31]Ibid., p. 845.

explanation that for second graders the anxiety-reducing effects of the individualized program may have been greater because of their longer exposure to it, is not convincing since the first graders also had been exposed to the program for 6 to 8 months prior to testing. It may be suspected that the criterion tests (since no difference in format and content for either grade was reported) were more adequate for the cognitive operations that second graders employ, or, if separate test forms were administered, they may not have been parallel tests.

Brucker[32] administered an individualized course in the use of audio-visual equipment to undergraduate education students. The anxiety level of the subjects was assumed to interact with environment and individualized instruction. The environment was varied in that one group worked in an open environment (i.e., a regular classroom in which each corner was set up so that a student could use the audio-equipment without earphones) and the other group worked in a closed environment (i.e., students worked in learning carrells, used earphones with the equipment and had no visual contact with others). Brucker found the achievement of both treatment groups

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[32]James Brucker, "The Effects of An Enclosed Individual Learning Environment Interacting with Two Personality Traits on the Achievement and Opinion of College Students Learning through the Use of Programmed Instruction" (Ph.D. dissertation, Indiana University, 1969).

significantly interacting with Ss' anxiety level (.05) and observed with a later measure of delayed retention similar results. High anxiety subjects did better in the open environment and low anxiety subjects were more successful in the closed environment. Yet, the experimenter fails to report whether the delayed retention test was administered days, weeks, or months after the post-test. With respect to the treatment modes he concedes

> . . . In fairness to programs around the country which include forms of individualized instruction, it might be said that differences in achievement would probably decrease somewhat after the students become more acclimated to the environment.[33]

He suggests that spatial environment may be of lesser importance for achievement in the long run.

The ATI studies discussed in this section contrast with the majority of ATI studies that did not produce significant interaction effects.

It may be inferred from the studies reviewed above that individually prescribed instruction as well as individualized instruction is well received by field-independent, more accommodating, less assertive, and high anxiety individuals. This method of instruction interacts significantly with either one of those personality characteristics mentioned above. If one can assume that independent learning behavior as a personality

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[33]Ibid., p. 92.

variable is related to any one of the characteristics dealt with in the reviewed studies, it is likely that independent learning behavior also interacts with individualized instruction.

Some of these studies have been concerned with Field-Dependence or Locus of Control and many of them with Anxiety as operative in various types of instructional settings. Others have been concerned with the relationship of these characteristics under the condition of Individualized Instruction. The underlying construct of the personality variable used in this study may be related to the constructs of locus of control, field-dependence, and anxiety or aggressiveness. But, whether this is so and to what extent is not known at the present time. The objectives of this study are:

1. To integrate the research insights gained by ATI researchers and to overcome shortcomings of previous research in this area.

2. To observe whether the Dependent or Independent learners do better in individualized instruction with or without additional tutoring.

3. To identify according to the level of Dependence and Independence, the person who achieves better in individualized instruction with or without additional tutoring.

4. To determine whether the Dependent learner/ Independent learner has a better attitude toward individualized instruction with or without additional tutoring.

Summary

The objective of this chapter was to review ATI studies which have a bearing on this study. The studies reviewed are among the few that produced significant differences out of a majority of ATI studies that did not. The results of the studies that were reviewed are summarized in this section.

Fitzgerald[34] has shown that in a university setting aggressiveness may interact with achievement; and Kight and Sassenrath[35] evidenced that test anxiety and achievement motivation affect the performance on programmed instruction. This knowledge base needs to be extended by investigating the manner in which Independence/ Dependence Via Achievement (as a variable that represents more closely observable learning behaviors) affects the students' interaction with instructional programs. Also, more insight is needed into the potential of particular instructional modes that interact with aptitude, namely,

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[34]Fitzgerald, loc. cit.

[35]Kight and Sassenrath, loc. cit.

individualized instruction based on the mastery model and tutoring.

It is known that subjects who are identified as internally controlled and field-independent are more successful in carrying out abstract tasks and that they do well under less structured conditions. Subjects who do not seem to demonstrate a strong social need and are more anxious generally, performed better in programmed instruction. It is also known that individuals low in trait anxiety, more obedient, less aggressive and high in internal control achieved highest in individualized learning environments. Will this study also find that Dependence/Independence Via Achievement as the aptitude variable proves to be as well a personality predictor of academic success in the interaction between individualized instruction and tutoring?

The reader might reasonably conclude from the research investigated in this chapter that it may be desirable for an educational environment to provide alternative instructional conditions which cater to alternative learning behaviors. For example, it may be that the person who seeks out personal guidance, interaction, and more structure in order to progress on his learning tasks may prefer tutorials over self-paced independent learning. Such a person might achieve better

in an individualized program supported by tutorials as compared to programmed instruction.

It has been found that highly anxious individuals have a less favorable attitude toward individualized instruction if it presents no more structure than the one provided by the instructional material itself. Will this also be true for the dependent learner? From Fitzgerald et al.,[36] there is an indication that curiosity and playfulness are characteristics of subjects who prefer individualized instruction. Such characteristics can be assumed to be considerably more dominant in the independent learner than in the dependent learner. Therefore, it seems likely that the independent learner may benefit from individualized instruction more than the dependent learner who does not seem to compensate for the absence of individual guidance with curiosity and playfulness regarding the individualized materials.

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[36]Fitzgerald, et al., loc. cit.

CHAPTER III

DESIGN OF THE STUDY

Introduction

The purpose of this chapter is to describe the research design and procedures of the investigation. Included are: a description of the population and sample, the design, the measuring instruments, the instructional materials and procedures, the data collection, testable hypotheses, and the model used for the analysis of the data.

Population and Sample

The subjects in this study were those students enrolled in intermediate microeconomics, E321. This course was offered as an elective at Indiana University-Purdue University at Fort Wayne during the Fall Semester, 1977. Of the twenty-four students enrolled in the course, eighteen were male and six were female. Further, the sample consisted of 4 freshmen, 4 sophmores, 9 juniors, and 7 seniors majoring in ten different fields of study. The subjects' grade point averages were:

one sixth 2.0 - 2.39

one eighth 2.4 - 2.79

one third 2.8 - 3.19

one fourth 3.2 - 3.59

one eighth 3.6 or higher

Nine students were under twenty years of age and fifteen students were between twenty and thirty. Seventeen students were single and seven were married.

As to prior instruction in economics, only eight students had had a full semester high school course in this subject matter area. But all students had taken college level courses in economics. Nineteen students has taken a course in calculus although it was not a prerequisite to Intermediate Microeconomics.

Students rated their interest prior to the course in Intermediate Microeconomics as a course relative to other introductory social science courses such as political science or sociology:

20.8 percent very high

62.5 percent high

12.5 percent average

4.2 percent low

Most of the students were from urban and suburban and rural areas around Fort Wayne. However, there were three foreign students--one each from India, Liberia, and Nigeria.

All subjects participating in this experiment were administered a subscale of the California Psychological Inventory[1] called Achievement Via Independence (AVI). The demarkation on the AVI scale which segregated the subjects into dependent and independent learners was the median score of 19.5. Because of the small size of this sample it was impossible to select subjects for this experiment on the basis of their clearly scoring at the high and low ends of this scale. Therefore, that half of the population falling below the median score was designated as dependent achievers and that half of the population falling above the median score was designated as independent achievers. The range of scores on the AVI scale fell between 8 and 19 for dependent achievers and between 20 and 27 for independent achievers, the national average being 19. The dependent and independent achievers were then assigned randomly to the two treatment conditions, "mastery learning" and "supplementary tutoring."

This sampling procedure was consistent with the Analysis of Variance used in the statistical analysis employed for this study.

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[1]Harrison G. Gough, California Psychological Inventory (Palo Alto: Consulting Psychologists Press, Inc., 1957).

Design

Because the purpose of this study is to determine whether the experimental condition "tutoring" produces a higher level of individual learning efficiency than does the condition of "individual learning for mastery only;" and whether the effect varies with the learning characteristics dependent or independent achievers; an Aptitude x Treatment interaction was hypothesized. A two-way Analysis of Variance with Random assignment for a balanced design was employed. This analysis was conducted with an equal number of observations. That is, there were six subjects in each cell.

Personality Type	Treatment	
	Nontutored	Tutored
Independent	N = 6	N = 6
Dependent	N = 6	N = 6

Figure 1.--Design of the Study

As can be seen in the diagram above, the independent variables were (1) Independent-Dependent Personality Characteristic and (2) the Method of Treatment--Tutored and Nontutored Individualized Learning for Mastery. Four cells resulted. Within each treatment block there were six units. Each treatment unit was

considered an independent unit. The degrees of freedom were 20, with N = 24.

To investigate the effect of the independent variables upon the dependent variables, namely, learning efficiency and attitude toward treatment under the aforementioned treatment conditions, this 2 x 2 interactive design was appropriate.

In order to permit each subject an equal chance for either method of Treatment, the Random Procedure used provided for other variables such as sex, race, intelligence quotient, grade point average, etc.

The dependent variables in this experiment were the learning efficiency of the subjects as well as each subject's attitude toward either treatment upon completion of the experiment.

Measuring Instruments

The instruments used in this study were (1) the AVI subscale of the California Psychological Inventory (AVI), (2) the Criterion-Referenced Post-Test for Individualized Microeconomics (CRP), and (3) the Survey Questionnaire for investigating subjects' Attitude Toward the Lab instruction in microeconomics (ATL) and demographic variables of the sample.

California Psychological Inventory

The California Psychological Inventory consists of eighteen separate, self-report rating scales for measuring personality characteristics. The 31-item AVI subscale measures the level of independence an individual demonstrates in a learning situation. That is, the personality's level of maturity, forcefulness, self-reliance in intellectual ability and judgment is indicated by a score at the high end of the scale. The individual's level of inhibition, anxiety and compliance before authority as well as of lacking in self-understanding is indicated by a score at the low end of the scale. Students are instructed to decide whether they find the statements made about themselves true or false. Most items begin with "I" introducing preferences, beliefs, opinions, etc.; for example:

Item 50: I seem to be about as capable and smart as most others around me.

Item 116: It is annoying to listen to a lecturer who cannot seem to make up his mind as to what he really believes.

The student who considers item 50 to be true and item 116 to be false would typically score as an independent achiever. The student who rates item 50 as false and item 116 as true would score on these items as a dependent achiever. In many of the items, the key terms are

indicative of the presence of anxiety or courage; or of a need for authority or self-reliance; or of guilt feelings or self-assertiveness.

The test-retest reliability of the AVI subscale has been estimated for a sample of 101 high school males as .63, for a sample of 125 high school females as .57 and for a sample of 200 male prisoners as .71. These estimates seem to reflect quite a discrepancy between the three samples. Furthermore,in that the sample in this study represents males as well as females and is limited to undergraduates who major in business, this population may not be directly comparable to any of the sample populations of which test-retest reliability coefficients were estimated. Validity of the scales for this measure has been estimated at .44 in being positively correlated with first semester grades of 220 Kansas State University agriculture freshmen tested at admission. That is, those students who are more independent are getting better grades. Yet, this correlation coefficient presents a rather low validity estimate, although it is typical for personality measures. The population in this study also consists of sophomores, juniors and seniors. Therefore, the estimated validity coefficient may not directly apply to the sample in this study.

Criterion-Referenced Post-Test for Individualized Microeconomics

A task analysis as described in Learning Systems Design by Davis, Alexander and Yelon[2] was conducted on the objectives presented in Weidenaar's[3] microeconomics module to extract concepts and principles and problems. Some of the objectives stated in Weidenaar's material were expressed in a general form such as, for example, the following objective:

> State the definition of elastic demand unitary elastic demand and inelastic demand.

Every such objective was analyzed according to a procedure recommended by Popham[4] in terms of the topic or topics which it covered. This was done so that the objective could be readily translated into one or more test items. The aforementioned objective was thus broken down into the following three test items:

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[2]Robert H. Davis, Lawrence T. Alexander and Stephen L. Yelon, Learning System Design (New York: McGraw-Hill Book Company, 1974), pp. 182-194.

[3]Dennis J. Weidenaar and Emanual Weiler, Student Tutor: Economics: An Introduction to the World Around You (Reading, Mass.: Addison-Wesley Publishing Company, Inc., 1976), pp. 4-5.

[4]W. James Popham, "Selecting Objectives and Generating Test Items," in Problems in Criterion-Referenced Measurement, eds. Chester W. Harris, Marvin C. Aikin, and James W. Popham (Los Angeles: Center for the Study of Evaluation, University of California, 1974).

a. define elastic demand

b. define unitary elastic demand

c. define inelastic demand

The identification of the specific cognitive level that each subobjective requires was carried out according to Bloom's Taxonomy of Educational Objectives[5] in order to determine the cognitive operation required of the student. Most were found to require either knowledge, comprehension or application and in only a few instances also analysis, synthesis and evaluation. (See Appendix A for the objectives.) The majority of test items was presented in the multiple choice format and only a few were true-false questions.

In order to establish whether the cognitive level and cognitive operations required of the students were the same for each item presented in Weidenaar's instrument and the test form developed by the experimenter, an independent evaluator compared both instruments. He* compared all the items in Weidenaar's test with those in the experimenter's test and found them to be sufficiently

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*The author wishes to thank Charles Bolyard, Director of Testing at Indiana University--Purdue University at Fort Wayne for his evaluation of the agreement between Weidenaar's and the experimenter's tests.

[5]Benjamin S. Bloom, et al. (eds.) Taxonomy of Educational Objectives Handbook I: Cognitive Domain (New York: David McKay Company, Inc., 1956), p. 156.

congruent. That is, the level of cognitive operation required for a subject's response to a specific item in Weidenaar's test was the same for the alternative item in the experimenter's test.

Content validity of the instruments measuring mastery of each item was established in that four doctoral candidates of economics rated each test item's stimulus part as well as its response part in terms of its congruence with the objective it relates to and found them to be sufficiently in agreement.** That is, more than 50 percent of the items were rated as "extremely relevant," and about 50 percent of the items were rates as "quite relevant." (See Appendix C for the ratings of the 69 items under consideration.)

The internal consistency of both alternative instruments has been established via Kuder-Richardson formula 20 as follows:

a. Reliability of Weidenaar's material on 69 items under consideration is estimated at .81 for a sample of 24 individuals.

b. Reliability of the alternative material on 69 items under consideration is estimated at .79 for a sample of 12 individuals.

**Also to Jerry D. Boswell, Chairman of the Department of Business Administration at St. Francis College at Fort Wayne, the author wishes to extend her gratitude for his evaluation of item quality.

Survey Questionnaire

An experimenter-constructed Survey Questionnaire (Appendix D) was used to gather demographic data concerning the students enrolled in the individualized microeconomics program. It inventoried the following six variables:

1. Sex
2. Marital Status
3. Age
4. Grade Point Average
5. Prior Education in Economics
6. Prior Education in Calculus

The questionnaire also presented a total of nineteen questions on a 5-point scale regarding students' attitude toward the lab experience in individualized microeconomics, economics as a subject, and the instructional format. Eight items filtered out as factor I as a result of factor analysis using Varimax Rotation with Kaiser Normalization in a 4-factor solution. The common denominator for these eight items appeared to best be labelled as "Attitude Toward Lab-experience in Individualized Microeconomics (ATL)." (For the results of the factor analysis, see Appendix E.)

Instructional Materials and Procedures

Instructional Materials

Each subject in the sample studied learning material that was provided in modularized form covering basic economics concepts, principles and problems in microeconomics (see objectives in Appendix A). The learning material has been developed by Dennis Weidenaar and Emanuel Weiler under the title Economics: An Introduction to the World Around You. It comprises six out of a total of ten units that constitute an individualized learning package in microeconomics. Each single unit introduced to the student in the student handbook, entitled "Student Tutor," a pre-test keyed to the objectives, guiding information and exercises. The materials and the instructional information provided in a tapescript prepared the student for taking the post-test which presents all the items of the pre-test again.

Students, who still missed one or more items on the post-test after studying the material of a unit in the Student Tutor and on the tapescript had the option of repeating on an alternative test the item(s) thay had failed. The items on the alternative test were developed by the experimenter to be synonymous in content, form and responding to the same objective with those on the pre- and post-test presented by Weidenaar and Weiler.

This self-paced individualized learning procedure was the same for the experimental as well as for the control group. Since the student's progress to a new mastery task was contingent upon mastery of the previous task (because through this condition mastery learning enhances the awareness of mastery in the individual), all students received immediate feedback on their test results. (See Figure 2.)

Procedures Varied for Experimental and Control Group

The instructor actively tutored the subjects in the experimental group in a two-pronged approach. That is:

1. The individuals in the experimental group received a tutorial whenever they missed an item or items on the post-test so that they were able to pass the alternative item or items on the back-up test.

2. They also were asked to jot down questions (relating to the instructional material but not to the testing material) on a questioning sheet which they kept highly visible to the tutor so that the tutor could respond to such questions whenever he was not engaged in tutoring on test items of the post-test.

Individuals that were members of the control group and had failed items on the mastery test were

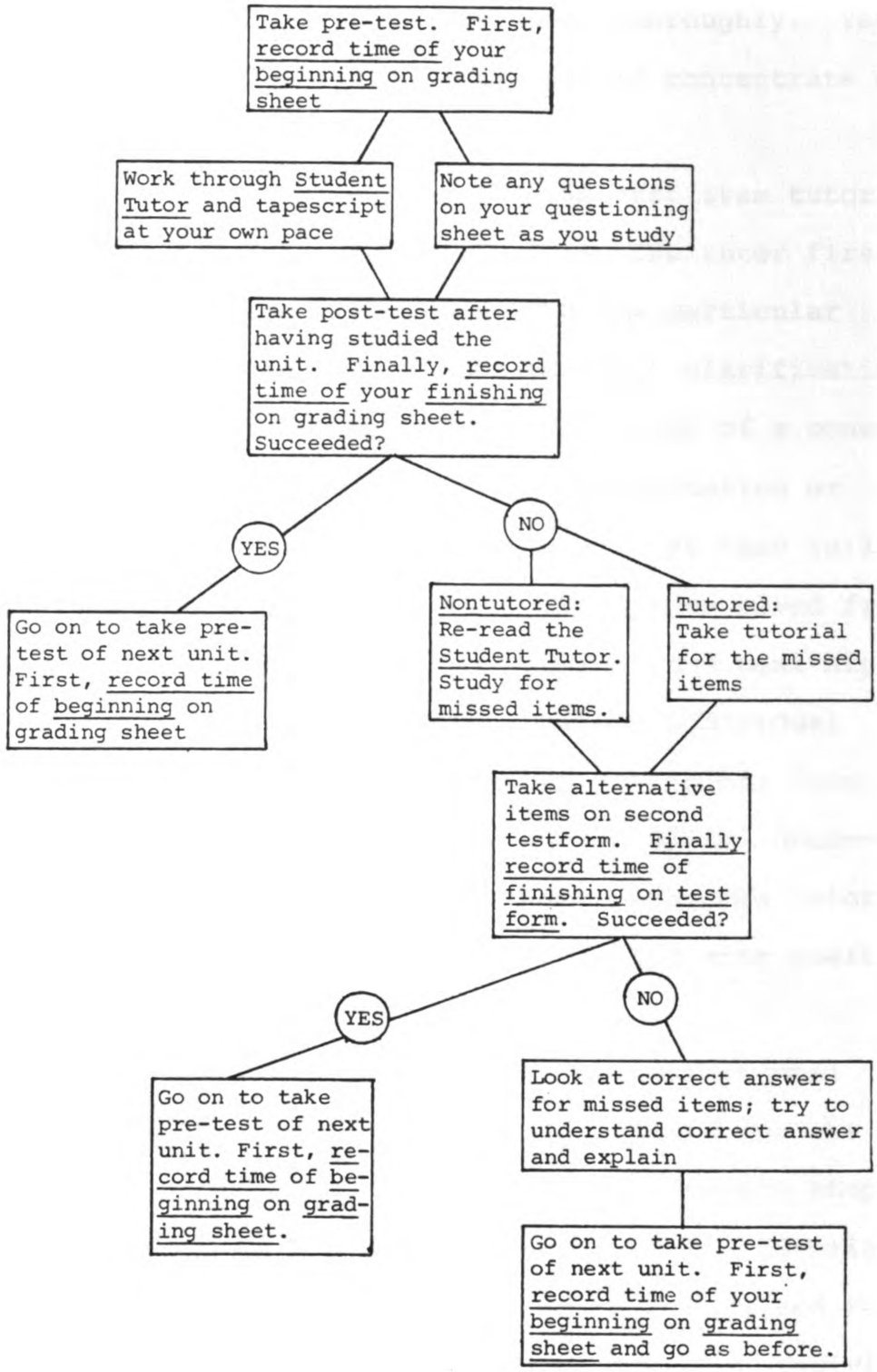

Figure 2.--Flowchart for Learning Lab in Microeconomics.

advised to study the related unit more thoroughly. Yet no particular hint as to what they should concentrate on was given to them.

The tutoring procedure for the test item tutorial consisted of five main steps. That is, the tutor first diagnosed the failure with respect to the particular item; then he decided on the most suitable clarification method (which may have been a simplification of a concept, principle and problem or its graphic presentation or another method that seemed appropriate). He then built up understanding in the individual in that he moved from lower levels in the learning hierarchy to the next higher ones each step in turn observing that the individual comprehended and was helped according to his/her learning needs. The next step was to let the individual demonstrate whether he/she had understood. Then, the tutor complemented the individual's demonstration with positive feedback.

The tutoring procedure for the instructional tutorial followed the format of the procedure for the test item tutorial in that the same five didactic steps were observed by the tutor. The instructional tutorial was conducted by the tutor when he was not required to tutor on test items and was free to observe the individual student's progress. For this purpose the tutor circulated among the students every five to ten minutes.

Data Collection

AVI Scores

The blocking variable was the measure of learner personality type. It came from the appropriate California Psychological Inventory scales for Achievement Via Independence and approximately followed a bimodal distribution. This measure was taken during the first class session of E 321 and separated dependent from independent learner types (comprising the subgroups of the two treatment groups).

CRP Scores

The measure of learning efficiency of each individual was computed according to the adjusted learning efficiency formula proposed by Reichman and Oosterhof.[6] The following components were included in the computation of the efficiency score:

1. t = the amount of student time allocated to completing 6 units or 69 items on the mastery test

2. T = the total of minutes allocated to working through the mastery material (525 min.). This included the time spent on tutorials. The average time spent on tutorials was 17.2 min. for a tutored student.

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[6]Susan L. Reichman and Albert C. Oosterhoof, Strategy Guidelines for the Construction of Mastery Tests. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, April 1976.

3. N = the number of pass no pass items completed for each unit on the entire test (69 items, that is)

4. L = the ratio of $\frac{t}{N}$ which indicates the individual's response time per item

5. M = the number of items failed and subsequently passed on the second trial (that is, the number that had to be repeated)

6. E = the efficiency score which is computed via the formula

$$E = \frac{T}{\frac{t}{N} x M}$$

or $$E = \frac{T}{L x M}$$

which can be considered an index of individual response time per item times number of times test items had to be repeated on back-up tests (under the constraints of the total number of minutes allocated to passing 69 items).

ATL Scores

The attitude score came from the Survey Questionnaire administered to the students at the end of the lab experience in individualized microeconomics and comprised the sum of the individual's responses to each of the eight items representing this factor.

Testable Hypotheses

There were eight research hypotheses to be tested:

A. There is an interaction between the characteristics of dependent and independent learning behaviors and the treatments of mastery learning with and without tutorials on the learning efficiency score.

H_A: $p < 0.05$

1. The independent learner's mean efficiency score will exceed the dependent learner's mean efficiency score on mastery learning that excludes tutorials.

H_1: $p < 0.05$

2. The dependent learner's mean efficiency score will exceed the independent learner's mean efficiency score on mastery learning that includes tutorials.

H_2: $p < 0.05$

3. The independent and dependent learner's mean efficiency score on tutored mastery learning will exceed their mean efficiency score on nontutored mastery learning.

H_3: $p < 0.05$

B. There is an interaction between the characteristics of dependent and independent learning behaviors and the treatments of mastery learning with and without tutorials on the attitude score.

H_B: $p < 0.05$

4. The independent learner's attitudinal mean score will exceed the dependent learner's attitudinal mean score with respect to mastery learning that excludes tutorials.

H_4: $p < 0.05$

5. The dependent learner's attitudinal mean score will exceed the independent learner's attitudinal mean score with respect to mastery learning that includes tutorials.

H_5: $p < 0.05$

6. The independent and dependent learner's attitudinal mean score with respect to tutored mastery learning will exceed their mean score on nontutored mastery learning.

H_6: $p < 0.05$

Model

The model used to test these hypothesis was the two-way analysis of variance. The independent variables were: (1) Independent-Dependent Personality Characteristic; and (2) the method of Treatment. The dependent variables were (1) learning efficiency on mastery tasks as calculated via the adjusted formula proposed by Reichmann and Oosterhof;[7] and (2) attitude toward the

[7]Op. cit., p. 2.

lab-experience in individualized microeconomics as summarized in the ATL score.

Pilot Study

Prior to conducting the actual experiment, a pilot study was done using as subjects in-service teachers in an economics education workshop. The pilot study was carried out primarily for the purpose of enacting and refining the tutoring procedures and for sequencing and revising the materials that were presented to the subjects. The pilot study also provided an opportunity for the experimenter to determine a reliability coefficient for both criterion mastery tests (that is, the post-test as well as the alternative test).

Additionally, data were gathered with which the questionnaire (that investigated students' attitude toward the lab in microeconomics and inquired about demographic variables) could be improved. The validation of this questionnaire on the basis of a factor analysis was also made possible through the conduct of the pilot study. Both the materials and procedures were described in preceding sections of this chapter. The experimenter also hoped to gain from the pilot study some useful information regarding the feasibility of a two-pronged approach for the tutoring procedure. Since this approach was found to

be appropriate with the pilot population it was retained for the experiment.

The pilot study followed all the anticipated procedures of the actual experiment with one exception: due to logistical problems only half of the population used as a post-test the post-test for the experiment; the rest used as post-test the testing material developed by the experimenter. Therefore, only students who had taken the experimental post-test took the experimental back-up test. But students who had taken as a post-test what was intended to be the experimental back-up test followed up on failed items with a back-up test which was intended to be the experimental post-test. This procedure provided for the advantage of validating both test forms simultaneously.

Of particular interest during the pilot study was the sequencing of tutorials according to student needs. For example, at certain times during the lab sessions an accumulation of requests for a tutorial occurred because several students in the tutored group had evidenced, through items failed on the post-test, that they would undergo a tutorial. Only one tutor, however, conducted the necessary tutorials. Therefore, one of the following alternatives had to be chosen. Either these students would wait until their turn for a tutorial would come,

or they would continue working on their individualized material until the tutor would be free to tutor them. The latter alternative was chosen for the tutored group because of time limitations.

As a result of the pilot study, the final experiment was improved in both design and procedure. Therefore, the final experiment was administered in a very systematic way.

Summary

It was decided that the most feasible study of the interaction of personality variables and learning conditions was one that employed analysis of variance. The dependent and independent personality characteristics as measured by a sub-scale of the CPI were selected as personality variables. The learning conditions were mastery learning with and without tutoring.

Two dependent measures were taken: a learning efficiency score and an attitudinal score. A separate analysis of variance was conducted using either one of the two measures as the dependent variable.

The attitudinal measure was analyzed in order to allow for more insight into the individuals' self-report with respect to feeling comfortable or uncomfortable under either treatment condition.

The sample consisted of twenty-four undergraduate Business majors at Indiana University-Purdue University at Fort Wayne.

CHAPTER IV

ANALYSIS OF RESULTS

Introduction

The data were analyzed to test the following two major research hypotheses and six minor research hypotheses. All of which were tested at the .05 level of significance:

A. There is an interaction between the characteristics of dependent and independent learning behaviors and the treatments of mastery learning with and without tutorials on the learning efficiency score.

   1. The independent learner's mean efficiency score will exceed the dependent learner's mean efficiency score on mastery learning that excludes tutorials.

   2. The dependent learner's mean efficiency score will exceed the independent learner's mean efficiency score on mastery learning that includes tutorials.

   3. The independent and dependent learner's mean efficiency score on tutored mastery learning will exceed their mean efficiency score on nontutored mastery learning.

B. There is an interaction between the characteristics of dependent and independent learning behaviors and the treatments of mastery learning with and without tutorials on the attitude score.

   4. The independent learner's attitudinal mean score will exceed the dependent learner's

attitudinal mean score with respect to mastery learning that excludes tutorials.

5. The dependent learner's attitudinal mean score will exceed the independent learner's attitudinal mean score with respect to mastery learning that includes tutorials.

6. The independent and dependent learner's attitudinal mean score with respect to tutored mastery learning will exceed their mean score on nontutored mastery learning.

A two-way analysis of variance was employed for the achievement score, the results of which are represented in response to Hypotheses A-3. Two-way analysis of variance was also employed for the attitude score, the results of which are represented in response to Hypotheses B-6. The characteristics by treatment interaction effect on the efficiency score was tested by research Hypothesis A. Research hypotheses 1 and 2 relate to the posthoc procedure to have been employed in the presence of a significant interaction effect on the efficiency score and H_3 is the treatment main effect. The characteristics by treatment interaction effect on the attitude score was tested by research hypothesis B. Hypotheses 4 and 5 relate to the posthoc procedure to have been employed in the presence of a significant interaction effect on the attitude score and H_6 is the treatment main effect. The Scheffé posthoc comparison test would have been used for a further analysis if a significant interaction effect would have been found. Hypotheses 3 and 6

were tested by an analysis of variance main effect on both the achievement score and the attitude score.

Nature and Treatment of the Data

Assumptions

For the two-way analysis of variance there were three underlying assumptions to be met by the data collected in this experiment:

1. Normality. In that a balanced design was employed which is robust with respect to normality this assumption would seem to have been met;

2. Independence. This assumption was satisfied through the procedure of random assignment; and

3. Homogeneity of variances, i.e.,

$$(\sigma_1^2 = \sigma_1^2 = \sigma_3^2 = \sigma_4^2)$$

This assumption was tested at the .05 level of significance using the data collected in this experiment. The F_{max} statistic was employed in this experiment in order to check for this assumption. That is, the F_{max} value of the largest error variance divided by the smallest error variance was tested at the .05 level of significance as proposed by Hartley.[1]

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[1]B. J. Winer, Statistical Principles in Experimental Design (New York: McGraw-Hill, 1962), pp. 93-94.

F_{max} Tests for the Efficiency Data and the Attitude Data

With respect to the efficiency data, all but one of the assumptions underlying the model were met. That is, an initial test of homogeneity of variance resulted in the rejection of the null hypothesis. The F_{max} test according to Hartley exceeded the confidence interval. As can be seen from Table 1 the interval between highest and lowest score of the efficiency data of tutored independent Ss (131.5) is more than seven times this range for the efficiency scores of nontutored dependent Ss (18.2).

TABLE 1.--Means, Ranges and Variances of Efficiency Data

	Mean	Interval Between Highest & Lowest Score	Variance	Standard Deviation
Dependent-Tutored Ss	22.83	53.0	368.790	19.204
Dependent-Nontutored Ss	12.48	18.2	48.542	6.967
Independent-Tutored Ss	60.13	131.5	2,341.686	48.391
Independent-Nontutored Ss	39.03	25.2	91.578	9.570

As revealed in Table 1, one reason for the within cell heterogeneity of the tutored independent group may have been that one of the Ss achieved a score (154.4) which was more than forty-four times that acquired by the slowest learner (3.5). This perhaps was due to the former's prior and far superior knowledge of microeconomics subject matter. His learning efficiency therefore was not realistically comparable to the learning efficiency of the other Ss in the experiment.

A transformation of the scores to $x' = \sqrt{(x + 1)}$ as suggested by Snedecor was undertaken in order to decrease the interval between highest and lowest scores. "To change the scale of measurement by a transformation" was Snedecor's recommendation in the event that one or all of the assumptions of the model are violated.[2] Hartley's test for homogeneity of variance was performed on the transformed data. However, the F_{max} value of 11.19 was less than the table value and thus fell in the critical area for no significant differences. That is, for F = 95.(13.7).

Therefore the transformation of the data according to Snedecor satisfied the assumption of homogeneity of variance, and the transformed data instead of the raw

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[2]George W. Snedecor, Statistical Methods (Iowa State University Press, 1956), pp. 314-315.

TABLE 2.--Means and Variances of Transformed Efficiency Data

	Mean	Variance	Standard Deviation
Dependent-Tutored Ss	4.55	3.76	1.94
Dependent-Nontutored Ss	3.56	.98	.99
Independent-Tutored Ss	7.42	7.36	2.71
Independent-Nontutored Ss	6.28	.66	.81

data constituted the dependent variable for the two-way analysis of variance. However, the analysis of variance conducted on the untransformed and on the transformed efficiency data produced similar results. (See Analysis of Variance Summaries in Appendix J.)

With respect to the attitude data, all the assumptions underlying the model were met prior to conducting the analysis of variance.

TABLE 3.--Means and Variances of Attitude Data

	Mean	Variance	Standard Deviation
Dependent-Tutored Ss	8.17	1.77	1.33
Dependent-Nontutored Ss	8.67	17.07	4.13
Independent-Tutored Ss	9.67	11.47	3.39
Independent-Nontutored Ss	9.50	5.50	2.35

When a test of homogeneity of variance was conducted, Hartley's F_{max} (9.66) produced evidence that the assumption was met, since F = .95(13.7).

Results

Efficiency Score as the Dependent Variable

With learning efficiency as the dependent variable, the statistics for the main effects (that is the treatment effect and the characteristics effect) and for the characteristics by treatment interaction effect are shown in Table 4.

TABLE 4.--Summary of the Analysis of Variance on the Transformed Efficiency Data

Sources of Variation	SS	df	MS	F	Level of Significance
Treatments (T)	6.752	1	6.752	2.116	.161
Characteristics (C)	46.900	1	46.900	14.698	.001*
C x T Interaction	.032	1	.032	.010	.922
Error	63.816	20	3.191		
Total	117.500	23	5.109		

*p < .05

From Table 4 it is evident that the hypothesis of major interest, A (which was tested by the characteristics by treatment interaction effect) failed to be accepted ($p < .922$). The posthoc research Hypotheses 1 and 2 as stated in the introduction to this chapter were related to Hypothesis A. Thus, with this two-way analysis of variance Hypotheses 1 and 2 also failed to be accepted.

The hypothesis tested by the treatment main effect also failed to be accepted ($p < .161$). This hypothesis was represented by research hypothesis 3. Table 4 reveals that the characteristics main effect, however, is statistically significant ($p < .001$).

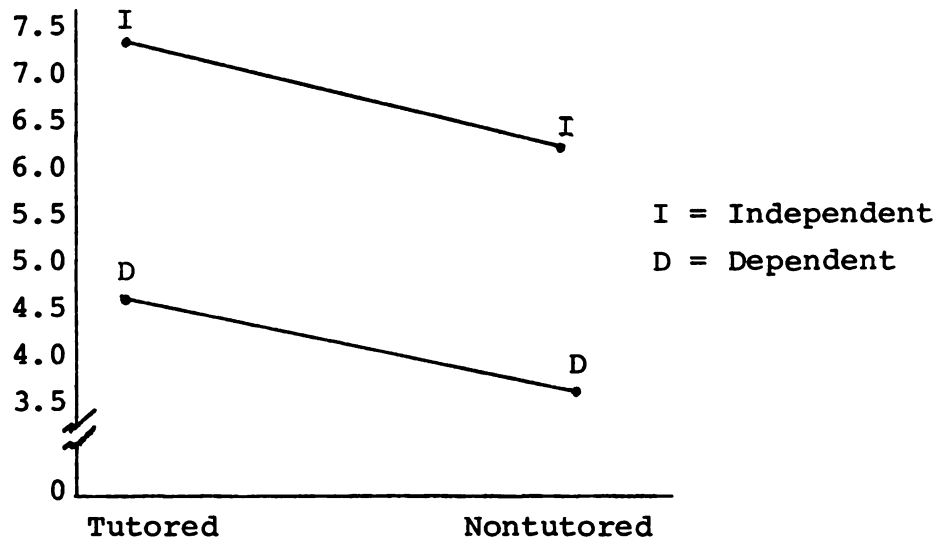

Figure 3.--A Plot of Means of the Transformed Efficiency Scores

As shown by Figure 3, the independent learners may appear to learn more efficiently than do the dependent learners regardless of the conditions of mastery instruction or of supplementary tutorials. The learning efficiency of independent learners may appear to be greater, though, if supplementary tutorials are given. Figure 3 shows the difference in mean efficiency scores as between independent and dependent learners comparing both treatments. For the independent learners the difference between the mean score under the tutored and nontutored condition is represented by 1.14 points; whereas for the dependent learners the difference between the mean score under the tutored and the nontutored condition is represented by only .99 points. However, due to the lack of a significant interaction effect these discrepancies are not statistically significant.

Figure 4 reveals that after eliminating the extreme score the difference between the mean efficiency scores of independent learners under both treatments is only .13. According to this information it would seem that the learning efficiency of independent learners is not very differently affected by either treatment. An analysis of variance conducted after the elimination of the extreme score did not produce evidence of significance beyond that produced by the analysis of variance which included the extreme score.

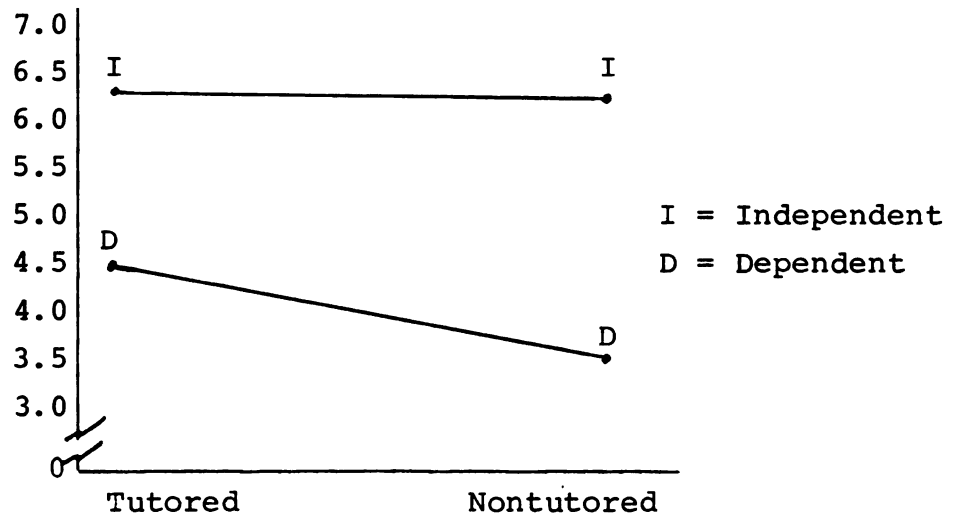

Figure 4.--A Plot of the Transformed Efficiency Scores After Elimination of the Extreme Score

Attitude Score as the Dependent Variable

With the attitude score as the dependent variable, the statistics for the main effects (that is the characteristics effect and the treatment effect) are shown in Table 5.

From Table 5 it is evident that the hypothesis of major interest, B (which was tested by the characteristics by treatment interaction effect) failed to reject H_o ($p < .788$). This hypothesis relates to the posthoc research Hypotheses 4 and 5 stated in the introduction to this chapter. Hypotheses 4 and 5 also fail to be accepted with this analysis of variance.

The hypothesis tested by the treatment main effect also failed to be accepted ($p < .893$). This

TABLE 5.--Summary of the Analysis of Variance on the Attitude Data

Sources of Variation	SS	df	MS	F	Level of Significance
Treatments (T)	.167	1	.167	.019	.893
Characteristics (C)	8.167	1	8.167	.912	.351
C x T Interaction	.667	1	.667	.074	.788
Error	179.000	20	8.950		
Total	188.000	23	8.174		

hypothesis was represented by research Hypothesis 6. An inspection of Table 5 reveals that additionally the characteristics main effect is not statistically significant ($p < .351$). And, as Figure 5 shows, the means of independent and dependent learners are identical if the treatment groups are compared.

The sum of means of both treatment groups ($\bar{x}$ = 17.84 for the tutored group and $\bar{x}$ = 17.17 for the non-tutored group) do not appear very different and thus indicate that students' attitude toward the learning experience in this experiment was not affected by either treatment condition; further, dependent learners formed an attitude toward this learning experience which did not

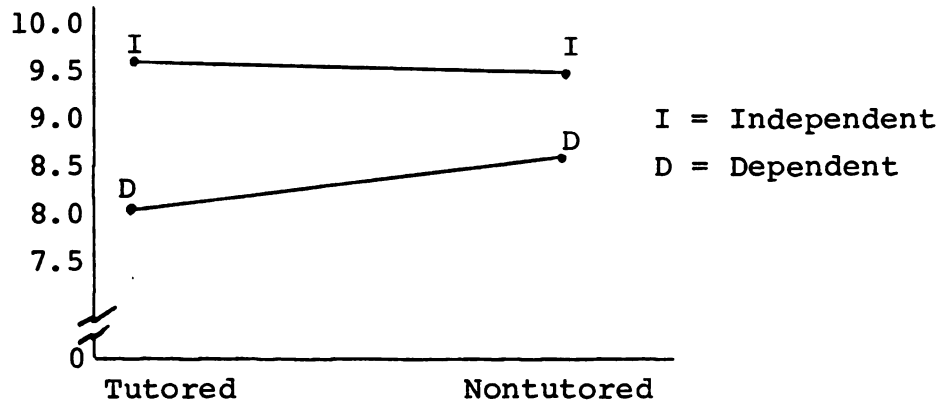

Figure 5.--A Plot of Means of Attitude Scores

significantly differ from the attitude formed by independent learners.

Achievement Data, Personality Data and the Variable of Prior High School Economics

The table of correlation coefficients given below provides information on the strength of the correlations between some of the variables used in this study. Students' G.P.A. correlated with their learning efficiency at r = .55 and with dependent/independent learning behaviors at r = .45. Students' prior knowledge for this course gained through high school economics correlated negatively with their dependent/independent learning behaviors at r = -.36. That is, the more dependent learner appeared to have had less prior knowledge gained through high school economics. Students' learning

efficiency was positively correlated with their independent learning behaviors at r = .73 but negatively correlated with need for tutorials at r = -.50. That is, the more independent the students were, the more learning efficient they appeared to be; and the less learning efficient, the more tutorials they needed. Students' independent learning behaviors were negatively correlated with tutoring at r = -.47. That is, the more students appeared to be independent learners, the less they needed tutorials.

TABLE 6.--Table of Correlation Coefficients

	1	2	3	4	5
1. G.P.A.		.095	.552**	.445*	-.277
2. High School Economics			-.082	-.359*	.152
3. Learning Efficiency				.727**	-.497*
4. Characteristics					-.466*
5. Tutoring					

*p < .05

**p < .005

Summary

Neither of the two major hypotheses, A and B, were statistically significant. Therefore, neither dependent nor independent personality characteristics interacted significantly with mastery learning which includes or excludes tutorials when learning efficiency was the dependent variable. Also, neither characteristic interacted with either treatment when attitude was the dependent variable.

Neither of the two hypotheses for the treatment main effect (that is, Hypotheses 3 and 6) were statistically significant. Thus, both treatments (that is, mastery learning with or without tutorials) did not have a significantly different effect on the subjects with respect to their learning efficiency or with regard to their attitude towards either treatment.

CHAPTER V

SUMMARY AND CONCLUSIONS

Introduction

The study produced the finding that learning efficiency is not significantly greater as a result of the use of either of the two instructional methods; mastery instruction with or without tutorials in interaction with the characteristics of dependence and independence. This investigation would seem to indicate that it may make no difference whether this personality characteristic is matched differentially with instructional condition. In the next sections we will consider each of the findings in greater detail, the study's limitations and suggestions for further research.

Discussion

The findings of the study did not confirm any of the stated research hypotheses:

1. This study did not produce evidence of a statistically significant interaction between the personality variables of dependent/independent learning behavior and the treatments of mastery learning with and without tutorials. Therefore, it would seem that neither

of the treatments constituted enough stimulus environment for the achievement of dependent learners to be affected differently from the achievement of independent learners.

2. Furthermore, no evidence of a statistically significant treatment effect for mastery learning with and without tutorials was produced by this experiment. Overall, Ss' learning efficiency does not improve significantly irrespective of whether mastery learning is accompanied by supplementary learning.

3. Moreover, the exclusion of an extreme score of one of the independent achievers almost equalized the means of independent learners under both treatment conditions. This suggests the possibility that neither treatment method may have a differential effect on the independent learner.

4. This study did not produce evidence of a statistically significant interaction between characteristics and treatments on the attitude score. Therefore, it would seem that neither of the treatments constituted a learning experience sufficiently different such that the attitude of dependent learners could be affected differently from the attitude of independent learners.

5. This study produced no evidence that mastery learning with or without tutorials affects individuals' attitude at a significantly different level. The finding

that the individuals' learning experience is not affected adversely by either treatment seems to indicate that both treatments may have been perceived as equally enjoyable or unenjoyable.

6. Further, neither personality variable seemed to affect individuals' attitude toward this learning experience at a significantly different level. That is, dependent as well as independent learners were equally favorably or unfavorably disposed toward either treatment.

However, there was a statistically significant difference for the characteristics main effect. That is, independent learners learn more efficiently regardless of the instructional method administered. This is in agreement with the findings of Crist-Whitzel and Hawley-Winne who found that field-independent learners perform better on individualized instruction than under traditional instruction. These findings are also in agreement with those of Parent, Forward et al. who investigated the interaction between internal/external locus of control and high/low external discipline conditions and found that subjects with internal locus of control do better under low external discipline conditions. The variable of field-independence used in Crist-Whitzel's study and the variable of locus of control used in Parent's study

seem to affect achievement similarly under stimulus conditions that provide for individual freedom (as does the variable of independent learning behavior used in this study).

Limitations of This Study

Some of the following reasons may or may not have been responsible for the fact that the ATI effect corresponding to the major hypotheses was not statistically significant:

1. The Aptitude measure may not have been reliable. However, this does not seem to be true as the California Psychological Inventory has proven to discriminate well between the personality variables under consideration as Domino[1] found. Buros[2] described this instrument as the "Minnesota Multiphasic Personality Inventory for the healthy individual" and the best measuring instrument of its kind. Since its AVI subscale has evidenced reliability for measuring the variables under consideration in this study in that it clearly segregated between both characteristics there seems no need to doubt

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[1]George Domino, "Differential Prediction of Academic Achievement in Conforming and Independent Settings," Journal of Educational Psychology 59 (1968): 256.

[2]Oscar Krisen Buros, Personality (Highland Park, N. J.: Gryphon Press, 1970), p. 27.

its usefulness for this experiment. The subscale was administered strictly according to the prescribed procedural regulations.

2. As mentioned earlier, the alternative treatments used in this study may not have constituted a strong enough treatment contrast for the alternative personality variables to produce an interaction effect. This speculation can be supported by the results of an analysis of variance conducted on the achievement score after elimination of the extreme score.

TABLE 7.--Summary of the Analysis of Variance on the Transformed Efficiency Data after Elimination of Extreme Score

Sources of Variance	SS	df	MS	F	Level of Significance
Treatment (T)	1.274	1	1.274	.729	.404
Characteristic (C)	30.591	1	30.591	17.521	.001*
C x T Interaction	1.071	1	1.071	.631	.443
Error	33.173	19	1.746		
Total	66.108	22	3.005		

*$p < .05$

Even though the significance level ($p < .443$) for the interaction effect in this analysis does not even come close to being statistically significant, it nevertheless is remarkably different from the significance level ($p < .922$) for the same effect in the analysis conducted before exclusion of the extreme score. Also, the mean efficiency score for the independent learners under the tutored condition dropped from 7.41 to 6.41 after elimination of the extreme score in this group almost equalizing it with the mean efficiency score (6.28) of these learners under the nontutored condition. Therefore, one could hypothesize that if tutoring would be employed as a method in its own right and not as a supplementary procedure for individualied instruction, it might affect the independent learner more adversely while simultaneously affecting the dependent learner more favorably. Thus, it might produce evidence of the expected ATI effect.

3. Although the statistical techniques were carefully employed, the duration of the experiment might not have been sufficient to discriminate among students with respect to achievement.

4. Also the sample might not have provided a sound enough basis for this experiment. Three foreign students had to fight with enormous language problems in

working through the individualized material. Their starting condition was different from that of any other student in the group and may have affected the outcome of this study.

In summary, it should be recognized that this study was characterized by some serious limitations. One limitation was that the sample was quite small, thus providing so few degrees of freedom as to make conclusive findings difficult. The small sample also made it impossible to select only those subjects who clearly ranked at the upper and lower ends of the CPI subscale. Scores of subjects ranking along the middle interquartile range may have weakened the difference between dependent and independent personality characteristic. Another weakness was that no proper provision was made to partition out the amount of variance in the efficiency score that was due to individual prior knowledge.

Implications for Further Research

1. Further research on ATI might prove to be more fruitful if the alternative treatments used draw more distinctly on contrasting personality variables than does supplementary tutoring and individualized instruction. For example, would tutoring be contrasted completely with individualized instruction (that is, if tutoring would be employed as a method in its own right

using one tutor for one tutee rather than as a supplementary procedure) the results of such an investigation might address more conclusively the hypothesis of ATI effects.

2. The tutorial procedure used in this experiment provided for tutorials that were geared directly toward those items a student had failed on the post-test; and for tutorials that were based on a written inquiry by students who needed guidance beyond a specific test item. This two-pronged approach had proven to be sufficiently effective when used with the pilot population consisting of in-service teachers. When used with the population of undergraduate students in this experiment, however, only the test item tutorial was preferred by the subjects. That is, none of the subjects inquired about any guidance beyond the test items they had failed on a post-test. When asked why they did not make use of the provision for written inquiries, the subjects gave various reasons. The most frequently given reason was that the individualized material was for the most part self-explanatory. (See Appendix G for a listing of the reasons.) It is noteworthy, though, that for the pilot population of in-service teachers this inquiry provision seemed to be of particular benefit. Its main impact on the tutoring procedure was that it strengthened the effect of

tutoring in comparison to mastery learning without tutorials. One might suspect that the atmosphere maintained during the pilot study (which was conducted in a workshop situation) was more conducive to taking individual initiative, whereas the classroom atmosphere observed during this experiment was not. Because written inquiries seem to enhance the effect of supplementary tutorials, the use of the written inquiry procedure might be recommended for those future ATI studies which employ supplementary tutorials. Written inquiries seem to service more directly the need of personal guidance and interaction in those subjects who are more dependent.

3. Although it would have been desirable for the size of the sample used in this study to have been much larger, twelve subjects were just about as many tutees as one tutor could reasonably handle. Hence, it might be suggested that further research that employs this procedure using a larger sample observe this tutor/tutee ratio.

4. Moreover, more ATI research needs to focus on the variable Achievement Via Independence as it interacts with individualized instruction and tutoring in other subject matter areas along the range of all grade levels. Also, as suggested earlier, a study such as the present one needs to be replicated over a longer period of time. Such a study which also analyzes one or more measures of delayed retention would greatly strengthen the results.

5. Since this experiment may be regarded a small contribution to ATI research, trends based on a sample of twenty-four subjects may not be readily interpretable. Therefore, for further ATI research, it would be prudent to experiment with larger sample sizes.

6. Because most beginning students of intermediate micro-economics have some prior knowledge of this subject matter area, it might be of benefit for further ATI research in this field to employ analysis of covariance using the pretest measure as the covariate. Such an analysis would partition out that variation in the equation for the achievement score that is due to prior knowledge and/or achievement such that the remaining variation in the equation can be more readily interpreted as being influenced by the experimental conditions posed by the interaction between treatments and personological variables.

7. Furthermore, a more powerful technique such as regression analysis may be used for ATI studies in such areas in which Ss can be assumed to lack any prior knowledge. Regression analysis does not involve artificial levels of a continuous variable as does the analysis of variance. The creation of artificial levels tends to increase the error component in the analysis.

8. Finally, it would seem likely that those ATI studies consisting of a larger sample may produce a stronger interaction effect if a more thorough segregation of dependent and independent learners can be carried out--that is, if only those individuals who clearly score at the upper and lower end of the scales can be included in the sample (whereas those individuals whose scores are dispersed around the mean or the median can be excluded).

Should ATI studies be pursued as a line of research in the future? The answer, of course, should not depend on the results of a particular study such as this one or on the fact that a majority of ATI studies conducted in the past have not produced the hypothesized characteristics by treatment interaction effect. But the answer might depend on the need for more detailed information on the instructional process. This information may be valuable if it sheds more light on effects that certain treatments have on the achievement of subjects with varying personality characteristics. For example, if there were evidence that independent learners do better than dependent learners under two specific treatment conditions, an educational designer might take that into account in making decisions about instruction.

Summary

In the discussion of the results of this study, it was pointed out that none of the stated hypotheses were found to be statistically significant, that is, the study produced the finding that learning efficiency is not significantly greater as a result of the use of either of the two instructional methods; mastery instruction with or without tutorials in interaction with the characteristics of dependence and independence.

In explaining the findings of this study it was recognized that this study had serious limitations. As the most consequential limitations were mentioned, the small size of the sample used for this experiment and the resulting lack of a clear discrimination between dependent and independent personality characteristics. Another major weakness of this study was considered to be the employment of a less powerful statistical technique than analysis of covariance.

A list of implications and recommendations for further research concluded the discussion of the results of this study.

APPENDICES

APPENDIX A

OBJECTIVES

OBJECTIVES

Unit 1

Objectives

1. Define the concept of scarcity.

2a. Name the major categories of resources.

2b. Give examples of the major categories of resources.

3. Given an economic situation in which a choice must be made between alternative commodities, explain the opportunity costs involved in the choice.

4. Explain the assumptions necessary in order to use the concept of production possibilities.

5. Interpret a production possibilities curve.

6. Interpret a schedule of production possibilities in terms of increasing costs.

7. Explain why an economy may be operating at a point below its production possibilities curve.

8. Explain how an outward shift in the production possibilities curve is possible.

9. Illustrate on a production possibilities graph a situation in which technological improvement occurs in the production of one of the two products.

10. Given two products, one a capital good and one a consumer good, explain how a society's future depends on its current choice between the two.

Unit 2

Objectives

1. Give examples of inputs and outputs for a given productive process.

2a. Define variable and fixed inputs.

2b. Give an example of a variable input.

2c. Give an example of a fixed input.

3. State the Law of Diminishing Marginal Returns.

4. Interpret the behavior of total product when plotted against a variable input.

5. Determine from a schedule the behavior of marginal output when units of a variable input are added and select the point at which marginal returns begin to diminish.

6. Explain the relationship between total product and marginal product.

7. Interpret a curve obtained by plotting the extra output of a product against the variable input.

8. Explain the difference between a short-run and long-run expansion.

9. Predict what will occur when a producer cannot increase a fixed input of production.

10. Explain how a change in input may determine the size of the whole production process.

11. Given a production situation, predict how a producer will go about expanding, taking into consideration The Law of Diminishing Marginal Returns.

Unit 3

Objectives

1. Define demand, demand schedule, and demand curve.

Objectives (Unit 3 continued)

2. Identify the quantity demanded on a demand curve when given the price.

3. Explain the shape of the demand curve in terms of the Law of Demand.

4. Explain how the behavior of people in response to various price levels is reflected in the Law of Demand.

5a. Derive a market demand schedule from individual demand schedules.

5b. Derive a market demand curve from the individual demand curves.

6. State and give examples of the factors underlying demand.

7. Explain a change in demand and illustrate it on a graph.

8. Identify the difference between a change in demand and the change in the quantity demanded.

9. Given a specific example of an economics event, determine whether it causes a change in demand or in the quantity demanded.

Unit 4

Objectives

1. Define supply, supply schedule, and supply curve.

2. Explain the relationships between price and quantity supplied.

3. Explain the difference between individual supply and market supply.

4. State and give examples of the factors underlying supply.

5. Using graphs, explain the difference between a change in supply and a change in quantity supplied.

Objectives (Unit 4 continued)

6. Given a specific example of an economic event, determine whether it reflects a change in supply or a change in quantity supplied.

Unit 5

Objectives

1a. State the definition of elastic demand.

1b. State the definition of unitary elastic demand.

1c. State the definition of inelastic demand.

2. Given a demand curve, compute the total revenue at each price.

3a. State the effect of a reduction in price on total revenue when demand is elastic.

3b. State the effect of a reduction in price on total revenue when demand is inelastic.

3c. State the effect of a reduction in price on total revenue when demand is unitary.

4a. State the effect of a price increase on total revenue when demand is elastic.

4b. State the effect of a price increase on total revenue when demand is inelastic.

4c. State the effect of a price increase on total revenue when demand is unitary.

5. Explain the meaning of the elasticity coefficient.

6. Given a demand schedule, compute the elasticity coefficient for a given price range using the mid-point formula.

7a. Given an elasticity coefficient, state whether it shows demand as being elastic.

7b. Given an elasticity coefficient, state whether it shows demand as being inelastic.

Objectives (Unit 5 continued)

7c. Given an elasticity coefficient, state whether it shows demand as being unitary.

8. Given an elasticity coefficient, state whether total revenue will rise, decline, or remain the same if the price declines or rises.

9. State the determinants of the elasticity of demand and give examples of each determinant.

10. Select the determinant(s) of elasticity of demand which influence the quantity demanded in a given situation.

Unit 6

Objectives

1a. Define the term market.

1b. Define the term competitive market.

1c. Define the term equilibrium.

1d. Define the term shortage.

1e. Define the term surplus.

2a. Label a given graph with shortage.

2b. Label a given graph with surplus.

2c. Label a given graph with equilibrium price.

3. Explain how shortages and surpluses are eliminated and how the equilibrium price is reached.

4. State the effect on the equilibrium price and quantity when demand or supply changes.

5. Explain how price acts as a rationing mechanism.

APPENDIX B

TESTING MATERIALS

UNIT 1A

1. Scarcity may be defined as a condition whereby
   a) resources are so abundant that everyone has enough of them
   b) quantities demanded exceed quantities supplied
   c) resources are limited but human wants are unlimited
   d) modern societies have not yet learned how to determine wants

2a. Which of the following is not considered to be one of the major categories of resources?
   a) labor
   b) waterpower
   c) capital
   d) all of the above

2b. Timber resources are classified in economics as:
   a) capital
   b) land
   c) entrepreneurship
   d) none of the above

3. Rather than spending Saturday afternoon skiing, Joe Cool spent four hours studying for his economics exam. As a result he received an "A" on his exam. The opportunity cost of getting as "A" was therefore
   a) the cost of renting the skiing equipment
   b) zero in that no money had to be paid out in order to get it
   c) the enjoyment foregone as a result of not going skiing
   d) none of the above

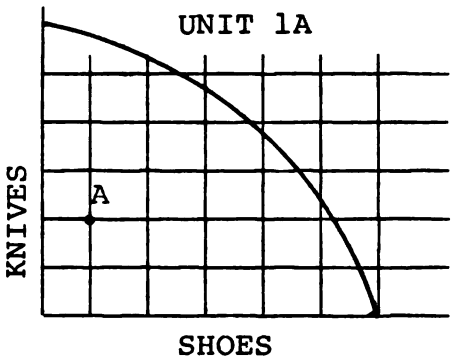
4. Which of the following is incorrect? The assumptions necessary to use the concept of a production possibilities curve are:
   a) production will be efficient
   b) supply of resources is fixed
   c) technology is constantly changing
   d) the quality of resources is fixed

UNIT 1A

5. A production possiblities curve shows:
   a) the combination of possible quantities that can be produced with fixed amount of input
   b) the amount of time required to make two products
   c) the optimum rate of economic growth
   d) the amount of resources available to make the product

6. The Law of Increasing Cost occurs for the following reason:
   a) as more of one product is produced the units of the other product can also be increased
   b) resources may be used to produce only one kind of product
   c) societies neglect to consider costs
   d) none of the above

7. UNIT 1A

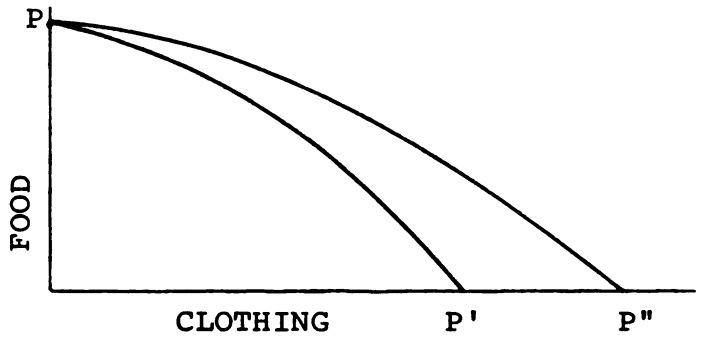


Point A on the above graph indicates that:
   a) there is no production possible
   b) there is inefficiency or unemployment
   c) resources are always limited
   d) no increase in production is possible

8. Economic growth is indicated on a graph by:
   a) the curve becoming more curved or bowed
   b) an outward shift of the production possibilities curve
   c) a "straightening" of the otherwise curved production possibilities line
   d) none of the above

UNIT 1A

9. A shift in the production possibilities curve in the figure below from PP' to PP" could illustrate:
   a) a change in consumer preferences away from food and toward clothing
   b) an increase in the economy's supplies of land, labor, and capital
   c) an improvement in the technology of food production
   d) an increase in the economy's rate of capital formation
   e) an improvement in the technology of clothing production



10. If a society chooses to produce a greater quantity of capital goods than consumer goods:
   a) it is not emphasizing future growth
   b) resources will not be shifted from consumer goods to capital goods
   c) the resulting automation will likely produce increased unemployment
   d) it is emphasizing future growth

UNIT 2A

1. Which of the following could be considered an output for a barber shop?
   a) scissors
   b) haircuts
   c) talcum powder
   d) none of the above are outputs; all are inputs

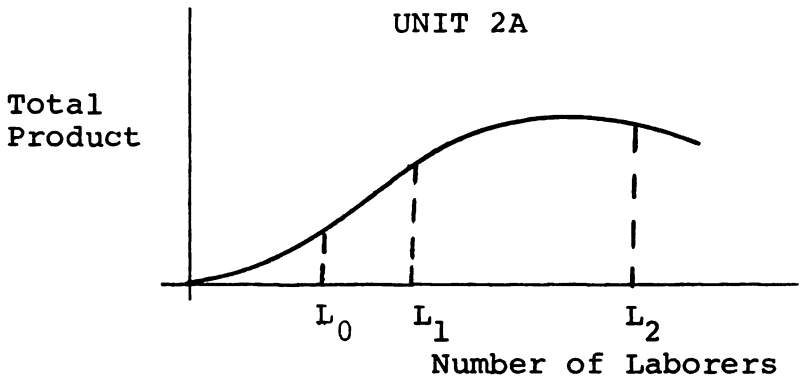
2a. The amount of "variable" input used by a firm
   a) increases as the firm produces more output in the short run
   b) decreases as the firm produces more output in the long run
   c) remains constant as the firm produces more output in the long run
   d) can never be objectively measured

2b. A "fixed" input is one which
   a) cannot be varied in the short run but which may be varied in the long run
   b) cannot ever be varied in either the short- or the long run
   c) can be varied in the short run but not in the long run
   d) none of the above

2c. As relates to an automobile repair garage two of the following would be considered to be fixed inputs and one would be considered to be a variable input. Identify the variable input
   a) the amount of garage space
   b) the number of service mechanics
   c) the number of automobile hoists

3. The Law of Diminishing Marginal Returns states that:
   a) total output will increase in the long run
   b) marginal returns will diminish if total output is increased in the long run
   c) marginal return falls as total output is decreased
   d) after a certain point, the additional output coming from using constant additions of extra input will decrease

4.



In the range, L_1 L_2 total product is

a) falling; but each successive decrease is larger than the preceding one
b) rising; but each successive increase is smaller than the preceding increase
c) rising; but each successive increase is larger than the preceding increase
d) none of the above

5.

Number of Factory Workers	Total Number of Tape Recorders
0	0
1	7
2	15
3	25
4	30
5	32

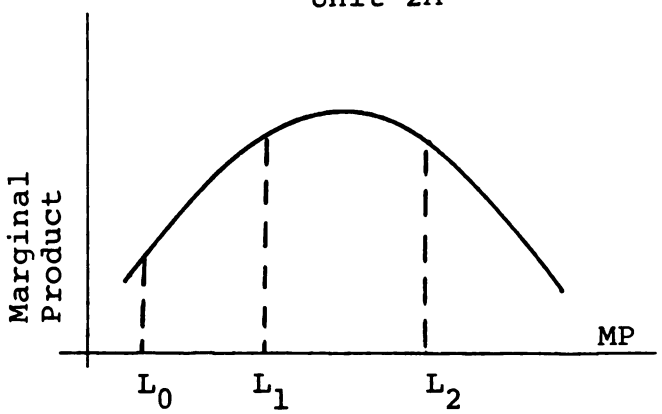
The point of diminishing marginal returns occurs when there is:

a) an increase from 1 to 2 men
b) an increase from 2 to 3 men
c) an increase from 3 to 4 men
d) an increase from 4 to 5 men

6. As labor input is changed by one unit, the resulting change in total output is called

a) average product
b) marginal product
c) marginal profit
d) marginal utility

7. Unit 2A



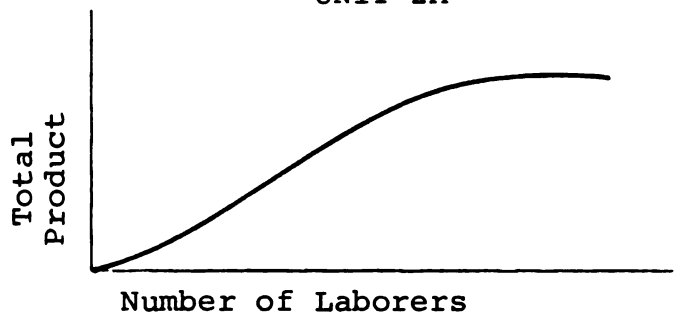
In the range L_1 L_2 the firm is experiencing

a) diminishing marginal returns
b) diminishing marginal profits
c) negative returns

8. Which of the following statements is (are) true?
   a) As the firm expands output in the short run, Diminishing Marginal Returns will be encountered at some stage of production
   b) As the firm expands output in the long run Diminishing Marginal Returns need not occur
   c) Both of the above statements are true
   d) none of the above

9. If, as the firm attempts to expand output, one of the inputs cannot be increased
   a) output will at some point begin to increase at a decreasing rate
   b) total output will diminish
   c) (a) and (b)
   d) neither (a) nor (b)

10.



The above graph shows a short-run production schedule for a typical firm. If in the long run the firm increases the number of machines (items of capital) in its plant

a) the entire production schedule will shift upward
b) the entire production schedule will remain the same
c) the entire production schedule will shift leftward
d) total production will fall because output can be expanded only in the short run

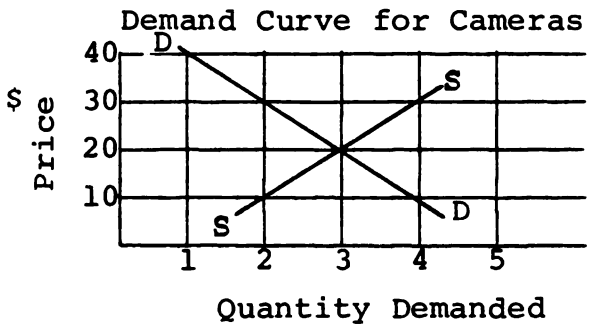
11. When a business cannot increase a fixed input, it will not be able to:

a) increase production
b) pay its bills
c) maintain indefinitely the extra amount of output per extra variable input added
d) keep the quality of its product high

UNIT 3A

1. Demand is defined as:
   a) a change in the tastes of consumers at a given time
   b) all of the amount of a product that a particular consumer can possibly use
   c) the amount that consumers are willing to buy at a particular price
   d) the various amounts of a product that consumers are willing and able to buy at each possible price

2. Answer the following question using the graph below. If the price of a camera is $30, what would be the quantity demanded?
   a) 1
   b) 2
   c) 3
   d) 4



3. The downward slope of a demand curve is due to the fact that as price rises
   a) demand falls
   b) quantity demanded falls
   c) quantity demanded rises
   d) quantity supplied remains the same

4. The Law of Demand states that as price falls
   a) quantity demanded rises
   b) demand rises
   c) demand falls
   d) none of the above

UNIT 3A

5a. The following are individual demand schedules for A and B

Price	Quantity Demanded for A	Quantity Demanded for B
10	3	0
9	4	0
8	6	0
7	8	4
6	10	5

If on the above information one were to produce a market demand schedule, one would find that quantity demanded (for the market) at a price of $8 is:

a) 0 units
b) 48 units
c) 6 units
d) 60 units

5b. The market demand curve is derived by:

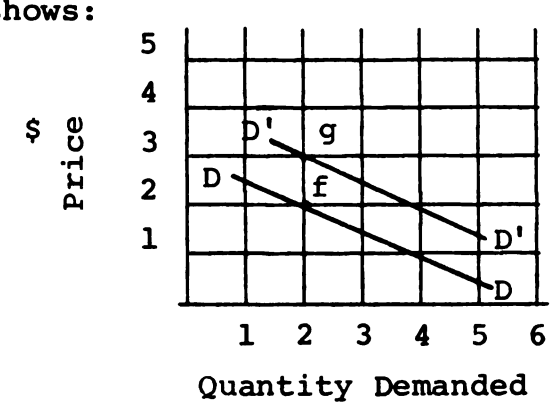
a) summing the individual demand curves
b) summing demand and supply
c) multiplying all quantities demanded by their respective prices
d) none of the above

6. All of the following economic events will cause demand to change except:

a) change in income
b) a change in price of that product
c) a change in taste
d) a change in expectations

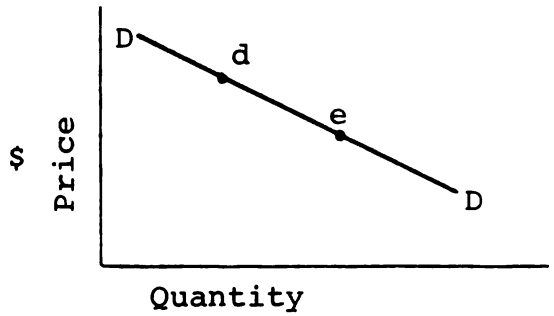
7. This question is based on the graph shown below. Moving from Point g to f shows:

a) a change in quantity demanded
b) a change in the stabilization of goods
c) less change than expected
d) a change in demand



UNIT 3A

8. This question is based on the graph shown below. Moving from Point d to e demonstrates a:
   a) change in demand
   b) change in quantity demanded
   c) stabilization of price
   d) change in income



9. If the price of coffee rises,
   a) the demand for coffee will likely fall
   b) the quantity of coffee demanded will likely fall
   c) both (a) and (b)
   d) neither (a) nor (b)

UNIT 4A

1. Supply may be defined as:
   a) the behavior of buyers in terms of the quantity of a commodity they are willing to buy when confronted with different prices for that commodity at some specified time
   b) the need for money in an economy
   c) the quality of the commodity produced when prices are low
   d) the behavior of producers in terms of the quantity of a commodity they are willing to sell when confronted with different prices for that commodity at some specified time

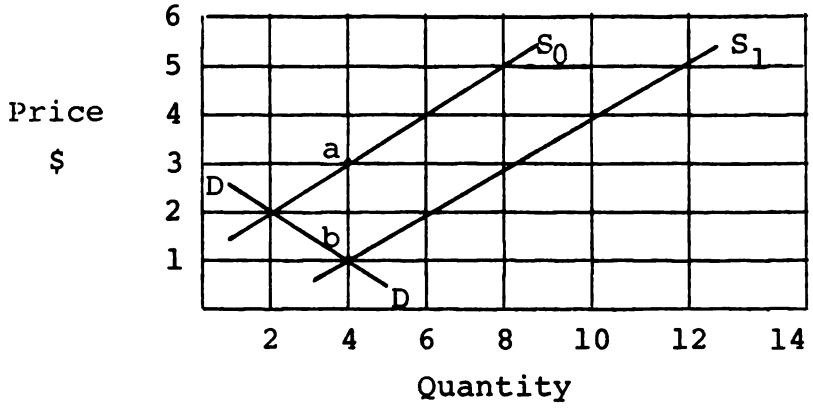
2. The Law of Supply states that:
   a) as the price of any commodity rises, the quantity that suppliers are willing and able to offer for sale decreases
   b) supply is always constant as the price rises
   c) as price rises, supply rises
   d) as the price of any commodity rises, the quantity suppliers are willing and able to offer for sale increases

3. An Individual Supply schedule shows:
   a) all of the amounts of a product which a given producer is willing and able to offer for sale at various possible prices
   b) a particular amount which a producer is willing and able to offer for sale at a particular price
   c) neither (a) nor (b)

4. All of the following economic events will cause supply to change except:
   a) costs of labor
   b) price of related goods
   c) weather
   d) price of that good

UNIT 4A

5. This question is based on the following graph. Moving from Point a to b shows:
   a) an increase in price
   b) a change in quantity demanded and a change in quantity supplied
   c) a change in supply
   d) a change in quantity supplied



6. If a firm that produces potato chips experiences an increase in the price which it must pay for potatoes, the likely result will be that
   a) the firm's demand for potatoes will rise
   b) the firm's demand for labor will rise
   c) the supply of potato chips will increase
   d) the supply of potato chips will decrease

UNIT 5A

1a. By elastic demand we mean that the consumer is able to stretch his dollar to the greatest degree possible.

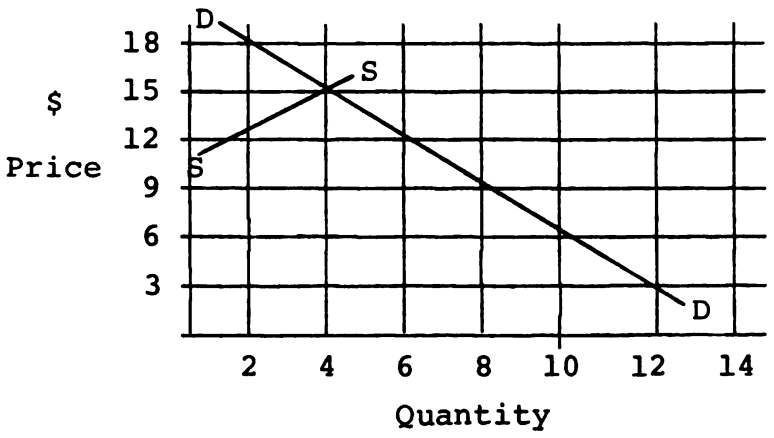
T F

1b. If demand is unitarily elastic and price is increased total revenue (expenditures) will
a) fall
b) rise
c) remain the same
d) change in a way that cannot be predicted

1c. If demand is inelastic an increase in price will cause quantity demanded to fall to zero.

T F

2. The total revenue when price is $15 is: (see graph below):
a) 72
b) 60
c) 15
d) 0



3a. If a reduction in price causes total receipts to fall,
a) the product is an inferior good
b) demand is inelastic
c) demand is unitarily elastic

3b. If demand in elastic and price is reduced, total revenue will
a) rise
b) fall
c) remain the same

UNIT 5A

3c. If demand is unitarily elastic and price is reduced, total revenue will
   a) rise
   b) fall
   c) remain the same

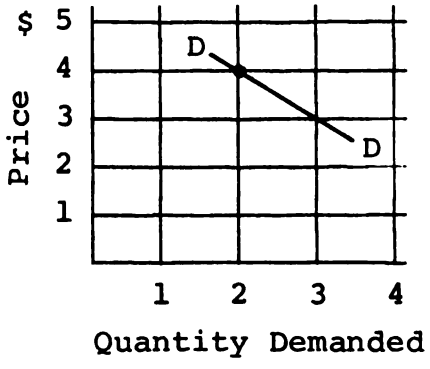
4a. If demand is elastic, an increase in price will cause total revenue to:
   a) increase
   b) decrease
   c) remain the same
   d) reverse itself

4b. If demand is inelastic and price is increased, total revenue will
   a) rise
   b) fall
   c) remain the same

4c. When an increase or decrease in price does not change total revenue, this is called:
   a) elastic demand
   b) inelastic demand
   c) altruistic elastic demand
   d) unitary elastic demand

5. The coefficient of price elasticity of demand is
   a) $\% \Delta Q_D / \% \Delta P$
   b) $\% \Delta P / \% \Delta Q_D$
   c) P/Q_D
   d) Q_D/P

6. Using the midpoint formula, compute the elasticity coefficient for a price increase from \$3 to \$4.
   a) 2.33
   b) 7.37
   c) 2.83
   d) None of the above



UNIT 5A

7a. An elasticity coefficient of 2 denotes that demand is:
  a) elastic
  b) inelastic
  c) unitary
  d) unlimited

7b. If $\frac{\text{\% Change in Quantity Demanded}}{\text{\% Change in Price}}$ is less than 1, but greater than zero
  a) quantity demanded is zero
  b) demand is inelastic
  c) demand is elastic
  d) none of the above

7c. If a price elasticity coefficient is 1.00, one may conclude that demand is
  a) elastic
  b) inelastic
  c) unitarily elastic

8. When $\frac{\text{\% Change in Quantity Demanded}}{\text{\% Change in Price}}$ is equal to 1 and price falls, total revenue will:
  a) fall
  b) rise
  c) remain the same
  d) equal 0

9. The following is <u>not</u> a determinant of elasticity of demand:
  a) number of uses of the product
  b) availability of substitutes
  c) the degree of necessity of the product
  d) the number of sellers in the market

10. The price of thimbles rises from $.05 to $.06. The primary determinant of degree of elasticity of demand for this product is
  a) the availability of leather shoes
  b) the necessity of the product
  c) the availability of substitutes
  d) the relatively low price of the product (as compared to the user's income)

UNIT 6A

1a. A market is
   a) any medium in which buyers and sellers interact
   b) defined by national boundaries
   c) defined by state boundaries
   d) a building in which goods and services are exchanged

1b. Which of the following are considered to be characteristic of a competitive market?
   a) there are many buyers and sellers
   b) there is free entry or exit
   c) the product is qualitatively the same among producers
   d) all of the above
   e) just (a) and (b)

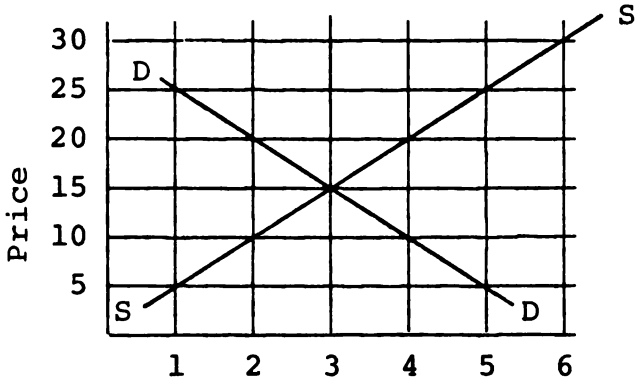
1c. Equilibrium price occurs when:
   a) there is a surplus and no shortage
   b) there are no shortages or surpluses
   c) quantity demanded is equal to quantity supplied
   d) both (b) and (c)

1d. A shortage occurs when:
   a) at a given price, quantity supplied is greater than quantity demanded
   b) at a given price, quantity supplied is less than quantity demanded
   c) consumers cannot buy all of a particular product which they can possibly use
   d) people want less of a commodity

1e. Which statement does <u>not</u> correctly identify the events surrounding a surplus?
   a) at a given price, quantity supplied is greater than quantity demanded
   b) supply is greater than demand
   c) competition will begin to decrease production
   d) all of the above are events surrounding a surplus

UNIT 6A

2a. The Supply and Demand for Blenders



A shortage exists at the following price:
- a) $20
- b) $25
- c) both (a) and (b)
- d) neither (a) nor (b)

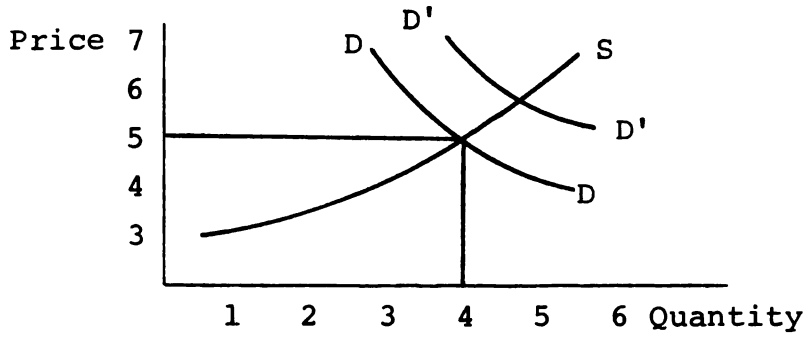
2b. At $25 the difference between quantity supplied and quantity demanded is:
- a) 4000 blenders
- b) 3000 blenders
- c) $20
- d) Not enough information is given in that the graph shows only supply and demand and not quantities demanded and supplied

2c. The equilibrium price for blenders is:
- a) $10
- b) $15
- c) $20
- d) Not enough information is given to determine equilibrium price

3. As the price of a good increases, we would expect that
- a) quantity supplied will decrease and quantity demanded will increase
- b) quantity demanded will decrease and quantity supplied will increase
- c) supply will increase and demand will decrease
- d) both demand and supply will decrease

UNIT 6A

4.



Price is initially in equilibrium at $5 (and the equilibrium quantity is 4 units). Now suppose that demand increases, as is represented by a rightward shift of the demand schedule to D'D. Accordingly, the new equilibrium price and quantity will be, respectively

a) 3 dollars and 3 units
b) 3 dollars and 5 units
c) 6 dollars and 3 units
d) 6 dollars and 5 units

5. Which one is <u>not</u> a rationing function of price?

a) it decides who will be able to obtain a commodity
b) it decides who will not be able to obtain a commodity
c) it decides who will be able to supply a commodity
d) it guarantees that everyone will be able to purchase all of a given product that is necessary to meet all of his needs

UNIT 1B

Name . . . . . .

1. When in economics we say that goods are scarce, we mean that
   a) the majority of the world's population, and some Americans, live in poverty
   b) many goods are rare and cannot be found in just any store
   c) there are not enough goods or resources to satisfy all human wants, even in a rich country
   d) quantity demanded exceeds quantity supplied for those goods

2a. Which of the following does not belong to one of the major categories of resources
   a) bulldozer
   b) skilled labor
   c) cash that a firm has on hand to purchase supplies
   d) owner and manager of a print shop

2b. An example of capital is
   a) lumber
   b) a factory
   c) a truck driver

3. The opportunity cost of my attending a football game is measured by
   a) what I could otherwise have bought by spending the price of the admission ticket on something else
   b) the $7 that I spent for the admission ticket plus the $3 spent on peanuts, hotdogs, and softdrinks watching the game
   c) the $7 that I spent for admission to the stadium
   d) the $7 for the admission ticket plus the anxiety caused by the fact that the home team lost the game
   e) the price of the foregone alternative (i.e., $2 admission to a rugby match)

4. Which of the following assumptions are necessary to define the concept of production possibilities?
   a) production is efficient
   b) supply of resources is fixed
   c) technology is changing
   d) both (a) and (b)

UNIT 1B

5. A production-possibility curve
   a) connects the points indicating all combinations of resources needed to produce a given combination of products
   b) is the border between combinations of goods that are obtainable and combinations of goods that are not obtainable
   c) divides those combinations of goods that are preferred by a consumer from those that are not preferred
   d) none of the above

6. The law of increasing cost occurs because
   a) different prices are charged for goods
   b) resources are not perfectly adaptable to producing different goods
   c) a certain product may satisfy some people more than others
   d) some methods of production are not efficient

7. Points to the left of the current production-possibility curve
   a) are currently unobtainable and are expected to remain so
   b) will be obtainable only if there is economic growth
   c) indicate that some factors of production are unemployed or underemployed
   d) both (b) and (c)

8. A shift outwards in the production-possibility curve
   a) would result if less production became more labor-intensive and capital-intensive
   b) could reflect higher prices for goods
   c) could reflect increased opportunity costs
   d) could result from the increased productivity of resources
   e) represents decreases in opportunity costs

9. If technology remains constant with respect to the production of food, but technology increases with respect to clothing production, the production possibilities curve will
   a) shift outward in parallel fashion
   b) shift outward on the clothing scale but not on the food scale
   c) shift inward on the food scale but remain constant on the clothing scale
   d) none of the above

UNIT 1B

10. The greater the proportion of resources which a society uses to produce capital goods (rather than consumer goods)
    a) the greater will be the future rate of unemployment
    b) the greater will be the future rate of growth
    c) the lower will be the future rate of production of consumer goods
    d) both (a) and (c)

Exact time of your completion . . . . . .

UNIT 2B

Name . . . . . .

1. Which of the following would be considered to be either an input or an output in a trucking operation?
   a) truck drivers
   b) Diesel fuel
   c) speeding fines
   d) all of the above

2a. A "variable" input is one which
   a) may be either increased or decreased in the long run
   b) may be either increased or decreased in the short run but not in the long run
   c) neither (a) nor (b)

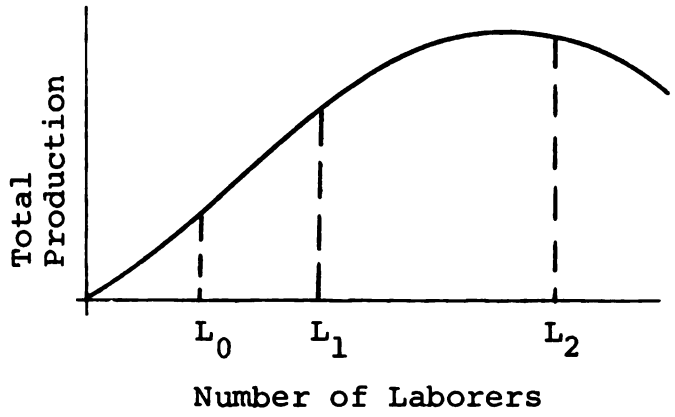
2b. Fixed input used by the firm
   a) increases as the firm increases output in the short run
   b) remains constant as the firm increases output in the short run
   c) will always be fixed at zero units in the short run
   d) causes output to be fixed at a constant level in the short run

2c. Which of the following would be considered to be a variable input for a sardine packing firm?
   a) the number of sardines used
   b) the number of sardine cleaning machines
   c) the number of sardine canning machines
   d) all of the above

3. In the range of Diminishing Marginal Returns
   a) total product (output) falls as more and more variable inputs are used in conjunction with given amounts of fixed inputs
   b) total product increases by successively smaller amounts as more and more variable inputs are used in conjunction with given amounts of fixed inputs
   c) the firm's total revenue (sales) fall as more and more variable inputs are added to given amounts of fixed input
   d) the firm's total profits fall as more and more variable input are added to given amounts of fixed input

UNIT 2B

4.



Diminishing Marginal Returns begins to occur at which rate of labor useage?

a) L_0
b) L_1
c) L_2
d) none of the above

5. At what employment level does the marginal output schedule at right <u>first</u> exhibit diminishing marginal returns?

a) 2 workers
b) 4 workers
c) 7 workers
d) none of the above

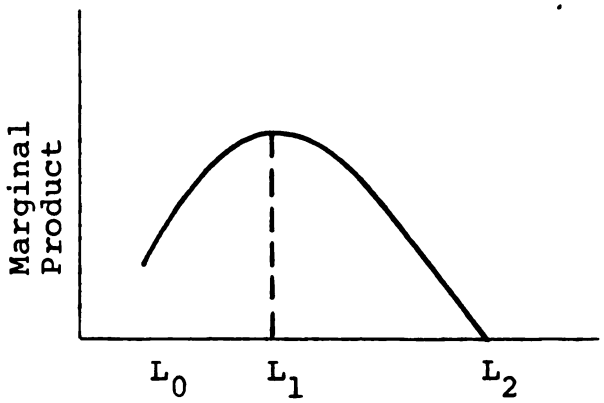
Labor	Total Output	Marginal Output
1	10	10
2	25	15
3	46	21
4	76	30
5	121	45
6	191	70
7	301	110

6. The rate of change in total output per unit change in Labor input is called

a) marginal cost
b) marginal utility
c) average product
d) none of the above

UNIT 2B

7.



In the range L_0 L_2 total output is
a) rising at decreasing rate
b) rising at an increasing rate
c) falling at an increasing rate
d) falling at a decreasing rate

8. Which of the following statements is (are) correct?
a) output follows the same expansion in both the short and long run
b) Diminishing Marginal Returns occurs only in the short run
c) output is certain to decrease in the long run
d) none of the above

9. If, as the firm attempts to expand output, one of the inputs cannot be increased (even in the long run)
a) the firm will eventually experience Diminishing Marginal Returns
b) production must immediately cease
c) production may continue but only at a more or less constant rate
d) none of the above

10. If the firm expands, the amount of machines (capital) which it has in production, the effect will be
a) that of increasing the productivity of the labor employed by the firm
b) that of decreasing the productivity of the labor in that each worker will have too many machines with which to work
c) that of increasing unemployment
d) that production will not be affected in any way unless more workers are added as well

UNIT 2B

11. If a producer with a production process consisting of two inputs, labor and capital, wishes to increase output in the long run in the most efficient manner, he should do so by increasing capital while keeping labor

T F

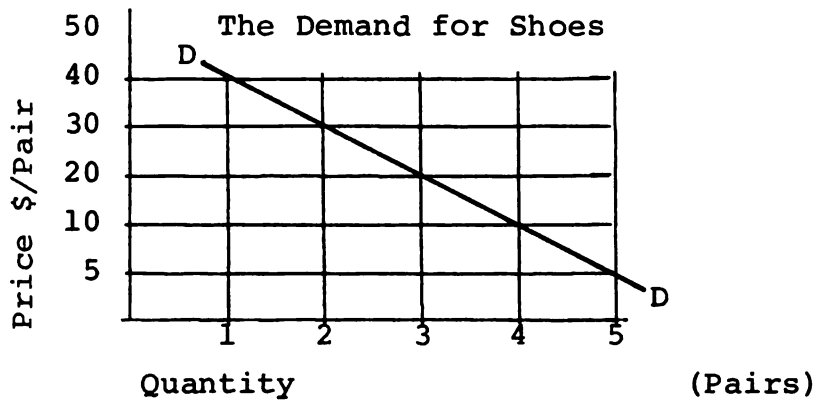
Exact time of your completion . . . . . .

UNIT 3B

Name . . . . . .

1. Demand is
   a) a schedule of the various amounts of a product which a consumer is willing and able to buy at various possible prices
   b) a schedule of the various amounts of a product that a producer is willing to offer for sale at various possible prices
   c) a specific amount that a consumer is willing and able to buy at a particular price
   d) undefinable

2.



At a price of $10 the quantity of shoes demanded will be
   a) 1 pair
   b) 2 pairs
   c) 3 pairs
   d) 4 pairs
   e) not enough information given to determine <u>quantity demanded</u>; the graph shows only <u>demand</u>

3. The demand curve is downward-sloping because
   a) consumers will buy more at higher prices than at lower prices
   b) consumers will buy more at lower prices than at higher prices
   c) producers start running out of the product as more is demanded
   d) producers are not willing to supply as much as product if price is decreased

UNIT 3B

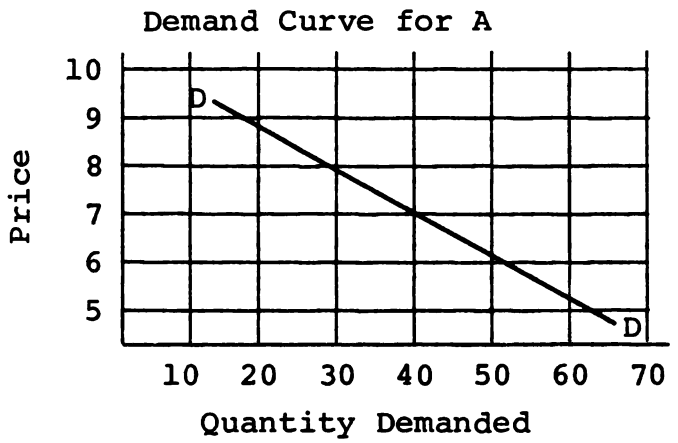
4. The "Law of Demand" states that
   a) more will be bought at higher prices than at lower prices
   b) more will be bought at lower prices than at higher prices
   c) supply determines demand
   d) demand determines price

5a. The following are individual demand schedules for X and Y

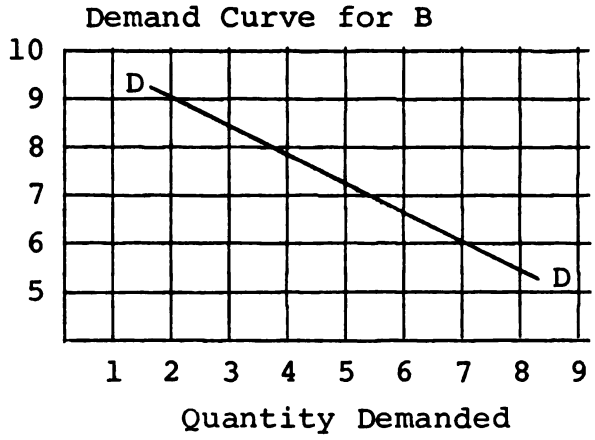
Price	Quantity Demanded by X	Quantity Demanded by Y
$20	0	1
18	0	2
16	0	3
14	1	4
12	2	5
10	3	6

If on the basis of the information above one were to produce a market demand schedule one would find that a price of $14, quantity demanded for the market is
   a) 14
   b) 4
   c) 5
   d) none of the above

5b. The following are individual demand curves for A and B



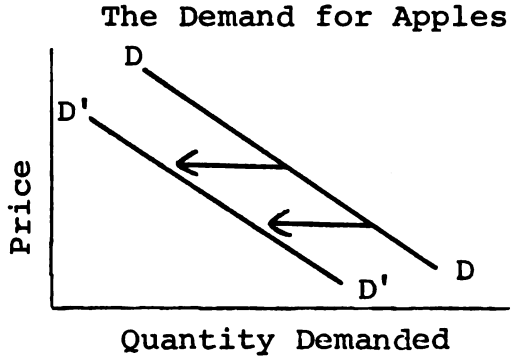
UNIT 3B



The curves show that at a price of $7 the quantity demanded by the market is
a) 40
b) 46
c) 6
d) the amount cannot be determined on the basis of the information given above

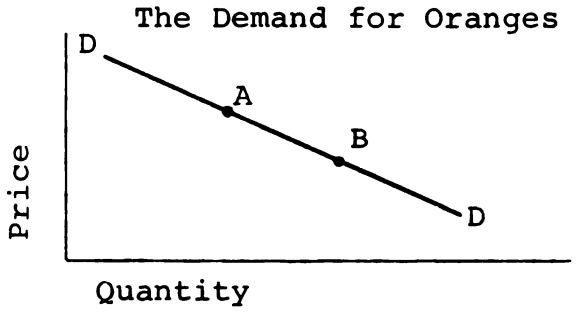
6. Which of the following would not lead to a change in the demand for a particular product?
a) a change in price of the product
b) a change in tastes
c) a change in income
d) a change in the prices of other goods

7.



The leftward shift in the demand schedule shows that
a) demand has increased
b) demand has decreased
c) demand has remained constant; only quantity demanded has changed
d) none of the above

UNIT 3B



Movement from Point A to Point B on the demand curve DD represents
a) an increase in demand
b) a decrease in demand
c) a decrease in quantity demanded
d) an increase in quantity demanded
e) both (a) and (d)

9. If the price of tea rises
a) the demand for coffee will likely rise
b) the quantity of tea demanded will likely rise
c) both (a) and (b)
d) neither (a) nor (b)

Exact time of your completion . . . . . .

UNIT 4B

Name . . . . . .

1. Supply is
   a) a schedule of the various amounts of a product which a consumer is willing and able to buy at various possible prices
   b) a schedule of the various amounts of a product which a producer is willing and able to offer for sale at various possible prices
   c) a specific amount of product which the producer is willing and able to make available at a particular price
   d) undefinable

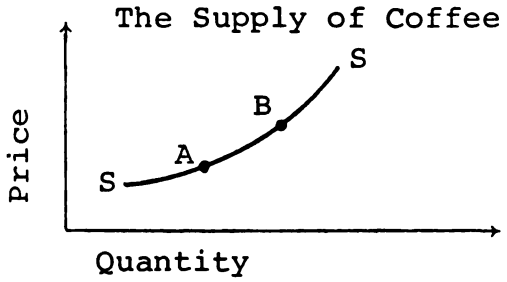
2. As price rises, quantity supplied
   a) rises
   b) falls
   c) remains the same
   d) cannot be predicted

3. A market supply schedule shows
   a) a summation of the supply curves of the individual producers
   b) the total number of producers who are willing to sell any amounts at all in a given market
   c) neither (a) nor (b)

4. Which of the following is not a determinant of the supply of a product?
   a) the price of the product
   b) the wages paid to labor used by the firm
   c) the transportation costs paid out by the firm to transport the product from the factory to the market
   d) all of the above

UNIT 4B

5.



Movement from Point A to Point B on Curve SS represents:

a) an increase in supply
b) an increase in quantity supplied
c) both (a) and (b)
d) neither (a) nor (b)

6. If the price of potato chips rises

a) the supply of potato chips will increase
b) the quantity of potato chips supplied will increase
c) both (a) and (b)
d) neither (a) nor (b)

Exact time of your completion . . . . . .

UNIT 5B

Name . . . . . .

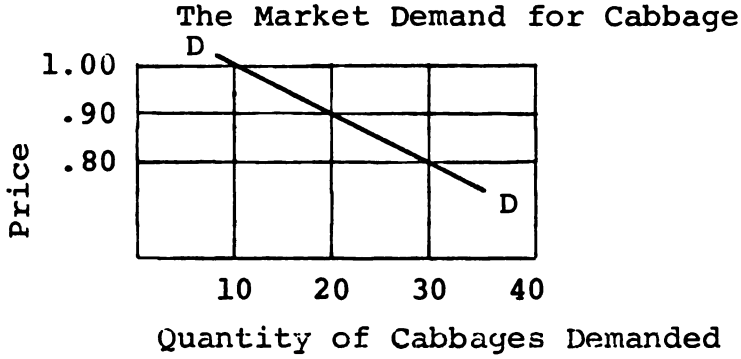
1a. Demand is elastic if the $\%\Delta Q_D / \% \Delta P$ is

a) equal to one (1)
b) greater than one (1)
c) less than one (1)
d) zero

1b. Demand is unitarily elastic if the $\%\Delta Q_D / \%\Delta P$
a) is equal to one (1)
b) is greater than one (1)
c) is less than one (1)
d) zero

1c. Demand is inelastic if the $\%\Delta Q_D / \%\Delta P$ is
a) equal to one (1)
b) greater than one (1)
c) less than one (1)
d) infinite

2.



At a unit price of $.90 the firm's total revenue
a) is $18
b) is $1.80
c) is $16
d) cannot be computed given the information shown above
e) none of the above

3a. If an increase in price leads to a reduction in total revenue, demand is said to be inelastic

T F

UNIT 5B

3b. Demand is said to be inelastic, if a reduction in price leads to a reduction in total revenue

T F

3c. Demand is said to be unitarily elastic if either increases or decreases in price leave total revenue unchanged

T F

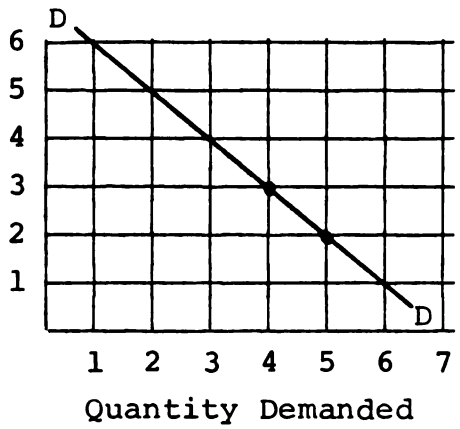
4a. If a price increase causes total revenue to fall, demand is said to be
- a) elastic
- b) inelastic
- c) unitarily elastic

4b. If demand is elastic and price is increased, total revenue will
- a) rise
- b) fall
- c) remain the same

4c. If demand is unitarily elastic and price is increased, total revenue will
- a) rise
- b) fall
- c) remain the same

5. The coefficient of price elasticity of demand is
- a) the percentage change in quantity demanded divided by the percentage change in price
- b) the percentage change in price divided by the percentage change in quantity demanded
- c) the absolute change in price divided by the absolute change in quantity demanded
- d) the absolute change in quantity demanded divided by the absolute change in price

6.



Using the midpoint formula, the computation of the elasticity coefficient for a price reduction from $3 to $2 is
a) .90
b) 1.71
c) .81
d) .55

7a. If a price elasticity coefficient is 2.11, one may conclude that
a) a 1% decrease in price will lead to a 2.11% increase in quantity demanded
b) a 1% decrease will lead to a 2.11 decrease in quantity demanded
c) demand is inelastic
d) none of the above

7b. If a price elasticity coefficient is .37 one may conclude that a price reduction will lead to
a) an increase in total revenue
b) a decrease in total revenue
c) no change in total revenue
d) none of the above

7c. If the demand elasticity coefficient is equal to one (1) demand is
a) inelastic at all prices
b) unitarily elastic at all prices
c) none of the above

8. If the coefficient of elasticity of demand is .74 a price increase will cause total revenue to
a) rise
b) fall
c) remain the same

UNIT 5B

9. Which of the following considerations are likely to affect the elasticity of demand for a particular brand of soap?
   a) the fact that there are a large number of competing brands of soap
   b) the fact that society has strong views about the importance of cleanliness
   c) the fact that the price of soap is very low relative to the income of those who use it
   d) all of the above

10. The price of table salt increases from $1.00 per 10 ounce box to $1.50. The primary determinant of elasticity of demand for this product is
   a) the number of uses for the product
   b) the necessity of the commodity
   c) the availability of substitutes

Exact time of your completion . . . . . .

UNIT 6B

1a. A market is always defined as any structure where goods and services are exchanged

T F

1b. Which of the following is not a characteristic of a competitive market?

a) there are many buyers but only one seller
b) there is free entry into or out of the market by buyers and sellers
c) there are many sellers

1c. "Equilibrium" price is always that price

a) which is established by Government
b) at which there are no shortages or surpluses
c) at which sellers are able to sell all of the output that they can possibly produce
d) consumers are able to buy all of the output that they can possible use
e) both (c) and (d)

1d. A shortage exists if

a) consumers have a need for a product but do not have the money to buy it
b) quantity supplied exceeds quantity demanded
c) quantity demanded exceeds quantity supplied
d) demand exceeds supply
e) none of the above

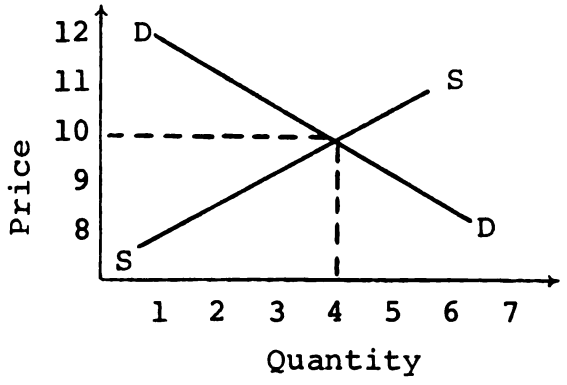
1e. A "surplus" of corn

a) represents an excess of quantity demanded over quantity supplied at existing price
b) results when existing price is lower than the equilibrium price
c) both (a) and (b)
d) neither (a) nor (b)

2a. A shortage exists at the following price:

UNIT 6B

The Demand and Supply for Sporting Events



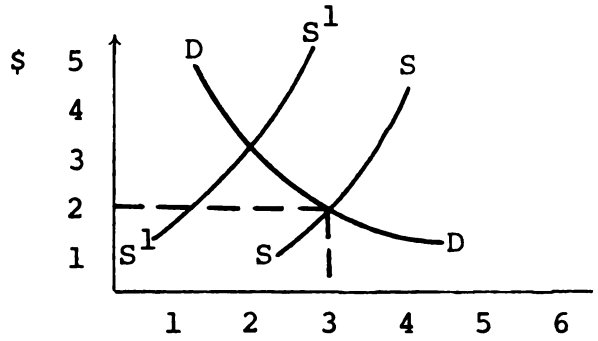
a) $10
b) $11
c) $12
d) $ 8

2b. A surplus exists at which price?
a) $8
b) $9
c) $10
d) none of the above answers is correct

2c. The equilibrium price for sporting events is:
a) $8
b) $9
c) $10
d) none of the above answers is correct

3. If, in the market for a particular good or service, quantity supplied exceeds quantity demanded
a) price will rise, quantity demanded will fall, and quantity supplied will rise
b) price will rise, demand will fall, and supply will rise
c) price will rise and quantity demanded and quantity supplied will remain the same
d) price will fall, quantity demanded will rise, and quantity supplied will fall
e) both (a) and (b)

4.



Price and quantity are initially in equilibrium at $2 and 3 units respectively. Now suppose that supply decreases (as is indicated by a leftward shift of the supply schedule to S^1S^1). Accordingly, the new equilibrium price and quantity will be respectively

a) $1 and 3 units
b) $1 and 2 units
c) $2 and 1 unit
d) none of the above

5. If at the prevailing price quantity demanded exceeds quantity supplied, price will serve as a rationing mechanism in that it will rise thereby

a) reducing quantity demanded
b) increasing quantity supplied
c) both (a) and (b)
d) neither (a) nor (b)

APPENDIX C

CONTENT VALIDATION OF ITEMS

TABLE C-1.--Content Validation of Items 1 - 69

Item No.	Testform A					Testform B					Item No.	Testform A					Testform B				
	G	Wi	B	We	S	G	Wi	B	We	S		G	Wi	B	We	S	G	Wi	B	We	S
1	3	3	-	4	4	3	3	-	3	4	19	3	3	-	4	4	3	3	-	3	3
2	3	3	-	3	3	3	3	-	3	4	20	3	3	-	4	4	3	3	-	4	4
3	3	3	-	3	3	3	3	-	4	4	21	3	3	-	3	4	3	3	-	3	4
4	3	3	-	4	4	3	3	-	4	4	22	3	3	-	4	4	4	3	-	4	4
5	3	3	-	3	3	3	3	-	3	3	23	3	3	-	3	4	3	4	-	4	4
6	4	3	-	4	3	3	3	-	3	4	24	3	3	-	3	3	3	3	-	4	4
7	3	3	-	3	3	3	3	-	4	4	25	3	3	-	3	4	3	4	-	4	4
8	3	3	-	3	4	3	3	-	3	4	26	4	3	-	3	4	4	3	-	4	4
9	3	3	-	3	4	3	3	-	4	4	27	4	3	-	4	4	3	3	-	4	4
10	3	4	-	3	4	3	3	-	3	4	28	4	3	-	4	4	4	3	-	4	4
11	3	3	-	3	4	3	3	-	3	4	29	3	3	-	3	4	3	3	-	4	4
12	3	3	-	4	4	4	3	-	3	4	30	3	3	-	4	4	3	3	-	4	4
13	3	3	-	3	4	3	3	-	3	3	31	3	3	-	4	4	3	3	-	4	4
14	3	3	-	4	4	3	3	-	3	4	32	3	3	-	4	4	3	3	-	4	4
15	4	3	-	4	4	3	3	-	4	4	33	4	3	-	4	4	4	3	-	3	4
16	4	3	-	4	4	4	4	-	3	4	34	3	3	-	3	4	4	3	-	4	4
17	3	4	-	3	4	3	3	-	3	4	35	3	3	-	3	4	3	3	-	4	4
18	3	3	-	3	4	3	3	-	4	4	36	3	3	-	3	4	4	3	-	4	3

TABLE C-1.--Continued

Item No.	Testform A					Testform B					Item No.	Testform A					Testform B				
	G	Wi	B	We	S	G	Wi	B	We	S		G	Wi	B	We	S	G	Wi	B	We	S
37	3	3	-	3	3	3	3	-	4	4	53	4	3	-	4	4	-	4	4	3	4
38	3	3	-	4	4	3	3	-	4	4	54	3	3	-	4	4	-	4	4	4	4
39	3	3	-	3	4	3	3	-	3	4	55	-	4	4	3	4	-	3	3	3	4
40	4	4	-	4	3	3	3	-	3	4	56	3	3	-	4	4	-	3	3	4	4
41	3	3	-	3	3	-	4	3	3	4	57	3	3	-	3	4	-	3	3	4	4
42	-	3	3	3	4	-	4	3	3	4	58	-	4	3	4	4	-	3	3	4	3
43	3	3	-	3	4	-	4	3	4	4	59	4	3	-	3	4	3	3	-	4	4
44	4	3	-	3	4	-	4	3	3	4	60	4	3	-	4	4	3	3	-	4	4
45	-	4	3	4	4	-	3	3	3	4	61	3	3	-	3	4	3	3	-	4	4
46	-	4	4	3	4	-	3	3	3	4	62	3	3	-	3	4	4	4	-	4	4
47	-	4	4	3	4	-	3	3	3	4	63	3	4	-	3	3	3	4	-	3	4
48	-	4	4	4	4	-	4	3	3	4	64	4	4	-	3	4	3	3	-	4	4
49	-	4	4	4	4	-	4	4	3	4	65	3	3	-	4	4	3	3	-	3	4
50	3	3	-	4	4	-	4	4	3	4	66	4	3	-	4	4	4	3	-	3	4
51	-	3	3	3	4	-	3	3	3	4	67	-	3	3	3	4	3	4	-	3	4
52	-	4	4	4	4	-	4	4	3	4	68	4	4	-	4	4	4	4	-	3	3
											69	3	3	-	3		3	3	-	4	4

Legend: B = J. Boswell; G = L. Goldberg; S = F. Shu; We - E. Weber; Wi - A. Wilkins
Rating of item with respect to obejctive: 1 = not at all relevant; 2 = somewhat relevant; 3 = quite relevant; 4 = extremely relevant

APPENDIX D

SURVEY QUESTIONNAIRE

Q U E S T I O N N A I R E

Please mark the answers to these questions on the scoring sheet and use a number 2 pencil only.

1. What is your sex?
   a) Male
   b) Female

2. Marital Status
   a) Single
   b) Married

3. Age
   a) 20 or younger
   b) 21 to 30
   c) 31 to 40
   d) 41 to 50
   e) .... years of age

4. Current grade point average
   a) 2.0 - 2.39
   b) 2.4 - 2.79
   c) 2.8 - 3.19
   d) 3.2 - 3.59
   e) 3.6 or higher

5. Have you ever had a college level course in economics before?
   a) Yes
   b) No

6. Have you ever had a full semester high school course in economics before?
   a) Yes
   b) No

7. Have you had a course in calculus?
   a) Yes
   b) No

8. How would you rate your interest in economics as a course relative to other introductory social science courses such as political science or sociology?
   a) Very High
   b) High
   c) Average
   d) Low
   e) Very Low

9. How would you rate the importance of economics?
   a) Very High
   b) High
   c) Average
   d) Low
   e) Very Low

10. Do you believe a course in economics should be required of all college students? Agree?
   a) Very strongly
   b) Yes
   c) Neutral
   d) Do not
   e) Very strongly disagree

11. The philosophy and instructional format adopted in the microeconomics lab was clearly different from that followed in most college courses. Agree?
   a) Very strongly
   b) Yes
   c) Neutral
   d) Do not
   e) Very strongly disagree

12. This lab in microeconomics provided a useful preparation for teaching economics. Agree?
   a) Very strongly
   b) Yes
   c) Neutral
   d) Do not
   e) Very strongly disagree

13. The lab in microeconomics was an enjoyable educational experience.
   a) Very strongly
   b) Yes
   c) Neutral
   d) Do not
   e) Very strongly disagree

14. I learn more in settings in which I can assume major responsibility for deciding how things will be learned than in those in which the instructor assumes this responsibility. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

15. The micro-lab personnel should make a concerted effort to improve the testing material for the microeconomics lab. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

16. I felt free to discuss my learning experiences with my tutor. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

17. My tutor provided frequent feedback regarding my learning progress in microeconomics. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

18. The stated objectives facilitated my learning. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

19. My tutor provided valuable feedback regarding my learning progress in microeconomics. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

20. I felt confident in learning situations that require me to self-pace my learning. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

21. I felt confident in laboratory learning situations that require me to work independently. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

22. I enjoyed working through self-instructional materials. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

23. I judged the instructional material in the micro-economics lab to be of good quality compared to the other materials used in other courses. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

24. Alternative test forms were a useful feature of this lab experience. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

25. I would recommend this lab in microeconomics to my friends in economics. Agree?
    a) Very strongly
    b) Yes
    c) Neutral
    d) Do not
    e) Very strongly disagree

APPENDIX E

FACTOR ANALYSIS

TABLE E-1.--Factor Analysis Varimax Rotated Factor Matrix After Rotation with Kaiser Normalization

Variable	Factor 1	Factor 2	Factor 3	Factor 4
5	-.04316	.02505	.28724	.24575
6	-.20264	.12588	.13139	.07910
7	.10423	.40910	.01374	.15166
8	.33054	-.30053	.68891	.17154
9	.28111	-.44487	.65636	.00360
10	.20359	-.26014	.66455	.09260
11	.30787	.00483	-.14997	.49026
12*	.73472	.13561	-.04595	-.04387
13*	.80202	.18620	.24402	-.06529
14	.08317	.71971	-.11832	-.11847
15	.03847	.08840	.01423	-.17105
16	.08875	-.36170	.05202	.08343
17*	.58718	-.14762	.12507	.08645
18	.16809	.40729	-.12128	.25497
19*	.62462	-.34335	.27276	-.00918
20*	.77837	.09168	.00720	-.00888
21*	.77897	.08091	-.10728	.04768
22*	.81464	.25271	.12025	.05112
23	.39564	.70438	-.00050	-.10626
24	-.23294	.38987	.40001	.02203
25*	.62001	.06809	.50025	.01228

* = Items on the Survey Questionnaire that filtered out as Factor 1 and are summarized as ATL score.

APPENDIX F

INSTRUCTIONS FOR MASTERY LEARNING

INSTRUCTIONS FOR MASTERY LEARNING

Welcome to the microeconomics lab. You will study microeconomics with self-instructional material that is presented in the Student Tutor and the accompanying tapescript. Dr. Sunday will assist you while you are working on each unit in the microeconomics module. You also will take a pre-test when you turn to a new unit. Instead of the pre- and posttests for each unit in the Student Tutor you will use those that are presented along with the tapescript.

In taking a pre-test you will get an idea of what you will learn in the unit or of what you already know. Please, do not forget to fill out the exact date and time including the day of the week before taking this test and hand it after your completion to Bea Helmke and then start working on the unit.

After your completing the unit take the post-test in order to find out whether all the principles and concepts taught in the unit are really clear to you. Again, please, don't forget to enter the exact time and date including day of the week after you finish the test. Then, turn this test in to Bea who will check for your answers and give you any additional test items that help you master a particular objective on the unit in case you missed the related test item.

This provision is made so that you can be absolutely certain of having mastered the entire unit before moving on to the next one in the Student Tutor.

The instructional material used for this microeconomics lab is designed to become optimally learning efficient and effective. Yet several revisions will probably be necessary before this can be accomplished. Therefore, your feedback is much appreciated and will help us improve the lab experience.

We also would like to find out whether you regard the learning material as helpful enough in itself or as better when being tutored. Therefore, we decided to assign you to one of two groups: either the one that is being tutored or the one that is not.

Of course, a tutorial may or may not be beneficial to you at all. According to past experimentation both conditions can lead to highest achievements. Some individuals prefer working through self-instructional material without any guidance and others don't. However, you will not be held responsible for having achieved less without or with being tutored if you believe so. In fact, the sole basis for evaluating your accomplishments in this lab will be the complete mastery of a single unit of the microeconomics module no matter how many times you may attempt to master a specific objective in taking on a new test item or how long it will take you to complete a single unit. It is important that you have an enjoyable learning experience.

APPENDIX G

REASONS FOR DOING WITHOUT QUESTIONING SHEET

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1. The material was very explanatory and no help was necessary.

2. I had few questions, but when I did have questions I thought it was easier to ask than to write them on paper.

3. The material was presented in such a way that any questions I did have could very easily be answered by reviewing my material and experience in E103.

4. I had questions, but I preferred talking to you directly about them rather than spend time writing them down.

5. I only had one question on the sheet the whole time. I don't think it was really on the material directly but it was a for instance type question on the material. The material explained pretty much everything so there was no questions as to what the material meant.

6. The few questions I did have were easier answered directly.

7. The only section that caused any difficulty was V. Rereading solved the problem I had no questions.

8. I just didn't have any questions.

9. The space provided for access to a student was not adequate to provide continuous monitoring of questions. Yes, it was easier to talk to you about a question due to time involved.

10. I didn't have any questions that weren't answered in the book.

11. The information was rather straight-forward. I really had no questions to ask.

12. The question that I first jotted down was soon answered when I read the Student Tutor.

APPENDIX H

REASONS FOR TAKING E 321

REASONS FOR TAKING E321

a. Answers Indicating Extrinsic Motivation

1. I am taking this course mainly because it just fit into my schedule.
2. I am taking this course to fill an elective requirement.
3. Required course for me.
4. Required to fill out one requirement.
5. It was recommended to me by my advisor.
6. It is a requirement in my degree program.
7. Because it was required.

b. Answers Indicating Intrinsic Motivation

1. It is optional and seemed like it might be interesting.
2. Hope to learn about small businesses.
3. To get me closer to knowledge about the subject.
4. I am taking this course to round out my education in business and accounting.
5. To increase my knowledge in the various aspects of the economics of the firm.
6. I am highly interested in business.
7. It sounded relatively interesting.
8. I hope to understand a lot more about economics.
9. I like Econ, and want to know more about the system.

10. I am taking this course because I found economics interesting.

11. My career ambitions include graduate work in international affairs and international law. Any understanding of economics will be of invaluable assistance in this regard.

12. It sounded like an interesting course.

13. Wanted to learn about pricing.

14. I'm taking this course to complete a basic knowledge of economics principles.

15. I'm taking this course because I'm fascinated by the economic system in the U. S.

16. I'm taking this couse to learn how prices affect what businessmen do.

17. I like economics, and it sounds interesting and a class that I believe I would enjoy.

APPENDIX I

SUMMARIES OF ANALYSIS OF VARIANCE OF EFFICIENCY RAW DATA

TABLE I-1.--Summaries of the Analysis of Variance on the Efficiency Raw Data

Sources of Variance	SS	df	MS	F	Level of Significance
	a. Including the Extreme Score				
Treatment (T)	1483.654	1	1483.654	2.083	.165
Characteristic (C)	6115.234	1	6115.234	8.581	.008*
C x T Interaction	173.344	1	173.344	.243	.627
Error	14252.988	20	712.649		
Total	22025.220	23	957.618		
	b. Excluding the Extreme Score				
Treatment (T)	171.083	1	171.083	.906	.353
Characteristic (C)	2948.937	1	2948.937	15.609	.001*
C x T Interaction	93.806	1	93.806	.497	.490
Error	3589.543	19	188.923		
Total	6803.369	22	309.244		

*$p < .05$

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