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**ABSTRACT**

The consistency of gender differences in attributions for success in two subject areas representing verbal and mathematical tasks was investigated. English and social science were used to represent verbal tasks and mathematics the computational task. In natural classroom settings, a total of 1,110 community college students completed a questionnaire comprised of the following 10 student attributions for success: luck, mood, effort, textbook, task difficulty, instructor, ability, attitude toward the subject, incentive to do well, and influence of others. Data on student age, prior course-taking, and race/ethnicity were also collected. Because the study focused on successful students only, data were analyzed for 421 students meeting the criteria for success: agreement between objective letter grade given and the student's subjective evaluation of performance. Data analysis indicated that while there were no gender differences in attributions for success, attributions did depend on the particular course being taken. Therefore attributions for success in mathematics were different from those in English. The role of attribution as a causal variable in a model of academic choice proposed by Meece et al. is addressed, along with recommendations for future attribution research. The Test Attribution Questionnaire is appended. (SW)

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GENDER DIFFERENCES IN COLLEGE STUDENTS'  
ATTRIBUTIONS FOR SUCCESS  
IN TWO SUBJECT AREAS

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Gender Differences in College Students'  
Attributions for Success  
in Two Subject Areas

ABSTRACT

During the 1970's, causal attribution took its place as a viable explanation for the underrepresentation of women in college level mathematics courses. Based upon the prior reporting of gender differences in attribution patterns, researchers have hypothesized that attributions have a significant mediating effect on the academic choices made by students. This study centered on the problem of attribution as a causal variable in a model of academic choice as proposed by Meece et al. (1982). In order to be considered a causal variable in such a model however, the assertion was made that attributions for women in areas where they do participate, such as English, must be different from attributions in areas where they do not participate, such as Mathematics, and different from those of men. The current study was undertaken to test hypotheses concerning apparent gender differences in attribution patterns for success in two subject areas.

An instrument was constructed to measure ten student attributions for success in natural classroom settings. 1,110 undergraduate community college students completed the instrument in either an English, Social Science, or Mathematics class. Analysis of data from the 421 successful students indicated that there are no gender differences in attributions for success, controverting several previous studies of this nature. However, attributions did depend upon the particular course being taken. Thus, attributions for success in Mathematics were different from those in English. The study concludes that causal attribution is probably not a causal variable in the Meece model of academic choice. The role of attribution as a causal variable in a model of academic choice is discussed, and recommendations made for future attribution research.

## BACKGROUND

During the 1970's, causal attribution took its place as one of the most potentially potent variables to explain the underrepresentation of women in college level mathematics courses. Attribution has been hypothesized as a causal variable contained within a larger, more comprehensive model of academic choice (Meece, Parsons, Kaczala, Goff, & Futterman, 1982).

The model formulated by Meece and her colleagues essentially states that: the effects of ability, past performances, and early socialization experiences are mediated by a person's "interpretations [attributions] of those events in light of cultural influences and a fairly stable perception of oneself" (Meece et al, 1982, p. 334). This model is important to educators for two reasons: 1) it extends to most of the factors already identified as influencing women's decisions about mathematics, and 2) it focuses on factors that are modifiable, giving it practical significance. (For example, a mother's educational level can influence a daughter's attitude toward mathematics. Changing the mother's level of educational attainment however, would be an impractical solution to improving girls' attitudes toward mathematics.)

No single model has as yet integrated all the biological, social, cognitive, educational, and affective factors which may account for the lack of participation by women in upper level mathematics courses. The Meece et al. model however, is one of the first attempts to conceptualize a comprehensive plan which includes all the factors presumed to contribute to students'

decisions about mathematics. Still, the utility of the model must be tested empirically. Further research is needed on each of the variables in the model before a unified theory can be presented.

This study centered on the problem of attribution as a causal variable in the model of academic choice proposed by Meece et al. (1982). Based upon the prior reporting of gender differences in attribution patterns, others have hypothesized that attributions have a significant mediating effect on the academic choices made by students. Thus, attribution has potential to explain why otherwise capable women fail to enroll or persist in upper level mathematics or science courses. In order to be considered a causal variable in such a model however, the assertion was made in this study that women's attributions for success in areas where they do participate, such as English, must be different from attributions in areas where they do not participate, such as Mathematics, and different from those of men. The current study was undertaken to test hypotheses concerning apparent gender differences in attribution patterns for success in two subject areas.

Part of the attraction in studying causal attribution lies in the fact that it lends itself easily to practical application. But, as with all theories whose applications are apparent, there is a tendency to over-generalize. In what Frieze has described as essentially her "last word" on causal attribution (McHugh, Frieze & Hanusa, 1982), she states that:

1. There is little empirical support for the proposed

models of attribution.

2. Findings are inconclusive and in some cases contradictory, yet results have been presented as established facts.
3. The models are ambiguous in terms of the predictions for attribution patterns.

Despite these criticisms, attribution continues to generate interest among researchers, who promulgate results from attribution studies in media as diverse as the Psychological Bulletin and the Today Show. Frieze goes on to say that if "attribution research is to advance, researchers need to consider..."

1. methodological issues,
  2. how expectancies and attributions relate to choice of task,
  3. an individual's own definition of, or orientation to, the task, and,
  4. the extent and conditions under which an individual reflects on the causes of her/his behavior
- (pp. 474-476).

Following Frieze's advice, pilot studies were designed to address some of the measurement issues in the study of attribution (e.g. meaning and dimensionality), and explored student definitions of success.

One of the reasons for the ambiguity in the models and for researchers' inability to make generalizations regarding male and female attribution patterns is that knowledge about attribution

patterns is incomplete. Most of what is known is based upon experimental studies using anagrams, angle matching and/or number sequence problems. If attribution research is to have practical meaning for educators, the understanding of attribution must extend beyond the laboratory. Only recently have attribution studies been conducted in natural settings. Even more recent is the attention paid to the nature of the task. In their latest discussion of the topic, Eccles (Parsons), Adler, and Meece state: "...few studies have actually assessed attributional differences related either to achievement tasks presented in naturalistic settings or to specific school subject areas" (1984, p. 27). The current study assesses attributions in real settings with attention to the subject area built into the design.

Research regarding attribution patterns in Mathematics suggests that female students tend to attribute success experiences to external or unstable causes and failures to lack of ability (Nichols, 1975; Wolleat, Pedro, Becker, & Fennema, 1980). Males appear less likely to attribute failure in Mathematics internally. Attribution studies in areas other than Mathematics have not yielded clear patterns for males and females. However, if attribution is to be considered as a causal variable explaining the lack of participation by women in Mathematics, there is a need to demonstrate that the attribution patterns exhibited by women in areas where they do not participate are different from those in areas where they do participate, and different from the patterns exhibited by men.

### RELATED RESEARCH

Although it is fairly easy to show disproportionate mathematics enrollment between males and females, it is very difficult to document the precise causes for those differences. Several studies however, have made contributions toward a greater understanding of causal attribution and its relation to the problem, and were important in defining this research. Brief descriptions of those studies relevant to this research are presented.

### CAUSAL ATTRIBUTION

An appealing common-sense approach to explaining behavior is contained in theories of attribution. Based on Heider's theory (1958), (labelled "naive psychology"), attribution theories seek to: 1) develop a model of how people process information about themselves or others, and 2) determine what effect these explanations have on feelings and future behavior. In a variety of settings, authors have linked causal attributions to performance (i.e. success or failure) and persistence outcomes (Wollett, 1980; Fennema, 1982; Pedro, Wollett, Fennema, & Becker, 1981). Attribution theory suggests that it is less the success or failure per se, but rather the causal attributions that one makes about one's performance that influence future behavior (Heider, 1958; Weiner, Frieze, Kukla, Rest, & Rosenbaum, 1971). Thus, an important shift takes place from the action itself to people's perceptions and explanations for those actions.

The basic model of attribution in academic situations was



formulated by Weiner et al. (1971). Originally, this theory proposed that reasons for academic performance could be classified along two dimensions (Locus and Stability) and generally fell into the categories of Ability, Effort, Luck, or Task Difficulty. Since that time, other studies have added to the list of possible causal attributions, including such things as Mood, the Instructor, and help from Others.

Frieze (1973) conducted the first experimental studies of causal attribution to identify the perceived causes of success or failure on an academic achievement task. She instructed college students to assume that a person had either succeeded or failed at an academic task (game). Eighty-six percent of the students' responses could be classified according to nine categories. These categories have formed the basis of the attribution research since that time, particularly the categories of Ability, Task, Effort and Luck. Passer (1977) questioned whether the forced-choice responses given by subjects in attribution experiments were actually the ones that would frequently come to mind. He found that the reasons commonly used in attribution studies were in fact the ones subjects conjured up with frequency. While open-ended response procedures have been shown to have less convergent validity (Ellig & Frieze, 1979), still all but a very small proportion of the responses were also measured by other structured measures included in the study. It can be concluded then, that the expanded list of attributions does represent the reasons that students would commonly give for academic performance.

The two, and later the three-dimensional models of causal attribution posed by Weiner, Russell and Lerman (1979), were thought to consist of dichotomous categories. That is, reasons for performance were thought to be either internal or external, stable or unstable, controllable or uncontrollable. For example, a student may attribute doing well on a test to the internal causes of ability or effort. On the other hand s/he may attribute performance to external causes of luck or an easy test. However, a student who attributes performance to studying hard with someone else, would fall midway between the internal and external extremes mentioned above. Frieze and her colleagues (1983) suggest that the original dichotomous categories are more accurately conceptualized as separate continua. Data from the pilot study for this research extend Frieze's suggestion and support the contention that each reason (i.e. Ability, Luck, etc.) be treated separately.

#### GENDER DIFFERENCES IN CAUSAL ATTRIBUTIONS

Heightened awareness of issues of sex equity in education during the last ten years have led researchers to explore potential gender differences in attributions for performance. In a valiant, albeit hurried, attempt to explain such phenomena as girls' lower achievement scores in mathematics after elementary school and the underrepresentation of women in post-secondary mathematics and "hard" science courses, scores of studies have been conducted in which data have been collected and analyzed by sex. (Gender/race differences have rarely been explored however, and may prove even more interesting. See Murray and Mednick,

1975; Erkut, 1979.) Certain conclusions have been drawn as a result of these data. Among them:

1. Women tend to be more external in attribution for success (Simon & Feather, 1973).
2. Women tend to attribute failure internally (Nicholls, 1975).
3. Women attribute their successes to luck more often than men (Frieze, 1973).

As typically happens with studies of gender differences, publication biases favor the reporting of significant sex differences (McHugh et al., 1982). Furthermore, in studies which indicate that women behave differently from men, that behavior is often thought to be less appropriate, less valued, or perhaps even to have harmful consequences for women. Unfortunately, the findings of attribution studies are inconclusive with respect to such inferences.

As attribution studies moved from the laboratory to natural settings, the model became even more suspect. One of the first applications of the model to college level academic tasks continues to be cited in support of women's general externality, yet failed to be replicated (Simon and Feather, 1973).

Experimental studies have shown some gender differences in attributions to Ability and/or Luck. Bar-Tal and Frieze (1977) found that women employed higher luck ratings on an anagram solving task than did men. All other sex differences were mediated by achievement level (high or low need for achievement). Nicholls (1975) labelled girls' attributions to ability as "self

derogatory" (p. 387). Girls, not boys, attributed failure to poor ability more than success to good ability on angle-matching tasks. In a correlational study, Pedro et al. (1981) reported that females with high math anxiety were likely to attribute failure to a lack of ability. This pattern was not in evidence for male students. Deaux and Farris (1977) found that females attributed their performance, whether success or failure on an anagram task, to luck more often than did males. Males, on the other hand, found skill to be important in their performance outcome. However, other findings in these studies were mediated or nullified by such things as ability, achievement motivation or sex-linkage of the task. Still other experiments have shown small or no sex differences in attribution patterns (Travis & Doering, 1982; Travis, 1982).

An important study for this research was conducted by Gitelson, Peterson, & Richards (1982). One hundred seventy-six, ninth to twelfth grade students were given three tasks which typically showed differences between boys and girls. Two were spatial tasks (space relations subtest from the Differential Aptitude Test; Bennet, Seashore & Wesman, 1973, and the Group Embedded Figures Test; Ottman, Raskin & Witkin, 1971), and one was a verbal task (DAT spelling subtest). Following the task, students were asked to respond to eight attribution statements that "might or might not describe how you feel about the test you just completed" (p. 14). (The attribution items included the four common categories of attribution as well as: Mood, Interest, Personality, and Importance of the task). Success and

failure were treated together; mean performance data were analyzed for boys and girls. There were no sex differences in performance nor were there any significant grade effects. On all three tasks however, performance covaried significantly with ascriptions to ability and task difficulty, indicating that those attributions are related to performance. On the two spatial tasks, boys attributed greater ability to themselves than did girls. Girls on the other hand, attributed greater task difficulty than did boys. On the verbal test, there were no differences in attributions made by males or females. The present study hopes to replicate Gitelson's finding of no sex differences on the verbal task in a natural (rather than experimental setting), and with a college (rather than high school) population. In addition, to the extent that attribution is a causal variable in the model of academic choice, sex differences would be expected on the mathematical task similar to those found by Gitelson.

Of similar interest are Nicholl's (1980) studies of New Zealand children. Among upper socio-economic status (SES) thirteen year olds he found no differences between boys and girls on attributions to ability for success on a ten item angle-matching task. In a different study among lower SES twelve year olds, students were asked to explain their scores on a test about a country on which they had just had a thirty minute lesson. He found males significantly more likely than females to attribute their success to ability, though boys and girls performed similarly. Girls in this study also were more likely to

attribute their success to luck. In still a third study of lower SES eight to ten year olds on reading tests, he found significant gender differences in ability ascriptions for success favoring girls (i.e. girls attributed greater ability to themselves than did boys). Nicholl's studies employed both verbal and spatial tasks, though not with the same subjects. He hypothesized that the contrary pattern of gender differences in attributions in the third study may have been a function of either SES or sex typing (within SES categories) of the tasks.

While the literature does show some support for the existence of gender differences in causal attribution patterns, those differences may be attenuated by such things as need for achievement, sex-linkage of the task, outcome, achievement domain, conceptual orientation, or race. Furthermore, studies of effect size indicate that even when gender differences appear, the effect size is small, accounting for a very small proportion of variance (Sohn, 1982; Frieze et al., 1982). One of the strengths of a field study such as this, is the likelihood of obtaining greater effects (Kerlinger, 1973, p. 407).

#### MEASUREMENT OF CAUSAL ATTRIBUTION

Several measurement issues are of interest in studies of causal attribution in everyday settings. Although the dimensions set forth by Weiner (Locus, Stability, and Control) are generally accepted, it is not always clear that they are supported empirically. For the most part, the theoretical dimensions of attribution posed intuitively by Weiner have been simply accepted as established. Thoughtful applications of

attribution theory have been made with little empirical evidence to support the existence of the particular dimensions studied. While pilot data for this study did indicate that students could understand causal attributions in terms of Weiner's three-dimensional model, a second pilot study of empirical relations did not yield the anticipated dimensions.

This study takes the perspective of actor (as opposed to observer) attributions as described by Jones and Nisbett (1971). In a study of self-attributions, Meyer (1982) found that approximately 50% of the variance could be explained by the dimensions of Locus, Stability, and Control. A fourth factor (accounting for 22% of the variance) was defined by anxiety on the positive pole and luck and test difficulty on the negative pole. (He suggests that, for highly anxious students, poor performance might be best explained by anxiety and mood, rather than luck and test difficulty.) Meyer also found that luck loaded in an internal direction on the Locus factor, indicating that some actors may perceive themselves as "lucky" individuals. Other studies have generally considered luck to exist outside of the person.

The measurement instrument itself has received attention. The type of question to use has been discussed by Elig & Frieze, (1979) and Maruyama (1982), and has guided the development of the instrument used in this study.

In addition to issues surrounding the dimensionality of attributions and the type of instruments used, several other considerations came to bear upon the study.

1. **Wording of attribution statements.** The ambiguous nature of attribution statements means that people will have different understandings about each scale. For example, Heckhausen (1980) critiques the findings of Streufert and Streufert's (1980) study of dimensionality using different types of instruments.

Heckhausen believed that a low ability score had two meanings:

1) ability was not an important factor in performance on a particular task, or 2) MY ability is low, therefore I failed (p. 189). It is important then that the statements be understood in similar ways by subjects in the study. This was induced by clear statements and an explanation of the perspective to be taken when completing the instrument; i.e. from one's own perspective as an actor, independent of any social comparison.

2. **Meaning of success.** Even though it can be established that attribution statements are "real," the meaning of those attribution statements has not been clarified. Meaning takes on additional significance with respect to individual definitions of success. It cannot be assumed that subjects will always agree with the researcher's definition of success. At the very least then, the researcher must ask for the individual's subjective evaluation of the performance outcome. More importantly, research is needed to determine what considerations enter into a person's determination of success, and how those considerations affect the attribution process. Frieze et al. (1983) propose a model in which the subjective evaluation of the level of success precedes the actual attribution. She distinguishes two types of statements; one type is attributional items which ask how



important a reason was in determining the subject's performance or how much a factor influenced the performance. The other type (often considered as attribution statements) is really information used in forming success evaluations. Such items might include: How smart are you? How hard did you study for this exam? How difficult was the test? This study explored the meaning of success by using both the informational and attribution items in the pilot study. Correlations between the information and attribution items ranged from  $-.51$  to  $.36$ . Although the correlations were in the predicted direction, they were weak, and yielded no consistent pattern. These data do suggest however, that the information and attribution items are not the same thing, and should not be used interchangeably. The current study elected to use the type of items Frieze considers as true "attribution" (as opposed to information) items.

3. Task difficulty. Even in experimental studies where subjects are programmed to succeed or fail prior to making attributions for their performance, the issue of task difficulty is not fully addressed. Miller and Ross (1976) suggests that there might be a general tendency to attribute success to ability rather than an easy task. However, because ability is a critical ascription in both success and failure conditions, task difficulty plays an important role in modifying those attributions. If items of medium difficulty most nearly call forth an individual's "true" measure of ability, then a task (or in the case of this study, a test) that is perceived as neither too easy nor too difficult should provide the most hospitable

circumstances for ascriptions to ability. Of interest in this study is test difficulty as perceived by the individual student. It is an individual's own assessment which will guide the attributions, unless of course, there are powerful cues regarding the difficulty of the test from the professor (e.g. "Everyone did so well on this test, I must have made it too easy!")

#### SOCIAL DESIRABILITY

A significant problem with most self inventories is the fact that people tend to make socially desirable responses (Nunnally, 1978, p. 557). This tendency to say good things about oneself is so powerful that Nunnally believes that the real question now is "whether a sufficient amount of independent variance remains in self inventories to produce other strong factors" (Nunnally, 1978, p. 557). The literature on sex role stereotyping suggests that the "socially desirable" response for women is not to be good in Mathematics. On the other hand, it is socially desirable for women to be successful in English. Social desirability consists of three major components: 1) actual state of adjustment, 2) knowledge about one's own personal characteristics, and 3) frankness in telling what one knows (Nunnally, 1978, p.558). Within this complex scheme, it is possible for people to differ in their responses from one situation to the next, to have varying amounts of self-knowledge about particular traits, and to choose the amount of frankness they will employ in disclosing information about themselves. Confidence in inferences made as a result of causal ascriptions may be reduced if it can be shown that people respond to causal

attribution items in only a socially desirable way. Kelly (1971) has called this the "discounting principle." "The role of a given cause in producing a given effect is discounted if other plausible causes are also present" (p. 8). In the pilot study, attribution items were correlated with the Marlowe-Crowne Social Desirability Scale. Correlations ranged from  $-.41$  to  $.329$ . Four of the ten attribution items showed significant correlations with the Social Desirability Scale: Ability (Males), Effort, Attitude, and Help from Others (Females).

#### **METHODOLOGY**

The purpose of the study was to determine the consistency of gender differences in attributions for success in two subject areas representing verbal and mathematical tasks. English and Social Science were used to represent verbal tasks and Mathematics the computational task. The design of the study included:

1. Development of an instrument to measure causal attributions for successful test performance in natural classroom settings;
2. An investigation of the extent to which social desirability affects attributions for success.
3. Selection of an appropriate college population;
4. Determination of the success attribution patterns for males and females in two subject areas (English/Social Studies and Mathematics).

The instrument was developed with particular attention paid to the issues of dimensionality, meaning, and wording of attribution statements. The final instrument was pilot tested to insure clarity and comprehensiveness.

The student population was comprised of beginning level students in each subject area. This group was selected specifically because it comprises the potential pool of upper level students; that is, students who had not already self-selected themselves into (or out of) certain courses. Courses represented in this study are among those required for all students. From a practical standpoint, this group also afforded the greatest opportunity for a large sample.

Social desirability is an important consideration in the verity of causal ascriptions. Results from the pilot study indicate that only certain attributions (three for females, and one for males) must be regarded as the socially desirable response and not necessarily an accurate reflection of students' true perceptions of the causes of their performance.

#### SUBJECTS

Professors of undergraduate students enrolled concurrently in an English or Social Studies course and a Mathematics course at Miami-Dade Community College were invited to have their classes participate in the study. Miami-Dade Community College is a large, urban, multi-campus community college serving the urban, multi-ethnic population of South Florida. The average age of students at MDCC is 26.05 years (Fall, 1983), reflecting the "graying" of higher education. Over 80% of the students in the

current study however, were traditional age college students (i.e. under 25 years). Female students comprise 56.5% of the students, which is indicative of the national data indicating that the majority of students in post-secondary education are female. It is important to note the large percentage of students (46.2%) for whom English is not their first language.

Nonetheless, despite the unique demographics of the college, the students participating in this study reflect national demographic trends. According to John Naisbett (1982, p. 8) who identified Florida as a "bellwether" state for megatrend analysis, what is happening in Florida today is a good barometer of situations that will be facing the nation in just a few decades.

The sample of college students was obtained by the researcher personally recruiting individual instructors to allow their classes to participate in the study. The classes were chosen specifically to yield students who were enrolled concurrently in one class requiring verbal and one class requiring non-verbal skills. Basic level classes were chosen, because therein lies the pool of potential students for upper level classes. The sample was 63% female and over 50% of the students identified themselves as minority students. The two largest groups were Hispanics (49%) and non-Hispanic Whites (42%). The distribution of minority students was not significantly different between genders,  $\chi^2 (4) = 3.87, p = .42$ , (Table 1).

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Insert Table 1 about here  
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Approximately half the students received "A's" and half received "B's" on the academic test or writing assignment which was considered the stimulus ( $M=4.51$ ; maximum grade A = 5). In English/Social Studies, women outperformed men ( $M= 4.49$  [Females],  $M = 4.42$  [Males]), though these differences were not significant. In Mathematics, men performed significantly better than women,  $t(106) = -1.97$ ,  $p < .025$ . Students' subjective evaluation of their performance was slightly lower than the actual letter grades given. Thus students tended to underestimate their performance slightly. All students rated the test of average difficulty, thereby providing the optimum environment for attributions not confounded by a test being either too easy or too hard.

#### TEST GRADES

All of the instructors whose students participated in this study administered to the students their own, regularly scheduled examinations. Each professor scored the students' papers as s/he normally would. Although individual professors were expected to have varied standards for grading, those differences were immaterial to this study, since success has been operationally defined in terms of letter grades and students' subjective judgments.

#### INSTRUMENTS

##### Test Attribution Questionnaire

This instrument was developed by the researcher for use in this study because no instrument was available that seemed appropriate for use with college students in a natural classroom setting. The TAQ is a 10 item instrument with a five point choice scale yielding separate scores for each of the following causal attributions:

1. LUCK
2. MOOD
3. EFFORT
4. TEXTBOOK
5. TASK DIFFICULTY
6. INSTRUCTOR
7. ABILITY
8. ATTITUDE TOWARD THE SUBJECT
9. INCENTIVE TO DO WELL
10. INFLUENCE OF OTHERS

Demographic data (age, prior course-taking, race/ethnicity) were collected for descriptive purposes. The distribution of these variables was examined to determine the need to control for their possible effects. Both the demographic questionnaire and instrument were trial tested for clarity and inclusiveness of response choices.

#### PROCEDURES

The following procedures were used for data collection:

1. With the assistance of the College's administration, courses were identified which enrolled the largest numbers of students concurrently. A potential matched sample of 250

students was identified.

2. The instructors of those courses were invited to have their classes participate. For the most part, instructors were contacted personally, with telephone and mail follow up.

3. The Test Attribution Questionnaire was administered during a five week period toward the end of the Spring term 1984, to students immediately after they received their grade on a regularly scheduled test or examination. The schedule of administration was varied; some students received the instrument in a Mathematics class first, others in an English/Social Science class.

4. The instrument was administered by the professors. Subjects were instructed that the class had been randomly selected for a study of student perceptions regarding the reasons for performance on an academic test. They were told that some students may have completed the instrument in another class. Those students were to complete the instrument again, but now from the perspective of their performance on this second subject area test.

5. Students were assured that their responses were confidential, and that data would be reported for groups only.

#### STATISTICAL TREATMENT

Pilot studies suggested that students view failure as something quite different from the opposite of success, and different attributions altogether may apply. Thus, data were analyzed only for successful students (i.e. those receiving a



grade of A or B). Secondly, data from only those successful students whose subjective evaluation of their performance concurred with the objective letter grade given were analyzed. This decision was made to avoid the necessity of accounting for the disparity in subjective and objective evaluations of performance. While such disparity is interesting, the role of attributions in such situations would be obfuscated. Descriptive statistics were reported. Hypotheses were tested using a two (Male & Female) by two (English/Social Science and Mathematics) factorial analysis of variance (with unequal n), using the classical regression approach where effects were adjusted for all other effects in the model (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). For purposes of this study Social Studies was considered to be like English in that it is essentially a verbal as opposed to a mathematical task. Each attribution was treated separately and tested for the interaction of Gender with Subject Area.

## RESULTS

The study was carried out in two phases. The first phase involved the development of the Test Attribution Questionnaire. Four pilot studies using samples of 27, 227, 109, and 15 undergraduate students respectively were conducted to determine the item content of the instrument itself and to test the attribution model posed by Weiner et al. (1971). Having set aside the dimensional model of attribution on the basis of the pilot data, the final version of the Test Attribution Questionnaire was used to test the following hypotheses:

1. Gender has no main affect on attributions for success.
2. Subject Area has no main effect on attributions for success.
3. There is no interaction between Gender and Subject Area in attributions for success.

The instrument was administered to 1,110 undergraduate students in 73 classes. Because this study focused on successful students only, data were analyzed for 421 students meeting the criteria for success: agreement between objective letter grade given and the student's own subjective evaluation of performance. Of the 421 successful students, 304 were in English or Social Science (183 women, 121 men); 108 were in Mathematics (75 women, 33 men). Nine had incomplete data. Each of the ten attribution statements were studied separately. Means and Standard Deviations for all attributions are given in Table 2. A two-way

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Insert Table 2 about here  
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analysis of variance yielded no significant Sex by Subject Area interactions. Neither did any significant gender differences in attribution patterns appear. Main effects for Subject Area were found for five of the ten attributions studied. Means are presented by Subject Area in Table 3. Students were in agreement

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Insert Table 3 about here  
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on the remaining attributions regardless of gender or subject area. Results of these analyses are found in Table 4.

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Insert Table 4 about here  
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### Subjects

Table 5 shows performance data for the students. In general,

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Insert Table 5 about here  
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males reported more high school coursework than females in the areas studied, though these differences were not significant. Males also appeared to have taken more college coursework, except in English. The most pronounced difference was in the amount of college Mathematics taken, where men reported taking approximately 2.5 courses and women .75 courses (reflecting the fact that they were nearly finished with their first college course in Mathematics). The self-report of the males here is suspect, as the College has no Mathematics course at a more basic level than the one studied. Men could have taken a Mathematics course at another college however, or be repeating the current course. There was no way to identify those students however, from the data collected. Consideration was given to the possibility that men simply understood the question differently from women. However, male and female students in English and Social Science reported similar course-taking history. An additional explanation might be that men are making an ego-

defensive statement of the type described by Nicholls (1975), somehow believing that they should have had more Mathematics than they have actually taken.

Among the women, 86% planned to take more English or Social Science courses in college; 93% of the women planned to take more Mathematics. Of the men, 86% planned to take more English or Social Science, while fully 97% planned to take more Mathematics. It is important to note that these results reflect the College's academic requirements. For degree-seeking students, additional coursework in English and Mathematics would be necessary. That is, such coursework is not optional. Thus these data are not in conflict with studies suggesting that women's coursetaking plans for Mathematics are different from (and lower than) those of their male student colleagues (e.g. Fox, Brody, & Tobin, 1980; Armstrong, 1980).

Significant differences between Mathematics and English/Social Science were found on the following attributions: Luck, Effort, Textbook, Instructor, and Influence of Others. A discussion of each attribution follows.

#### Luck Attributions

Luck was not considered an important factor in performance by any group, but students in Mathematics voiced the strongest disagreement,  $F(1,406) = 9.26$ ,  $p = .002$ . The women in contrast to the men in this study showed no tendency toward using Luck as an attribution for success as Bar-Tal and Frieze (1977) found in an experimental study using anagram solving tasks. Of the ten attributions, Luck was seen as least important by all groups. A

similar result was shown by Erkut (1979), although she studied only the four common attributions.

### Effort Attributions

Effort was considered an important factor in determining students' performance on the test, to a greater extent for students in Mathematics, than in English/Social Science,  $F(1,406) = 12.3, p = .001$ . For students in Mathematics, it was the most important factor. This finding concurred with other recent studies highlighting effort as one of the primary attributions in academic and other settings (See Parsons, et al, 1982; Wolleat et al, 1980; Major & Plake, 1983). Deaux (1976) believes that effort attributions are "generally very high by both sexes under a variety of experimental conditions" (p. 344). This may be the result of the subjects' attempts to please the experimenter, or perhaps in natural settings, the instructor. Nicholls (1975) offers another explanation for the common use of effort attributions. Effort, unlike ability, can be directly known by the actor. Thus students who may have little sense of their own ability, know immediately when they have tried hard. Bond and Deming (1982) reported that effort was utilized more often for sex inappropriate tasks. The current study lends some small support to that notion as students in Mathematics used effort attributions more than students in English/Social Science. Although this study is congruent with Bond and Deming's notion for women, it fails to explain why men are equally likely to employ effort attributions in Mathematics. Effort was also an attribution that correlated with the Social Desirability scale

(women only), suggesting that women's attributions to Effort are reflections of what they consider the role-appropriate response.

#### Textbook Attributions

Attributions regarding the importance of the textbook varied greatly. Main effects for Subject Area were large,  $F(1,406) = 30.12$ ,  $p < .001$ . This was possibly due to differences in individual professors' use of a text. In Mathematics, the Text was seen as relatively important, while in some English classes, because no text was used at all, this attribution had no substantial meaning for those students.

#### Instructor Attribution

Students in English/Social Science were more likely than students in Mathematics to agree that the Instructor was an important factor in their success,  $F(1,406) = 6.40$ ,  $p = .012$ . Pilot data also showed a consistent emphasis on the importance of a good instructor in facilitating success. Perhaps the instructor's role is less manifest however, in a subject area which is seen as "objective" and less subject to interpretation. These results can be contrasted with the results on the Textbook attribution, where students in Mathematics rated the text of greater importance than students in English.

#### Studying with Others Attribution

Students expressed slight disagreement with the statement that "studying with others was an important factor in determining your grade on this test." Students in Mathematics were significantly more likely to agree with the statement than students in English/Social Science,  $F(1,406) = 5.12$ ,  $p = .024$ .

It should be noted that for women, this item also correlated significantly with the Marlow-Crowne Social Desirability Scale administered in Pilot Study Three.

Mood, Test Difficulty, Ability, Attitude, Incentive Attributions

There were no main effects for either gender or subject area for the attributions Mood, Test Difficulty, Ability, Attitude, and the fact that it was Important to do Well. Students expressed strong agreement with all five statements, with consensus across subject areas. The "Important to do Well" item is not a common attribution item, and was nearly discarded for this study based upon findings of significant gender differences in the pilot study.

Nevertheless, this item was included because of its obvious importance to women, and the strong consensus suggests that this statement is important to both male and female students in both subject areas. The same is true of the "Attitude" attribution.

Eccles' (1984) study assessed the subjective task value of English and Mathematics and concluded that it is this task value which mediates sex differences in course enrollment. The "Important to do Well" item may be an item which more directly relates to Eccles' notion of subjective task value (particularly for women), and when seen from this perspective, it can be argued that this item is not an attribution at all.

Discussion

There were two major components of this study. First, an instrument was developed for use with a college student population in natural classroom settings to measure student

attributions for successful performance. The instrument itself seems to be a moderately valid and reliable research tool. It improves upon earlier instruments that either assumed Weiner's dimensional model or at the very least gave students too limited a choice of attribution responses. Students responded well to the instrument. There was little missing data on the ten TAQ items, and results were fairly consistent. Additional attempts to improve the reliability of the instrument however, would be welcome.

Results from the final application of the TAQ do not support the notion that women generally give different reasons than men for their academic success, nor that those reasons are self-derogatory. Successful men and women agreed upon the reasons for their performance, since no main effects for gender were found.

Not surprisingly, there were differences between subject areas. This means that readers of attribution studies must be reminded to pay particular attention to the specific task or subject area being considered in any attribution research. Weiner's application of attribution theory to academic achievement-related contexts may overlook some of the fundamental differences between subject areas that are reflected in attributions. Similar questions to those posed by Ernest (1976) may need to be revisited. Specifically, what goes on inside some classrooms that encourage or discourage students (both male and female) from making certain academic choices? Questions could also be posed about the precise differences between the subject areas included in this study.



Additionally, now that attribution studies are being conducted in real classrooms, the results of earlier experimental studies often fail to be replicated. The importance of the instructor for example, would not be a factor in an experiment where no one was present in that role. The present study partially replicated the findings of Gittelsohn et al. (1982) in finding no effects for sex in attributions on the verbal task. Unlike their study however, this investigation also found no significant gender differences in attributions on the mathematical task. These findings do not support their conclusion that sex differences might be the result of the sex-appropriateness of the task. If that were true, then gender differences should have appeared in students' attributions for success in Mathematics. Conclusions and inferences from studies noted earlier (e.g. Simon and Feather, 1973; Nicholls, 1975; Deaux and Farris, 1977) are further weakened by these data. Women are no more likely than men to use luck to explain success in either subject area, and conversely, they are no less likely than men to attribute their performance to ability. That is not to say however, that attribution studies are of no value in studying problems relating to academic choice and/or achievement. Perhaps the real worth of the studies lies in the nonsignificant results. In the current study for example, no gender or subject area differences were found among the students on five attributions. These attributions (Mood, Test Difficulty, Ability, Attitude, and Important to do Well) may generalize across both students and subject areas. These attributions might

form the core of a new set of attributions for use with students in natural classroom settings, extending and refining what is known on the basis of the experiments conducted to date.

The major conclusion of this study however, concerns attribution as a causal variable in the Meece model of academic choice. Meece and her colleagues have taken a bold step in developing a comprehensive model and specifying the relationship between variables. There is no question but that there is a need for such a model to help educators understand the phenomenon of academic choice and its role in resolving problems of educational equity. The model recognizes the multiplicity of factors which likely enter into enrollment decisions. Still, the matter of causation is troublesome. Data from this study suggest that attribution has not fulfilled one of the necessary conditions to be included as a causal variable in the model. Attributions for women in English, where they do participate were not significantly different from those in Mathematics, where they are underrepresented. Attributional differences may have a stronger relationship to affect, i.e. how one feels about one's performance (Arkin, 1979), or to expectations for future performance (Frieze, 1983).

From a philosophical standpoint, Locke and Pennington (1982) point out that attribution theorists need to consider the distinction between reasons and causes. They go on to propose that reasons are only one type of internal cause. Thus any given set of attributions can be considered valid reasons. The task of attribution theory then, is to "explain why, from our different

perspectives, we tend to emphasize different parts of the same total explanation" (p. 218). This approach refutes the notion that the use of one attribution over another is either better or worse for that group (a common inference in studies of sex differences). It also makes appropriate questions about the circumstances under which sex differences appear, rather than the mere fact of their existence. Jayaratne and Kaczala (1983) call for just such an approach when sex differences are studied.

Finally, a refinement of the basic question of this study remains unanswered. It has yet to be demonstrated exactly how the same students respond to the attribution items in two different subject areas. The major problem in answering that question is a practical one. Clearly a sample of several thousand students would be needed to generate a pool of only 100 matched students. Nonetheless, the question is an important one to answer if attribution research is to advance.

Findings from the current study have raised other, perhaps even more interesting, questions. Of necessity, this study was limited to "successful" students, that is, students who did well on the academic task and knew they did well. Nearly 60% of the students who completed the instrument were not included in the data analysis. These are students who either did not do well on the tests, or did well but did not see themselves as successful. What about those students? What reasons do they give for their performance? What accounts for the disparity between some students' objective letter grades and their subjective evaluation of their performance? Are there gender differences in

attributions for failure, and are those differences dependent upon subject area? How do the Unsuccessful students' attributions compare to those of Successful students?

Another area of interest is possible gender-race-ethnic differences in attributions for success. The largest proportion of attribution studies done to date either fail to report the race/ethnicity of the subjects or when such data is reported, the sample is generally White. The large number of students who identify themselves as minority students in this study, give added significance to these results.

Taken altogether, the value of this research lies in the development of a new instrument to measure students' attributions for successful performance on an academic task in real settings, and in the test of an important theoretical model. Even given the limitations of the present study, it is safe to conclude that attribution is probably not a causal variable in the model of academic choice proposed by Meece.

Table 1  
 Percentage of Subjects by Gender  
 and Race/Ethnicity

	Caucasion	Hispanic	Black	Other
Females	41.0	49.8	5.2	4.0
Males	42.6	45.9	3.4	7.9

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 $\chi^2 (4) = 3.87, p = .42.$

Note: missing data not included; n=412.

Table 2  
Means and Standard Deviations  
for Ten Attributions for Success

Item	Mean	Standard Deviation
Luck	4.26	1.03
Mood	2.20	1.07
Effort	1.64	.99
Textbook	2.39	1.26
Test Difficulty	2.37	1.00
Instructor	1.85	1.11
Ability	1.80	.81
Attitude	1.73	.88
Important to do Well	1.39	.64
Other People	3.83	1.26

Note: maximum score = 5.0 ("disagree completely").

n = 413 - 419; missing data not included in calculations.

Table 3  
Means and Standard Deviations  
by Class for Ten Attributions  
for Success

Item	Mean		Standard Deviation	
	English	Math	English	Math
Luck	4.16	4.53	1.08	.82
Mood	2.15	2.32	1.08	1.28
Effort	1.75	1.33	1.05	.73
Textbook	2.59	1.83	1.31	.86
Test Difficulty	2.36	2.42	1.00	1.02
Instructor	1.79	2.02	1.04	1.27
Ability	1.78	1.86	.77	.92
Attitude	1.73	1.73	.86	.94
Important to do Well	1.41	1.34	.64	.61
Other People	3.94	3.54	1.22	1.35

Note: maximum score = 5.0 ("disagree completely").

n = 413 - 419; missing data not included in calculations.

Table 4  
 Summary of Separate Analyses of Variance,  
 F Test for Each Dependent Measure

Source of variance	df	F Values									
		Luck	Mood	Effort	Text	Dif.	Instructor	Ability	Attitude	Important	Others
Gender(A)	1	.006	1.33	.44	.005	.06	.74	.53	2.42	.63	.42
Class(B)	1	9.26 <sup>b</sup>	1.86	12.30 <sup>a</sup>	30.16 <sup>b</sup>	.002	6.40 <sup>a</sup>	.81	.45	.19	5.12 <sup>a</sup>
A X B	1	.08	.08	.02	.38	2.50	1.38	.78	2.09	.26	2.18

<sup>a</sup>p < .01.

<sup>b</sup>p < .05.



Table 5  
Student Performance Data

	Females <sup>a</sup>		Males <sup>b</sup>	
	M	SD	M	SD
Objective Grade <sup>c</sup>	4.51	.53	4.49	.50
Subjective Grade <sup>d</sup>	4.43	.50	4.35	.50
Test Difficulty <sup>e</sup>	2.95	.93	2.99	.92

<sup>a</sup> n = 258

<sup>b</sup> n = 154

<sup>c</sup> Maximum grade = 5 (A)

<sup>d</sup> Maximum score = 5 ("Very Well")

<sup>e</sup> Maximum score = 5 ("Very Difficult")

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TEST ATTRIBUTION QUESTIONNAIRE

PLEASE CIRCLE THE APPROPRIATE RESPONSE

1. Luck was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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2. Your mood when you took this test was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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3. Your effort (how hard you studied) was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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4. The quality of the textbook was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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5. The difficulty of this test was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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6. The instructor was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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7. Your ability in this subject was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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8. Your attitude toward this subject was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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9. The fact that it was important to you to do well was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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10. Studying with other people was an important factor in determining your grade on this test.

<u>1</u> Agree Completely	<u>2</u> Agree Somewhat	<u>3</u> No Opinion	<u>4</u> Disagree Somewhat	<u>5</u> Disagree Completely
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DID YOU INCLUDE YOUR STUDENT NUMBER ON PAGE ONE?

STUDENT NUMBER: \_\_\_\_\_

AGE: \_\_\_\_\_

SEQUENCE NUMBER: \_\_\_\_\_

GENDER: FEMALE \_\_\_\_\_  
MALE \_\_\_\_\_

RACE: BLACK \_\_\_\_\_  
HISPANIC \_\_\_\_\_  
ORIENTAL \_\_\_\_\_  
CAUCASIAN \_\_\_\_\_  
OTHER \_\_\_\_\_

1. What was your grade on this test:

A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_ D \_\_\_\_\_ F \_\_\_\_\_

2. How well do YOU think you did on this test?

1                      2                      3                      4                      5  
Very                      Less than                      Average                      Better than                      Very  
Poorly                      Average                                           average                      Well

3. How difficult was this test?

1                      2                      3                      4                      5  
Very                      Somewhat                      Average                      Somewhat                      Very  
Easy                      Easy                                           Difficult                      Difficult

4. How much Social Studies have you taken previously?

High School

College

None \_\_\_\_\_  
1 Year \_\_\_\_\_  
2 Years \_\_\_\_\_  
3 Years \_\_\_\_\_  
4 Years \_\_\_\_\_

None \_\_\_\_\_  
1 Course \_\_\_\_\_  
2 Courses \_\_\_\_\_  
3 or more Courses \_\_\_\_\_

5. Do you plan to take more courses in Social Studies?

Yes \_\_\_\_\_ No \_\_\_\_\_

6. On a scale of 1 to 5, with 5 being a great deal, how much of each of the following does it take to succeed in this course?

\_\_\_\_\_ Natural Ability  
\_\_\_\_\_ Luck  
\_\_\_\_\_ Hard Work  
\_\_\_\_\_ A Good Instructor  
\_\_\_\_\_ Easy Tests  
\_\_\_\_\_ A Good Textbook  
\_\_\_\_\_ A Positive Attitude Toward the Subject  
\_\_\_\_\_ A Reason to do Well  
\_\_\_\_\_ Help from Other People