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ABSTRACT

It was hypothesized that subjects who were trained in selected task-related learning strategies would exhibit significantly increased performance and academic motivation over untrained subjects. Students in an associate degree management course (n=54) participated in either treatment or control groups. Both groups received training in management-case study analysis, and the treatment group also received training in learning strategies. The treatment resulted in significant performance increases in some areas. There were no significant increases in motivation resulting from treatment, but there were tendencies toward more overall learning-strategy use in the treatment group. Complex synergistic interactions among learning-strategy value, individual characteristics, motivation, and learning-strategy use in the "black boxes" of the mind are suggested by treatment effects. Implications for practice include the integration by educators and students of task-related learning strategies into educational programs at all levels. The instructional package should include subject content knowledge, learning strategies, and attributions awareness. Appendix A provides operational definitions and appendix B contains 11 tables of correlations and findings. (Contains 20 references.) (SLD)

Title:

Synergistic Effects of Learning Strategies Training: Comparing "Black Boxes"

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Introduction: Theoretical Perspective and Objectives of Study

This is an analysis of experimental outcomes that resulted in different synergistic performance, motivational, and learning strategies relationships between and among the variables studied in two groups.

The hypothesis of the study was that subjects trained in selected task-related learning strategies would exhibit significantly increased performance and academic motivation over untrained subjects. Previous research had recommended learning strategy interventions based on reported correlations between selected learning strategies, performance, and self-concept related motivational dimensions (See Eison, Pollio, & Milton, 1986; McCombs, 1984, 1987; Pintrich, 1986, 1987; Pintrich & De Groot, 1988; Schutz, Ridley, Glanz, & Weinstein, 1989).

According to a social-cognitive/expectancy-value model of college learning and teaching developed by McKeachie, Pintrich, Lin, & Smith (1986), student motivation and knowledge of learning strategies not only affect each other, but lead to both self-regulated learning (engagement in learning or application of learning strategies) and academic performance. Individual student characteristics (including personal academic beliefs, attributions to success and failure, and demographics), however, may influence task-related motivation, and academic performance.

Figure 1 presents a theoretical framework of the study, and Figure 2 diagrams experimental variables.

The task was a management case study. As shown in Figure 2, training was provided in the use of techniques related to five types of cognitive, metacognitive, and resource management learning strategies. Performance was defined as scores on three parts of a case study task.

Motivation was defined as scores on each of three self-report measures of motivation: (a) perceived task-related self-efficacy for learning, (b) expectations for task-specific academic success, and (c) desire to continue learning more about business management.

Two categories of learning strategies were assessed: (a) "primary" learning strategies (general cognitive and metacognitive strategies, classified as self-regulated learning strategies by Pintrich et al., 1989), and (b) "other" learning strategies used and valued (specific study skills-like tactics).

Operational definitions for all variables appear in Appendix A.

Methods and Data Sources

Three sections of an Associate Degree introductory management course volunteered to be subjects (N = 54); they were located on two regional campuses of a comprehensive state university. Half the students in each class were randomly assigned to be subjects in either a control group or a treatment group.

Figure 1

Figure 2

In a posttest-only two-group experimental design, both groups received training in management case study analysis over a two-week period involving four 75-minute class sessions. In addition, the treatment group received training in learning strategies. All training was transmitted via written materials developed and validated by the research investigator via expert review and extensive pilot testing (See Nuttall, 1993).

Performance was assessed by expert grading of open-ended answers. A ten-page self-report questionnaire was used to gather other data (learning strategy use, learning strategy value, individual characteristics, and motivation outcomes). MANOVA was used to assess group differences at a .05 significance level. Follow-up interviews were conducted with 17 percent of the sample.

Sources for the questionnaire included: (a) adaptations (from context of course to task) of the Motivated Strategies for Learning Questionnaire, (MSLQ, Pintrich, Smith, & McKeachie, 1989), (b) the Achievement subscale of the Multidimensional-Multiattributional Causality Scales (MMCS-IV, Lefcourt, Von Baeyer, Ware, & Cox, 1979), and (c) investigator-prepared questions. Both interitem alpha and test-retest Pearson r reliabilities were compiled for all questionnaire items.

Limitations

Limitations included possible effects of time and use of self-report assessment. Concerning time, it was noted that pilot studies, which took place over longer periods of time, showed significant gains in planning, self-efficacy, and expectancy for success. As related to accurate reporting by subjects, limitations were considered as related to social desirability of responses, accuracy of perceptions of use, and semantics.

Summary of Results

___A summary of results are presented for performance, motivation, learning strategies use, and interactions of variables (See also Nuttall, 1992).

Performance

The treatment resulted in significant performance increases in two tasks: (a) listing symptoms of case problem(s), and (b) labelling symptoms according to management function or process. There was no significant increase for a third task, writing a problem statement.

Motivation

Concerning the three motivation outcomes, there were no significant increases. However, raw scores on self-efficacy and expectancy for success (which were correlated with each other) were slightly higher for the treatment group; and follow-up interviews with subjects indicated that they felt the use of learning strategies was motivating.

Furthermore, analyses of interactions between all the variables in the study (discussed

below) indicate that motivation, along with individual characteristics, played a key role in performance outcomes among treatment group subjects, albeit in an indirect way. In particular, correlations between self-regulated learning (primary learning strategies) and motivation were stronger for the treatment group.

Supported by results obtained in a pre-pilot study, it is anticipated that, with additional time, motivational results would have been significant, at least in the areas of self-efficacy and expectancy for success.

Learning Strategies Use

Post hoc analyses indicated: (a) significant uses of two "other" learning strategies (referring frequently to instructions and other material, and reading the case more than once), and (b) tendencies toward more overall learning strategy use in the treatment group.

Interactions of Variables

Theoretical relationships between the following sets of variables were supported: (a) self-regulated learning and motivation, (b) self-regulated learning and individual characteristics, (c) functions aspect of task and self-efficacy, and (d) task-related motivation and individual characteristics. There was no support for the relationship between self-regulated learning and performance.

Synergistic Interactions of Variables Within Groups

In this study, the learning strategies treatment appears to have caused differences between the groups that were not obvious from merely looking at significant differences for performance and motivation outcomes. Figures 3 and 4 illustrate complex, synergistic relationships at work in the "black boxes" of the mind between learning strategy value, individual characteristics, motivation, and learning strategy use. These figures are entitled "General Relationships..." because, for the learning strategies variables, only general categories are provided rather than specific strategies.

Fifteen areas where correlations were unique or higher in the control group are indicated in Figure 3 as Letters D, F, G, I, L through Q, and R through V. Seventeen areas where correlations were unique or higher for the treatment group are indicated in Figure 4 as Letters A through Q.

To show relationships between variables, Pearson correlation coefficients were computed by individual subject. Two-tailed significance at the .05 level was computed for each group--control (S) and treatment (T) as well as for the total sample.

Although individual correlations are all significant at the .05 level, no between-group significance statistics were calculated. Differences were determined by observing whether: (a) one group had a correlation between two variables that the other group did not have (a unique correlation), or (b) one group had a noticeably higher (around .1000 higher) correlation than the other.

Of the 19 correlations that are indicated as being higher for one group than the other, six differences range from .0638 to .0968, and 13 differences range from .1126 to .1710.

A summary of unique and higher correlations between the groups appear in Appendix B, Tables 1 through 11. A brief summary of types of differences between the treatment, Group T (Figure 3), and the control, Group S (Figure 4), appears below in alphabetical order.

A, B, and C signify Group T's unique correlations between motivation outcomes (self-efficacy, expectancy for success, and desire to continue learning) and self-regulated (primary) learning strategies (See Table 1).

Figure 3

Figure 4

D signifies unique correlations for both groups between self-regulated (primary) learning strategies and individual characteristics (See Table 2).

E, F, and G signify correlations between motivation and individual characteristics (See Table 3). Only Group T has unique correlations between self-efficacy and individual characteristics (E), while both groups have unique correlations between individual characteristics and: (a) expectancy for success (F), and (b) desire to learn (G).

H indicates unique correlations between symptoms and other learning strategies valued for Group T, while I indicates unique correlations for both groups between problem and individual characteristics (See Table 4).

J and K indicate unique correlations for Group T between desire to learn and: (a) self-efficacy and (b) expectancy for success, respectively (See Table 1).

L indicates unique correlations for both groups between self-efficacy and other learning strategies use (See Table 5).

M, N, and O signify differences for both groups in correlations between other learning strategies valued and: (a) self-efficacy (M),
(b) expectancy for success (N), and (c) desire to learn (O). (See Table 6.)

P indicates differences in both groups between individual characteristics and other learning strategies used. Group S's correlations appear in Tables 3 and 4, while Group T's correlations appear in Table 9.

Q indicates that Group T exhibited higher correlations between other learning strategy use and value (See footnote in Table 5 plus Tables 10 and 11).

R indicates Group S's unique correlations between functions and self-efficacy (See Table 4).

S indicates Group S's unique correlations between problem and other learning strategies used (See Table 4).

T indicates Group S's unique correlations between problem and other learning strategies valued (See Table 4).

U and V indicate Group S's unique correlations between other learning strategies used and: (a) expectancy for success and (b) desire to learn, respectively (See Table 5).

Analysis of Group Differences: Comparing "Black Boxes"

After extensive post hoc analysis of the data, it is evident that there are complex explanations of the outcomes. As Dansereau (1985) has observed:

> We...know very little about the relationships between individual difference variables and training effectiveness...(and) about why the strategies work. We don't know what alterations in the participant's cognitive processing are responsible for improved test performance (pp. 230-231).

To interpret interactions between and among variables in this study, and to thus analyze what is occurring in each group's "black box," (See Figures 3 and 4), the following categories of relationships are discussed: (a) Role of other learning strategies valued, (b) other learning strategies used and individual characteristics, (c) self-regulated learning and individual characteristics, (d) motivation and individual characteristics, (e) association of motivation outcomes with each other, (f) motivation and self-regulated learning, (g) motivation and other learning strategies used, and (h) associations with performance outcomes.

After empirical results are discussed, a theoretical discussion of the interaction of variables within groups is presented in the form of a hypothetical model. This model attempts to explain processes occurring within the "black boxes."

Role of Other Learning Strategies Valued

The role of learning strategy value was evident in several unique correlations in the treatment group. First, the treatment group had higher correlations of value with use (See Tables 10 and 11) for selected strategies. Second, the treatment group had a unique correlation of symptoms and one learning strategy valued (Value of asking others for help), a strategy presented to the treatment group and not the control group (Table 4, Code H).

Third, the treatment group had more unique correlations of learning strategies valued with self-efficacy and expectancy for success (Table 6, Codes M and N).

Fourth, although both experimental groups exhibited unique associations between motivation outcomes and other learning strategies valued, there were differences in particular strategies and specific motivation outcomes correlated (See Table 6).

Evidently the treatment evoked these associations, since all the strategies associated with all three motivational outcomes by the treatment group were recommended in the learning strategies intervention.

Other Learning Strategies Used and Individual Characteristics

Tables 7 and 8 (Code P) show the control group's unique associations between other learning strategies (12 particular skills) used and individual characteristics/demographics, while Table 9 (Code P) exhibits the treatment group's unique associations.

The treatment group's correlations between other learning strategies used and individual characteristics/demographics were generally limited to task utility, task importance, and overall task value (interest, importance, and utility). There were no associations of other learning strategy use with the following individual characteristics: task interest, test anxiety/cognitive interference, or generally any type of causality beliefs such as effort, internal or external beliefs, and attributions to failure experience.

On the other hand, for purposes of discussion, control group correlations may be grouped into four categories. In the first category are those characteristics that seem to indicate that learning strategies are not generally helpful and are used only as a last resort to avoid failing: (a) overall test anxiety, (b) low GPA, (c) no prerequisite Introduction to Business course, (d) attributions to failure experiences, and (e) external causality.

The second category indicates ease in, or time available for, using the strategies: low semester credit load. The third category of individual characteristics relates to interest in task: (a) task value (interest) and (b) negative interest in study. The fourth category indicates particular types of students: (a) high attendance and (b) male.

Self-Regulated Learning and Individual Characteristics

As indicated in Table 2 (Code D), the treatment group exhibited more than 30 unique correlations between self-regulated learning and individual characteristics, while the control group exhibited only two such correlations.

While the control group's associations of individual characteristics with primary learning strategies were limited to effort and task utility, the treatment group exhibited more combinations of personal academic beliefs and learning strategy use that indicated tendencies toward intrinsic motivation and overall task value; and they seemed to value the whole learning experience more, including both task completion and learning strategy use.

Motivation and Individual Characteristics

Since motivation and self-regulated learning variables are correlated (See Table 1), similar relationships between motivation and individual characteristics could be expected, which was the case in this study. As indicated in Table 3, for the control group, there were only four unique correlations between motivation and individual characteristics. On the other hand, the treatment group had more numerous and complex unique correlations between motivation and individual characteristics, as explained below.

Individual characteristics associated with self-efficacy. As shown under Code E, the learning strategies treatment seems to have evoked associations with self-efficacy of overall task value (particularly interest and utility) as well as a tendency to not associate external events or luck with academic performance.

Individual characteristics associated with expectancy for success. As shown under Code F, the learning strategies treatment seems to have evoked associations with expectancy for success that were identical to self-efficacy associations in all but two aspects: task utility and overall task value (There was no difference between the control and treatment groups for these two associations).

Individual characteristics associated with desire to learn. As shown under Code G, the learning strategies treatment seems to have evoked more associations in both groups between desire to learn and all individual characteristics than other motivation outcomes did. Also, similar to self-efficacy and expectancy for success associations, the treatment seems to have evoked an association with desire to learn of not associating external events, luck, or past failure with academic performance. Again, the control group associated desire to learn with such variables as task utility, effort beliefs, and internal causality beliefs.

(Years since high school is an unexplainable association with desire to learn for both total sample and the treatment group unless it indicated the experimental groups were not equivalent in some combination of variables, such as gender and age.)

Associations of Motivational Outcomes with Each Other

___In the treatment group, there were higher correlations between: desire to learn and: (a) self-efficacy and (b) expectancy for success (See Table 1, Codes J and K).

Motivation and Self-Regulated Learning

As shown in Table 1 (Codes A and B), the treatment group had unique correlations between the two motivational variables of self-efficacy and expectancy for success and the two self-regulated learning variables of planning and regulating. The treatment group's correlation between desire to learn and all self-regulated learning strategies were also higher (Table 1, Code C).

Motivation and Other Learning Strategies Used

As indicated in Table 5 (Code L), the treatment group had only two unique correlations: (a) Self-efficacy and writing notes in the margin, and (b) self-efficacy and referring frequently to instructions and other materials. However, these strategies were ranked as high-use and high-value by both groups. There were no treatment correlations between expectancy for success or desire to learn and other learning strategies used.

In the control group, two strategies were associated with both self-efficacy and expectancy for success (Codes U and V): Timing work and making a diagram of case facts, both which were low-use, low-value ranked strategies by both groups.

It appears that the treatment group associated referring frequently to instructions and other materials with personal ability to perform a task (self-efficacy), whereas the control group associated the same learning strategy with personal interest in the task or desire to learn more about it.

It appears that self-efficacy may have been the key to increased performance in symptoms and functions, since it was linked with the only learning strategy used significantly more by the treatment group. Furthermore, self-efficacy was linked to functions for the total sample, and functions and symptoms were linked for all groups.

Associations with Performance Outcomes

The following associations (shown in Table 4) may have influenced better performance outcomes for symptoms and functions in the treatment group.

1. The association between symptoms and valuing asking others for help (Code H). This strategy appeared in the treatment instructions although it could not be used unless students talked outside of class (the experimental site); however, the rationale for its leading to increased performance would be supported by Dansereau's (1985) finding that peer/dyad learning leads to increased achievement.

2. The inclination to not associate self-efficacy with performance (Code R). One reason for this situation may have been that, while both groups received feedback on their performance throughout the experimental training period, the treatment group did not worry about getting low scores because they knew they had an arsenal of learning strategies that would help them perform better. In effect, the treatment group's self-efficacy would appear to be higher, despite non-significantly higher raw scores.

Theoretical Discussion of Interaction of Variables Within Groups: A Hypothetical Model

Figure 5 presents a theoretical model of the relationships of what possibly could be the most instrumental variables in the study. While results of the study indicated correlations between various types of variables, no statistical analyses of directionality were conducted. Therefore, while data suggest a possible tendency of movement from the top of the diagram downward, and from right to left, there may in fact be circular relationships operating among the variables. Also, before accepting this model, not only cause-effect relationships should be tested, but between-groups tests of significance should be conducted on the unique correlations in each group.

The treatment evoked different associations for each group between motivation and learning strategy use, which may be related to differences in performance directly, or indirectly (through the role of individual characteristics or motivational affects).

In addition, learning strategy value appears to be the variable most closely associated with training; and use of particular learning strategies appears to be the variable most closely associated with performance. Other, possibly intervening and interacting, variables are discussed below.

Learning Strategy Value, Use and Individual Characteristics

Data from the study suggest that, because the treatment group associated value of learning strategies with use to a greater degree than the control group, they may have used strategies (including primary learning strategies) more effectively. As evidenced by unique associations with personal beliefs and attributions (individual characteristics), the treatment group may have had more unconditional acceptances of learning strategy use.

Conversely, the control group may have viewed learning strategies as generally not helpful, to be used only if the task was interesting, it was convenient or easy to do so, or as a last resort to avoid failing.

Theoretical Role of Individual Characteristics in Outcomes

Personal interest and value in a task or subject may be key individual characteristics related to academic performance, motivation, and learning strategy use (both primary and other learning strategies). Results indicate that the control group had more of a tendency to associate the use of a strategy with task interest, effort, and unproductive personal attributions (i.e., the need to avoid academic failure).

Conversely, results indicate that the treatment group had more of a tendency to associate overall task value (interest, importance, and utility) with learning strategy use. It appears that the treatment planted an unconscious, unconditional recognition of the value of learning strategy use.

In addition, follow-up interviews suggest that task value or interest may have the power to override knowledge of either subject or learning strategies as an academic motivator.

Figure 5

It also appears that the following three general principles may be at work:

1. Individual characteristics (i.e., task importance and utility) may affect use of "primary" learning strategies (groups of cognitive and metacognitive strategies), which seem to be directly related to
motivational outcomes, and indirectly to performance.

2. Individual characteristics may affect use of "other" learning strategies (particular strategies and techniques, including resource management) that may directly influence performance.

3. The mix of individual characteristics, "primary" (self-regulated) learning strategies, and motivation outcomes, in combination with particular other learning strategies, may indirectly lead to different performance outcomes.

The study did not assess learning strategy goals, yet the treatment could also have affected such goals. According to Weinstein and Mayer (1986), the goal of any particular learning strategy may be the "...way in which the learner selects, acquires, organizes, or integrates new knowledge" (p. 315). Perhaps the treatment affected one or more of these variables.

Individual Characteristics, Motivation and Performance

High correlations between task interest and motivation, as well as correlations between self-regulating strategies (planning and regulating) and both self-efficacy and expectancy for success may have evoked other learning strategy use that was relevant to increased performance.

Theoretical Motivational Patterns

Results confirmed the dynamism of continuing intrinsic motivation, which has been defined by McCombs (1984) as:

a dynamic, internally mediated set of metacognitive, cognitive, and affective processes (including expectations, attitudes, and beliefs about the self and the learning environment) that can influence a student's tendency to approach, engage in, expend effort in, and persist in learning tasks on a continuing self-directed basis (p. 200).

Data from the study suggest that self-efficacy may have been the motivational variable most related to differences between the groups in relationships among the other variables. For example, the treatment group had more associations with self-efficacy than the control group, including the previously mentioned links with learning strategy use.

Secondly, the treatment group associated self-efficacy with learning strategy use, as opposed to the control group's association of self-efficacy with performance. Thirdly, although there were no significant differences in scores, the treatment group showed higher correlations (synergistic effects) between expectancy for success and desire to learn (43 percent higher), and desire to learn and self-efficacy (49 percent higher).

Although self-efficacy and active engagement in learning are seen in the literature as motivational aspects of self-regulated learning, the literature provided no definitive descriptions of motivational outcomes of self-regulated learning. What was discussed is a circular relationship between achievement and motivation; for example, Corno (1986) implied that one must be motivated to achieve, yet one may be motivated by achievement.

Follow-up interviews in this study supported the idea that learning strategy use can be motivational, and the treatment group did have higher scores on two performance (achievement) outcomes.

Pintrich and De Groot (1988) suggest that important factors in student achievement include planning (among other metacognitive strategies), self-efficacy, and motivation to employ self-regulated strategies and regulate cognition and effort. In addition, Easton and Ginsberg (1983) and Zimmerman (1986) note that planning is an achievement factor.

As related to this study, planning significantly increased for the pilot subjects (N = 90), and both self-efficacy and expectancy for success significantly increased for pre-pilot subjects (N = 20) two and one-half months after the training intervention, during which time they were enrolled in a course involving nothing else but the analysis of case studies.

It is theorized that perceived self-efficacy (a combination of perceived personal competence and self-confidence, or ability to discriminate between controllable and uncontrollable situations) leads to increased motivation (Bandura, 1986; McCombs, 1988). Perhaps the treatment caused a link between self-efficacy and some other variable, which produced the same effect as self-efficacy alone.

Various researchers (Bandura, 1986; McKeachie, 1988; McCombs, 1988; Schunk, 1987) indicate that self-efficacy may either affect learning strategies training or be affected by it.

Concerning the relationship between self-efficacy and performance, Bandura (1986) notes that people who have high self-efficacy will "mobilize greater effort and persist longer on a task" (p. 413). In this connection, self-efficacy is an important element of self-regulated learning which, when combined with low anxiety toward learning, is a good predictor of

student achievement, according to Pintrich and De Groot (1988).

However, is self-efficacy necessary for performance, or is it an effect of performance? In analyzing performance results for this study, it appears that, for the treatment group, self-efficacy may have resulted from a knowledge of learning strategy use (or other related variables) and then become a precursor to performance. Conversely, it appears that, for the control group, lower self-efficacy was a result of, instead of a precursor to, performance, since the control group subjects did not have a storehouse of learning strategies presented to them in the study.

Also, since self-efficacy and expectancy for success are highly correlated, it might be said that, because the treatment group had training in learning strategies, they may have had higher expectations for success and, therefore, higher self-efficacy, despite insignificant higher raw scores with large standard deviations.

Regarding the interaction of motivation and self-regulated learning, if one agrees that the functions of learning strategies training/use are both cognitive and affective, and involve self-directed learning (Weinstein & Mayer, 1986; McCombs, 1987), it is obvious that the experimental treatment made a difference. Furthermore, if one accepts McCombs' (1987) argument that all learning is inherently autonomous (independent and self-directed) and that students ultimately have to be guided by their own motivation (including interests) and ability, it would appear that the treatment group exhibited more autonomous-like interactions.

Implications for Practice

Implications for practice include the integration, by both educators and students, of task-related learning strategies into educational programs at all levels. The instructional package would include knowledge of subject content, learning strategies, and attributions awareness (knowledge of how individual characteristics, values, and motivation may affect learning).

Recommendations for Research

Recommendations for further research are listed below.

1. Study synergistic interactions of more than one variable at a time when analyzing performance and motivational outcomes.

2. Regarding motivational variables, continue to assess self-efficacy and expectancy for success in the self-concept context. Desire to learn is a more complex variable in that it incorporates more than the self-concept context. An additional variable would be effort.

3. Regarding instrumentation, subjects need to be tested as to their actual knowledge and application of learning strategies. Such assessments as journals, observation and testing might be appropriate.

4. Allow adequate time--i.e., a minimum of three to six months--for appropriate practice, mastery, and motivation for actual use of learning strategies.

5. Incorporate peer/teacher discussion in the learning strategies package.

6. Via cluster analysis, determine if students fall into particular categories of learning strategies use and motivational characteristics.

7. Determine which particular strategies cause the most variance in particular performance and motivation outcomes.

8. Determine whether case guidelines act as strategies by setting up a control group which is not provided with such extensive instructions.

9. Complete more classroom application studies similar to this study; but use more complex problems and add problem solution to problem statement as a performance outcome.

10. Integrate learning strategies training with other types of tasks and compare results of training.

11. Apply findings to not only other subject areas, but all levels and types of education--elementary, secondary, postsecondary, and adult and on-the-job training.

12. Test the proposed directional associations in the theoretical model concerning the relationships between learning strategies training, learning strategies valued, individual characteristics, self-regulated learning, other learning strategies used, and performance.

13. Continue developing theoretical models that portray relationships between significant variables that impact on motivation and performance. This involves reviewing literature in the various areas of motivation, metacognition, self-regulated learning, learning strategies, instructional design, and higher education, etc.

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Appendix A

Operational Definitions

Included herein are operational definitions of variables studied. They are categorized by performance outcomes, motivational outcomes, individual characteristics, learning strategies abilities and self-regulated learning, and learning strategies training. All assessments except performance were based on self-report.

Performance Outcomes

Performance includes separate scores on three different aspects of a case problem analysis: (a) Listing symptoms that indicate management problems exist; (b) classifying symptoms as appropriate management functions (planning, organizing, directing, and controlling) and/or processes (decision making and communication).

Motivational Outcomes

Since motivation is, by definition, consciously or unconsciously decided goal-directed behavior, goal orientation and self-concept motivational variables are emphasized as outcomes in this study--i.e., desire to continue learning, expectancy for success, and self-efficacy for learning.

Desire to continue learning. Desire to continue learning includes the desire to learn more about both management in general and case study analysis in particular.

Expectancy for success. Expectancy for success relates to expectations for task-specific academic success. It indicates generally "how well" and, in particular, the extent to which subjects will obtain high scores on business case problem tasks.

Self-efficacy for learning. Self-efficacy for learning is operationalized as perceived task-related self-efficacy for learning. Components are understanding difficult written or oral information presented, learning basic concepts, mastering skills being taught, and confidence in completing assignments and tests involved in a case problem research project.

Individual Characteristics

Twenty-two individual characteristics were assessed. Ten individual characteristics are defined. An additional 12 demographic variables are simply listed since they are self-explanatory.

Ability beliefs. These reflect the causal role a student believes ability plays in obtaining good grades and understanding material presented at school.

Attributions to failure experiences. These reflect beliefs about the causal role four elements (ability, context, effort and ability) play in such assessments of "academic low points" as getting low grades, not understanding school materials, or not doing as well as expected.

Attributions to success experiences. These reflect beliefs about the causal role four elements (ability, context, effort and ability) play in such assessments of academic success as good grades, overcoming obstacles in the path of academic success, having the teacher think highly of one's work, and success on exams.

Context beliefs. These beliefs account for the assignment of causality for academic success or failure to such contextual elements as the teacher's grading scheme, difficulty level of course, teacher's opinion of student, or teacher's ability to make course interesting.

Demographic variables. These included: Ethnic group, gender, degree program, college major, class level, completion of an Introduction to Business course, interest in participating in study, years since high school graduation, number of years full-time work experience, number of current semester credit hours, total credit hours completed, and cumulative gradepoint average.

Effort beliefs. These beliefs account for the assignment of causality for academic success or failure to personal effort or degree of studying or working hard.

External causality beliefs. These beliefs assign causality for academic success or failure to luck or contextual factors listed in "context beliefs" (i.e., the teacher's actions or the course itself).

Internal causality beliefs. These beliefs assign causality for academic success or failure to personal ability and effort.

Luck beliefs. These beliefs assign causality for academic success or failure to luck--i.e., having the right questions show up on an exam or getting bad breaks.

Task value. Task value incorporates three aspects: (a) interest in the subject matter of the course, (b) the importance of understanding management case problems, and (c) the usefulness (utility) of learning about case problem analysis.

Test anxiety. Test anxiety incorporates two aspects, cognitive interference and emotionality. Cognitive interference is the degree to which students think about items on a test they can't answer, the consequences of failing, and how poorly they are doing in comparison with other students. Emotionality refers to the uneasy, upset feelings (i.e., fast-beating heart) that may arise in taking an exam.

Learning Strategies Abilities and Self-Regulated Learning

Learning strategies are flexible patterns of thoughts and behaviors used to acquire, manipulate, and retain knowledge and skills. Three major categories of learning strategies are cognitive, metacognitive, and resource management strategies. The cognitive aspect is knowledge about particular strategies; the metacognitive aspect is ability to plan for and regulate strategy use. Resource management strategies relate to the use of external sources of learning support and include, in this study: Timing work, asking others for help, and concentrating in a quiet place.

However, knowledge of learning strategies alone is not enough to affect performance and

motivational outcomes. Active control over and engagement in the learning process through application of learning strategies is needed. This self-controlled use or application of learning strategies is known as self-regulated learning.

Learning Strategies Training

In this study, a variety of learning strategies were provided in the training treatment. Consequently, two categories of learning strategy use were assessed: (a) "self-regulated" or "primary" learning strategies, and (b) "other" learning strategies.

The assessment of "primary" strategies followed Pintrich et al's (1989) assessments of four categories of cognitive/metacognitive strategies related to self-regulated learning: Organization, Elaboration, Planning and Regulating. These strategies are defined below, per Pintrich et al (1989).

The assessment of "other" learning strategies involved the reported use of twelve particular study techniques, rather than groups of strategies, that had been listed as being useful in completing the case study tasks in the pilot study. These other learning learning strategies are also listed below; they included organizing, regulating, and resource management techniques, as indicated in parentheses.

Elaboration strategies. Elaboration, as related to business case studies, includes a composite of: (a) pulling together information from different sources, such as lectures, handout information or readings; (b) trying to relate new material to what the subject already knows; (c) writing brief summaries of main ideas in a case; (d) making connections between readings and concepts from lecture; (e) applying ideas from other classes to cases; and (f) relating ideas learned from management case studies to other courses.

Organization strategies. Case-related organization strategies include a composite of: (a) locating important ideas; (b) outlining both case study materials and personal notes; and (c) making simple charts, diagrams or tables to organize or summarize materials.

Planning strategies. Case-related planning strategies include a composite of: (a) skimming new material before studying it thoroughly; (b) making up questions about written materials; (c) setting goals to direct activities in each study period; and (d) thinking through what is to be learned rather than just reading written material.

Regulating strategies. Case-related regulating strategies include: (a) Rereading confusing material to figure it out; (b) changing the way difficult material is read; (c) adapting studying and learning style to instructor's requirements and teaching style; and (d) sorting out confusing ideas or instructions and doing something about it before next class meeting.

Other learning strategies. Other learning strategies included individual (rather than composite) assessments of use (LSU) and value (LSV) of the following twelve strategies: (1) having all materials organized before beginning task (organizing); (2) timing work (resource management); (3) asking others for help (resource management); (4) reading the case more than once (regulating); (5) underlining or highlighting important points (organizing); (6) writing notes in the margin of the case (organizing); (7) taking written notes about the case (organizing); (8) making a diagram of the case facts (organizing); (9) using a worksheet to

organize symptoms (organizing); (10) writing a rough draft of problem statement (organizing); (11) concentrating in a quiet place (resource management); and (12) referring frequently to instructions and other materials.

Appendix B

Tables 1 - 11

Table 1

Figure Codes A-C and J-K, Summary of Experimental Group Differences: Group T's Unique or Higher

Correlations between Motivation Outcomes (Self-Efficacy, Expectancy for Success, and Desire to Learn)

and Self-Regulated (Primary) Learning Strategies

Variables Correlated	Group S	Group T
CODE A:		
Self-efficacy and Organization	.4294	.5135
Self-efficacy and Elaboration	.5633	.7801
Self-efficacy and Planning	-	.6204
Self-efficacy and Regulatin	-	.6677
Self-efficacy and Total Metacognition	-	.6855
CODE B:		
Expectancy for Success and Elaboration	.5315	.7345
Expectancy for Success and Planning	-	.6690
Expectancy for Success and Total Metacognition	-	.6490
CODE C:		
Desire to Learn and Organization	.5410	.6215
Desire to Learn and Elaboration	.6094	.7029
Desire to Learn and Planning	.6087	.7320
Desire to Learn and Regulating	.6261	.6937
Desire to Learn and Total Metacognition	.7049	.7687
CODE J:		
Self-efficacy and desire to learn	.4281	.6114

CODE K:

Expectancy for success and desire to learn	.3852	.5750

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

N for total sample = 54; N for Group S = 28; N for Group T = 26

Table 2

Figure Code D. Summary of Experimental Group Differences: Unique or Higher Correlations between

Individual Characteristics and Self-Regulated (Primary) Learning Strategies

INDIVIDUAL CHARACTERISTICS CORRELATED WITH ORGANIZATION STRATEGIES:

Group S - None

Group T - Importance of task, utility of task, overall task value (interest, importance and utility), negative context beliefs, negative externality causality, and negative overall externality causality beliefs (All unique with range = .4301 to .6176)

INDIVIDUAL CHARACTERISTICS CORRELATED WITH ELABORATION STRATEGIES:

Group S - None

Group T - Unique (ranging from .4435 to .5075) - Interest in task, negative context beliefs, and negative externality causality beliefs. Higher - importance of task (.5964 vs. .3935) and overall task value (.6104 vs. .4070).

INDIVIDUAL CHARACTERISTICS CORRELATED WITH PLANNING STRATEGIES:

Group S - Task utility (.4090)

Group T - Unique (ranging from .4158 to .5778) - Interest in task, importance of task, and negative relationships with context beliefs, luck beliefs, externality causality, overall externality causality beliefs, attributions to success experiences, and attributions to failure experiences. Higher - Task value (.5452 vs. .4326)

INDIVIDUAL CHARACTERISTICS CORRELATED WITH REGULATING STRATEGIES:

Group S - Effort (.4424)

Group T - Unique (.4011 to .5978 range) - Interest in task, years since high school, and negative relationships with test anxiety (cognitive interference), context beliefs, luck beliefs, externality causality beliefs, and attributions to failure experiences. Higher - Importance of

task (.6104 vs. .4022) and overall task value (.6291 vs. .3971)

Notes: This material has been extracted from Table 24, Nuttall (1991). $p < .05$ for correlations within each group; between-group significance was not calculated. Total sample N = 54; N for Group S = 28; N for Group T = 26.

Table 3

Figure Codes E-G, Summary of Experimental Group Differences: Unique or Higher Correlations

between Motivation Outcomes (Self-Efficacy, Expectancy for Success, and Desire to Learn) and

Individual Characteristics

Variables Correlated	Group S	Group T
CODE E (Group T is unique or higher):		
Self-efficacy and task interest	-	.6778
Self-efficacy and task utility	-	.4739
Self-efficacy and overall task value	.4046	.6756
Self-efficacy and luck beliefs	-	-.4145
Self-efficacy and external causality beliefs	-	-.4045
CODE F (Both groups have unique correlations):		
Expectancy for success and task importance	.4331	-
Expectancy for success and task interest	-	.6308
Expectancy for success and luck beliefs	-	-.4961
Expectancy for success and external causality beliefs	-	-.4171
CODE G (Both groups have unique correlations):		
Desire to learn and task utility	.4765	-
Desire to learn and effort beliefs	.4866	-
Desire to learn and internal beliefs	.3949	
Desire to learn and task interest	.4815	.7153
Desire to learn and task importance	.4993	.5961
Desire to learn and overall task value	.5594	.6759
Desire to learn and context beliefs	-	-.5081
Desire to learn and luck beliefs	-	-.4197
Desire to learn and external causality beliefs	-	-.5085
Desire to learn and attributions to failure experiences	--.5306	

Desire to learn and years since high school graduation	-	.5411

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

Total sample N = 54; N for Group S = 28; N for Group T = 26.

Table 4

Figure Codes H, I, and R-S, Summary of Experimental Group Differences: Unique or Higher Correlations between Performance (Symptoms, Functions, and Problem) and Other Variables

Variables Correlated	Group S	Group T
CODE H (Group T is unique):		
Symptoms and valuing asking others for help (LSV3)	-	.5588
CODE I (Both groups have unique correlations):		
Problem and luck beliefs	-.4418	-
Problem and semester credit hours	-.4185	-
Problem and female gender	-	.4694
CODE R (Group S is unique):		
Functions and self-efficacy	.4744	-
CODE S (Group S is unique):		
Problem and concentrating in a quiet place (LSU11)	.4408	-
CODE T (Group S is unique):		
Problem and valuing asking others for help (LSV3)	-.3981	-
Problem and valuing concentrating in a quiet place (LSV11)	.5825	-

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

Total sample N = 54; N for Group S = 28; N for Group T = 26.

Table 5

Figure Codes L, U , V, and Q*, Summary of Experimental Group Differences: Unique or Higher

Correlations between Motivation (Self-Efficacy, Expectancy for Success, and Desire to Learn) and Other

Learning Strategies Used

Variables Correlated	Group S	Group T
CODE L (Both groups have unique correlations):		
Self-efficacy and timing work	.4466	-
Self-efficacy and making a diagram of case facts	.5151	-
Self-efficacy and writing notes in margin		.3922
Self-efficacy and referring frequently to instructions and other materials		.5199
CODE U (Group S has unique correlations):		
Expectancy for success and timing work	.3754	-
Expectancy for success and making a diagram of case facts	.5292	-
CODE V (Group S has unique correlations):		
Desire to learn and having all materials organized before beginning task	.5480	-
Desire to learn and reading the case more than once	.5850	-
Desire to learn and concentrating in a quiet place	.4737	-
Desire to learn and referring frequently to instructions and other materials	.4133	-

*Figure CODE Q indicates that Group T exhibited higher correlations between other learning strategy use and value (See Tables 10 and 11), with one exception:. Group S's correlation of use with value was higher for referring more frequently to instructions and other materials (.7080 vs. .5467).

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

N for total sample = 54; N for Group S = 28; N for Group T = 26.

Table 6

Figure Codes M-O. Summary of Experimental Group Differences: Unique or Higher Correlations

between Motivation (Self-Efficacy, Expectancy for Success, and Desire to Learn) and Other Learning

Strategies Valued

Variables Correlated	Group S	Group T
CODE M (Both groups have unique correlations):		
Self-efficacy and valuing timing work	.4666	
Self-efficacy and valuing making a diagram of case facts	.5347	
Self-efficacy and valuing having all materials organized before beginning task	-	.4124
Self-efficacy and valuing referring frequently to instructions and other materials	-	.4872
Self-efficacy and valuing underlining or highlighting important points	-	.4362
CODE N (Both groups have unique correlations):		
Expectancy for success and valuing making a diagram of case facts	.4242	
Expectancy for success and valuing having all materials organized before beginning task	-	.4377
Expectancy for success and valuing underlining or highlighting important points	-	.4267
Expectancy for success and valuing referring frequently to instructions and other materials	-	.4872
CODE O (Both groups have unique correlations):		
Desire to learn and valuing having all materials organized before beginning task	.5253	-
Desire to learn and valuing reading the case more than once	.5057	-
Desire to learn and valuing concentrating in a quiet place	.4598	-
Desire to learn and valuing using a worksheet to organize symptoms		.4410
Desire to learn and valuing referring frequently to instructions and other material	-	.4850

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

Total sample N = 54; N for Group S = 28; N for Group T = 26.

Table 7

Figure Code P, Summary of Experimental Group Differences: Group S's Unique Correlations between

Other Learning Strategies Used and Individual Characteristics

Variables Correlated	Group S
Task interest and:	
(a) asking others for help (LSU3)	.3869
(b) reading the case more than once (LSU4)	.4291
Test anxiety (emotionality) and timing work (LSU2)	.4070
Overall test anxiety and timing work (LSU2)	.3867
Effort beliefs and:	
(a) having all materials organized before beginning task (LSU1)	4554
(b) timing work (LSU2)	.5122
(c) reading the case more than once (LSU4)	.6523
(d) referring frequently to instructions and other materials (LSU12)	.6020
Internal causality beliefs and:	
(a) having all materials organized before beginning task (LSU1)	3864
(b) reading the case more than once (LSU4)	.5255
(c) underlining or highlighting important points (LSU5)	.4262
(d) referring frequently to instructions and other materials (LSU12)	.5154
External beliefs and timing work (LSU2)	.4565
Attributions to success experiences and:	
(a) having all materials organized before beginning task (LSU1)	4578
(b) timing work (LSU2)	.5063
(c) reading the case more than once (LSU4)	.5171
Attributions to failure experiences and timing work (LSU2)	.4266

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

N for total sample = 54; N for Group S = 28; N for Group T = 26

Table 8

Figure Code P, Summary of Experimental Group Differences: Group S's Unique Correlations between

Other Learning Strategies Used and Demographics

Variables Correlated	Group S
Negative relationship between Introduction to Business course and:	
(a) timing work (LSU2)	.4568
(b) taking written notes about the case (LSU7)	.4217

Negative relationship between interest in study and:	
(a) having all materials organized before beginning task (LSU1)	.3945
(b) reading the case more than once (LSU4)	.3871
Male gender and underlining or highlighting important points (LSU5)*	4074
Negative relationship between semester credit hours and:	
(a) writing notes in the margin of the case (LSU6)	.3811
(b) concentrating in a quiet place (LSU11)	.5651
Negative relationship between GPA and:	
(a) timing work (LSU2)	.4658
(b) asking others for help (LSU3)	.6080
Negative relationship between absences and making a diagram of the case facts (LSU8)	.4383

*There were no significant main effects for gender at the .05 level for using this strategy.

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

N for total sample = 54; N for Group S = 28; N for Group T = 26

Table 9

Figure Code P, Summary of Experimental Group Differences: Group T's Unique Correlations between Other Learning Strategies Used and Individual Characteristics/Demographics

Variables Correlated	Group T
Task utility and:	
(a) having all materials organized before beginning task (LSU1)	.4922
(b) using a worksheet to organize symptoms (LSU9)	.4101
(c) referring frequently to instructions and other materials (LSU12)	.6352
Task importance and:	
(a) using a worksheet to organize symptoms (LSU9)	.6839
(b) referring frequently to instructions and other materials (LSU12)	.4704
Overall task value (interest, importance, and utility) and:	
(a) using a worksheet to organize symptoms (LSU9)	.4829
(b) referring frequently to instructions and other materials (LSU12)	.6232
Test anxiety (emotionality) and making a diagram of the case facts (LSU8)	.3890
Attributions to success experience and writing a rough draft of problem statement (LSU10)	.4241
Associate degree major (vs. bachelor's) and timing work (LSU2)	.4799

Notes: $p < .05$ for correlations within each group; between-group significance was not calculated.

N for total sample = 54; N for Group S = 28; N for Group T = 26

Table 10

Correlations of Other Learning Strategies Valued (LSV1-6) with Other Learning Strategies Used for

Total Sample and Experimental Group

	Strategies Valued					
Strategies Used	LSV1	LSV2	LSV3	LSV4	LSV5	LSV6
LSU1	.8452 .8640S .7797T				.4104S	
LSU2		.8335 .7659S .8911T	.3933 - .4940T			.4913 .5730S .4002T
LSU3	.3957S	.3963 - .6120T	.7831 .7549S .8363T		.3161	
LSU4	.3128 .4614S			.5083 .6135S		
LSU5	.3842 .6123S			.3691 -	.6836 .5558S .9068T	
LSU6		.4364 .4136S .4619T		.4002T	.4320T	.8457 .7200S .9595T
LSU8		.2925 .4221T				
LSU9	.5057 .4408S .5314T					
LSU11	.3258 .5592S				.5179S	
LSU12	.4318T			.3131		

Notes: p = < .05. A complete listing of LSU/LSV is in Exhibit A. N for total sample = 54; N for Group S = 28; N for Group T = 26

Table 11

Correlations of Other Learning Strategies Valued (LSV7-12) with Other Learning Strategies Used for Total Sample and Experimental Group

	Strategies Valued					
Strategies Used	LSV7	LSV8	LSV9	LSV10	LSV11	LSV12
LSU1			.3452 .4112T		.2676	.3250 .4411T
LSU2	.2977	.3703 .3800S		.2975		
LSU3	.3022 .4274T			.3091		
LSU4						.4088 .4762S
LSU5					.4231S	
LSU7	.8196 .6971S .9323T			.3227 - .6553T	.2714 -	
LSU8		.8615 .8707S .8243T	.3476 .5579S	.3659 - .5809T		
LSU9		.3547 .5933S	.8748 .8292S .9466T			
LSU10	.4343 - .6388T	.4067T		.8680 .7681S .9755T		
LSU11					.7662 .7895S .7889T	
LSU12					.5467T	.6568 .7080S

Notes: p = < .05. A complete listing of these items is in Exhibit A. N for total sample = 54; N for Group S = 28; N for Group T = 26