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ATTRIBUTIONS REGARDING HIGH SCHOOL SUCCESS AND THEIR EFFECTS ON FIRST-TERM COLLEGE PERFORMANCE

The Ohio State University

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ATTRIBUTIONS REGARDING HIGH SCHOOL SUCCESS AND
THEIR EFFECTS ON FIRST-TERM COLLEGE PERFORMANCE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of the Ohio State University

by

Craig W. Platt, B.A., M.A.

* * * * *

The Ohio State University
1986

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Approved by

Advisor
Department of Psychology
In loving memory of
Marjorie Winsor Marston
1905-1986
I wish to thank my advisor, Professor Philip Clark, for his guidance and for allowing me to venture into unfamiliar intellectual territory. Thanks are also owed to Professors John Gibbs and Robert Rodgers for their assistance and support as members of my dissertation committee, and to Professor Robert MacCallum for his skillful teaching and generous assistance with the statistical methods used in this study.

I would also like to express my special appreciation to Dr. Robert Wright and the rest of the administration and staff of the College of Engineering, for allowing me to intrude in their orientation activities and for graciously offering time and information.

Finally, I wish to thank my wife, Brenda Kimball Platt, for her patience, support, and help.
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# TABLE OF CONTENTS

DEDICATION ................................................. ii  
ACKNOWLEDGEMENTS .......................................... iii  
VITA ....................................................... iv  
LIST OF TABLES ............................................. vii  
LIST OF FIGURES ............................................. viii  

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.  INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Causal Attribution and Achievement Motivation</td>
<td>2</td>
</tr>
<tr>
<td>II. REVIEW OF THE LITERATURE</td>
<td>6</td>
</tr>
<tr>
<td>Weiner's Attributional Model of</td>
<td>6</td>
</tr>
<tr>
<td>Achievement Motivation</td>
<td>33</td>
</tr>
<tr>
<td>Research Hypotheses</td>
<td></td>
</tr>
<tr>
<td>III. METHOD</td>
<td>37</td>
</tr>
<tr>
<td>Subjects and Procedure</td>
<td>37</td>
</tr>
<tr>
<td>Measures</td>
<td>38</td>
</tr>
<tr>
<td>Statistical Analysis</td>
<td>41</td>
</tr>
<tr>
<td>IV. RESULTS</td>
<td>45</td>
</tr>
<tr>
<td>The Covariance Structure Model - Hypothesis 1</td>
<td>45</td>
</tr>
<tr>
<td>Multiple Regression Analysis -</td>
<td>60</td>
</tr>
<tr>
<td>Hypotheses 2 through 4</td>
<td></td>
</tr>
<tr>
<td>Sex Differences - Hypothesis 5</td>
<td>62</td>
</tr>
<tr>
<td>Descriptive Statistics and Correlations</td>
<td>62</td>
</tr>
<tr>
<td>V.  DISCUSSION</td>
<td>67</td>
</tr>
<tr>
<td>The Structural Model</td>
<td>67</td>
</tr>
<tr>
<td>Predicting Academic Performance</td>
<td>74</td>
</tr>
<tr>
<td>Sex Differences</td>
<td>77</td>
</tr>
<tr>
<td>Measurement of Attribution</td>
<td>78</td>
</tr>
<tr>
<td>Summary, Implications, and Directions for</td>
<td>80</td>
</tr>
<tr>
<td>Future Research</td>
<td></td>
</tr>
<tr>
<td>TABLE</td>
<td>PAGE</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1. Matrix of specific causal attributions</td>
<td>2</td>
</tr>
<tr>
<td>2. Specific causes on a three-dimensional model</td>
<td>10</td>
</tr>
<tr>
<td>3. Informational cues utilized in causal attributions for success and failure</td>
<td>12</td>
</tr>
<tr>
<td>4. Covariances among measured variables</td>
<td>49</td>
</tr>
<tr>
<td>5. Summary of steps in specification search</td>
<td>54</td>
</tr>
<tr>
<td>6. Squared multiple correlations for dependent variables</td>
<td>59</td>
</tr>
<tr>
<td>7. Multiple regression analyses with GPA as dependent variable</td>
<td>61</td>
</tr>
<tr>
<td>8. Means, standard deviations, and differences for all variables by sex</td>
<td>63</td>
</tr>
<tr>
<td>9. Means and standard deviations for measured variables</td>
<td>64</td>
</tr>
<tr>
<td>10. Intercorrelations among measured variables</td>
<td>66</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Posited mediation of attributions between high school success and college performance</td>
<td>34</td>
</tr>
<tr>
<td>2. Hypothesized model</td>
<td>46</td>
</tr>
<tr>
<td>3. Results of initial analysis</td>
<td>51</td>
</tr>
<tr>
<td>4. Final model (Model J)</td>
<td>57</td>
</tr>
<tr>
<td>5. Hypothesized structural model</td>
<td>68</td>
</tr>
<tr>
<td>6. Modified structural model</td>
<td>68</td>
</tr>
</tbody>
</table>
It has become axiomatic among professionals interested in the prediction of college academic performance that aptitude test scores, and to a lesser extent high school grades, are relatively powerful predictors of college grade point average (Austin, 1971; Linn, 1982). Variables such as ACT scores, SAT scores and high school class rank have quite defensibly been used to help make various selection and placement decisions concerning incoming college students. It is also clear, however, that these traditional predictors are not perfect correlates of college-level performance. Students with low aptitude scores and mediocre high school grades sometimes succeed in college, while some who enter with quite impressive credentials perform at average or below average levels. This study examines the students selected for direct enrollment in the College of Engineering at The Ohio State University—a group whose aptitude scores would lead us to predict success for them in college—and attempts to explain some of the variability in first-term performance within that select group that cannot be explained by differences in aptitude.

In any situation such as this, in which people of approximately equal ability are found to perform at varying levels, the
motivational domain is an obvious place to look for causal factors. In this case, more specifically, Bernard Weiner's (1979, 1980, 1985) attributional model of achievement motivation will be used to generate a set of hypotheses about the variables that might mediate between past and future academic performance.

Causal Attribution and Achievement Motivation

According to Weiner's model, individuals consistently seek to identify the causes of their successes and failures on achievement-related tasks, and the resulting causal attributions vary along certain important dimensions. The two most identifiable and significant dimensions are **locus** (internal vs. external) and **stability** (stable vs. unstable). These two dimensions are seen as orthogonal, and thus can be represented in a four-celled matrix (see Table 1).

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Stability</th>
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<tbody>
<tr>
<td>Locus</td>
<td></td>
</tr>
<tr>
<td>Internal</td>
<td>Stable</td>
</tr>
<tr>
<td></td>
<td>Ability</td>
</tr>
<tr>
<td>External</td>
<td>Task difficulty</td>
</tr>
</tbody>
</table>
The specific causes listed in each cell in Table 1 are not the only conceivable causal explanations to fall in the four cells, but they are perhaps the most illustrative, and have been used to represent the four combinations in most of the attribution research. Ability is both internal and stable (meaning that it tends to be seen as a characteristic of the person that remains unchanged over time), effort is internal and unstable, task difficulty is external and stable (unchanging across repetitions of the same task), and luck is both external and unstable.

The significance of the attributional model for the present study lies in the finding that the different attributions have distinct affective and motivational consequences that are likely to affect future achievement. The locus dimension, for instance, is related to affective responses, such that success attributed to internal factors leads to increased pride and self-esteem, while failure attributed to internal causes yields the greatest shame, guilt, and loss of self-esteem. The stability dimension, meanwhile, is related to the magnitude of expectancy shifts. A stable attribution after success leads to the most increase in the expectancy of success on future tasks, while a stable attribution for failure leads to the greatest decrease in expectancy. Also, Weiner (1980) reports research demonstrating that unstable attributions are correlated with intensity and persistence in the face of failure.

Among incoming college students who have been successful on academic tasks at the secondary level (assuming for the moment that
this sample did well in high school, and that their subjective perception is that they were successful), these findings suggest that students' attributions concerning the reasons for that past success will be an important mediator between high school and college performance. Attributions of that earlier success to ability and/or effort (both internal factors) should yield a higher academic self-concept, which will contribute to college-level performance (Reynolds, Ramirez, Magrina, & Allen, 1980; Shavelson, Hubner, & Stanton, 1976).

Attribution to ability in particular, because ability is stable, should also correlate with expectancy for success in college, while effort attributions may lead to increased intensity and persistence in course work. On the negative side, high school success attributed to external factors (either task difficulty or luck) should contribute less to students' academic self-concept. Also, attribution of high school success to low task difficulty will do little for the expectancy of success in college, despite the usual classification of task difficulty as a "stable" cause. A student who feels that he or she succeeded at the secondary level because high school was easy is not necessarily led to the conclusion that college also will be easy. In a sense, for students making the transition to a new academic setting, task difficulty becomes an unstable factor.

The predictions summarized here are based on both theoretical and empirical literature generated by the attributional model. The following chapter will review the literature in greater detail, and
will discuss the connections between that body of work and the particular real-life educational problem which is the subject of the present study.
CHAPTER TWO
REVIEW OF THE LITERATURE

Weiner's Attributional Model of Achievement Motivation

The current attributional approach to achievement motivation has its roots primarily in the "naive psychology" of Fritz Heider (1958). Heider's theory was based on the premise that humans are by nature seekers of information, or as Weiner (1979) writes, "the search for understanding is the (or a) basic 'spring of action'" which "stands with hedonism among the primary sources of motivation." One manifestation of this basic need to understand the world is the tendency to draw inferences about the reasons for our own and others' behavior. Heider's theory of naive psychology describes the process by which we make such inferences.

Achievement-related performance is one category of behavior about which we frequently make the kinds of causal inferences studied by Heider. After we receive feedback about performance on an achievement-related task, the attributional question becomes: Why did I succeed or fail at this task? According to Weiner, an individual is particularly motivated to engage in such a causal search in achievement situations where the outcome is unexpected, negative, or important to the individual. As Heider initially
pointed out, the conclusions we draw concerning the causes of our own success or failure are likely to have consequences for our affective reactions, expectancy of future success, and even the quality of performance when faced with achievement tasks in the future. These consequences of various attributions of causality in achievement situations have been explored further in the attributional model developed by Weiner and associates over the past 15 years (Weiner, 1979, 1980, 1985; Weiner, Heckhausen, Meyer, & Cook, 1972; Weiner & Kukla, 1970;)

The following sections of this chapter will discuss the details of Weiner's theory—the dimensions along which attributions vary; the effects of those attributional dimensions on affect, expectancy, and performance; biases and individual differences in attributional tendencies; and finally the relation of the model to the educational problem under investigation in the present study.

The attributional dimensions. Heider's theory describes four distinct possibilities for causal ascription after success or failure: ability, effort, task difficulty, and luck. The most significant variation among these causes, in Heider's view, is along the dimension of internal vs. external locus. Ability and effort are internal characteristics of the person, while task difficulty and luck are features of the external world. Clearly, the locus of an inferred cause after a success or failure can have some important effects. A student who receives an "A" on a test, if she attributes that success to internal causes, may be more likely to approach academic challenges in the future, may raise her expectations
regarding future performance, and will probably feel good about her current performance.

This same internal vs. external theme is central to the work of Rotter (1966) and Phares (1976) on the construct they call "locus of control." In Rotter's conception, individuals vary in the extent to which they perceive reinforcements as contingent upon their own behavior (i.e., internal control) as opposed to outside forces such as luck or fate (external control). An internal locus of control would appear to be related to a more active, directive style of dealing with the environment, while an extreme external style may be associated with the type of hopeless inactivity described by Seligman (1975) as "learned helplessness."

Weiner's model of attribution continues to emphasize the four traditional causes posited by Heider (ability, effort, task difficulty, and luck) and agrees with both Heider and Rotter that the locus dimension is of major importance. Weiner's theory, however, promotes the dimension of stability to an independent position of equal significance. The stability dimension, which was first described by Heider but not emphasized in the original theory, refers to the extent to which an inferred causal factor can be presumed to remain the same across repeated situations. Of the four traditional causes, ability and task difficulty are stable, effort and luck unstable. Weiner (1979) points out that locus of control research typically confounds the two dimensions, offering subjects a choice between ascription of outcomes to ability (an internal and stable cause) or to luck (an external and unstable cause).
The stability and locus dimensions have comprised the model underlying most of the research by Weiner and others investigating attributions in achievement situations. Other dimensions have been proposed, however, including one which was originally labeled "intentionality" by Heider (1958) and Rosenbaum (1972) but which Weiner refers to as "controllability." This third dimension was added to distinguish particularly between the very different specific causes, such as effort (controllable) and mood (uncontrollable), that could fall within the internal/unstable cell of the two-dimensional model. Weiner (1979) has described controllability as a third independent dimension in a three-dimensional model (Table 2), but it is not at all clear that controllability is simply orthogonal to the locus and stability dimensions. From the perspective of the actor, by definition, no external cause of success or failure can be controllable. Weiner skirts this issue by focusing on external causes involving other people, whose helpful or unhelpful influence may be under their control. From the actor's perspective, however, factors such as teacher bias or the helpfulness of a classmate are still uncontrollable, precisely because their locus is external to the actor. It is probably best to think of controllability, then, as a useful distinction among certain specific internal and unstable causal attributions.
### Table 2  
**Specific Causes on a Three-Dimensional Model**

<table>
<thead>
<tr>
<th>Controllability</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stable</td>
<td>Unstable</td>
</tr>
<tr>
<td></td>
<td>Stable</td>
<td>Unstable</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td>Ability</td>
<td>Mood</td>
</tr>
<tr>
<td></td>
<td>Typical</td>
<td>Immediate</td>
</tr>
<tr>
<td>Controllable</td>
<td>Effort</td>
<td>Effort</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>Bias</td>
</tr>
<tr>
<td></td>
<td>Unusual help</td>
<td>from others</td>
</tr>
</tbody>
</table>

Other possibly independent dimensions have been suggested. Weiner (1979) speculates that in some domains there could be an intentionality dimension separate from the control dimension. A graduate student, for instance, may report that he wanted to work on his dissertation but could not prevent himself from watching the baseball game on television. Abramson, Seligman, and Teasdale (1978) have also suggested a globality dimension, which may be particularly significant within stable attributions. When a student fails a history test, the psychological consequences of a global ability attribution (I failed because I am stupid) will be very different from the consequences of a more specific ability attribution (I failed because I am bad at history). This globality dimension can be seen as a cognitive formulation of the behavioral concept of stimulus generalization.

While these additional dimensions are the subject of speculation, the two-dimensional model (with some references to
controllability) remains the basis for the body of attribution research. The stability and locus dimensions are logically derived, but there is also some empirical support for their existence in people's conceptions of causality. Weiner (1979) cites an unpublished report by Cooper and Burger (1978) which summarized several studies in which open-ended questionnaires have been used to elicit attributions concerning achievement by self or others. Ability, effort, and task difficulty are among the categories most frequently cited by subjects, although luck, the fourth posited specific cause, does not appear on the list. Other determinants found by Cooper and Burger include physiological processes such as mood and health-illness, "acquired characteristics" including attitudes and habits, motivational characteristics such as attention and interest, and the influence of other people.

Other studies have attempted to validate the two dimensions themselves. Passer (1977) presented subjects with all possible pairs from a list of 18 specific potential causes of success or failure on an exam, and asked the subjects to rate the similarity of each pair. Multidimensional scaling revealed that subjects perceived two dimensions of causality, which Passer labeled internal-external ("bad mood" and "no self-confidence" at one extreme and "bad teacher" and "hard exam" at the other) and intentional-unintentional ("never studies hard" and "lazy" vs. "nervous" and "bad mood"). The stability dimension was not supported by Passer's data, but the two reported dimensions clearly correspond to Weiner's locus and controllability dimensions.
A factor analytic study by Meyer (1978) did support Weiner's three dimensions. Meyer gave subjects information regarding students' past history as well as social norms on a hypothetical exam, then had subjects rate nine perceived causes of success and failure. Factor analysis yielded three factors corresponding to locus, stability, and control.

If we accept this evidence that Weiner's dimensions exist in individuals' conceptions of causality, and that the four specific causes are the most frequent and salient, we still must ask what it is that leads individuals to infer each type of cause for success or failure. Weiner (1980) provides a summary of the informational cues associated with each of the four typical attributions (Table 3).

Table 3

<table>
<thead>
<tr>
<th>Informational Cues Utilized in Causal Attributions for Success and Failure</th>
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</thead>
<tbody>
<tr>
<td>Causes</td>
</tr>
<tr>
<td>Ability</td>
</tr>
<tr>
<td>Effort</td>
</tr>
<tr>
<td>Task difficulty</td>
</tr>
<tr>
<td>Luck</td>
</tr>
</tbody>
</table>

Adapted from Weiner, 1980, p. 332.
Ability ascriptions, as Table 3 indicates, are generally associated with information regarding past history of success, particularly where information about social norms on the task is available so that task difficulty can be inferred (Frieze & Weiner, 1971). There also appears to be a primacy effect, such that individuals displaying early success and then descending performance are seen as more able than individuals who are seen as working up to success (Jone, Rock, Shaver, Goethals, & Ward, 1968). A peak in performance also encourages ability ascriptions, even where the actor's average performance is not superior (Rosenbaum, 1971).

Effort attributions concerning one's own behavior are of course influenced in part by direct observations of the energy one has expended. Research by Weiner and Kukla (1970) and Kukla (1972), however, indicates that effort ascriptions are also affected by outcome. Subjects in these experiments performed a digit-guessing task in which there was actually no discernible pattern—in other words, outcome was random, although subjects were led to believe otherwise. In both experiments, subjects who were successful believed they had expended more effort than did unsuccessful subjects. Weiner (1980) suggests that this tendency reflects a very adaptive lesson learned in real life, where outcome frequently does covary with effort.

Social norms are probably the most salient cues for ascription of performance to task difficulty. If everyone in a class has failed an exam, for instance, then one's own failure can be attributed largely to a "hard test." For some tasks, objective
characteristics of the situation also indicate the relative ease or
difficulty of the challenge, but Weiner argues that this kind of cue
is secondary wherever outcome norms are available.

Attributions to luck, according to Weiner, are frequently based
on observable characteristics of the task. In a typical gambling
game, for instance, the individual can see that outcomes will be
random. In a situation where results are not so transparently
determined by luck, continued observation of a random pattern of
outcomes may lead to a luck ascription. (In many attribution
experiments, subjects show a consistent inability to recognize the
randomness of their results on some performance task, but in these
situations the researcher's instructions have typically been
designed to convince subjects that outcomes will not be random.) It
has also been found in attribution research (Feather & Simon, 1971)
that unique outcomes—one failure after continued success or vice
versa—are typically ascribed to luck.

This discussion is not intended to imply that individuals are
always rational in their attribution regarding success and failure,
or that all individuals display identical patterns. Biases and
individual differences in attributional tendencies will be discussed
in a later section of this chapter.

Consequences for affect, expectancy, and performance. The
significance of attribution theory for academic achievement rests on
the assumption, introduced by Heider, that different attributions
for any success or failure will have distinct consequences for the
individual's affective reaction, expectancy of success, and
subsequent performance. Weiner and other researchers have further explored the consequences of causal attributions in achievement-related situations, and have found linkages between the attributional dimensions and particular effects (for reviews, see Bar-Tal, 1978; Weiner, 1978, 1980). In general, the research has revealed that the stability dimension is related to expectancy levels, locus of causality is a determinant of affective reactions, and both dimensions relate in complex ways to behavior in future achievement situations. The added controllability dimension is the subject of some controversy, but may be an important influencing factor in both expectancy and affective reactions, particularly after failure (Forsyth & McMillan, 1981; Weiner, 1979, 1985).

For both success and failure, according to Weiner's theoretical formulation, attribution to stable factors leads to a greater magnitude of expectancy shift. Failure attributed to stable factors (either lack of ability or task difficulty) causes a greater decrease in expectancy than failure attributed to unstable factors, and success attributed to the stable factors of ability or ease of task results in a larger increment in expectancy than success attributed to unstable causes.

Early empirical support for the stability-expectancy link came from Meyer (1970; described in Weiner, 1980). Male high school students in this experiment completed five failing trials at a digit-symbol substitution task. After each trial subjects reported their attributions by assigning a percentage to each of the four traditional causes (low ability, insufficient effort, task
difficulty, and bad luck) and also estimated the probability that they would succeed on the next trial. Results indicated that subjects in general lowered their expectations with each new failure, but the decrements in expectation were greatest when ascriptions to low ability and task difficulty were high and ascriptions to insufficient effort and bad luck were low.

McMahan (1973) replicated Meyer's study, but with a broader age range (11 - 20) and using a paired-comparison method for assessing attributions. Subjects in McMahon's experiment were forced to choose, from each possible pair of the four specific causes, "Which of these two causes was more responsible for your outcome?" Again in this study, results demonstrated the predicted relationship between the stability dimension and decrements in expectancy after failure.

Other studies have used experimental manipulation of attributions, rather than the more correlational approach of Meyer and McMahan, to test the stability-expectancy hypothesis. Rosenbaum (1972) presented subjects with the story of a hypothetical situation in which a supervisor and an employee worked together on a project. The stories heard by different subjects varied according to outcome (success vs. failure) and the apparent cause of success or failure. After hearing the story, subjects were asked to indicate their expectancy for success on the next project undertaken by the two characters. As in the McMahan and Meyer results, expectancies in this study were affected in part by the outcome itself—i.e., the failure condition yielded lower expectancies. There was also an
effect for stability, however, such that success attributed to
stable factors led to the highest expectancies, and failure
attributed to stable causes produced the lowest expectancies.

Weiner, Nierenberg, and Goldstein (1976) provided further
evidence that expectancy is related to the stability and not the
locus dimension. In this study different groups of subjects were
given 0, 1, 2, 3, 4, or 5 successful trials on a block-design task,
then reported their causal attributions and expectancy of future
success on the task. To assess attributions, Weiner et al. had
subjects rate their agreement on four scales, each of which varied
one of the two major dimensions while holding the other constant.
For instance, the question "Did you succeed on this task because you
are always good at these kinds of tasks or because you tried
especially hard on this particular task?" forces a comparison
between two causes which are both internal in locus but which vary
in terms of stability. The findings of this study again support the
hypothesized connection. Subjects' expectancies were found to be
related to the stability dimension but not to the locus dimension.

Despite the empirical support provided by these laboratory
studies, some researchers have questioned the stability-expectancy
Forsyth and McMillan suggest that the artificiality of the
experimental studies may cause an inflated picture of the importance
of stability, as subjects are typically not concerned with the long-
range implications of their performance. In real academic settings,
students can be assumed to be seeking ways to achieve maximum
performance in the future, and therefore to be quite concerned with putting to use information regarding the reasons for their past successes and failures. While the causes they infer may indeed be more or less stable, students in school settings are likely to be more concerned with whether—and in what way—they can control the outcome of future tasks.

One difficulty in interpreting the research regarding this issue is that "effort" as a specific cause confounds stability with controllability. If failure attributed to lack of effort leads to less of a decrement in expectancy, we may interpret this effect either as support for the importance of the stability dimension, or as an indication that the controllability of the cause allows subjects to remain optimistic in the face of failure. Forsyth and McMillan (1981) attempted to tease apart the two dimensions by directly assessing attributions along the dimensions rather than on specific causes. College students in this study were asked to rate the reasons for their success or failure on an exam by responding on an agreement scale to items such as, "To what extent do you think your score on the test was caused by things that are stable (don't change) versus unstable (change)"? Expectancy levels were found to be related to the controllability item more than to stability. Individuals who succeeded expressed more positive expectations when they attributed their performance to internal, controllable factors, while students who failed expressed the most negative expectations when they ascribed their failure to external, uncontrollable causes.
Early conceptions of the relationship between the attributional model and affective reactions (Weiner et al., 1971) focused on the emotions of pride and shame, the two achievement-related affects which have traditionally been the presumed correlates of success and failure in achievement situations (Atkinson, 1964). Weiner and associates hypothesized that the magnitude of these emotions, after success and failure, would be mediated by the locus dimension of causal attributions. Success attributed to internal causes would generate more pride than success attributed to external factors, and failure attributed internally would lead to greater shame than failure attributed to external causes.

Subsequent research, however, has produced a more complex view of the attributional mediation between achievement and affective response (Weiner, 1979, 1985; Weiner, Russell, & Lerman, 1978). The more recent research has typically assessed a variety of specific emotions, rather than pride and shame alone, after success and failure. The findings continue to support the predicted effect of locus of attribution on some affective reactions, including pride and shame, but other emotions appear to have different sources. Weiner (1979, 1980) concludes that achievement-related emotions must be divided conceptually into three sets: (1) those emotions tied directly to outcome regardless of attribution, such as happiness/unhappiness, (2) distinct emotions related to particular causal ascriptions, such as gratitude when a helpful classmate is seen as a cause of success or anger when a failure is attributed to a teacher's bias, and (3) affects related to self-esteem (e.g.,
pride, shame, feelings of competence), which are mediated by the internal-external attributional dimension.

Support for the first two of these categories—outcome-linked emotions and emotions related to specific causes—comes from a study by Weiner, Russell, and Lerman (1978). Subjects were given a story in which the protagonist either succeeded or failed at an exam, and the outcome was attributed to a particular cause (e.g., "Joan failed because she did not have the ability."). Subjects were then provided a list of affects (100 for the success scenarios, 150 for the failure) and asked to use a rating scale to indicate the intensity with which each of the emotions would be experienced by the character.

The investigators found some reported affects to be simply dependent on outcome, regardless of attribution. These included pleased, happy, satisfied and other "good feelings" for success, and upset, displeased, uncheerful and others in the failure condition. Other specific emotions, however, were associated with particular attributions. Given success, ability attributions were linked to competence and confidence, luck to surprise, helpful others to gratitude, and so on. For failure, specific attribution-affect connections included lack of ability to incompetence, others to aggression, and lack of effort to guilt and shame.

Another study by Weiner, Russell, and Lerman (reported to Weiner, 1979) produced similar results, and also reinforced the postulated role of internal attributions in general as a source of some emotional responses. In this study subjects were asked to
recall a particular incident in which they had succeeded or failed at an exam as a result of ability, typical effort, immediate effort, help (or hindrance) from others, personality, or luck. Subjects then were asked to list three emotions they experienced regarding that success or failure. Results here again demonstrated the existence of outcome-dependent emotions and attribution-specific emotions. Additionally, as predicted, some affects were found to cluster consistently around all of the internal attributions. Internal attributions for success were associated with pride, confidence, satisfaction, and feelings of competence. Internal ascriptions for failure led to guilt and resignation.

Other evidence suggests that the stability and controllability dimensions are also involved in determining some affective responses after success and failure. In the Weiner et al. (1978) study, the affects of depression, apathy, and resignation were most often reported when the protagonist's failure was attributable to causes that were internal and stable—lack of ability, lack of typical effort (i.e., a tendency not to try hard), or personality deficit. This stability-affect linkage after failure is predictable given the relationship between stability and expectancy; if a failure has occurred due to causes that are likely to remain the same, then expectancies are lowered and feelings of hopelessness and depression follow.

Arkin and Maruyama (1979) have also demonstrated a stability-emotion connection in a study which assessed college students' attributions regarding their success or failure at a
college class. Subjects' anxiety regarding school performance was measured, and among successful students the stability of attributions was negatively correlated with anxiety. For unsuccessful students, stability and anxiety were positively correlated; students experienced more fear if they felt that their failure had been caused by stable factors.

The third dimension of controllability also appears to influence emotional responses. Research involving other constructs, such as locus of control (Rotter, 1966) and learned helplessness (Seligman, 1975; Abramson et al., 1978) suggest a connection between perceived loss of control and depression. Forsyth and McMillan (1981) contend that much of the past attribution research on the significance of the locus and stability dimensions for affective reaction can be reinterpreted in favor of a controllability-affect hypothesis. The Forsyth and McMillan study itself found that both controllability and locus are related to particular sets of affective responses. Students who considered their performance to be caused largely by controllable factors—whether they succeeded or not—reported more happiness and satisfaction than those who ascribed their performance to uncontrollable factors.

The controllability dimension in the Forsyth and McMillan study was not, however, related to self-evaluative feelings such as competence and pride. As the Weiner model would predict, these reactions were associated with the locus dimension. Among individuals who failed, those who rated internal causes high reported significantly more negative feelings about their competence
and adequacy. Within the successful group, internal attributions were related to more positive affect.

As the preceding discussion demonstrates, research based on Weiner's attributional model has focused on the consequences of causal ascriptions for expectancy and affect rather than directly investigating the relationship between attributions and subsequent achievement striving and performance. As Weiner (1980) maintains, however, the assumptions of a cognitive model of motivation must lead one to expect that attributions will affect achievement behavior:

...cognitive theories of motivation specify that performance is a function of the expectancy that the response will lead to the goal and the affective consequences of goal attainment. It has been established that causal ascriptions influence both goal expectations and emotional experience. It therefore follows that causal ascriptions also should influence a variety of behaviors (Weiner, 1980, p. 380).

More specifically, Weiner argues that attributions can affect the individual's choice of tasks and intensity and persistence of behavior.

A limited collection of studies, some correlational and some involving training programs, support Weiner's hypotheses. In Meyer's (1970) study, subjects encountered repeated failures on a digit-symbol task and reported their causal attributions after each trial. Meyer assessed subjects' intensity (defined as the time taken to complete 75% of the task) and found that increased intensity was a function of ascription to unstable causes.
Dweck and Reppucci (1973) found that internal attributions for failure had a positive effect on persistence. This study exposed subjects to repeated failures (30 trials on a block design task), but then presented them with two soluble tasks. Subjects completed an inventory designed to assess the individual's tendency to attribute performance to internal or external causes. When subjects were divided into "helpless" and "persistent" groups according to their performance on the two soluble problems, the persistent group was found to have made the more internal attributions.

Based on these correlational findings, the attribution-performance hypothesis was further tested by Dweck in applications of the model to training programs. Dweck (1975) worked with a group of children selected for their lack of persistence in the face of failure. The children in the experimental group were given a series of tests in which they received 20% failures. After each failure trial, they were told, "You got only ______ right. That means you should have tried harder." After training, both performance and attributional tendencies were assessed, and compared to pre-test levels and to a control group. Only the experimental group showed an increase in intensity (correct answers per minute) and in their tendency to attribute failure to low effort.

Chapin and Dyck (1976) replicated the Dweck findings in a similar training study with learning disabled children. Again, achievement striving increased when children were trained to attribute failure to lack of effort.
Given a failure experience, then, the evidence indicates that effort attributions have the optimal impact on future performance. Because effort is an internal factor, blaming failure on a lack of trying may not be satisfying affectively. What appears to be most important in the face of failure, however, is that effort's instability allows one not to lower one's expectations. Also, unlike some other specific unstable causes (e.g., mood or luck), effort is experienced as a controllable factor.

Given success, on the other hand, neither empirical evidence nor logical analysis provides quite so clear a conclusion as to which specific internal causal attribution will best facilitate future performance. Ascription of success to ability should promote both a sense of competence and self-confidence—i.e., high expectancy—but could at the extreme result in a destructive overconfidence. Effort attributions for success, because effort is unstable, will allow much less growth in confidence and expectancy, but may promote good feelings and future effort expenditure in such a way that performance will be enhanced. The best logical conclusion appears to be that future success is optimally facilitated by a balance of ability and effort ascriptions for success. The most desirable state of affairs for a currently successful student, then, would be to infer that his success has required both aptitude and hard work.

**Biases and individual differences in attribution.** A preceding section of this chapter described the informational antecedents which give rise to various causal attributions after success and
The assumption underlying much of that earlier discussion was that human beings are rational processors of information, not controlled by systematic motivational biases which might intervene between information-gathering and causal attributions regarding the reasons for one's own performance. However, almost any perspective in psychology would lead one to expect that people will violate that rational model, and authors in the field of attribution theory have described various self-enhancing and defensive biases (Nicholls, 1975; Zuckerman, 1979; Weiner, 1980; Griffin, Combs, Land, & Combs, 1983).

In a review of the attribution research, Zuckerman (1979) reported that 71% of studies he reviewed found a tendency for subjects to ascribe success more than failure to internal causes. Griffin et al. (1983) also summarize findings indicating some bias toward more stable attributions after success than after failure.

As Weiner (1980) concludes, it has been difficult to demonstrate self-serving biases in attribution because most of the research has utilized very artificial task situations. Regardless of the causes one infers, performance on a digit-symbol or block design task probably has little potential to damage or enhance one's self-esteem. Some research, however, has used college exam and course performance to test for attributional biases. Gilmore and Reid (1979) found that students who were successful on an exam ascribed their success more to the traditional internal causes (ability and effort) than to external factors, while unsuccessful students made more attributions to task difficulty. In another
study of exam performance, Arkin and Maruyama (1979) found that successful students made more internal attributions than did unsuccessful students. Griffin et al. (1983) studied the causal ascriptions of students regarding overall performance at the end of a course, and found that more successful than unsuccessful students agreed with the standard internal causal attributions of ability and effort.

It has been suggested that attributional biases are related to certain person variables, particularly achievement needs and gender. Weiner (1980; Weiner & Kukla, 1970) has presented his attributional model as a reinterpretation of the Atkinson construct of achievement motivation (Atkinson, 1964; McClelland, Atkinson, Clark, & Lowell, 1953). Atkinson defines achievement motivation as "the capacity for experiencing pride in accomplishment" (1964, p. 214). According to Weiner's model, that capacity reflects a particular set of attributional biases regarding success and failure (Kukla, 1972). Individuals high in achievement motivation display a general tendency to make internal attributions (both ability and effort) for success. Because these internal ascriptions lead to heightened affective "reward" for success, the individual displaying this attributional bias experiences both an increased self-esteem and an increased incentive to approach achievement-related activities in the future. After failure, on the other hand, the individual high in achievement motivation tends to make attributions specifically to lack of effort, which is internal but also unstable and controllable. As a result, the person high in achievement needs
will perform more vigorously and persistently in the face of failure.

The attributional reinterpretation of Atkinson's model has received some empirical support. Kukla (1972) administered a digit-guessing task on which success or failure were entirely due to chance, although subjects were led to believe that a discernible pattern existed. Subjects then rated their performance on a 1-10 scale, and rated the causal contribution of ability, effort, task difficulty, and luck. Results indicated that individuals high in achievement motivation, given either success or failure, made more attributions to effort than did intermediate and low achievement motivation groups. The intermediate group made more attributions to luck than did either of the two extreme groups.

In two subsequent experiments, Kukla (1972) tested the relationship between these attributional tendencies and achievement behavior. In each experiment one group of subjects was given instructions intended to produce the kind of attributions typical of individuals high in achievement motivation (ability and effort), while another group was given instructions more consistent with the attributional style of low achievement motivation (ability only). The prediction was that the former group would perform on the experimental task in ways typical of individuals high in achievement motivation—that is, more intense performance and relatively high risk-taking—while the ability-only group would perform more in the fashion of low achievers. Results were consistent with those hypotheses, but only for subjects who were initially high in
measured achievement motivation. Kukla concluded that this type of attributional intervention does have the potential to arouse achievement behavior, but only according to each individual's dispositional level of achievement motivation.

The research literature also includes evidence that there are sex differences in attributional tendencies. The exact conclusions regarding the nature of differences vary from study to study, depending on the population and situational variables (McHugh, Frieze, & Hanusa, 1982). Most authors agree, however, with the general conclusion that females are less likely to attribute success to ability than are men, and therefore gain less self-enhancement from their successes.

Griffin et al. (1983) report a typical finding regarding gender differences. For male college students in this study, perceived success on an exam was correlated with the level of attribution to ability, while for females success and attributions to unstable causes (effort and interest) were positively correlated. The men, in other words, demonstrated a self-enhancing bias which was not displayed by the women.

Nicholls (1975) found not just the absence of a self-enhancing bias among females, but also a self-derogatory bias. After exposure to either success or failure treatments on an angle-matching task, 4th grade girls in this study more often attributed failure to low ability than success to high ability. Boys, in contrast, tended to attribute failure to bad luck.
Much of the disparity between the sexes in attributional tendencies may be explained as resulting from the covariation of gender with dispositional individual difference variables, particularly achievement motivation (McHugh et al., 1982). Research cited here suggests that subjects low in achievement motivation generally demonstrate an absence of self-enhancing and self-protective attributions similar to the pattern found among female subjects in the Griffin et al. and Nicholls studies. Levine, Gillman, and Reiss (1982) provided empirical evidence for the link between achievement needs and sex differences in attribution. Subjects in this study worked in pairs on anagrams, in a competitive setting in which the winner was actually prearranged. Causal attributions for success and failure were then assessed along with various individual difference variables. The predicted sex differences were found, with women making more effort and luck attributions and fewer ability attributions than men. These differences were eliminated, however, when the contribution of achievement motivation was statistically controlled. In other words, all of the differences between males and females on the ability, effort, and luck attributions could be accounted for by differences in the need for achievement.

The present study: Attributions and the prediction of academic performance. The present study applies the attributional model to a specific practical educational question: Among students who enter college with high academic aptitude scores and perceived success in high school, what intervening factors influence their performance as
college freshmen? It is reasonable to expect that incoming college students, faced with the unknown of college academic life, will look to their past experience as students for relevant information. The theoretical model and empirical evidence reviewed here suggest that these students will search cognitively for the causes of their performance at the high school level, and that the inferences they make will ultimately have an effect on their initial college achievements.

This particular application of the attributional model does in significant ways depart from past research in the field. First, much of the empirical literature has involved subjects in artificial laboratory situations. Only a few studies have analyzed students' causal attributions for success and failure on real academic tasks such as course exams (e.g., Arkin & Maruyama, 1979; Forsyth & McMillan, 1981; Griffin et al., 1983).

Even less attribution research has focused on a past achievement event as broadly conceived as "high school performance." One study which came closest to this kind of application was that of DeBoer (1983), who obtained students' attributions regarding the reasons for their first-term performance in college. Results of DeBoer's study are somewhat difficult to interpret, however, because of the technique used to assess attributions. Subjects were asked to rate each of 11 potential causal factors, not according to its importance but instead on a 7-point scale that ranged from "most negative" to "most positive" effect. Students who felt that they failed, for instance, were put in the apparently confusing position
of having to rate how negative or positive an effect "effort" (not lack of effort) had on their performance. The author's intention apparently was that students who blamed their failure on lack of effort would indicate so by rating effort "very positive," but this could not have been clear to respondents. At any rate, DeBoer did find some of the predicted relationships between attributions and affective reactions, expectancy, and subsequent performance. For successful students, affective reaction (pleased vs. disappointed) was related to "effort," "ability to concentrate while studying," and "high school preparation." Expectancy for later success, for successful students, was correlated with attribution to "ability to work long and hard." Second term performance (GPA) was predicted by attributions of success to "academic aptitude"—in other words, students who exceeded their expectations during the first term were most likely to do well during their second term if they ascribed the initial success to ability.

The present study also differs from most of the past research by relating attributions to subsequent levels of performance. The Weiner model clearly implies that attributions regarding past performance can influence later success or failure on similar tasks. Aside from the DeBoer study, however, most of the research goes only so far as the prediction of affective reactions and expectancy levels, and in some cases intensity and persistence of subsequent behavior. The present study extends the predictive model to include future achievement as a consequence of attributions; these hypotheses are derived more from a logical extension of the theory
than from empirical evidence.

Research Hypotheses

The structural model. Figure 1 summarizes the posited mediating effect of causal attributions between high school success and first-term performance in college. In general, attributions to both ability and effort were expected to have a favorable impact on college achievement. Both ability and effort attributions for past school success, because these are internal causes, were predicted to contribute to affective reactions such as pride and self-esteem, and therefore to academic self-concept. Academic self-concept, in turn, has been shown to correlate with college grade point average (Reynolds et al., 1980) and it was expected that this would be particularly true for new students facing the often intimidating transition into college. Also, attribution of past success to the stable cause of ability in particular was expected to enhance students' expectancy of success in college and thus facilitate achievement striving. Finally, attribution of high school success to the internal, unstable, and controllable factor of effort specifically was expected to lead to greater expenditure of effort on college course work and therefore contribute to performance. Research does not clearly support this last posited causal effect, as most studies have focused on the adaptive value as ascribing failure to low effort. It is reasonable to suppose, however, that those who perceive some covariation between their level of effort and past performance--whether successful or unsuccessful--will
Perceived success attributed to:

- Ability
- Expectancy of Success (→ College)
- Task ease (→ Academic Self-Concept, Effort)
- Luck
- Effort → Effort in College

--- = positive effect

---------- = negative effect

Figure 1 Posited Mediation of Attributions Between High school Success and College Performance

continue to presume the efficacy of effort in future achievement situations.

The proposed model also includes some negative effects. First, attribution of high school success to task ease was expected to correlate negatively with subjects' expectancy of success in college. This prediction runs contrary to the usual role of task ease/task difficulty in attribution theory as a "stable" cause of success or failure. The departure is justified in this particular situation, on the grounds that new college students will not regard the easiness of high school as a predictor of the level of difficulty they will encounter in college work. It was also hypothesized that attribution to task ease, because task ease is an
external factor, would correlate negatively with academic self-concept in this population. Finally, attribution to luck was expected to covary negatively with expectancy (because luck is typically seen as unstable) and with academic self-concept (because luck is an external factor). The contention in all of these predictions is not that past success, when attributed to task ease or luck, actually has a damaging effect on expectancy or self-concept. The assumption is rather that, given perceived success, ascription of that outcome to external, unstable factors limits the degree of enhancement one can gain from the successful experience.

The entire network of posited effects among these variables can be summarized as the first hypothesis of this study:

Hypothesis 1—The model presented in Figure 1 will provide a plausible representation of the relationship among these variables in the population.

Aptitude scores and prediction of performance. An important premise of this study is that the variables included in the model described above are capable of accounting for differences in academic performance that cannot be predicted by aptitude test scores. Hypotheses 2 through 4 state that premise more precisely:

Hypothesis 2—The entire set of variables in the model will explain a significant portion of the variance in first-term GPA beyond that which can be accounted for by aptitude scores.

Hypothesis 3—The set of four attribution variables in the model will collectively explain a significant portion of the variance in GPA beyond that which can be accounted for by aptitude scores.
Hypothesis 4—Each of the intervening variables in the model—expectancy, academic self-concept, and predicted effort—will explain a significant portion of the variances in GPA beyond that which can be accounted for by aptitude scores.

**Sex differences.** Past research also led to a hypothesis that there would be sex differences in causal attribution.

Hypothesis 5—Females will make lower ability attributions than males for success, and greater attributions to effort, luck, and task ease.
Subjects and Procedure

Subjects in this study represent a sample from the 600 new first quarter freshmen who enrolled directly in the College of Engineering at The Ohio State University for Autumn Quarter, 1985. These students are selected according to aptitude score; permission to enroll directly in the College of Engineering is contingent upon minimum scores of 25 on the ACT Mathematics scale or 550 on the Mathematics scale of the SAT—approximately the top 20% on the overall national distributions for these aptitude tests.

Students' participation was solicited at two orientation sessions conducted by the College of Engineering during the week preceding the beginning of Autumn Quarter classes. Each student at these sessions received the research questionnaires and a consent form. Completed questionnaires were collected during the first week of classes at the first meeting of each section of the required University Survey course for engineering students. Subjects were informed during the initial contact that their participation was entirely voluntary and would not affect their standing in the course.
A total of 233 completed questionnaires were collected (\(N = 39\%\) of the potential sample). Of these 233, nineteen were eliminated because subjects reported that they were "unsuccessful" or "very unsuccessful" in high school and six others were removed because they were filled out incorrectly or incompletely. The remaining sample included 208 students (\(N = 35\%\) of the potential sample). Of these, 170 (82\%) were male and 38 (18\%) female, with an average age of 18.0 years (range = 17--19). Average ACT Composite score for the sample was 26.6, which represents no significant difference from the mean score of 26.5 for the entire direct enrollment engineering class of 600.

Grades and aptitude test scores were gathered from the College of Engineering, with subjects' consent, after the end of the Autumn Quarter.

**Measures**

**High school success.** the first item in the research questionnaire (see item 1, Appendix B) asked subjects to rate their performance in high school along a four-point scale, with very successful, successful, unsuccessful and very unsuccessful as the four points along the scale. This was ultimately used to eliminate from analysis those students who characterized their high school experience as unsuccessful.

**Attributions.** Attributions regarding high school success or failure were assessed by a series of agreement scales based on the technique suggested by Elig and Frieze (1979). Separate sets of items were included for success and lack of success (see items 2a
Students who viewed their high school experience as successful (unsuccessful) were instructed to "rate the extent to which each of the following factors contributed to your success (lack of success), 1 if the factor to no extent caused your success (lack of success), 7 if the factor was a very important cause of your success (lack of success)." The items were limited to the four traditional causes, again worded differently for success and lack of success:

- Your high level of (lack of) ability ______
- The easiness (difficulty) of your high school classes ______
- The effort you put into your schoolwork (your lack of effort) ______
- Your good (bad) luck ______

An open-ended item was also included asking subjects to name any important factors other than the ones listed.

**Expectancy of success.** Two questionnaire items were included to measure expectancy of success in college (see items 3 and 4, Appendix B). The first item asked students to respond on a four-point scale to the item "How successful do you expect to be in college?" The second item asked students to predict a grade-point average for the first quarter of college, with choices descending by half-point decrements from 4.0 to 0.

**Predicted effort.** In the absence of any way to measure directly the expenditure of effort on college course work, three items on the questionnaire asked subjects to predict their level of effort (see items 5, 6, and 7, Appendix B). Each of these items
named and gave a definition of a particular aspect of achievement striving: **persistence** (defined as the tendency to keep trying rather than give up when faced with a failure or disappointment), **diligence** (defined as the amount of time spent on schoolwork), and **intensity** (defined as how hard one works during whatever time is spent studying). Respondents predicted their level of each along a 5-point scale.

**Academic self-concept.** The Academic Self-Concept Scale (ASCS) developed by Reynolds and associates (Reynolds et al., 1980; Reynolds, 1981) was used to assess this variable (see Appendix C). Reynolds et al. report an estimated internal reliability for the 40-item scale of .91, and established construct validity by correlating college students' ASCS scores with GPA and with scores on the Rosenberg Self-Esteem Scale. GPA and Rosenberg scores, taken together as predictor variables in a multiple regression analysis, accounted for .64 of the variance in ASCS scores. Reynolds (1981) also reports low correlations between the ASCS and the Marlowe-Crowne Social Desirability Scale (r = .17), and between ASCS and SAT Math (r = .05), Verbal (r = .15) and Total (r = .12) scales.

It must be noted that the ASCS was designed for use with a college population, and that the subjects in this study did not yet have any college experience at the time of assessment. As a result, three of the 40 items required minor changes. The phrase "in college" was deleted in items 8 and 15, and the word "college" was replaced by "school" in item 14. The changes do not appear to alter the meaning of these items significantly.
Aptitude. Scores on the ACT Mathematics and Composite scales were available for most students and were used as measures of aptitude. In the 18 cases where SAT Math and Total scores were available rather than the ACT, percentile distributions for the two tests were used to compute "converted" ACT Math and Composite scores. An SAT Math score of 630, for instance, was converted to an ACT Math score of 30 on the grounds that these scores are in the 96th percentile in their respective overall national distributions. SAT Total scores were converted in the same manner to ACT Composite scores.

Grade point average. The overall point-hour ratio for each subject was gathered from College of Engineering records at the end of the first quarter. This average served as the primary indicator of academic performance. A math/physics/engineering (M/P/E) GPA was also computed to serve as a measure of performance in areas related to the engineering major.

Statistical Analysis

Hypothesis 1. The primary hypothesis of this study is that the model presented in Figure 1 provides a plausible representation of the relationships among variables in the population. This hypothesis was tested using a statistical technique referred to most commonly as covariance structure modeling or analysis of covariance structures (Bentler, 1980; Long, 1983; Joreskog & Sorbom, 1984). In this procedure, the covariances among a set of observed variables are explained in terms of the relationships among a usually smaller set of unobserved (latent) variables. A specified model thus
involves both a factor analytic model, describing the posited status of the measured variables (MVs) as indicators of particular latent variables (LVs), and a structural equation model describing the hypothesized causal relationships among LVs. In some applications, including the present study, some of the "latent" variables in the structural model have only one measured variable serving as an indicator of each. In such a case the model contains the assumption that the MV is a perfect measure of the corresponding LV, and the MV itself can be thought of as part of the structural equation model.

Analysis in this study was carried out using the LISREL software package (Joreskog & Sorbom, 1984). The LISREL program estimates values for the non-zero parameters specified in the model, using the maximum likelihood method to yield parameter estimates that provide the "best fit" of the posited model to the observed covariances among measured variables.

Even the best-fitting solution for the parameters specified in a model, of course, can amount to a poor fit with the observed data. In that case the hypothesized model is rejected as an inaccurate description of the "true" relationships in the population which gave rise to the data. Statistically, the decision regarding the general goodness of fit of the model can be made on the basis of a chi-squared ($\chi^2$) statistic yielded by the LISREL program. The $\chi^2$ statistic provides a direct test of the hypothesis that the model fits perfectly in the population--not a test of a competing null hypothesis. Thus the significance test works somewhat paradoxically here: If $\chi^2$ is large relative to its degrees of freedom (i.e.,
significant), then the model is rejected. If $\chi^2$ is small (i.e., nonsignificant), then the model may be retained as a plausible description of the situation in the population.

The preceding discussion presents the analysis of covariance structures as a purely confirmatory technique—in other words, as a means for testing theory. This kind of analysis can also be used in exploratory fashion, to create a modified model which better fits the observed data. LISREL yields various statistics which allow the researcher to identify stresses in the model: MVs that are weak indicators of the corresponding LV, parameters whose estimates are nonsignificant, and parameters not originally included in the model which need to be added. The process of making modifications to a model based on these findings is known as a "specification search" (Long, 1983; Bentler, 1980). Such a search is an important part of the statistical analysis in this study.

Hypotheses 2, 3, and 4. Hypotheses 2 through 4 all contend that various variables included in the covariance structure model will predict a portion of the variance in academic performance beyond that which is accounted for by aptitude scores. Multiple linear regression analysis was used to test these hypotheses, with ACT Composite score as the initial independent variable and GPA as dependent variable. In testing each hypothesis, the statistic of interest is the increment in $R^2$ when the variables in question are added to the model. A significant value of that statistic allows us to reject the null hypothesis that the added variable accounts for none of the variance in GPA beyond that which is accounted for by
Hypothesis 5. Sex differences in attributions were tested using a two-tailed t-test for the difference between group means. A significant value of the t statistic would allow us to reject the null hypothesis that the group means are equal in the population.
CHAPTER FOUR

RESULTS

The Covariance Structure Model—Hypothesis 1

Hypothesized model. Figure 2 shows the full hypothesized model using the conventional notation of covariance structure modeling (Long, 1983; Joreskog & Sorbom, 1984). Measured variables are enclosed in rectangles, latent variables in circles. The structural model in this case includes only two LVs—expectancy and predicted effort—that have more than one MV serving as indicators. All other variables are measured directly as one MV.

Relationships among variables can be represented by one-directional arrows, indicating a directional (or "causal") effect, or by two-directional arrows, indicating simply a correlation between two variables. All of the specified relationships in the present model are directional effects. For the purpose of exposition in Figure 2, broken lines have been used to represent relationships that are expected to be negative. Mathematically, that distinction is not a part of the specified model.

Variables in the structural equation model can be categorized as independent variables (those that are determined entirely outside the model) and dependent variables (those that are the recipient of
Figure 2

Hypothesized Model
Figure 2. Hypothesized model

Attribution of success to:

- Ability
- Task ease
- Luck
- Effort

Expected success

Predicted effort

Expected GPA

Academic self-concept

GPA

Persist Dilig.

Effort

Negative effect
Positive effect

\( \gamma_{11} \)
\( \gamma_{21} \)
\( \gamma_{12} \)
\( \gamma_{22} \)
\( \gamma_{13} \)
\( \gamma_{23} \)
\( \gamma_{24} \)
\( \gamma_{34} \)
\( \lambda_{x1} \)
\( \lambda_{x2} \)
\( \lambda_{y1} \)
\( \lambda_{y2} \)
\( \lambda_{y3} \)
\( \beta_{41} \)
\( \beta_{42} \)
\( \beta_{43} \)
at least one directional effect in the model). In this model, the four attribution variables serve as independent variables, while dependent variables are expectancy, academic self-concept, predicted effort, and GPA. Among the non-zero parameters specified in the model, the effects of independent variables on dependent variables are labeled $Y_{ij}$ (the effect of independent variable $j$ on dependent variable $i$). Each effect of a dependent variable on another dependent variable is labeled $\beta_{ij}$ (the effect of dependent variable $j$ on dependent variable $i$). The parameters $\zeta_1$ through $\zeta_4$ are also part of the structural model, representing the errors in the prediction of each of the dependent variables.

In the case of expectancy and predicted effort, the model also specifies the contribution of the latent variable to each of its measured indicators. Each parameter $\lambda_{yij}$ represents the contribution of hypothetical latent variable $j$ to the measured variable $i$. The $\epsilon$ parameters represent the error in measurement associated with each indicator variable. Error of measurement for the measured variables standing alone in the structural model is assumed to be 0, so these terms are not included graphically in the model.

Table 4 shows the covariance matrix obtained for the 11 measured variables in the model. Results of the LISREL analysis using these data are shown in Figure 3. The statistic of greatest immediate interest is the $\chi^2$ statistic indicating overall goodness of fit. As was explained in Chapter Three, the $\chi^2$ in this analysis works in a manner contrary to the usual logic of hypothesis testing,
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Exp. Success</td>
<td>0.253</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Exp. GPA</td>
<td>-0.060</td>
<td>0.159</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>ASCS</td>
<td>-1.079</td>
<td>1.899</td>
<td>132.430</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4.</td>
<td>Persistence</td>
<td>-0.058</td>
<td>0.037</td>
<td>1.984</td>
<td>0.394</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Diligence</td>
<td>-0.042</td>
<td>0.046</td>
<td>1.393</td>
<td>0.164</td>
<td>0.397</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Intensity</td>
<td>-0.084</td>
<td>0.043</td>
<td>1.172</td>
<td>0.133</td>
<td>0.150</td>
<td>0.461</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Total GPA</td>
<td>-0.035</td>
<td>0.070</td>
<td>0.784</td>
<td>0.030</td>
<td>0.096</td>
<td>-0.022</td>
<td>0.489</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Att. Ability</td>
<td>-0.132</td>
<td>0.106</td>
<td>4.320</td>
<td>0.147</td>
<td>0.057</td>
<td>0.123</td>
<td>0.095</td>
<td>1.436</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Att. Task</td>
<td>0.106</td>
<td>-0.029</td>
<td>-2.513</td>
<td>-0.072</td>
<td>-0.132</td>
<td>-0.211</td>
<td>-0.006</td>
<td>0.089</td>
<td>2.491</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Att. Luck</td>
<td>-0.052</td>
<td>-0.043</td>
<td>-1.475</td>
<td>-0.036</td>
<td>-0.107</td>
<td>-0.073</td>
<td>-0.081</td>
<td>-0.333</td>
<td>0.247</td>
<td>1.904</td>
</tr>
<tr>
<td>11.</td>
<td>Att. Effort</td>
<td>-0.104</td>
<td>0.052</td>
<td>5.615</td>
<td>0.266</td>
<td>0.459</td>
<td>0.152</td>
<td>0.141</td>
<td>0.178</td>
<td>-0.344</td>
<td>-0.285</td>
</tr>
</tbody>
</table>
such that a significant value leads to rejection of the hypothesized model. The $\chi^2$ for this model is 114.23 (df = 39), which clearly is significant ($p < .001$). The model was thus rejected as a plausible description of the relationship among these variables in the population.

Another indicator of overall fit listed in Figure 3 is the $\rho$ statistic suggested by Bentler and Bonett (1980) as an alternative to the $\chi^2$. Bentler and Bonett contend that the $\chi^2$ can be overly stringent in large samples, tending ultimately to reject even the most accurate of models when sample size is extremely large. The $\rho$ statistic does not allow an inferential statistical test, but is especially useful as a criterion by which the fit of competing models can be compared. The formula for $\rho$ for a given model $A$ is

$$\rho_A = \frac{Q_0 - Q_A}{Q_0 - 1.0}$$

where $Q_A$ is the ratio $\chi^2/df$ for the hypothesized model, and $Q_0$ is the corresponding ratio for a "worst-fitting" model in which the observed variables are specified as having no pattern of relatedness. The term 1.0 in the denominator is the value of $\chi^2/df$ for the hypothetical "perfect" model. The $\rho$ statistic, then, is a ratio comparing the improvement in fit obtained by moving from the worst-fitting model to the specified model, against the improvement that would be obtained, theoretically, if a perfect model could be specified. Values for $\rho$ can range from 0 to 1.0.

The value of $\rho$ for this model is .61. The absolute value of is somewhat difficult to interpret, but an obtained $\rho$ of .61 is
Figure 3

Results of Initial Analysis
Figure 3. Results of initial analysis

Attribution of success to:

- **Ability**
  - $\gamma_{11} = 0.081$
  - $\gamma_{21} = -0.024^*$
  - Hypothesized positive effect

- **Task ease**
  - $\gamma_{12} = 0.011^*$
  - $\gamma_{22} = -0.874$
  - Hypothesized negative effect

- **Luck**
  - $\gamma_{13} = 0.115^*$
  - $\gamma_{23} = 1.847$
  - Hypothesized positive effect

- **Effort**
  - $\gamma_{14} = 0.096$

- **Expected success**
  - $\lambda_{e1} = 0.860$

- **Expected GPA**
  - $\lambda_{e2} = 0.115^*$

- **Predicted effort**
  - $\lambda_{e3} = 0.847$

- **Academic self-concept**
  - $\beta_{a1} = 0.811$

- **GPA**
  - $\beta_{a2} = -0.002^*$
  - $\beta_{a3} = 0.403$

- **Persist.**
  - $\gamma_{4} = 0.043$

- **Dilig.**
  - $\gamma_{5} = 0.063$

- **Intens.**
  - $\gamma_{6} = 0.083$

$\chi^2$ with 39 df = 114.03 (p<.001)
$p = 0.61$

*p > .05*
All other values significant at p<.05.
consistent with the rejection of the model based on the $\chi^2$
probability level. According to Bentler and Bonett, models with a
$P$-value below .90 "can usually be improved significantly."

The LISREL program also computes an estimate and standard error
for each specified parameter. Estimates for the parameters of the
structural equation model are presented in Figure 3. The raw values
of these parameter estimates are not meaningful because they depend
on the scales of the variables involved. The significance of each
parameter can be tested, however, using the value referred to in
LISREL as the $T$-value—that is, the parameter estimate divided by
its standard error. These values have an approximate $z$
distribution, thus estimates with a $T$-value smaller than 2.0 are
typically described as nonsignificant and are candidates for removal
from the model (Bentler, 1980; Joreskog & Sorbom, 1984). As Figure
3 indicates, four parameters in this model had clearly
nonsignificant estimates: $\gamma_{12}$ (the effect of task attribution on
expectancy), $\gamma_{13}$ (the effect of luck attribution on expectancy), $\gamma_{23}$
(the effect of luck attribution on academic self-concept) and $\beta_{42}$
(the effect of academic self-concept on GPA). These findings, among
others, play a role in the stepwise specification search which is
described in the following section of this chapter.

**Specification search.** A variety of statistics provided by the
LISREL program were used to modify the model in a series of nine
steps. The modifications were constrained by substantive
theoretical considerations, of course; Chapter Five will present the
theoretical justification for each change in the model. Changes
included the elimination of two measured variables as indicators of a latent variable, the inclusion of four new effects in the model, and the deletion of four nonsignificant parameters. The modifications are summarized in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Model</th>
<th>Modification</th>
<th>Reason for Modification</th>
<th>$\chi^2$</th>
<th>df</th>
<th>p($\chi^2$)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>--</td>
<td>--</td>
<td>114.03</td>
<td>39</td>
<td>( .001 .61</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>deleted MV's</td>
<td>low SMC's</td>
<td>71.41</td>
<td>23</td>
<td>( .001 .58</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>added $\beta_{12}$</td>
<td>MI = 20.44</td>
<td>44.29</td>
<td>22</td>
<td>.003 .80</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>added $\Theta_{31}$</td>
<td>MI = 8.37</td>
<td>35.74</td>
<td>21</td>
<td>.023 .86</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>added $\beta_{31}$</td>
<td>MI = 5.31</td>
<td>30.24</td>
<td>20</td>
<td>.066 .90</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>added $\Phi_{42}$</td>
<td>MI = 3.54</td>
<td>26.67</td>
<td>19</td>
<td>.113 .92</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>deleted $Y_{13}$</td>
<td>$T = -.077$</td>
<td>26.67</td>
<td>20</td>
<td>.145 .93</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>deleted $Y_{23}$</td>
<td>$T = .216$</td>
<td>26.72</td>
<td>21</td>
<td>.180 .95</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>deleted $Y_{12}$</td>
<td>$T = -.423$</td>
<td>26.88</td>
<td>22</td>
<td>.216 .96</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>deleted $\beta_{42}$</td>
<td>$T = -1.054$</td>
<td>28.11</td>
<td>23</td>
<td>.212 .96</td>
<td></td>
</tr>
</tbody>
</table>

The first modified model (Model B) eliminated persistence and intensity as measures of predicted effort. Each of these measures was eliminated on the basis of a low squared multiple correlation—a value indicating the proportion of variance in the MV accounted for by the hypothetical LV. This statistic is equivalent to a "communality" in factor analysis (Long, 1983). The squared multiple
correlation for diligence, the other indicator of predicted effort in the original model, was .768.

χ² for Model B was 71.41 with 23 degrees of freedom (p < .001), still a highly significant value. Even if a χ² with a much higher probability level had been obtained, however, it can be argued that a re-specified model should not be assessed in terms of a significance test (Bentler & Bonett, 1980). Because the new model is being fitted to the same data that prompted the modification, the risk of capitalizing on chance is great. As a result, the ρ statistic becomes particularly appropriate as a criterion for comparing a modified model to the original. The value of ρ for this model was .58, a lower ρ-value than that obtained for the initial model. This does not negate the value of this modification, however, because this particular kind of alteration is justified on grounds other than a direct improvement in overall goodness of fit.

The improvement of the measurement model allows a better-fitting model to be specified at subsequent stages of analysis.

The next four steps in the specification search involved the specification of additional parameters. These changes were based on the "modification indices" (MI) provided by LISREL (estimates of the decrease in χ² to be obtained by adding each missing parameter to the model), combined with substantive theoretical considerations. First, the effect of academic self-concept on expectancy (β₁z) was added to the model. The χ²-value for the resulting model (Model C) was reduced to 44.29 with 22 df (p = .003). The value of ρ for Model C was .80, which represents a large improvement over the .58
obtained for Model B.

The next model (Model D) added the negative correlation between luck and ability attributions ($\phi_{31}$), again based on a relatively high modification index. The resulting $\chi^2$ was 35.74 with 21 df ($p = .023$). The $p$-value for Model D was .86.

Model E included the effect of expectancy on predicted effort ($\beta_{31}$). The $\chi^2$-value for Model E was 30.24 with 20 df ($p = .066$). The value of $p$ for Model E was .90.

Finally, Model F added the correlation between task and effort attributions ($\phi_{42}$). This modification was justified by a combination of substantive considerations and a modest modification index. The resulting $\chi^2$ was 26.67 with 19 df ($p = .113$). The $p$-value was .92.

The four remaining steps in the specification search (Models G, H, I, and J) involved the deletion of the four parameters from the original model whose values were clearly nonsignificant. The value of the $\chi^2$ statistic cannot be decreased by the deletion of parameters, but $p$-values tend to improve as degrees of freedom are returned to the model. In that sense, the $p$ statistic contains a reward for parsimony in model-building. Values of these statistics are included in rows G through J of Table 5.

The final model (Model J) is presented in Figure 4 with parameter estimates and measures of overall goodness of fit. The $\chi^2$ value for this model is 28.11 with 23 df ($p = .212$). The value of $p$ is .96. It should be noted that two nonsignificant parameters have been retained in the model: the correlation between task and
Figure 4

Final Model (Model J)
Figure 4. Final model (Model J)

Attribution of success to:

- Ability
- Task ease
- Luck
- Effort

Expected success

Expected GPA

Academic self-concept

Predicted effort

\[ \chi^2 \text{ with } 23 \text{ df } = 28.11 \quad (p = .212) \]
\[ \rho = .96 \]

* T-value = 1.9

All other values significant at \( p < .05 \).

--- negative effect

--- positive effect
effort attributions ($\phi_{42}$) and the effect of task attributions on academic self-concept ($Y_{22}$). Both parameters were retained because (a) they are theoretically important, and (b) both had T-values of approximately 1.9, which barely fails to reach significance at the .05 level.

LISREL also provides a squared multiple correlation ($R^2$) for each dependent variable in the structural equation model. The value of $R^2$ represents the proportion of variance in the dependent variable accounted for by the latent variables which affect it in the model. Table 6 presents the value of $R^2$ for each dependent variable.

### Table 6

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effects of:</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectancy</td>
<td>Attribution to ability, Academic self-concept</td>
<td>.253</td>
</tr>
<tr>
<td>Academic self-concept</td>
<td>Attribution to ability, Attribution to task ease</td>
<td>.178</td>
</tr>
<tr>
<td>Predicted effort</td>
<td>Attribution to effort, Expectancy</td>
<td>.232</td>
</tr>
<tr>
<td>GPA</td>
<td>Expectancy, Predicted effort</td>
<td>.105</td>
</tr>
</tbody>
</table>
Multiple Regression Analysis—Hypotheses 2 through 4

The second, third, and fourth research hypotheses predicted that various sets of measured variables in the model would predict variation in grade-point average beyond that which could be accounted for by aptitude scores. These hypotheses were tested using a series of hierarchical multiple regression analyses, with first-term GPA as the dependent variable and ACT Composite score as the first independent variable in each analysis. Each set of variables was tested in a separate analysis by adding it to the model containing the ACT variable. The statistic of interest in each analysis is $sR^2$—the increment in $R^2$ when the new variable or set of variables is added to ACT scores in the regression model (Cohen & Cohen, 1975).

Table 7 summarizes the results of those analyses. ACT score alone accounted for 13.7% of the variance in GPA, a figure which was significant at $p < .01$. The 10 measured variables in the original covariance structure model, added to the equation as a set, increase $R^2$ by 9.7% ($p < .01$). Among the more limited sets of variables tested, the measures of expectancy (expected GPA and expected success) caused a significant increase in $R^2$ (2.9%; $p < .05$), as did the measures of predicted effort (persistence, diligence, and intensity). Because analysis of covariance structures indicated some difficulties with the persistence and intensity items, diligence was first tested alone and was found to have a significant effect on $R^2$ (7.3%; $p < .01$). The inclusion of persistence and intensity along with diligence did not add significantly further to $R^2$. 
Table 7

Multiple Regression Analyses with GPA as Dependent Variable

<table>
<thead>
<tr>
<th>Variables</th>
<th>R²</th>
<th>sR²</th>
<th>F(sR²)</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT Composite plus:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attribution to ability, effort, task difficulty, and luck</td>
<td>.160</td>
<td>.023</td>
<td>1.37</td>
<td>4/202</td>
</tr>
<tr>
<td>Expected GPA and expected success</td>
<td>.166</td>
<td>.029</td>
<td>3.54*</td>
<td>2/204</td>
</tr>
<tr>
<td>Academic Self-Concept Scale (ASCS)</td>
<td>.139</td>
<td>.002</td>
<td>.48</td>
<td>1/205</td>
</tr>
<tr>
<td>Diligence</td>
<td>.195</td>
<td>.058</td>
<td>14.77**</td>
<td>1/205</td>
</tr>
<tr>
<td>Attribution variables, expected success, expected GPA, ASCS, diligence, persistence, and intensity</td>
<td>.234</td>
<td>.097</td>
<td>2.49**</td>
<td>10/196</td>
</tr>
</tbody>
</table>

R² for ACT Composite Scale alone was .137
*p < .05
**p < .01
The attributional variables, added as a set, did not significantly increase $R^2$ beyond the $R^2$ value for ACT alone, nor did the Academic Self-Concept Scale. These findings are consistent with the final version of the covariance structure model, which does not contain direct effects of these variables on GPA.

**Sex Differences—Hypothesis 5**

The fifth research hypothesis stated that men would make greater attributions of success to ability than would women, while women would make higher attributions to effort, task ease, and luck. Data regarding sex differences on these and all other measured variables are presented in Table 8. A two-tailed t-test was used to test the significance of all differences.

No significant sex difference was found in attributions to ability or to luck. Women in the sample did make significantly higher attributions to effort, and significantly lower attributions to task ease. The former finding is consistent with the hypothesis, while the latter is a reversal of the expected pattern.

Among the other variables presented in Table 8, a significant sex difference was found only in predicted diligence. Females averaged higher on this item than males.

**Descriptive Statistics and Correlations**

Table 9 presents means and standard deviations for all measured variables, including those used in the covariance structure model as well as math/physics/engineering GPA and the ACT Mathematics and Composite scales.
<table>
<thead>
<tr>
<th>Variable</th>
<th>$\bar{x}_m$</th>
<th>$s_{d_m}$</th>
<th>$\bar{x}_f$</th>
<th>$s_{d_f}$</th>
<th>$\bar{x}_m - \bar{x}_f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.S. Success</td>
<td>1.55</td>
<td>.50</td>
<td>1.53</td>
<td>.51</td>
<td>.02</td>
</tr>
<tr>
<td>Att. Ability</td>
<td>5.58</td>
<td>1.20</td>
<td>5.44</td>
<td>1.18</td>
<td>.14</td>
</tr>
<tr>
<td>Att. Task Ease</td>
<td>3.11</td>
<td>1.62</td>
<td>2.26</td>
<td>1.20</td>
<td>.85**</td>
</tr>
<tr>
<td>Att. Effort</td>
<td>4.67</td>
<td>1.57</td>
<td>5.61</td>
<td>1.62</td>
<td>-.94**</td>
</tr>
<tr>
<td>Att. Luck</td>
<td>2.44</td>
<td>1.43</td>
<td>2.26</td>
<td>1.11</td>
<td>.18</td>
</tr>
<tr>
<td>Exp. Success</td>
<td>1.72</td>
<td>.52</td>
<td>1.79</td>
<td>.41</td>
<td>-.07</td>
</tr>
<tr>
<td>Exp. GPA</td>
<td>3.33</td>
<td>.40</td>
<td>3.28</td>
<td>.41</td>
<td>.05</td>
</tr>
<tr>
<td>Persistence</td>
<td>4.27</td>
<td>.62</td>
<td>4.21</td>
<td>.62</td>
<td>.06</td>
</tr>
<tr>
<td>Diligence</td>
<td>4.05</td>
<td>.64</td>
<td>4.32</td>
<td>.53</td>
<td>-.27*</td>
</tr>
<tr>
<td>Intensity</td>
<td>4.02</td>
<td>.69</td>
<td>4.16</td>
<td>.64</td>
<td>-.14</td>
</tr>
<tr>
<td>ASCS</td>
<td>119.11</td>
<td>11.87</td>
<td>119.84</td>
<td>9.99</td>
<td>-.73</td>
</tr>
<tr>
<td>M/P/E GPA</td>
<td>2.85</td>
<td>.87</td>
<td>2.66</td>
<td>.91</td>
<td>.19</td>
</tr>
<tr>
<td>Total GPA</td>
<td>2.91</td>
<td>.70</td>
<td>2.85</td>
<td>.71</td>
<td>.06</td>
</tr>
<tr>
<td>ACT Math</td>
<td>28.66</td>
<td>3.28</td>
<td>29.11</td>
<td>3.37</td>
<td>-.45</td>
</tr>
<tr>
<td>ACT Comp.</td>
<td>26.54</td>
<td>2.78</td>
<td>26.97</td>
<td>2.79</td>
<td>-.43</td>
</tr>
</tbody>
</table>

N Male = 170  
N Female = 38  
*p < .05  
**p < .01
Table 9

Means and Standard Deviations for Measured Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.S. Success</td>
<td>1.54</td>
<td>.50</td>
</tr>
<tr>
<td>Att. ability</td>
<td>5.56</td>
<td>1.20</td>
</tr>
<tr>
<td>Att. task ease</td>
<td>2.96</td>
<td>1.58</td>
</tr>
<tr>
<td>Att. effort</td>
<td>4.84</td>
<td>1.62</td>
</tr>
<tr>
<td>Att. luck</td>
<td>2.40</td>
<td>1.38</td>
</tr>
<tr>
<td>Exp. success</td>
<td>1.74</td>
<td>.50</td>
</tr>
<tr>
<td>Exp. GPA</td>
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<tr>
<td>Persistence</td>
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<td>.63</td>
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<tr>
<td>Diligence</td>
<td>4.10</td>
<td>.63</td>
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<tr>
<td>Intensity</td>
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<td>.68</td>
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<tr>
<td>ASCS</td>
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<tr>
<td>M/P/E GPA</td>
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<tr>
<td>Total GPA</td>
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<td>.70</td>
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<tr>
<td>ACT Math</td>
<td>28.75</td>
<td>3.29</td>
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<tr>
<td>ACT Comp</td>
<td>26.62</td>
<td>2.78</td>
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</table>

N = 208

The mean ACT scores for this sample are 28.75 on the Mathematics scale and 26.62 on the Composite scale. According to national norms for tested high school students graduating in 1985, these averages correspond approximately to the 94th percentile on the Math scale and the 90th percentile on the Composite scale (American College Testing Program, 1985).

Average ratings for the four attribution items are also worthy of note. As would be predicted in a successful group, ability was the most popular attribution (mean = 5.56). The average effort attribution was second highest (mean = 4.84), followed by much lower averages for task ease (mean = 2.95) and luck (mean = 2.40).
The matrix of correlations among measured variables is presented in Table 10. For the first 11 variables in this table, which were included in the covariance structure model, these correlations are a restatement of the data used in that analysis. New information is contained in the correlation involving M/P/E GPA and the two ACT scales.

The correlational picture for M/P/E GPA is very much similar to that of total GPA. The more specific measure of performance correlated significantly with expected GPA ($r = .22$), predicted diligence ($r = .21$), ACT Math scale ($r = .19$), ACT Composite scale ($r = .25$), and of course with overall GPA ($r = .91$).

The two ACT scales both correlated significantly with ability attributions, expected GPA, ASCS, total GPA, M/P/E GPA, and with one another. The ACT Math scale, but not the Composite, was correlated with expected success. It is also interesting that the Composite scale was a better predictor than the Math scale for both total GPA and M/P/E GPA.
Table 10

Intercorrelations Among Measured Variables

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<td>1. Att. Ability</td>
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<td>2. Att. Task ease</td>
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<td>3. Att. Effort</td>
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<td>-.13</td>
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<td>4. Att. Luck</td>
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<td>-.12</td>
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<tr>
<td>5. Exp. Success*</td>
<td>-.22**</td>
<td>.14*</td>
<td>-.12</td>
<td>-.08</td>
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<td>6. Exp. GPA</td>
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<td>.08</td>
<td>-.08</td>
<td>-.30**</td>
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<td>7. ASCS</td>
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<tr>
<td>8. Persistence</td>
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<td>-.08</td>
<td>.26**</td>
<td>-.05</td>
<td>-.19**</td>
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<tr>
<td>10. Intensity</td>
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<td>.13</td>
<td>-.08</td>
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<td>.15*</td>
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<td>.35**</td>
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<td>11. Total GPA</td>
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<td>.13</td>
<td>-.09</td>
<td>-.10</td>
<td>.25**</td>
<td>.10</td>
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<tr>
<td>12. M/P/E GPA</td>
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<td>.06</td>
<td>-.03</td>
<td>-.07</td>
<td>.22**</td>
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<td>.91**</td>
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<tr>
<td>13. ACT Math</td>
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<td>-.07</td>
<td>-.07</td>
<td>-.05</td>
<td>-.14*</td>
<td>.21**</td>
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<td>.00</td>
<td>.25**</td>
<td>.19**</td>
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<tr>
<td>14. ACT Composite</td>
<td>.27**</td>
<td>-.06</td>
<td>-.06</td>
<td>-.12</td>
<td>-.08</td>
<td>.23**</td>
<td>.15*</td>
<td>.02</td>
<td>-.06</td>
<td>-.04</td>
<td>.37**</td>
<td>.28**</td>
<td>.64**</td>
<td>---</td>
</tr>
</tbody>
</table>

* The variable "expected success" was scaled negatively in the research questionnaire, resulting in negative correlations.

*p < .05

**p < .01
The Structural Model

Figure 5 reproduces in simplified form the hypothesized model of the relationships among causal attributions for past success, academic self-concept, predicted effort in college, and first-term grade-point average. As the results reported in Chapter Four indicate, estimation and analysis of this model resulted in its being rejected as a plausible representation of the "true" relationships among these variables in the population.

While the $\chi^2$ test in covariance structure modeling has been described as potentially too stringent (Bentler & Bonnett, 1980), the descriptive measure of overall goodness of fit provided by the $\rho$ statistic also indicated that modification of the initial model was in order. Figure 6 presents a simplified picture of the final model that resulted after modifications were made. This model fit the data quite well, with a $\rho$-value of approximately .96.
Figure 5. Hypothesized Structural Model

Figure 6. Modified Structural Model
The changes made in the structural model during the specification search must of course be defended on substantive theoretical grounds. As various authors have emphasized, the fit of a model to a set of data can always be improved at least slightly by adding to the model any relationship that happens to be non-zero in the data (Cliff, 1983; Bentler, 1980). In practice, then, given a set of additional parameters which could improve the fit of a model mathematically, the critical decision to add each parameter must be driven by theory.

Additions to the model. The following paragraphs discuss the substantive justification for each parameter added to the structural model during the specification search in this study.

1. **Effect of academic self-concept on expectancy.** The original model implied a correlation between these two variables by hypothesizing that both were effected by the same attribution variables—positively by ability attributions, negatively by attributions to task ease and luck. This added parameter indicates that the relationship is more extensive than that implied in the initial model—that is, feeling good about oneself as a student has a direct impact on confidence that goes beyond the two variables' shared dependence on the attribution variables.

2. **Negative correlation of ability and luck attributions; task ease and effort attributions.** On an informal level, these two inverse relationships appear to make intuitive sense. They can also be explained, however, in terms of the
theoretical dimensions of locus and stability. It is true of both pairs of variables that the members represent opposite poles on both dimensions. Ability is internal and stable, while luck is external and unstable. Task ease is external and stable, while effort is internal and stable. By the same logic, it is predictable that there were no other correlations in either a negative or positive direction between attribution variables, as all other pairings would share the same status on one dimension and be opposites on the other.

3. Effect of expectancy on predicted effort. This effect, though not included in the original model, would in fact be predicted by any Expectancy x Value theory of achievement motivation (Weiner, 1980). If achievement striving is a function of the individual's expectancy of success as well as the attractiveness of the goal, then expectancy in this model should have a positive effect on the amount of effort students will expend in pursuit of academic success.

Deletions from the model. Modification of these hypothesized model also involved the deletion of some parameters. The changes are based somewhat more directly on statistical logic; for each of these hypothesized relationships, a significance test failed to reject the hypothesis that the parameter was equal to 0. The challenge, then, is to understand why the data did not contain these predicted relationships. The following paragraphs address that issue.
4. **Effect of luck attributions on expectancy and academic self-concept.** The absence of these predicted negative effects is particularly surprising given the obtained negative correlation between luck and ability attributions. One plausible explanation is that "luck" in the current context was not always interpreted as unstable and external. As Weiner (1985) has recently suggested, some individuals in some settings may see luck as internal and somewhat stable (I am a lucky person). That interpretation could create a very different set of relationships between luck attributions and consequences such as expectancy and self-concept.

It may also be the case that because luck is not a very salient causal factor for these students, their level of attribution to luck in fact has little in the way of psychological consequences. This speculation is consistent with the very low average luck attribution in this study, and with past research which has found luck to be cited by subjects less frequently than the other traditional causes when open-ended assessment techniques are use (Cooper & Burger, 1978).

5. **Effect of attribution to task ease on expectancy.** The absence of this posited relationship may again be related to some conceptual ambiguity. This effect was predicted on the grounds that task ease in this context would amount to an unstable cause. In other words, it was suggested that a
student who feels he succeeded in high school largely because the work was easy may as a result lack confidence as he approaches the presumably more difficult academic challenges of college work. The rejection of that hypothesis may indicate that, for some students, task ease is serving as a stable factor (i.e., high school was easy and college will be the same). As with luck attributions, it may be that differences in interpretation of the concept created a mixture of effects across the sample.

6. **Effect of academic self-concept on GPA.** Perhaps the most interesting of the rejected parameters was the hypothesized positive effect of academic self-concept on performance. The absence of this direct effect does not demonstrate a complete absence of relationship between these two variables, as ASC does affect expectancy, which in turn affects GPA. The simple correlation between ASC and GPA, however, was not significant ($r = .10$; see Table 10), indicating that the relationship between these two variables in the sample was very small even without the shared correlation with expectancy partialled out.

This finding stands in direct contrast to the correlations reported by Reynolds (1981) between ASCS and GPA for an overall college sample ($r = .49$) and for freshmen in particular ($r = .40$). The absence of correlation in the present study is difficult to interpret, but may be due in part to special characteristics of the
The select sample in this study may not represent the entire population studied by Reynolds et al. with regard to academic self-concept. Mean ASCS score for this sample was higher than in the Reynolds study (119.25 compared to Reynolds' 108.91) and variability was slightly more restricted (present study sd = 11.53; Reynolds study sd = 14.51). It is also plausible that the short-term measure of performance used here (GPA after one quarter) is especially subject to chance or "error" influences, but the same problem would seem to apply equally to Reynolds' freshman sample.

In sum, the final model retains the same basic causal structure proposed in the original model, with some changes based on a combination of statistical analysis and substantive theoretical considerations. Attribution of high school success to ability affects both expectancy and academic self-concept, while attribution to effort affects academic self-concept and predicted effort in college. Attribution to luck apparently has no influence, negative or positive, on the dependent variables, and attribution to task ease has a small negative effect on academic self-concept. Among the dependent variables, academic self-concept affects expectancy of success in college, and expectancy in turn affects both GPA and predicted effort. Finally, predicted effort (which is presumed to be a measure of actual effort) affects GPA.

For the most part, the model is highly consistent with the existing literature, particularly regarding the consequences of
ability and effort attributions. The absence of consequences for attributions to task ease and luck is contrary to prediction, but appears to be interpretable in the context of the present study. The most difficult finding to interpret is the lack of direct relationship between academic self-concept and GPA. More research would be required before this result could be explained adequately.

**Predicting Academic Performance**

A basic premise of this study was that, among a group of students entering college with impressive credentials, differences in attributions regarding the causes of past academic success would account for some of the variability in college performance. The covariance structure analysis described above was aimed at describing how the attribution variables affect college grades by way of the intervening variables expectancy of success, academic self-concept, and effort. The primary objective in that statistical analysis was not to create a formula optimizing the prediction of grades, but rather to represent optimally a system of relationships among the variables in the model. Among its other results, of course, the covariance structure model does yield a squared multiple correlation for each dependent variable in the model (see Table 6); that statistic for GPA revealed that the model accounted for 10.5% of the variance in grades.

The covariance structure analysis reported here does not, however, address another, more specific premise of this study—that the variables in the model can help to explain successes and failures that cannot be explained in terms of differences in
ability. This claim has special practical significance for the population being studied here, which consists of students who were selected on the basis of high ability but whose performance does not always live up to expectations.

The series of multiple regression analyses reported in Chapter Four were conducted to test statistically the hypothesis described above—that variables in the model, taken together and in sets, could account for a portion of the variance in grades that cannot be accounted for by aptitude scores. Results of these analyses were mixed (see Table 7), but generally support the idea that the effects described in the structural model cannot be explained away in terms of aptitude. The measures of expectancy, for instance, although they did correlate with ACT scores, predicted a unique portion of the variance in GPA. Similarly, the measures of predicted effort still accounted for a significant portion of the variance in grades when ACT score was partialled out. The set of attribution variables, meanwhile, did not add significantly to the prediction of GPA when added to ACT score as independent variables, nor did academic self-concept.

Again, these results are generally consistent with the most basic premise of this study. Expectancy and predicted effort clearly are predictors of grade performance, even with aptitude partialled out. The attribution variables do not have the same degree of relatedness to performance, but as partial causes of expectancy and predicted effort they can be thought of as representing a set of "second-order" influences on performance.
There remains some possibility, of course, that first-term GPA is not an accurate indicator of college performance over the long run, and that the predictive variables studied here would display a different pattern or degree of relationship to a longer-term measure of performance. The importance of early college performance in this population was demonstrated in a study conducted by Wright (1985), who found that first-year grades were a strong predictor of eventual graduation from this university. Somewhat less confidence is justified with regard to first-term grades, however, because they may be more subject to differences in the nature and difficulty of courses taken. The freshman engineering students involved in this study certainly did enroll in a more uniform curriculum than one would find in a sample from the university at large, but they were enrolled according to placement test scores into different levels of physics and particularly math courses. Also, some students had required or elective courses in areas such as English and history while other did not. Evidence indicates that this last distinction is probably not an important one, however, as overall GPA and GPA in the major were very highly correlated (r = .91).

First-quarter GPA, then, is probably not the perfect measure of academic performance, either conceptually or in terms of correlation with long-term achievement. It was appropriate in the present study to use a measure of early performance in college, however, because the variables studied here were expected to be especially important for the transition from high school to college. The ideal measure of first-term performance would have been one that held course
difficulty constant either experimentally or statistically, but neither of those approaches was possible here. If such a "pure" measure of performance had been obtainable, it is reasonable to speculate that the predictive power of the model may have been increased.

**Sex Differences**

The findings of this study with regard to sex differences (see Table 8) present some interesting departures from previous conclusions in the literature. First, contrary to hypothesis, men and women did not differ in their level of attributions to ability. This result differs from past research indicating more of a self-enhancing attributional bias in males (Nicholls, 1975; Griffin et al., 1983). Similarly, women in this sample did not make greater attributions of high school success to the easiness of their classes than did men. In fact, men made significantly higher attributions to task ease. No sex differences were found in luck attributions, again contrary to the hypothesis that women would rate luck more highly. Finally, consistent with prediction, women did make significantly higher attributions to effort.

In general, then, these results did not support the idea that women make less adaptive causal ascriptions about achievement outcomes. Females in this study ascribed success to ability as much as men did, thus gaining enhancement of self-esteem and expectancy from their past success. Women also can be expected to benefit from their higher attributions to effort. The benefit of higher effort ascriptions appears in fact to be demonstrated by the only other
significant sex difference in this study—higher predicted diligence on the part of the female group.

Due to the nature of the sample, the generalizability of these findings regarding sex differences is debatable. Not only is this sample selected for high ability, but the women in the sample are entering a traditionally masculine field. It is plausible that a group sampled from a variety of majors would show a more conventional pattern of gender differences.

**Measurement of Attributions**

One of the more difficult aspects of the design of this study was the assessment of attributions. Because assessment techniques have been the topic of some debate in the literature, and because the results of this study suggest some problems with the methods used here, a discussion of this topic appears to be in order.

Previous studies measuring causal attributions for achievement have utilized a variety of assessment methods. A few studies have used open-ended techniques to obtain verbal responses which must then be coded (Elig & Frieze, 1974). More frequently, structured rating scales have been used, typically asking subjects to rate independently the degree to which each of the four standard causes (and sometimes others) contributed to an outcome.

As others have pointed out (Elig & Frieze, 1979; Forsyth & McMillan, 1981; Weiner, 1979, 1985), there are risks inherent in the use of specific causes as cues. An instrument may fail to list some atypical cause that is particularly salient for some individuals in some situations, or the presence of a specific cause may suggest to
a subject an inference that she may not otherwise have made. Also, as Weiner (1979, 1985) warns, some specific causes may vary in terms of their standing on the dimensions of causality. For instance, illness as a cause of failure may be seen as internal and stable in some contexts (I am a sickly person) and external and unstable in other instances (the flu bug got me). Forsyth and McMillan (1981) attempted to avoid these difficulties by asking subjects to make ratings along the dimensions themselves (i.e., how controllable were the causes of your performance, how stable, and how internal). Most researchers, however, have preferred to provide more concrete cues than these.

In an attempt to assess the relative validity and reliability of the various assessment techniques, Elig and Frieze (1979) exposed subjects to a contrived success-failure event, then measured attributions in five different ways. Their conclusion favored the independent structured rating scales as the psychometric technique with the greatest interest validity, reliability, and face validity. Elig and Frieze do recommend, however, that researchers not limit their taxonomy of causes to ability, effort, task difficulty, and luck in situations where there is reason to expect that other specific causes will be salient for subjects.

This study employed the method suggested by Elig and Frieze, with items worded separately for successful and unsuccessful subjects. (Unsuccessful subjects were later eliminated from analysis.) The decision was made to limit the items to the four traditional causes on the grounds that other typical causes cited in
the literature were more ephemeral factors (e.g., mood, illness) which would not be relevant to an achievement event as broadly gauged as "high school success." An open-ended question was included on the questionnaire, asking students to name any other important factors. Very few subjects responded to this item, and responses would be difficult to code, but several who did respond listed factors such as "good teachers" or "quality of high school." The frequency of these responses suggests that additional items should be included in future attribution research dealing with long-term academic performance.

Results of this study also suggest that the meaning of some causal factors may become somewhat ambiguous in the context of long-term outcomes. The fact that attributions to luck did not have any negative consequences, for instance, may indicate that reported "good luck" over the course of a high school career can refer to a perceived characteristic of the person rather than to an instance of random chance.

This discussion is not intended as an indictment of the use of structured rating scales in attribution research. Rather, the point is that a new taxonomy of typical causes may be needed for attributions regarding long-term outcomes.

Summary, Implications, and Directions for Future Research

This study was undertaken to examine factors affecting the academic performance of a select group of freshman students enrolled in the College of Engineering at The Ohio State University. Specifically, the attributional theory developed by Bernard Weiner
and others was used to build a model which was hypothesized to explain a portion of the variance in academic performance in this group.

The primary research hypothesis proposed a covariance structural model (presented in Figure 5) of the interrelationships among attributions regarding past success, expectancy of college success, academic self-concept, predicted effort in college, and grade-point average. The model was rejected statistically as a representation of the relationships among these variables in the population. Subsequent modification, however, resulted in a model which did fit the obtained data closely. According to this model (presented in Figure 6), attribution of high school success to ability positively affects both expectancy of success in college and academic self-concept. Attribution to effort affects academic self-concept and predicted effort. Attribution to task ease has a small negative effect on academic self-concept. Academic self-concept, in turn, has an effect on expectancy, and expectancy influences predicted effort. Finally, both expectancy and predicted effort have a direct effect on academic performance. The study also tested the ability of the variables in the model to predict academic performance beyond the predictive power of aptitude test scores. Partialling techniques in multiple regression analysis revealed that expectancy of success and predicted effort did account for a significant portion of the variance in performance which could not be explained in terms of aptitude scores.
Finally, sex differences in the attribution of success were investigated. Women in this sample were found to make significantly higher attributions to effort than did men, while men rated task ease more highly. These differences, along with the absence of a difference in ability ascriptions, are largely contradictory to the body of literature which describes females' attributions as less self-enhancing than males' and perhaps even self-derogatory (Griffin et al., 1983; Nicholls, 1975). It was suggested here that the present findings may be specific to the special female population in this study, who were relatively high in aptitude scores and were studying in a traditionally masculine field.

As an addition to the literature on causal attributions in achievement contexts, this study explores some new ground and highlights some particular areas in which further research is needed. One unusual aspect of this research is that it investigated attributions regarding a very broadly conceived achievement "event"—namely, high school performance. This approach appears to represent a fruitful new direction for attribution research, but results here suggest the need for further analysis of the salience and meaning of various perceived causes in the context of long-term achievement.

The general statistical model applied in this study also represents a potentially useful new direction for research on the consequences of causal attributions. Future research applying the covariance structure model could benefit particularly from progress in the measurement of attributions, as the statistical techniques
become more precise and informative when the research design includes multiple measures of each variable.

This study also stands as part of a trend toward investigating the consequences of attributions on subsequent achievement itself. The Weiner model clearly includes the assertion that causal attributions after success or failure can make a difference in future performance, but most of the research has gone only so far as investigating the consequences for affect and expectancy. More recently, researchers have tested the idea that attributions for failure can be manipulated to enhance subsequent performance (Foersterling, in press; cited in Weiner, 1985). The present study similarly investigates the consequences of attributions for performance, but deals specifically with attributions for success rather than failure.

The implications of this study are generally supportive of the theoretical literature. Among students who enter college with a history of academic success, the inferences they make regarding the reasons for that success can influence their feelings about themselves as students, the confidence with which they approach college studies, the amount of time they plan to commit to studying, and ultimately their performance as new college students.

For high school and college educators, these findings suggest an important set of responsibilities regarding students making the transition from high school to college. According to the theoretical model developed here to describe the present research sample, the desirable state of affairs for successful students is
that they leave high school with a balanced perception of the importance of both ability and effort as causes of academic achievement. For the most part, students who have received high grades in high school probably can be counted upon to have a strong sense that they are capable, given their past success and relatively high scores on college entrance examinations. A healthy respect for the role of effort, however, may depend on these students' being challenged more by high school academics than is sometimes the case. If students are to perceive effort as an important cause of success, then reality may have to be altered in such a way that high school classes will convey the message that diligence pays off, even for the most able students.

Given the negative effects of attributions to task ease in the model, this study also suggests a danger in conveying to successful students that high school work should be regarded as extremely easy compared to college. Students frequently do receive that message, from high school teachers warning that "it won't be this easy in college" or from college officials declaring to the freshman class that a majority of them "won't be around at graduation time." At best, of course, these admonitions may prepare students to expend greater effort in college. The point here, however, is that the enhancement of self-concept and confidence that students can derive from past success also contributes to subsequent performance, and an over-emphasis on the differences between high school and college work could deprive students of that self-enhancement. Again, the best educational response to this issue may be to deal with the
underlying reality, making sure that high school work is in fact not too easy to be a meaningful challenge for bright college-bound students, but some independent consideration of students' perceptions is also warranted.

In sum, individuals moving from success in high school to a new set of challenges at the college level can be expected to have a special need to understand the forces that have influenced success and failure for them in the past. This study suggests that, if we can help students to build a healthy understanding of those influences, we can help them to re-create a pattern of success for the future.
REFERENCES


APPENDIX A

Consent Form
CONSENT FOR PARTICIPATION

I consent to participate in research entitled "Attributions and Academic Performance" conducted by Craig W. Platt and Dr. Philip M. Clark in cooperation with the College of Engineering. The purpose, procedures, and possible benefits of the study have been explained, and I am aware that my participation is voluntary.

I agree to give my permission to the researchers to use my ACT and/or SAT scores and my grades, both in high school and in my first year at this University. I understand that all of the information gathered for use in this study will remain confidential and will be reported only in a statistical manner.

Signed: ______________________ Date: _______________
(Participant)

Philip M. Clark, Ph.D.
Principal Investigator

Craig W. Platt, M.A.
Investigator

Robert R. Wright, Ph.D.
College of Engineering
APPENDIX B

Research Questionnaire
QUESTIONNAIRE

Name: __________________________  S.S.# _________
Age: __________
Sex:  M  F

PLEASE ANSWER THE FOLLOWING QUESTIONS BY CIRCLING THE APPROPRIATE NUMBER:

1) How successful would you say you were as a high school student?

1  very successful  2  successful  3  unsuccessful  4  very unsuccessful

2) If you answered "very successful" or "successful" to question (1), please answer the items in (2a). If you answered "unsuccessful" or "very unsuccessful" to question (1), please answer the items in (2b)

(2a) We are interested in your ideas about what caused your success in high school. Please rate the extent to which each of the following factors contributed to your success, 1 if the factor to no extent caused your success, 7 if the factor was a very important cause of your success.

Your high level of ability. 1  2  3  4  5  6  7
The easiness of your high school classes. 1  2  3  4  5  6  7
The effort you put into your schoolwork. 1  2  3  4  5  6  7
Your good luck. 1  2  3  4  5  6  7
If there were important factors other than the four listed above, please use the following space to name them.

(2b) We are interested in your ideas about what caused your lack of success in high school. Please rate the extent to which each of the following factors contributed to your lack of success, 1 if the factor to no extent caused your lack of success, 7 if the factor was a very important cause.

Your lack of ability. 1  2  3  4  5  6  7
The difficulty of your high school classes. 1  2  3  4  5  6  7
Your lack of effort. 1  2  3  4  5  6  7
Your bad luck. 1  2  3  4  5  6  7
(2b) cont'd. If there were any important factors other than the four listed on the preceding page, please use the following space to name them.

3) How successful do you expect to be as a college student?

   1  2  3  4
very successful successful unsuccessful very unsuccessful

4) Which of the following comes closest to the grade average you expect to earn in your first quarter? (Letter grade A = 4, B = 3, C = 2, D = 1, E = 0)

   4.0  3.5  3.0  2.5  2.0  1.5  1.0  0.5  0

5) Students often differ from one another in their level of persistence—that is, the extent to which they will keep trying rather than give up when faced with a failure or disappointment. How persistent do you expect to be as a college student?

   1  2  3  4  5
not persistent at all extremely persistent

6) Students also differ in terms of diligence—that is, the amount of time they spend on their schoolwork. How diligent do you expect to be as a college student?

   1  2  3  4  5
not diligent at all extremely diligent

7) Another factor on which students differ is the intensity of their studying—that is, how hard they work during whatever time they spend studying. How intense do you expect you will be when you study in college?

   1  2  3  4  5
not intense at all extremely intense
APPENDIX C

Academic Self-Concept Scale
Listed below are a number of statements concerning school-related attitudes. Rate each item as it pertains to you personally. Base your ratings on how you feel most of the time. Use the following scale to rate each statement:

A. Strongly Disagree  B. Disagree  C. Agree  D. Strongly Agree

INDICATE YOUR RESPONSE BY CIRCLING THE APPROPRIATE LETTER. Be sure to answer all items. Also try to respond to each item independently, do not be influenced by your previous choices.

1. Being a student is a very rewarding experience.  A B C D
2. If I try hard enough, I will be able to get good grades.  A B C D
3. Most of the time my efforts in school are rewarded.  A B C D
4. No matter how hard I try I don't do well in school.  A B C D
5. I often expect to do poorly on exams.  A B C D
6. All in all, I feel I am a capable student.  A B C D
7. I do well in my courses given the amount of time I dedicate to studying.  A B C D
8. My parents are not satisfied with my grades.  A B C D
9. Others view me as intelligent.  A B C D
10. Most courses are very easy for me.  A B C D
11. I sometimes feel like dropping out of school.  A B C D
12. Most of my classmates do better in school than I do.  A B C D
13. Most of my instructors think that I am a good student.  A B C D
14. At times I feel school is too difficult for me.  A B C D
15. All in all, I am proud of my grades.  A B C D
16. Most of the time when taking a test I feel confident.  A B C D
17. I feel capable of helping others with their classwork.  A B C D
18. I feel teachers’ standards are too high for me.  A B C D
19. It’s hard for me to keep up with my classwork.  A B C D
20. I am satisfied with the class assignments that I turn in.  A B C D
21. At times I feel like a failure.  A B C D
22. I feel I don’t study enough before a test.  A B C D
23. Most exams are easy for me.  A B C D
24. I have doubts that I will do well in my major.  A B C D
25. For me, studying hard pays off.  A B C D
26. I have a hard time getting through school.  A B C D
27. I am good at scheduling my study time.  A B C D
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<tr>
<td>28.</td>
<td>I have a fairly clear sense of my academic goals.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>29.</td>
<td>I'd like to be a much better student than I am now.</td>
<td>A</td>
<td>B</td>
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<tr>
<td>30.</td>
<td>I often get discouraged about school.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>31.</td>
<td>I enjoy doing my schoolwork.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>32.</td>
<td>I consider myself a very good student.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>33.</td>
<td>I usually get the grades I deserve in my courses.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>34.</td>
<td>I do not study as much as I should.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>35.</td>
<td>I usually feel on top of my work by finals week.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>36.</td>
<td>Others consider me a good student.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>37.</td>
<td>I feel that I am better than the average college student.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>38.</td>
<td>In most of the courses, I feel that my classmates are better prepared than I am.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>39.</td>
<td>I feel that I don't have the necessary abilities for certain courses in my major.</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>40.</td>
<td>I have poor study habits.</td>
<td>A</td>
<td>B</td>
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