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I am submitting herewith a dissertation written by Diana Brent entitled "The Effect of Cognitive and Personality Variables on Mastery Learning of Nonsense Syllables." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Educational Psychology and Guidance.

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THE EFFECT OF COGNITIVE AND PERSONALITY VARIABLES ON MASTERY LEARNING OF NONSENSE SYLLABLES

A Dissertation

Presented for the

Doctor of Education

Degree

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Diana Brent

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ABSTRACT

The present study was designed to further investigate the role of prerequisite skills in mastery learning. Also of interest was the affect of general verbal and nonverbal ability and the general personality characteristics of need achievement, locus of control, debilitating anxiety, and facilitating anxiety.

One hundred and six undergraduate volunteers in psychology courses in a small southern university were randomly assigned to one of two groups. Paper-and-pencil measures of cognitive ability and personality constructs were obtained for each subject. The non-mastery group was presented nonsense syllables individually by computer and given only one opportunity to study them. The mastery group had the same treatment on the first trial but then were re-presented the NSS until they had learned them all. Subjects proceeded through the program until they had been presented ten lists of five nonsense syllables of increasing difficulty levels. Nonsense syllables were chosen as the task to minimize prerequisite skills. Since differences in mastery and non-mastery learning have been attributed to prerequisite skills there should have been no differences in the two groups. This was true.

There was no relationship between need achievement, locus of control, debilitating anxiety, and facilitating anxiety and persistence or learning. The only significant findings were between persistence and non-verbal ability on non-mastery learning and the general cognitive factors also predicted persistence for the easier task. Other than on the above mentioned, there was no interaction with difficulty levels. There was also no evidence of learning to learn.

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CHAPTER I

STATEMENT OF PROBLEM

Block (1974) and Burns (1979) have stated that we need to know more about why mastery teaching works. However, even though some research on mastery learning has been conducted there are still many unanswered questions. Therefore, the present study is directed toward filling this research void.

Bloom (1976) reported that long term personality constructs were not important to learning, but the person's attitude toward the subject was. However, several other researchers (e.g. Atkinson, 1957; Chan, 1978; Lefcourt, 1976; S. Sarason & Mandler, 1952; Wine, 1971) found relationships between learning and these long term personality constructs. Therefore, a second purpose of the present study is to find out which of the above two points of view is correct.

Rationale

Mastery Learning

Bloom (1976), in the interest of maximizing education and minimizing individual differences, studied mastery learning and incorporated it into a model for school learning. Looking at school achievement in the first six years, Bloom found that the students who mastered the first

grade did better in the second grade. If the students continued to master in the second, then their achievement was high in the third grade. The effect was consistent--each year built upon the previous year. Conversely, students who got a poor start in first grade, did not do as well in the second, and continued to drop in performance unless some change was effected.

How to effect this change was a concern of Blooms. He studied mastery on a smaller scale and found that if the skills needed to perform were maintained during the learning of a series of tasks, mastery students performed better than non-mastery even though both groups started with the same entry behaviors. Analyzing studies of smaller units of learning, Bloom found that mastery students began at the same place as the non-mastery students but did better on the second task after mastering the first. This behavior pattern continued. When mastery students were tested on each task, they had learned more than the non-mastery students in less time. The farther along they went in a series of subsequent tasks the better the mastery students learned. This was not true for non-mastery students.

Figure 1 shows graphically how the groups change over time. Both groups were being measured on the same test and similar learning conditions, but the mastery group is given guided instruction and/or opportunity to master the material. Guided instruction took the form of some type of

correctives to help the mastery student learn the material. Correctives may have been another type presentation of the same material or individual help. Sometimes the mastery student worked on the same material until it was mastered, usually until at least 80% criterion.

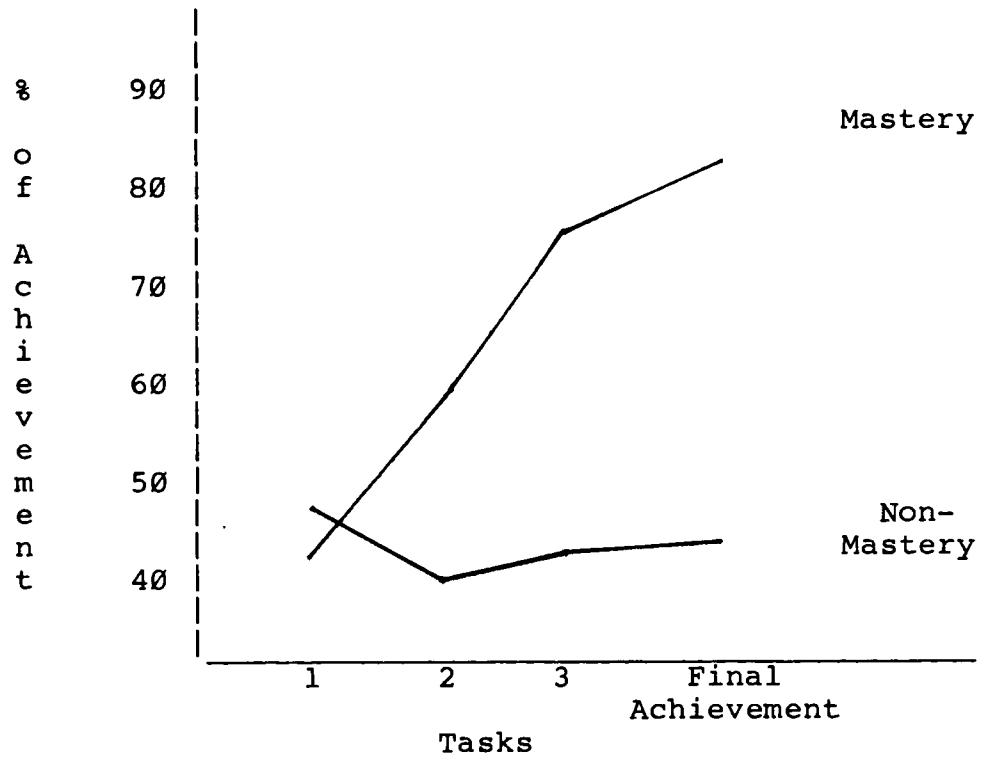


Figure 1

Example of studies cited in Bloom (1976)

Bloom attributed the superiority of mastery teaching over non-mastery teaching to the student's acquisition of prerequisite skills. An example would be learning long division. In doing a task analysis of long division, the first thing the student would need to know (assuming

recognition, naming, and writing of numbers) would be addition. Perhaps, next would be subtraction, then multiplication, short division, and finally long division. It makes sense that if any one of these tasks is not learned, then the learning of long division would become very difficult. On the other hand, if students master the concepts, e.g. multiplication, as they go along then learning the long division would be easier and take less time. Bloom pointed out that each task becomes the prerequisite skill for the next task. According to him, this explains why mastery teaching is superior. It increases relevant prerequisite skills.

Other Theorists

In 1949, Harlow first presented his research on the formation of learning sets. He has expanded and refined this research and gives an excellent discription of learning to learn in his (1979) work with Mears. In Harlow's research, he found animals could be taught a series of tasks. Their behavior showed that after trial-and-error learning, they had developed hypotheses and insight. It appeared that they were able to generalize this learning to similar tasks. For example, once apes learned to use a stick to reach a banana that had been placed out of their reach, it took very little time to get the banana. After this initial learning, they would use the stick to get the

banana regardless of where it was placed. With the stick, they knocked the banana down and with the stick they raked it in. They climbed the sticks or pole vaulted with them. They even assembled short sticks into longer sticks when they were not long enough. Harlow generalized this type of insight learning into all types of learning. He applied it to human primates also.

The pattern that shows learning to learn has taken place is very predictable, according to Harlow (1979). Initial tasks would not show much learning taking place because of trial-and-error learning. Once the subjects has gained insight, there should be a sudden increase in learning then a leveling off and just a gradual increase.

Block (1975) states "mastery methods have yielded some evidence that they are helping students learn how to learn. This evidence is primarily anecdotal and impressionistic;..." The learning of NSS syllables should show a pattern similar to the ones Harlow (1979) discusses if the students are learning to learn. Hopefully this study may provide more concrete evidence for the idea that mastery teaching helps the student learn how to learn.

Burns (1979) and Hyman and Cohen (1979) in reporting the state of the art in mastery learning brought up reasons why they believed mastery learning works. They believed it is the extra time and attention given to the material by the student that causes them to do better when they work to

mastery. There appears to be no empirical evidence for their positions.

Personality

Bloom (1976), in studying the affect of personality on learning, cited a simple measure of the student's attitude toward the subject. The students were asked if they liked the subject or how they felt about the task. Positive relationships were found between these indicators and mastery learning. Students liked the subject better and performed better under mastery conditions.

During the past few years research has proliferated in the area of general personality characteristics of the learner. Findings have been controversial but in general some conclusions have been supported in the literature. Anxiety has been found to influence learning and persistence by causing the student to either be more attuned (facilitating) or have feelings that interfere (debilitating). Debilitating anxiety is also thought to cause the students to hurry when they need to study longer. Atkinson and Feather (1966) and Crawford (1978) found subjects who were highly anxious either felt they could learn more on easier tasks, or that the reason they were not learning was because it was too difficult so they were less anxious and studied longer. Students with less debilitating

anxiety appeared to be more realistic and choose to spend their time on medium difficulty level material.

People with high need for achievement learned more but this again can be associated with difficulty level (Atkinson & Feather, 1966; Crawford, 1978). The students with high need achievement worked harder and learned more on medium difficulty level tasks. Persistence appeared to be related to the way the student felt about the task and if they took personal responsibility for outcomes. The researchers concluded that the students felt they could achieve more for the amount of time invested at this level.

Very few causal studies (Stipek, 198Ø) have been conducted, but they have suggested that locus of control caused achievement rather than the reverse. Social learning theorists (e.g. Rotter, 1966) believe that students' behaviors in achievement situations were influenced by their perceived control of the situation. If the students believed that the outcome was contingent on their behavior, success would increase the likelihood of the students' instrumental behaviors such as attention or persistence on future tasks. If there was no perceived contingency between outcome and behavior then the academic success would not increase the likelihood of such instrumental behaviors.

In this research interest is in bringing together Bloom's theories of mastery learning and the body of research on need achievement, locus of control, and

debilitating anxiety to see if these long term traits have any influence on the students performance in learning a series of tasks using nonsense syllables (NSS).

Questions

In designing the research two broad questions were in mind. (1) While minimizing specific learning prerequisites, by using nonsense syllables will mastery learning subjects score higher and spend less time than non-mastery subjects? (2) Will general cognitive and affective variables relate to persistence and learning? Based on the literature, the following specific hypotheses will be addressed.

Hypotheses

Hypothesis 1

There will be no difference between mastery and non-mastery subjects in learning on the last task in a series of learning tasks using NSS of increasing levels of difficulty.

Hypothesis 2

There will be no difference between mastery and non-mastery subjects in persistence on the last task in a series of learning tasks using NSS of increasing levels of difficulty.

Hypothesis 3

There will be no difference between mastery and non-mastery subjects in learning on a series of ten learning tasks using NSS of increasing levels of difficulty.

Hypothesis 4

There will be no difference between mastery and non-mastery subjects in persistence on a series of ten learning tasks using NSS of increasing levels of difficulty.

Hypothesis 5

The personality factors of need achievement, locus of control, debilitating anxiety, and facilitating anxiety either considered separately or together will not significantly influence the learning of NSS for mastery and non-mastery subjects.

Hypothesis 6

The personality factors of need achievement, locus of control, debilitating anxiety, and facilitating anxiety either considered separately or together will not significantly influence the persistence on the learning of NSS for mastery and non-mastery subjects.

Hypothesis 7

The cognitive factors of verbal or nonverbal ability either considered separately or together will not

significantly influence the learning of NSS for mastery and non-mastery subjects.

Hypothesis 8

The cognitive factors of verbal or nonverbal ability either considered separately or together will not significantly influence the persistence on the learning of NSS for mastery and non-mastery subjects.

Operational Definitions

Learning

For this experiment learning is the number of correct NSS the subjects are able to type after studying as long as they choose. Learning and achievement are used interchangeably.

Persistence

Persistence is the amount of time the subjects spend in studying from the initial presentation of the five word list until they signal they are finished studying and ready to type.

Mastery

The mastery criterion for the study was 100% correct score. The subjects had as much time and as many chances as they needed. Nonspecific feedback was given in that the list was repeated when a NSS was missed. Corrections were

made by trial-and-error. The first trial conditions were the same for both groups.

Non-mastery

The subjects are told they can have as much time as they want, or need, but only have one opportunity to study each list of NSS. The score for this group was the number they remembered correctly after studying for as long as they chose. They differed from the mastery group in that they only had the one trial. When they finished typing what they could remember on the first five nonsense syllables they went to the second set and so on to the end of the experiment.

Personality

These are the general affective characteristics rather than the subjects immediate attitude toward the task. Specifically, need achievement, locus of control, debilitating anxiety, and facilitating anxiety as measured by the Prestatie Motivatie Test (PMT), Rotter's Internal-External Locus of Control Scale (I-E scale), and the Achievement Anxiety Test (AAT+or-).

Cognitive Factors

General cognitive factors as measured by the Quick Word Test (QWT), a measure of verbal ability, and the SRA

Pictorial Reasoning Test (PRT), a measure of nonverbal ability.

Specific Cognitive Behaviors

The prerequisite skills or knowledge needed to learn the present task.

CHAPTER II

REVIEW OF LITERATURE

Bloom (1976) postulated a theory of school learning with which he attempted to present a small number of variables that accounted for most of the variance in learning. His central thesis was that variations in the cognitive entry behaviors, affective entry characteristics, and the quality of instruction will determine the learning outcomes. If one of these variables is less than optimal then this will affect the achievement, the difficulty encountered, and the time and effort required to learn the task. The following review of the literature is based on Bloom's model as it was used to study mastery learning.

Cognitive Entry Behaviors

Cognitive entry behaviors are those overall intellectual characteristics the person has developed in the past. Bloom (1964) states that general intelligence measures have relatively fixed or stable qualities after age ten. He believes they are predictors of achievement and usually account for about 25% of the variance. Archer (196Ø) called nonsense syllables a verbal learning task and if this is true then the measure most likely to predict performance in this study would be the verbal ability rather than the nonverbal ability.

Mastery Learning

Carroll (1963), Bloom (1976), and Block (1974) all supported the idea that students can learn what is to be taught if they are given the chance to learn in a correct manner. Bloom discussed this under mastery learning. Basic to the idea of mastery teaching is that the student is helped with difficulties, given the time needed, and given a clear criterion. Since Bloom's mastery students were given feedback and/or correctives, the prior tasks would affect subsequent tasks and the differences between mastery and non-mastery scores would become greater as the students go from one task to the next on related material.

In reviewing the literature, it was found that despite criticisms that mastery teaching stifles individuality (e.g. Glickman, 1979) and is too behavioristic (e.g. Horton, 1979) mastery learning does increase achievement. Mastery teaching was superior in teaching reading (e.g. Freebury, 1978; Katims, 1977), psychology (e.g. Goldwater & Acker, 1975; Hapkiewicz, 1972), statistics (e.g. Biehler, 197Ø), mathematics (e.g. Fehlen, 1976; Burrows & Okey, 1975), physics (e.g. Putt, 1977), and social studies (e.g. Hymel & Mathews, 198Ø).

At the university level mastery learning has also been found superior to traditional teaching (e.g. Jones, 1975; Hapkiewicz, 1972; Goldwater & Acher, 1975; Hulteen, 1978;

Knight & Nation, 1978; Fehlen, 1976) and the elementary school level (e.g. Hannon, 1979; Burrows & Okey, 1975). Kim (1975) also found mastery learning superior for junior high students.

It has been found to help reverse effects of cultural deprivation (Ausubel, 1964), help deal with individual differences (Block, 1970, cited in Block, 1974; Gagne' & Paradise, 1961), and help cut down on time needed for original (not review) learning (Merrill, Barton, & Wood, 1970).

Bloom (1976) would attribute the success of mastery learning to prerequisite skill building. Block (1974) also said it helped the student learn to learn. Hyman and Cohen (1979) came to the conclusion in their review of the literature that the success of mastery learning is due to the participation of the student. The students spent more time and gave more attention to the material, therefore, they learned more. Enough empirical research has not been conducted to indicate what components in mastery learning cause it to work. If these components were known inconclusively, perhaps mastery learning could be more readily adaped to various subjects and different kinds of learners.

Learning Task

Bloom (1976) described relevant prerequisite skills as

those which can be defined by task analysis. NSS syllables do not lend themselves to a task analysis so would not fit Bloom's catagory. Since controlled meaningfulness studies (Archer, 1960) had been conducted with nonsense syllables they were used to add the dimension of difficulty level.

Difficulty Level

The literature is replete with studies on what has come to be known as errorless learning. Skinner (1961) and other behaviorists (e.g., Holland, 1967) have transferred laboratory findings to the classroom assuming that because lower error rates are characterized by lowered frustration, shorter study time, and less emotionality that this technique makes for a better learning environment.

Much research has been conducted since the Skinnerian teaching methods were introduced to the field of education. This method is still controversial. There is some preoccupation with the technique itself as many studies (e.g., Etzel, 1979; Johnson, 1977; McCoy, 1976) deal with different ways of presenting and processing material. Animal studies are popular (e.g., Biederman, 1971; McCoy, 1976; Robinson, 1976; Kodera, 1976) as are studies using handicapped and retarded children (e.g., Etzel, 1979; Johnson, 1977).

Behaviorists maintain that errors should be kept to a minimum of no more than 5% (Skinner, 1961; Holland, 1967)

and research continues to support favorable learning conditions with lower error rates (Johnson, 1977; Robinson, 1978; Lambert, 1974). On the other hand (e.g., Bruner, 1960; Pressey and Kinser, 1964) some researchers have presented and defended research data that indicate different results. They felt learning conditions with more challenge (which resulted in a higher error rate) were more conducive to learning new information. Evidence has continued to support their theories (Payne, 1977; Prather, 1971; Everett, 1977).

Taking the research into consideration there seems to be no pat answer to the question of optimal level of difficulty. Cronbach (1957, 1975) and Hunt (1975) believe that learner characteristics that are relevant to the task should be considered before perscription is made. This study will possibly shed light on some of these learner characteristics.

Nonsense Syllables (NSS)

In looking at the literature, Ganzer found high test-anxious and middle test-anxious subjects did not learn NSS as well as low test-anxious subjects with an observer present. Steininger and Seliger (1978) found task anxiety and recall of NSS negatively correlated for females but not for males. Srivatsava (1977) studied high (HA) and low anxiety (LA) groups on free and serial recall of NSS.

Performance scores of the HA subjects were significantly lower than those of LA subjects. Both groups showed better free recall than serial recall. In an interactional study Gakhar, Joshi, and Passi (1973) found a significant interaction between IQ, extroversion, and anxiety. subjects learned a list of NSS under massed or spaced practice conditions. Spaced practice, high intelligence, extraverts, with average anxiety obtained the highest score. Spaced practice, low intelligence, extraverts with high anxiety scored lowest. Scores may have been affected by both anxiety and IQ.

Passi and Singh (1972) found that intelligence, anxiety, and the interaction of intelligence, anxiety, association, and difficulty level had a significant affect upon learning of NSS. In their study with 14 year-olds they used the serial reproduction in the 5th trial. Krishna and Varma (1972) divided 11th graders into high and low test -anxiety groups. Their performance in a rote serial learning of NSS of uniform association value was examined. High-anxious subjects had significantly more errors and took significantly more trials to reach a criterion of two successive errorless serial reproductions.

One study was found using NSS and locus of control. Internal subjects made more errors when they anticipated not having control over a later situation. They were told it was controlled by chance. External subjects made more

when they thought they had control over the later situation (Watson and Baumal, 1967).

In concluding the review of studies using NSS, one can say high-anxious subjects are affected by an observer, do less well on serial recall, do better on massed practice and less difficult material. Many of the studies were conducted in India and some of the ones that were in the United States used younger subjects. Locus of control was used with NSS in a situation where the subjects perception of control was manipulated. As far as can be ascertained, no studies have been conducted looking at nAch, locus of control, and test anxiety with varying difficulty levels of NSS to see if there is a relationship with performance and persistence. They have also not been used to test mastery learning.

Affective Entry Characteristics

Carroll (1963) operationally defined motivation in terms of perseverance the individual brings to a task or the effort the person was willing to make to accomplish the task. It is an excellent behavioral index and was used to measure effort. Also the general attitude toward learning and learning situations, as measured by a need achievement scale, locus of control scale, and two measures of achievement anxiety, will be studied.

Achievement Motivation

Based primarily on empirical data and mathematical models, Atkinson (1957) postulated achievement motivation. High achievers are individuals who have a stronger motive to achieve relative to their motive to avoid failure, whereas low achievers have a stronger motive to avoid failure relative to their motive to achieve. In Atkinson's formula [nAch = f (Motive x Expectancy x Incentive)] motive is seen as a personality disposition to strive for success and to experience pride in accomplishment; expectancy is the subjective probability that one's performance will end in success; incentive refers to the strength and desirability of reward. Need achievement is related to the construct of general expectancies which aid in development of feelings of control.

Research based on Atkinson's theory and later developments has proven inconsistent. Clark (1978) found inconsistent results when predictions were based on achievement motivation measures. Grade point averages and course grades did not correlate (Bendig, 1959; Reitman, 1960; Krumboltz, Farquahan, 1957; Mitchell, 1961; Reiter, 1964; Shaw, 1961; Uhlinger & Stephens, 1960) with nAch. Other studies found significant correlations between achievement motivation measures and grades (McClelland, Atkinson, Clark, & Lowell, 1953; Morgan 1952; Robinson, 1964), however, these last studies were questionable due to

the use of extreme groups. Weiss, Wertheimer, and Groesbeck (1959) obtained a coefficient of .39 with GPA and nAch on college males using all subjects. This relationship was low but significant. Bachman (1964) and Kazmier (1961) found that a self-report measure of achievement motive did not predict GPA's, although Mitchell (1961) stated that self-report measures appear to be slightly better than projective methods in predicting performance.

Bar-Tal (1978) in a review of the literature of achievement-related research concluded that there is a relationship between the persons' need achievement and their performance. He suggested that educators should pay attention to individual differences in this area.

Test Anxiety

Kaplan (1965) talks about anxiety being a "normal, natural and healthy emotion but when anxiety becomes intense its positive values are eliminated and it becomes an obstacle to reasoned behavior by narrowing ones perceptions, obscuring intellectual functions, and focusing attention on internal problems".

S. Sarason and Mandler (1952) related some of the same ideas to test anxiety. They believed that testing situations evoke both learned task drives and anxiety task drives. Some of the anxiety drives are task relevant while others are task irrelevant. The learned task drives and the

task-relevant anxiety drives facilitate test performance while the task-irrelevant anxiety drives decrease test performance. The debilitating anxiety is suffered by the high test-anxious person during performance resulting in a lowered score.

Wine (1971) suggested an attentional interpretation of the debilitating effects of test anxiety. The high test-anxious person attends to both self-relevant and task-relevant variables in contrast to the low test- anxious person who attends mostly to task-relevant variables.

Support continues for the debilitating effect of certain kinds of anxiety. When confronted with an evaluative or learning situation, the high test-anxious individual emits self-oriented, negative responses which cause time to seem to pass more slowly and interfere with the task at hand (I. Sarason & Stoops, 1978).

There was a great deal of support for the theory that a student develops a negative or a positive attitude toward learning and the evaluation of learning over time (Bloom, 1976) which affects performance. Anxiety appears to be a carryover from past academic experiences so that if the student sees a relationship between the task at hand and other tasks from the past then either a facilitating or a debilitating anxiety will result, interfering or helping present performance. Bloom believed it is possible to choose a task which eliminates these feelings. The author

was interested in both the relationship of the task to anxiety and the relationship of the two types of anxiety to persistance and learning.

Achievement Motivation and Anxiety

Atkinson and Feather's (1966) theory of achievement motivation yields specific predictions concerning optimal difficulty levels for learners with varying levels of anxiety and achievement motivation. They predicted that individuals with a tendency to approach success (high-need-for-achievement) and low anxiety (low-fear-of-failure) would perform increasingly better as the difficulty level approaches 50% but that there is a decline in performance as the difficulty level goes beyond the 50% range. Individuals whose tendency to avoid failure (anxiety) is greater than their tendency to approach success (motivation) showed an opposite pattern.

Crawford (1978) investigated difficulty levels on programmed materials in relationship to need achievement and anxiety and found that subjects with high need achievement and low anxiety performed better on materials that had a higher predicted error rate. Subjects with high anxiety and low need achievement functioned better under errorless learning.

If these predictions are correct then there should be a relationship between difficulty level, motivation, and

anxiety. In this study the high-anxious, high nAch person and the low-anxious, low nAch person are both included as no previous research could be found which included all groups.

Locus of Control

Another aspect of motivation to be considered is locus of control, a theoretical concept found in the works of Aronfreed (1968), Bialer (1961), De Charm (1968), Rotter (1954, 1966), Rotter, Seeman, and Liverant (1962), and Weiner (1972, 1973). Evidence has been found to support the theory that people differ widely in their perception of the amount of control they have over things that happen to them. Some believe that they are controlled by fate or luck or even by others in their environment. These people are said to be externally controlled. On the other hand, people who attribute their success or failure to their own efforts or ability are internally controlled.

Most studies on locus of control and academic achievement correlate questionnaire scores and grades and many have been significant. McGhee and Crandall (1968), Messer (1972), and Nowicki and Segal (1974) found predictions better for grades than achievement tests on specific locus of control measures.

James (cited in Stipik and Weisz, 1981) found that internally controlled persons persist longer. Thurber, Heacock, and Peterson (1974) also found adult internals to

be more persistent. On the other hand Littig and Sanders (1979) found indices of persistence (time spent to solve puzzles and number of attempts to solve puzzles) were not related to the I-E scale.

In a population of college students, Rajamohan (1978) found high internals were more significantly achievement motivated and that their exam grades were significantly related to achievement motivation. Contrary to this Blustein and Lester (1979) found no relationship between I-E scale and grades in college students.

Kassin and Reber (1979) found no difference on recall of an artificial language between internals and externals. In an unstructured memory task, Nowicki and Winograd (1979) found internals did better but when encoding was provided there was no difference between the two. Using the I-E scale and Academic Anxiety Test, Grover and Tessier (1978) found non-coping (in unanticipated academically frustrating situations) students demonstrated higher levels of debilitating anxiety, lower facilitating anxiety, and more external locus of control. T. Morrison and R. Morrison (1979) found that (contrary to their hypothesis) subjects with external control on Rotter's scale were more accurate than internals in estimating their grades on exams taken or to be taken. To further confuse the issue, Santogrossi and Roberts (1978) found students who were medium- or fast-paced in a PSI course were more external. The fast pacers were

higher achievers on SAT and GPA and scored higher on the course exam.

Lefcourt (1976) stated: "Research that focuses upon the possible relationships between achievement and locus of control has continued unabated though not in a manner that can generate firm conclusions." However, he comes to the same conclusions as Chan (1978) in inferring that internally controlled persons are more oriented toward the pursuit of achievement. Although this may be accurate, there seems to be conflicting support for a stable construct called locus of control which is a good predictor that is not task and situation specific.

CHAPTER III

METHOD

Mastery learning was studied based on the model for school learning presented by Carroll (1963) and elaborated by Bloom (1974). In order to control for instructional consistency the task was presented on a computer. Nonsense syllables were chosen in order to minimize prerequisite and subsequent specific cognitive behaviors. General personality and ability measures were also used to study the relationship of the affective and cognitive domains on persistance and learning.

Subjects

Students in the undergraduate psychology classes in a small southern rural university were given an opportunity to volunteer for extra class credit by particapating in this investigation. Other extra credit projects were offered during the quarter so no particular pressure was put on the students to volunteer. Subjects were enrolled in freshman and sophomore level courses. The age range was from 18 to 47 as courses contained some re-entry students. T-tests indicated no differences between the two groups on demographic, personality, or cognitive variables. Means and standard deviations are given in Table 1.

Table 1

Means and standard deviations of demographic, personality, and cognitive variables in the subject population

	Mastery N=51		Non-mastery N=55	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Age	24.3	5.8	25.5	8.4
Sex*	58%	.49	56%	.5
Race*	72%	.45	78%	.4
Hour*	12	2.4	12	2.6
AAT+	27.1	3.1	27.9	3.Ø
AAT-	27.9	4.8	29.6	5.1
PMT	96.5	8.4	98.1	8.5
I-E scale	9.7	4.Ø	1Ø.Ø	4.2
QWT	95.2	18.2	9Ø.5	13.2
PRT	85.8	12.9	86.2	9.9

*Sex code male Ø, female 1; race code Black Ø, Caucasian 1; hour based on 1-24.

Apparatus

A 16 KRA Dynamic Read/Write Memory Module Sol Terminal Computer manufactured by Processor Technology Corporation was used to present consonant-vowel-consonant trigrams. The stimuli were presented on a 15 inch Panasonic black and white T.V. screen. The computer had a standard typewriter keyboard which was used for the subjects to respond. Time was recorded to 1/1Ø,ØØØ of a second and the recall score was recorded as the number of correct responses. For the mastery group the number of trials was also recorded.

Setting

The room that housed the computer was an 8x10 foot cubical with two standard tables for equipment and a comfortable chair. The small window at the back left side of the subject was covered with a black curtain and all writing materials were removed. The personality and ability measures were administered in a small classroom with study cubicles which separated the subjects.

Instrumentation

Consonant-Vowel-Consonant Trigrams (CVC)

The task chosen was CVC trigrams in order to control for cognitive entry behaviors. It was thought that on this task initial and subsequent cognitive entry behaviors would be minimized. Group 1, who received only one trial, was given no feedback. The mastery group, Group 2, received feedback and trial-and-error correctives.

Archer (1960) evaluated the meaningfulness of all possible CVC trigrams and established a list varying from 100% to 1% in their degree of meaningfulness to his sample. Difficulty level should follow the same distribution (Buxton, 1949; McGeogh, 1942). The percentages are based on the yes or no responses of 108 men and 108 women, who reported the trigrams as meaningful or not meaningful.

Test-retest correlation of consistency of judgment over a 48-hour period was .882 (214df, p<.Ø1).

The Archer scale appears to offer the best estimate of meaningfulness available and is by far the most thorough. The trigrams selected for this study were chosen randomly from Archer's list of all possible trigrams in increments of ten starting with the 1ØØ% most meaningful and going to 1Ø%, least meaningful. This means that starting with the first set which had all meaningful trigrams, the sets grew less meaningful and increasingly more difficult (e.g. McGeogh, 1942). Weights, based on Archer's study, were given to each level of meaningfulness in order to control for level of difficulty.

Internal versus External Locus of Control (I-E scale)

Rotter (1966) developed a scale to measure control of reinforcement or locus of control. The I-E scale is a 29-item, forced-choice test including 6 filler items intended to make the purpose more ambiguous and is scored with criteria established by Rotter (1966). Ones score is the total number of external choices. If persons feel that reinforcement comes from chance or luck or fate rather than their own behavior then they would believe in external control. People who feel rewards or events that happen to them are contingent on their characteristics or behavior are said to be internally controlled.

The internal consistancy estimates of the I-E scale range from .65 to .76 and are relatively stable. The test-retest reliability ranges from .49 to .78. These last scores were considered to be less consistent because there were variations in the testing procedure but basically the test shows reasonable consistency, especially when used for group investigations (Rotter, 1966).

In studying construct validity Blackman (1962) compared the I-E scale with a James-Phares Likert-type scale. He found a correlation of .56 for 151 elementary psychology students.

In addition, Rotter (1966) cites unpublished masters theses for three students to support his scale. Florence Johnson compared a James-Phares Likert-type scale to the I-E scale and obtained an r of .58 for 120 students. J. Adams-Webber compared the I-E scale with a story completion measure of locus of control and found the two significantly related. Mariam Cardi used an interview method to obtain a measure of internal-external control which correlated with the I-E scale, $r=.61, p<.002$.

Seeman and Evans (1962), Gore and Rotter (1963), Strickland (1965), and Phares (1965) all found that internals manifested the expected behaviors in their environment. Internals search more actively for information and retain, process, utilize, recall, and reproduce that information better than externals.

Prestatie Motivatie Test (PMT)

Hermans (1970) used empirical and theoretical knowledge about achievement motivation (nAch) to develop a questionaire to measure this motive which he called the Prestatie Motivatie Test (PMT). A pool of heterogenous items was used that included measurements of the various aspects or characteristics of the trait as it had been defined in the literature using projective techniques. The items were treated by the iterative cluster analysis (Boon Van Ostade, 1967). Twenty-nine items were selected which had a reliability of.82 and were representative of 9 out of the 10 aspects of nAch as developed in the literature. All aspects except risk-taking behavior are represented by one or more items in the achievement cluster.

The Prestatie Motivatie Test (PMT) correlated with the number of hits on the Pursuit-Rotor Task in an achievement-oriented condition, ($r=.32$ and .41, $p<.05$) but not in a neutral condition (Hermans, 1970) This indicates that high nAch subjects, as measured by the PMT, will perform better than low nAch subjects in situations where they are expected to excell.

In an unstructured classroom program, Hermans (1970) found a .57 ($p<.01$) correlation between scores on the PMT and the number of exams the students took voluntarily. There was also a .34 ($p<.05$) correlation between the same subjects grades and the PMT. He found no relationship

between PMT and grades in another course with the same content but under structured conditions, only grades and aptitude correlated with each other.

Hamilton (1965) found the PMT related to persistence as measured by the length of time a student spent on a final exam with no time limit ($r=.28$, $df=38$, $p<.05$). In the same study Hamilton investigated the relationship between performance on a test over content previously specified and the PMT ($r=.54$, $df=21$, $p<.005$). He concluded that the PMT measured achievement seeking behavior.

Hermans' PMT correlated ($r=.40$ and $.47$, $p<.01$) with the Achievement via conformance and Achievement via independence Scales of the California Psychological Inventory in a study by Morris and Snyder (1978). They also found the PMT correlated with Mehrabian's (1968) Resultant Achievement Motivation Test ($r=.44$, $p<.01$).

Waters and Waters (1976) found that Hermans' scale was consistently related to grade point averages across several samples. Also they found the PMT significantly ($p<.01$) related to Mehrabian's scale.

Achievement Anxiety Test (AAT)

Alpert and Haber (1960) developed a scale for measuring achievement or test anxiety. The AAT consists of two independent scales: a facilitating scale of nine items and a debilitating scale of ten items. Facilitating anxiety is

composed of those responses that promote better performance --"Anxiety helps me do better during examinations and tests." Debilitating anxiety includes negative type responses --"I can't do well on this test." An individual can have both, or neither, but the presence of one does not infer the absence of the other or vice versa. Both scales have been revised until the test-retest reliabilities for a 10-week interval are .83 and .87 respectively and an 8 month period are .75 and .76.

The authors believe the specific anxiety scale is better for the prediction of academic performance than are general anxiety scales. Their correlational studies bear this out. According to their study using the same subjects taking several scales, intercorrelations among the specific scales were significantly higher than those involving general scales. The correlations among general anxiety scales--The Taylor Manifest Anxiety Scale, the Welsh Anxiety Inventory, and the Freeman Anxiety Scale--ranged from .32 to .39.

Correlations between these three tests and specific anxiety scales--The Mandler-Sarason Test Anxiety Scale and the AAT scales--ranged from .24 to .38. The Mandler-Sarason and the two AAT scales had correlations ranging from .40 to .64. Alpert and Haber concluded that specific scales should not be replaced by a general scale. In another part of the same study, they found that the specific scales were

significantly better predictors of academic performance than the general scales.

The Quick Word Test (QWT)

Bogatta and Corsini (1960) developed and objective instrument to measure verbal ability by using the ability to understand the meaning of words. It is a power test which has 100 words blocked for difficulty level. Form Am, Level 2 was used as this was the appropriate form for college students. Administration and scoring was based on manual guidelines.

Validity studies were conducted by Borgatta and Corsini (1964) and the following correlations were found: Otis Quick-Scoring Test of Mental Ability, r=.62; Wonderlic Personnel Test, r=.69; Wesman personnel Classification Test, Total L score, r=.80. The split-half reliability coefficient was .90 and alternate form coefficients were .88 and .89.

SRA Pictorial Reasoning Test (PRT)

The PRT (McMurry and Arnold, 1973) is a nonverbal test of general ability that was developed empirically to measure learning potential. Each question is made up of five pictures, four of which are related in some way. The examinee identifies the unrelated picture.

The reliability scores range from .59 to .83 with a total r=.75. Correlation with the Wechsler Scales are:

Verbal .52, Performance .45, and Full Scale .55. PRT correlated with the Lorge Thorndike .53.

This test and the QWT are screening instruments and were used in the study for purposes of comparing ability levels of the subjects. Care should be taken in using these tests in other contexts or in interpreting the general ability level as they were designed to be used in conjunction with other instruments.

Procedures

Data were collected for all subjects in the following order: (1) a packet containing the PMT, AAT, I-E scale, QWT, and PRT was administered and (2) memorization of nonsense syllables on the computer. The procedure and measures taken to assess personality characteristics and ability levels were the same for all subjects on the first trial. Group 2, the group who worked until 100% mastery was accomplished, had further opportunity to study and a measure of total time to mastery and number of trials were taken. The specific procedures used for the research are described in detail in the following sections.

Personality and Ability Measures

Packets containing the PMT, AAT, I-E scale, QWT, and PRT were prepared so that the tests were presented in random order. None of the tests were timed. Subjects were given a

minimum of verbal instructions (Appendix A) and then instructed to sign up for a time to use the computer to complete the experiment. At this time subjects signed informed consent forms (Appendix B) and then were administered the tests according to published procedures. This part of the experiment took place in a small group setting. The experimenter or a graduate student in psychology, who had training in testing, conducted this part of the procedure.

Experimental Treatment

The experimenter, a female doctoral student, was the same for all subjects. Subjects were assigned to two treatment groups. Randomization was used to group. Each subject worked alone with the exception of the first set of trigrams when the experimenter was in the room.

Group 1. At the beginning of the experimental procedure, the subject entered the computer room and the experimenter typed in an identifying number. The subject was seated and the following instructions appeared on the screen:

> You are going to learn a series of 50 three letter words. They will be shown to you in sets of five words, and each set will be more difficult to learn than the previous sets.
>
> You may study each list of words for as long as you like. When you think you can remember them, press the red button on the little box to the left of the computer. When

> the screen goes blank, type in all the words you can remember. The words do not have to be in any order. If you make a mistake press the delete key and retype the letter or letters. When you finish typing a new list of words will appear on the screen for you to study. Press the space bar when you are ready to begin.

When the subject pressed the space bar the first set of 5 trigrams appeared. The subject attempted to memorize this list and then pressed the red button to indicate being ready. "Wait for instructions." came on the screen. After 15 seconds the instructions "Type as many words as you can remember. Do not press the space bar between words." were printed on the screen. The subject then typed as many words as could be remembered and then "Press the space bar when you are ready." appeared.

The experimenter remained in the computer room until the first set of trigrams were studied and recall was attempted. Any questions about procedure were answered at this time. After the experimenter was certain the subject understood the instructions, she left the room and the subject proceeded through the program.

After typing the first list of 5 words and pressing the bar the subject is presented the next list of words to be studied. These words are studied and then the subject pressed the red button when ready, as for the first trial. "Wait for instructions." came on the screen and after 15 seconds the "Type as many words as you can remember." instructions appeared. This is the same as the instructions

for the first list. The format is repeated until all ten sets have been presented, studied, and typing attempted.

At the end of the last set the instructions "You have finished the experiment. Tell the experimenter." appears. The experimenter who is in the next room comes back to thank the subject and turn off the computer.

Group 2. On the first trial for each list the procedure is exactly the same as for Group 1. At the beginning the second group gets these additional instructions:

> If you got all the words correct the computer will tell you to press the space bar to be given a new list of words. If you miss a word the same list of words will appear on the screen for you to study. You must learn all 5 words before you can go to the next list.
>
> During the first trial on each list you will be able to type in all the words you can remember even though you might make a mistake. After the first trial the old list will appear for you to study as soon as you make a mistake. Press the space bar when you are ready to begin.

The subject proceeded through all ten lists studying each one until it was mastered. The experiment ends the same as for Group 1.

A measure of time taken to study each list was stored by the computer accurate to 1/10,000 of a second. The computer also stored the number of correct responses and the number of trials for mastery. These became the dependent variables.

At the conclusion of all data collection, feedback was given to each student in written form and a general discussion was conducted in groups. Subjects were invited to make appointments to discuss their scores individually.

CHAPTER IV

RESULTS

T-tests (Hays, 1973) were used to test for significant differences between the two groups as stated in the first question: While minimizing specific learning prerequisites, by using nonsense syllables, do mastery learning subjects score higher and spend less time than non-mastery subjects? This question was addressed specifically in hypotheses 1-4.

Alpha was set at .Ø5 for a one-tailed test. Since 2Ø tests were conducted the formula m/α (Huck, personal communication) was used to adjust the alpha level in order to decrease the probability of a Type I error. In the formula m is the number of tests conducted and α is the global alpha level. P=.Ø5 and m=2Ø was used to find the adjusted alpha level of .ØØ25.

To test the question: Will general cognitive and affective variables relate to persistence and learning, which is addressed in hypotheses 5-8, the Statistical Analysis System (SAS) Correlation (CORR) and General linear Models (GLM) procedures were used. The SAS technique yields a Pearson product-moment correlation. Multiple regression analysis was conducted for each of the four hypotheses at the first and last level of difficulty. In multiple regression, the values of a dependent or response variable are discribed or predicted in terms of one or more

independent or explanatory variables. GLM provides, among other things, an F value for the overall model,an F value for the additive effect of each independent variable, and a students t value for testing the null hypothesis that the parameter equals zero. After testing a linear model the data were plotted and based on the plots no further models were tested. Based on Huck's formula m/ an adjusted alpha level was found for both the F's and t's (Lasater, personal communication). The adjusted alpha level for the correlations is .ØØ2 based on m=24 and p=.Ø5. For the F tests alpha is .Ø125 based on m=4 and p=.Ø5.

Hypothesis 1

There will be no difference between mastery and non-mastery subjects in learning on the last task in a series of learning tasks using NSS of increasing levels of difficulty.

The test for differences (t=-2.11,df=1Ø4,p<.Ø5) resulted in acceptance of the null hypothesis since alpha equaled .ØØ25 (See Table 2). The non-mastery group (mean was 34.55) was superior to the mastery group (mean was 33.92) in learning but the difference was not significant.

Table 2

Differences in learning between mastery and non-mastery subjects on the ten tasks

Task	Mastery N=51 Mean Score	Mastery N=51 Standard Deviation	Non-mastery N=55 Mean Score	Non-mastery N=55 Standard Deviation	t
1	4.29	1.Ø8	3.84	1.2Ø	2.Ø7
2	7.76	2.87	8.36	2.Ø8	-1.22
3	1Ø.29	4.Ø8	1Ø.85	3.89	-.72
4	14.98	5.7Ø	14.69	5.17	.26
5	18.24	6.99	16.73	7.83	.73
6	22.94	7.66	22.15	7.56	.38
7	25.57	1Ø.57	23.55	9.93	1.Ø1
8	26.57	13.75	27.78	12.4Ø	-.38
9	31.24	14.21	26.35	13.29	1.83
1Ø	33.92	15.63	34.55	14.76	-2.11

*p-.ØØ25

Hypothesis 2

There will be no difference between mastery and non-mastery subjects in persistence on the last task in a series of learning tasks using NSS of increasing levels of difficulty (see Table 3).

The test for differences (t=-2.26,df=1Ø4,p<.Ø5) resulted in acceptance of the null hypothesis since alpha equaled .ØØ25. The non-mastery group (mean was 1.45) used more time than the mastery group (mean was 1.13). The difference was not significant.

Table 3

Differences in persistence between mastery and non-mastery subjects on the ten tasks

	Mastery N=51		Non-mastery N=55		
Task	Mean Time	Standard Deviation	Mean Time	Standard Deviation	t
1	.3463	.3858	.2684	.1311	1.37
2	.4238	.1842	.6615	.6062	-2.77
3	.6557	.3344	.8046	.6646	-1.47
4	.6845	.3501	.8751	.8069	-1.60
5	.9265	.4873	1.0938	.6622	-1.49
6	.9188	.5152	1.0590	.8269	-1.06
7	1.1304	.5062	1.2422	.8668	-.82
8	1.0696	.5247	1.1798	.7079	-.91
9	1.2255	.6532	1.4915	.9675	-1.67
10	1.1321	.5356	1.4545	.8992	-2.26

*p=.0025

Hypothesis 3

There will be no difference between mastery and non-mastery subjects in learning on each task in a series of learning tasks using NSS of increasing levels of difficulty.

As can be seen in Table 3 none of the t's are significant. The null hypothesis was accepted for Hypothesis 3. The groups varied slightly with neither being better all the time.

Hypothesis 4

There will be no difference between mastery and non-mastery subjects in persistence on each task in a series

of learning tasks using NSS of increasing levels of difficulty.

As can be seen in Table 3 none of the *t*'s are significant. The null hypothesis was accepted for Hypothesis 4. After the first task the non-mastery group took more time but the difference was not significant.

To test Hypotheses 5 through 8 a correlation between each of the personality and cognitive factors and the total number of correct scores for the first trial of each task was used. To test Hypotheses 6 and 8, a correlation between each of the personality and cognitive factors and the total time taken on the first trial of each task was used. To test interaction *F*-tests on the least difficult, first task, and the most difficult, last task, tasks were used. Only the model for all four personality factors and both cognitive factors were tested since all but one of the factors turned out to be very poor predictors of learning or persistence.

Hypothesis 5

The personality factors of need achievement, locus of control, debilitating anxiety, and facilitating anxiety either considered separately or together will not significantly influence the learning of NSS for mastery and non-mastery subjects.

The correlations and regressions (see Table 4 and 5) were not significant. Based on these results the hypothesis was accepted.

Table 4

Correlations between personality and cognitive factors with learning and persistence

	Learning		Persistence	
	Mastery N=51 r	Non-mastery N=55 r	Mastery N=51 r	Non-mastery N=55 r
PMT	-.Ø1	.11	.Ø2	-.Ø9
I-E scale	-.1Ø	-.14	-.15	.ØØ7
AAT-	-.13	-.14	.Ø9	-.21
AAt+	-.Ø7	.1Ø	.Ø9	-.Ø1
QWT	.22	-.Ø3	.Ø9	-.4Ø
PRT	.15	-.ØØ4	.Ø9	-.26

*p=.ØØ2

Hypothesis 6

The personality factors of need achievement, locus of control, debilitating anxiety, and facilitating anxiety either considered separately or together will not significantly influence the persistence on the learning of NSS for mastery and non-mastery subjects.

The correlations and regressions (see Table 4 and 5) were not significant. Based on these results the hypothesis was accepted.

Table 5

Regressions for personality and cognitive factors with learning and persistence

	Learning		Persistence	
	Mastery N=51 F	Non-mastery N=55 F	Mastery N=51 F	Non-mastery N=55 F
Personality				
First task	.76	1.59	.35	.50
Last task	.94	1.15	.49	.49
Cognitive				
First task	.76	.11	1.02	9.72*
Last task	2.04	1.08	1.05	2.49

*p=.0125

Hypothesis 7

The cognitive factors of verbal or nonverbal ability either considered separately or together will not significantly influence the learning of NSS for mastery and non-mastery subjects.

Based on the results presented in Table 4 the null hypothesis was accepted. The adjusted alpha was .002.

Hypothesis 8

The cognitive factors of verbal or nonverbal ability either considered separately or together will not significantly influence the persistence on the learning of NSS for mastery and non-mastery subjects.

The verbal ability for the non-mastery subjects was significant (r=-.40,df=54,p=.003). Alpha was set at .002. Also the F for the first trial in the non-mastery group was significant (F(1,53)=9.72, p=.003). Alpha was set .0125. (see Table 5) Based on these findings the hypothesis was rejected.

CHAPTER V

DISCUSSION

This study was designed to answer two major questions. First, an attempt was made to determine what accounts for superior learning of students who are taught by mastery teaching and secondly, to determine whether personality factors make a difference in mastery and non-mastery performance. On the first question, Bloom (1976) contends that mastery teaching allows the student to master the relevant prerequisites of a task, thus being better able to understand and remember the relevant factors of the next task in sequential order. He assumes that all school tasks are arranged in some sequential order and the student will not be able to master a task unless she/he has mastered the prerequisite skills. Thus mastery teaching is the mastering of the prerequisite skills. The student is given guided instruction and continues to work until a score of 80% or more can be obtained before going on to the next task.

The first part of this study attempts to determine whether superior performance of mastery students is a result of the mastery of prerequisite skills or simply the learning of cognitive strategies as in learning to learn (Harlow, 1979) or time and attention given to the material (Burns, 1979; Hyman & Cohen, 1979). Also of interest was the influence of general stable affective characteristics on

learning because there is conflict in the literature over their importance to the immediate learning situation. Bloom contended that the only personality factor which infuenced performance was the students attitude toward a particular task, yet other research showed differences in performance which were related to such personality factors as need achievement, anxiety, and locus of control.

By using a computer presentation the teaching was held constant in this study and NSS minimized prerequisite skills since the influence of past experience was small.

Learning

In exploring how mastery and non-mastery teaching techniques influence learning, Bloom (1976) found the achievement on the first task, in a series of similar tasks, to be almost the same for both mastery and non-mastery learning. When the groups started out they were much closer together in their entry characteristic and performance. As they continue through the series of tasks, the mastery group performed progressively better. The mastery group scored much higher on the tests measuring their learning in the subject. Bloom attributed these results to the acquisition of specific entry behaviors or prerequisite skills.

The present study did not show the same results. The groups performed about the same as they progressed through the series of tasks. The subjects may have been prevented

from developing any type of expertise in memorization of NSS by virtue of the nature of the task. NSS do not lend themselves to task analysis, a necessary condition of prerequisite skills, according to Bloom (1976). In not developing the cognitive entry behaviors needed for the next task, each time a new list of NSS syllables was presented the subjects would be the same in skill as they were for the first task. If time spent in learning and attention to the material were important then there should have been differences in the two groups. This did not happen as the mastery group spent more total time (Figure 2) and gave more attention to the task but did not learn more (Figure 3).

In conclusion, it appeared that Bloom is essentially correct in his deduction that mastery learning works because the student learns the prerequisite skills for the next task in mastering the present task. In minimizing the acquisition of prerequisite skills the differences between the groups, in the present study, was eliminated.

Persistence

Carroll (1963) theorized on the place of time in school learning. He believed that time is a key factor and that any student could learn if given the time needed. Incorporating time into his model of mastery teaching, Bloom (1976) found that students who work to mastery take increasingly less time to reach the same level of expertise

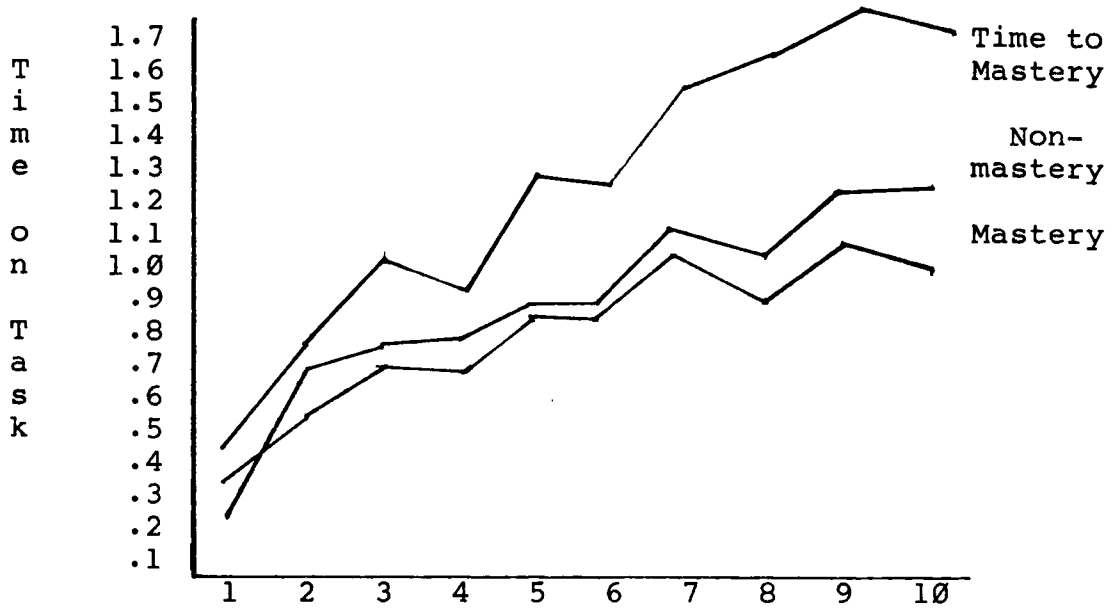


Figure 2

Time spent in studying each of the ten tasks

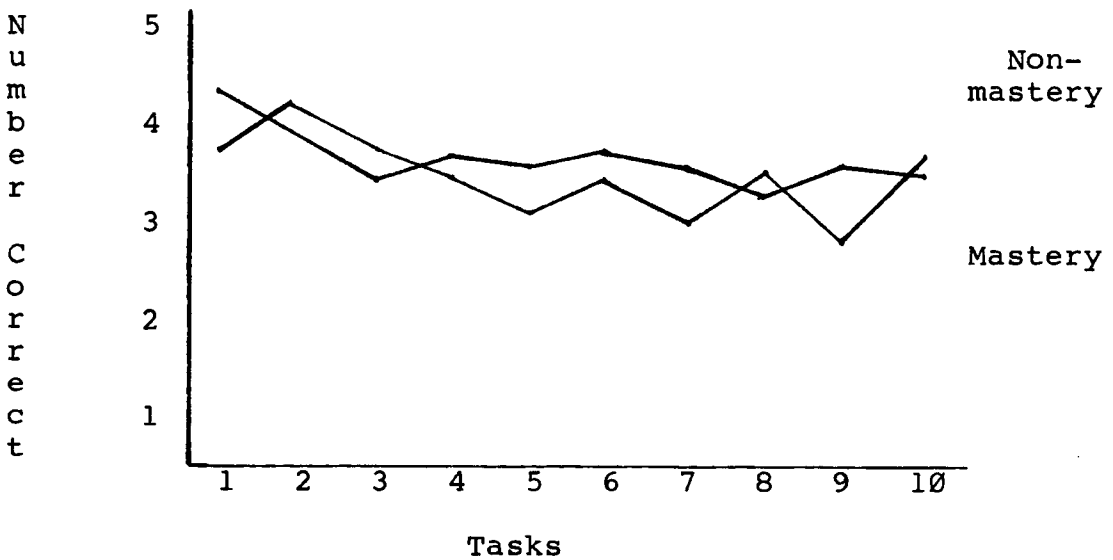


Figure 3

Average score on each of the ten tasks

on subsequent skills as non-mastery students. They actually learn as much in less time. Bloom imputed these results to the acquiring of needed skills which made it easier to learn the related task or his theory of prerequisite skills.

In studying the learning of NSS the subjects did not respond in this way. Learning on the first trial reflected a similar pattern (Figure 3) for both groups. As the difficulty level went up the amount of time spent or persistence increased but not performance. This supports Carroll's hypothesis of a linear relationship between difficulty and time, but not Bloom's findings on the superiority of mastery teaching.

The Non-mastery students did not take significantly longer than the mastery students to reach the same level of academic performance. There seems to be nothing in the mastery of NSS that would aid in the subsequent learning of new but similar tasks. Again the conclusion seems to support Bloom's model in that taking away a chance to develop prerequisite skills causes the subjects in this study not to learn in a similar manner to the groups in Bloom's research. There is a very good chance that mastery of relevant prerequisites allows the students to master subsequent tasks more rapidly.

Learning to Learn

There is no evidence of learning to learn. Based on Harlow's (1979) theory of the development of cognitive strategies that generalize to similiar tasks, mastery subjects would be expected to improve in performance as they proceed through a series of tasks. This did not happen. There was no significant differences between the groups on persistence or level of learning (Tables 2 and 3).

From these results it appears that the findings in other mastery studies could be from the learning of prerequisite skills rather than a development of cognitive strategies as in learning to learn.

Personality

Referring back to Chapter 2, the general conclusion of reviewers of the literature in the areas of locus of control (e.g. Chan, 1973) need achievement (e.g. Bar-Tal, 1978), and test anxiety (e.g. Wine, 1971) is that many times there has been a relationship between personality and achievement. What could be expected is that persons with high need achievement, low debilitating anxiety, high facilitating anxiety, and internal locus of control would take longer to study the medium difficulty level tasks and learn more. In this study correlations at these levels did not show the results which were found in Atkinson and Feather's (1966)

and Crawford's (1978) research. Also the high anxiety, low need achievement group did not do better on the easier tasks. In fact no relationship was found with either group on persistence or learning and the personality factors.

A possible deduction may be that personality does not affect learning unless the students, when they can not master, realize that they do not possess the prerequisite skills they need to accomplish the task. On a task that mimimizes prerequisite skills one possible explanation, and this may not be inconclusively supported, is that the highly anxious person would not be as threatened or the person with high need achievement would not feel as much pressure to succeed. It may be that if entering behavior is assessed properly and maintained as the students progress through a program, individual differences in personality could be minimized.

These findings possibly support Bloom's conclusions that the student's attitude toward the subject is the more important affective consideration.

Cognitive Ability

Bloom (1976) found that general cognitive ability accounts for 25% of the variance in learning. This study found significance in only one correlation in non-mastery conditions--it was between persistence and verbal ability. There was also an increase in the predictive power of the

cognitive tests on easier tasks (see Table 5) for the non-mastery group.

There was no relationship between learning and cognitive ability. In the mastery group there was no relationship between time and cognitive ability. Bloom did not find these results in his work. Even though there was a negative relationship between the subjects verbal ability and the amount of time they were willing to spend in learning, it still only accounted for 16% of the variance. A possible conclusion would be that the nature of the task caused past learning strategies to break down. It would appear that the subjects could not rely on past knowledge or learning to help them with this exercise. Another possible explanation could be the fact that the non-mastery group was told that they had only one chance, establishing a mental set to take longer.

Limitations

The subjects for this study were volunteers at the university level, therefore, the results would not be generalizable to all populations. Further research would be needed before it would be known whether all subjects react in this same way.

Mastery learning in this study differed from Bloom's in that there was no guided instruction, or the student was not given help when they made mistakes. However, some studies

reviewed the same material until it was mastered as was done in this study and mastery still outperformed non-mastery (Block, 1974). There is the possibility that differences in procedures could account for the different results in the present study and past studies in mastery learning.

Some of the conclusions are based on the assumption that NSS minimize prerequisite skills. The assumption is based on Bloom's definition of prerequisite skills (Chapter 1). The idea of a task that does not allow the subjects to acquire relevant skills has not been tested in the laboratory. If it is correct, then Bloom's conclusions appear to be justified. If it is not correct, then mastery students may do better for some yet undiscovered reason.

The subjects attitude toward the task could not be directly assessed as they had had no prior experience with NSS. A comparison could not be made on their attitude toward a task containing prerequisite skills as this was not included in the study.

There may be long term general personality characteristics which subjects bring into learning situations that affect the way the subjects approach the task. The instruments used may not have measured these characteristics. If this is true then a more accurate, reliable way to test personality needs to be developed. This was beyond the scope of the research conducted here. The more researched instruments were chosen to be used here

as they were considered the best the field had to offer and had results with which comparisons could be made.

Summary

It would appear that the present study supports Bloom's theory of mastery learning. Specific cognitive behaviors are very important to learning a task and become more important as students proceed through a series of tasks. They become prerequisite behaviors for the next task and are vital to the building of an education. Once a person is behind in learning it is very difficult to catch up.

In light of the body of research that has been conducted using personality factors as predictors of learning, this research may have raised some pertinent questions. Possibly the key area of concentration should be on the prerequisites because if the student feels competent then the personality constructs do not come into play. It is only when she/he feels threatened or inadequate that need achievement, locus of control, or anxiety would have any bearing on the prediction of learning. This could be the reason findings have been so varied as many of the studies do not take into account the persons prior skills.

Care should be taken in generalizing this study to a larger group but it does raise an intriguing question. Are the prerequisite skills or past successes of the learner the single most important predictor of learning or success in

the present task? If so, then more effort should be put into ways to deal with changing the student as this is an area where there is hope. It can be changed.

Future Research

The question of feelings of competence could be considered when research using personality constructs is conducted. Also assessing entering behavior might help clarify just which measures of personality are good predictors of learning. It may also be worthwhile to study attitudes toward a particular subject and the student's personality in conjunction with learning.

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APPENDICES

APPENDIX A

VERBAL INSTRUCTIONS

Answer the questions carefully and truthfully. Your scores will be kept confidental and when I get the results I will talk about the experiment in general to the class. We will not discuss individual scores unless you ask to do so in private. Later in the quarter you will be given instructions on how and when to sign up for a time to do the computer part of the experiment.

APPENDIX B

INFORMED CONSENT FORM

For my doctoral dissertation I am studying three personality characteristics and their relationships to the learning of ten sets of five words each. Questionnaires will be used to measure the personality characteristics. Since verbal learning is involved, I will also be using verbal and nonverbal ability measures. The task is to be presented on a computer and there is no stress or pressure involved. The words are three letters in length and you have as much time as you want to study them. It will take approximately an hour of time outside of class for the personality measures and approximately 30 minutes of computer time.

You will be assigned a number and any information concerning you will be looked at in relationship to the group as a whole. I will explain what the different tests measure to your class and at that time will be giving you your scores under your number. You may set up an individual appointment to talk about your scores if you choose. At any time you are free to withdraw from the experiment or discontinue participation without penality. Your signiture indicates your willingness to participate in this experiment.

Signed: _____

Diana Brent
Doctoral Student
489 Georgetown Road
Clarksville, TN 37040
647-7508

Donald J. Dickinson
Associate Professor
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974-5146

APPENDIX C

PROGRAM FOR GROUP 1

```
  5 PRINT "&K"
 10 FILE 1;BRENT,2
 20 INPUT "SUBJECT ?,S$
 30 PRINT 1;S$
 40 PRINT "&K"
 50 PRINT "    YOU ARE GOING TO LEARN A SERIES OF 50 THREE LETTER"
 60 PRINT "WORDS.  THEY WILL BE SHOWN TO YOU IN SETS OF FIVE WORDS,"
 70 PRINT "AND EACH SET WILL BE MORE DIFFICULT TO LEARN THAN THE"
 80 PRINT "PREVIOUS SETS."
 90 PRINT "    YOU MAY STUDY EACH LIST OF WORDS FOR AS LONG AS YOU"
100 PRINT "LIKE.  WHEN YOU THINK YOU CAN REMEMBER THEM, PRESS THE"
110 PRINT "RED BUTTON ON THE LITTLE BOX TO THE LEFT OF THE COMPUTER."
120 PRINT "WHEN THE SCREEN GOES BLANK, TYPE IN ALL THE WORDS YOU CAN"
130 PRINT "REMEMBER.  THE WORDS DO NOT HAVE TO BE IN ORDER.  IF YOU"
140 PRINT "MAKE A MISTAKE PRESS THE DELETE (DEL) KEY AND RETYPE THE"
150 PRINT "LETTER OR LETTERS.  WHEN YOU FINISH TYPING A NEW LIST OF"
160 PRINT "WORDS WILL APPEAR ON THE SCREEN FOR YOU TO STUDY.  PRESS"
170 PRINT "THE SPACE BAR WHEN YOU ARE READY TO BEGIN."
180 INPUT (1,0)G$
190 LET G=10
200 LET S=5
210 DIM A(1,S),B(1,S)
220 LET I=I+1
230 MAT B=CON
240 LET E=0
250 PRINT "&K"
260 FOR J=1 TO S
270   READ A$
280   PRINT A$
290   PRINT
300 NEXT J
310 PRINT "PRESS THE RED BUTTON WHEN READY."
320 FOR C=1 TO 1000000
330   IF INP(25)=81 THEN  GOTO 350
340 NEXT C
350 PRINT "&K"
353 PRINT "WAIT FOR INSTRUCTIONS."
355 PAUSE 150
357 PRINT "&K"
360 PRINT "TYPE AS MANY WORDS AS YOU CAN REMEMBER."
365 PRINT "DO NOT PRESS THE SPACE BAR BETWEEN WORDS."
367 PRINT
370 FOR J=1 TO S
380   INPUT (3,0)B$
390   IF I=1 THEN  RESTORE 660
400   IF I=2 THEN  RESTORE 670
```

```
410   IF I=3 THEN  RESTORE 680
420   IF I=4 THEN  RESTORE 690
430   IF I=5 THEN  RESTORE 700
440   IF I=6 THEN  RESTORE 710
450   IF I=7 THEN  RESTORE 720
460   IF I=8 THEN  RESTORE 730
470   IF I=9 THEN  RESTORE 740
480   IF I=10 THEN  RESTORE 750
490   FOR K=1 TO S
500     READ A$
510     IF B(1,K)=0 THEN  GOTO 540
520     IF B$=A$ THEN  LET E=E+1
530     IF B$=A$ THEN  LET B=(1,K)=0
540  .NEXT K
550 NEXT J
560 LET R=R+E
570 LET C1=C/7000
571 LET C2=C1*10000
572 LET C3=INT(C2)
573 LET C1=C3/10000
580 PRINT 1;I,C1,E
590 IF I=G THEN  GOTO 640
600 PRINT
610 PRINT "PRESS THE SPACE BAR WHEN READY"
620 INPUT (1,0)G$
630 GOTO 220
635 PRINT "&K"
640 PRINT "YOU HAVE FINISHED THE EXPERIMENT.  TELL THE EXPERIMENTER."
650 END
660 DATA "BIT","CAN","JOY","TEX","MED"
670 DATA "BUL","DIK","HAC","PER","ROG"
680 DATA "BEC","GIM","KOB","JAS","TUK"
690 DATA "HEV","KUB","VON","DYM","ZAP"
700 DATA "CYT","GAZ","PYS","WEP","DOX"
710 DATA "CYR","FAH","KYN","MOX","QIK"
720 DATA "CIY","GOK","KYC","QAN","TOZ"
730 DATA "DOJ","GIK","LUY","SYZ","ZAB"
740 DATA "FIQ","PYM","QOF","ZUH","JIC"
750 DATA "DOQ","HIJ","VOF","XOM","PYB"
```

APPENDIX D

PROGRAM FOR GROUP 2

```
  5 PRINT "&K"
 10 FILE 1;"BRENT",2
 20 INPUT "SUBJECT"  ?",S$
 30 PRINT  1;S$
 40 PRINT "&K"
 50 PRINT "    YOU ARE GOING TO LEARN A SERIES OF 50 THREE LETTER"
 60 PRINT "WORDS.  THEY WILL BE SHOWN TO YOU IN SETS OF FIVE WORDS,"
 70 PRINT "AND EACH SET WILL BE MORE DIFFICULT TO LEARN THAN THE"
 80 PRINT "PREVIOUS SETS."
 82 PRINT
 84 PRINT "PRESS THE SPACE BAR WHEN READY."
 85 INPUT (1,0)G$
 87 PRINT "&K"
 90 PRINT "    YOU MAY STUDY EACH LIST OF WORDS FOR AS LONG AS YOU"
100 PRINT "LIKE.  WHEN YOU THINK YOU CAN REMEMBER THEM, PRESS THE"
110 PRINT "RED BUTTON ON THE LITTLE BOX TO THE LEFT OF THE COMPUTER."
120 PRINT "WHEN THE SCREEN GOES BLANK, TYPE IN ALL THE WORDS YOU CAN"
130 PRINT "REMEMBER.  THE WORDS DO NOT HAVE TO BE IN ORDER.  IF YOU"
140 PRINT "MAKE A MISTAKE PRESS THE DELETE (DEL) KEY AND RETYPE THE"
150 PRINT "LETTER OR LETTERS.  IF YOU GOT ALL THE WORDS CORRECT THE"
160 PRINT "COMPUTER WILL TELL YOU TO PRESS THE SPACE BAR TO BE GIVEN"
165 PRINT "A NEW LIST OF WORDS.  IF YOU MISS A WORD THE SAME LIST
170 PRINT "OF WORDS WILL APPEAR ON THE SCREEN FOR YOU TO STUDY."
180 PRINT "YOU MUST LEARN ALL 5 WORDS BEFORE YOU CAN GO TO THE NEXT LIST."
185 PRINT
190 PRINT "PRESS THE SPACE BAR."
200 INPUT (1,0)G$
202 PRINT "    DURING THE FIRST TRIAL ON EACH LIST YOU"
203 PRINT "WILL BE ABLE TO TYPE IN ALL THE WORDS YOU CAN"
204 PRINT "REMEMBER EVEN THOUGH YOU MIGHT MAKE A MISTAKE."
205 PRINT "AFTER THE FIRST TRIAL THE OLD LIST WILL APPEAR"
206 PRINT "FOR YOU TO STUDY AS SOON AS YOU MAKE ANY MISTAKE."
207 PRINT
208 PRINT "PRESS THE SPACE BAR WHEN YOU ARE READY TO BEGIN."
209 INPUT (1,0)G$
210 LET G=10
220 LET S=5
230 DIM A(1,S),B(1,S)
240 LET I=I+1
250 MAT B=CON
260 LET E=0
270 PRINT "&K"
280 GOSUB 710
290 FOR J=1 TO S
300   READ A$
310   PRINT A$
```

```
320 PRINT
330 NEXT J
340 PRINT
350 PRINT "PRESS THE RED BUTTON WHEN READY."
360 FOR C=1 TO 1000000
370   IF INP(25)=81 THEN GOTO 390
380 NEXT C
390 PRINT "&K"
392 PRINT "WAIT FOR INSTRUCTIONS."
394 PAUSE 150
396 PRINT "&K"
400 PRINT "TYPE AS MANY WORDS AS YOU CAN REMEMBER."
405 PRINT "DO NOT PRESS THE SPACE BAR BETWEEN WORDS."
407 PRINT
410 FOR J=1 TO S
420   INPUT (3,0)B$
430   GOSUB 710
440   FOR K=1 TO S
450     READ A$
460     IF B(1,K)=0 THEN GOTO 500
470     IF B$=A$ THEN LET E=E+1
480     IF B$=A$ THEN LET B(1,K)=0
490     LET Z=Z+B(1,K)
500   NEXT K
505   IF L=0 THEN GOTO 530
510   IF Z>(5-J)THEN GOTO 540
520   LET Z=0
530 NEXT J
540 LET R=R+E
550 LET C1=C/7000
551 LET C2=C1*10000
552 LET C3=INT(C2)
553 LET C1=C3/10000
560 LET T=T+C1
570 LET L=L+1
580 LET Z=0
585 IF L=1 THEN PRINT  1;I,E,C1
590 IF E<5 THEN GOTO 250
600 PRINT 1;I,L,T
610 LET L=0
620 LET T=0
630 PRINT
640 INPUT (1,0)"PRESS THE SPACE BAR WHEN READY",G$
650 IF I=G THEN GOTO 670
660 GOTO 240
670 PRINT "&K
680 PRINT "YOU HAVE FINISHED THE EXPERIMENT."
690 PRINT "TELL THE EXPERIMENTER."
700 END
710 IF I=1 THEN RESTORE 820
720 IF I=2 THEN RESTORE 830
730 IF I=3 THEN RESTORE 840
```

```
740 IF I=4 THEN RESTORE 850
750 IF I=5 THEN RESTORE 860
760 IF I=6 THEN RESTORE 870
770 IF I=7 THEN RESTORE 880
780 IF I=8 THEN RESTORE 890
790 IF I=9 THEN RESTORE 900
800 IF I=10 THEN RESTORE 910
810 RETURN
820 DATA "BIT","CAN","JOY","TEX","MED"
830 DATA "BUL","DIK","HAC","PER","ROG"
840 DATA "BEC","GIM","KOB","JAS","TUK"
850 DATA "HEV","KUB","VON","DYM","ZAP"
860 DATA "CYT","GAZ","PYS","WEP","DOX"
870 DATA "CYR","FAH","KYN","MOX","QIK"
880 DATA "CIY","GOK","KYC","QAN","TOZ"
890 DATA "DOJ","GIK","LUY","SYZ","ZAB"
900 DATA "FIQ","PYM","QOF","ZUH","JIC"
910 DATA "DOQ","HIJ","VOF","XOM","PYB"
```

VITA

Diana Brent was born in Vicksburg, Mississippi, on January 6, 1939. She was graduated from Central High School in Evansville, Indiana in May, 1957 and Bob Jones University, Greenville, South Carolina, May 1962. She taught public school for three years and was a teacher and principal at a private boys academy for five years. In 1974 she received a masters in psychology and taught psychology at Austin Peay State University, Clarksville, Tennessee, for four years. She is a licensed psychological examiner in clinical psychology and a certified school psychologist in the state of Tennessee. During the academic year 1977-78 she served as a graduate teaching assistant and a parttime school psychologist for Knox County. Upon completing her course work she was appointed to the graduate faculty at the University of Kansas, Lawrence, for the academic year 1979-80. She received the Doctor of Education Degree in Educational Psychology and Guidance from The University of Tennessee at Knoxville in March 1982.