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TRAINING ARTICULATION OF KEY CAUSES, KEY RESOURCES, AND KEY GOALS: CONTENT-BASED TRAINING AS AN ALTERNATIVE TO IMPROVING PLANNING PERFORMANCE

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TRAINING ARTICULATION OF KEY CAUSES, KEY RESOURCES, AND KEY GOALS: CONTENT-BASED TRAINING AS AN ALTERNATIVE TO IMPROVING PLANNING PERFORMANCE

A Dissertation APPROVED FOR THE
DEPARTMENT OF PSYCHOLOGY

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for my beautiful wife Michelle.
I love you.

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Abstract

In organizational settings, effective planning is critical in obtaining a broad range of outcomes ranging from profitability to teamwork. However, this process is extremely complex and loaded with potential hazards. Considering these factors, prior research has offered instruction in metacognitive processes, including forecasting and proactive error management, as a means to improve planning performance. However, results from these efforts are mixed at best. This study examines the feasibility of using content-based instruction as an alternative approach to improving planning performance. Specifically, participants were given instruction in planning definitions, concepts, and processes, and trained to identify and articulate a combination of key causes, key resources, or key goals before developing plans to address an organizational problem. Results demonstrate the feasibility of using content-based instruction as an effective alternative to process-based training to facilitate planning performance. Findings also illustrated that effective content-based training protocols vary according to various individual difference constructs, with more intensive training needed to facilitate performance of individuals with fewer requisite planning skills. The importance of understanding planning definitions, concepts, and processes, and articulating key causes, key goals, and key resources is discussed in terms of their importance in developing effective template, revised, and contingency plans.

Training Articulation of Key Causes, Key Resources, and Key Goals: Content-Based Training as an Alternative to Improving Planning Performance

Almost regardless of context, planning represents a critical influence on organizational performance (Armstrong, 1982; Yukl, 1998). Recent research confirms this maxim across a number of performance domains. For example, in their meta-analytic review of the effects of strategic planning on financial outcomes, Schwenk and Shrader (1993) demonstrated that planning significantly impacted financial performance across studies. Miller and Cardinal (1994) later demonstrated similar impacts of planning on organizational growth and profitability. Castrogiovani (1996) also argued that planning likely influences the success of entrepreneurial ventures, especially when financial support must be obtained within a turbulent business environment. However, planning may also have substantial influence on performance across group and individual levels.

For example, on the group level, Weldon, Jehn and Pradhan (1991) found a mediating role for group planning on the relationship between assigned group goals and teamwork on a three-trial group production task. On the individual level, Kops and Belmont (1985) found that inefficient or poor task planning largely impacted poor academic performance in poor- and average-achieving children. They further suggested that improvements in planning and organizing might lead to increased academic performance. Along similar lines, Smith, Locke and Barry (1990) demonstrated in an organizational simulation that college students who spent more time planning in managerial, staff, or production roles demonstrated higher levels of task motivation than did participants who spent less time planning. Thus, it seems that planning represents a pervasive influence on key and peripheral aspects of performance across organizational,

group, and individual performance settings. However, before turning to how individuals develop effective plans, a discussion of the various definitions of planning is warranted.

Planning Definitions

Conceptually, two main styles of planning definitions have been offered in the literature—structural and generative definitions. Structural definitions, such as those proposed by McDermott (1978), Wilensky (1983), and Read (1987), consider planning as a chunking of the activities involved in obtaining important goals in order to enhance efficiency and direct action. Although this type of planning definition is effective in sequencing interrelated sets of activities, structural definitions suffer from two main problems. First, these definitions constrain planning to the rote assembly of a rigid, predefined script. As such, under structural definitions, planning lacks flexibility and adaptability to changing situational demands. The second limitation of structural planning definitions is their lack of attention to the significant cognitive processes involved in developing and implementing effective plans.

In response to these limitations, generative definitions of planning have been offered that do not constrain plans to specific attributes. These definitions, such as those offered by Berger, Carol, and Jordan (1989), Simons and Galotti (1992), and Patalino and Seifert (1997), stress the active conscious construction, or mental simulation, of future action sequences in order to organize effort and optimize attainment of specific goals. For the purpose of examining planning performance following training in articulation of case content features, generative definitions are appropriate for two reasons: 1) generative definitions explicitly stress the cognitive processes involved in the construction and execution of effective plans, and 2) these definitions seek to understand the kinds of

variables that influence the development of effective plans. With these generative definitions of planning in mind, a model of planning processes may now be discussed.

Planning Model

Mumford, Schultz, and Osburn (2002) recently proposed a model emphasizing planning as a conscious, selective information processing activity pursued in response to environmental demands. This model may be referenced in Figure 1. In this model, planning begins when an individual recognizes an opportunity to attain significant goals given an appropriate set of actions (Early and Perry, 1987). To determine these opportunities, the individual scans the environment, either through incidental monitoring or directed search, to identify operable goals and any imposed contingencies on goal attainment (Daft, Sarmunen and Parks, 1988). Information obtained during this search may pertain to a number of goal attributes, including 1) clarity, 2) ambiguity, 3) complexity, 4) coherence, 5) salience, and 6) temporal stability. Environmental scanning represents an important influence on planning performance, as successful planners are more likely to spend more time analyzing goals and constraints on goal attainment prior to plan generation than their less successful counterparts (Goldin and Hayes-Roth, 1980).

Once significant goals and goal constraints have been identified, the individual begins to generate a plan by identifying the key causes operating in a given situation and the actions likely to affect those causes. Prior research indicates that similar cases drawn from past experience provide an initial model from which to specify potential actions to address key causes and information needed to detail a plan for application to a given situation (Hammond, 1990; Xiao, Milgram and Doyle, 1997). However, in order to elaborate plans based on information from prior cases, several pieces of information are

required: 1) key causes operating in a situation that must be impacted to bring about goal attainment, 2) action sequences needed to impact key causes, 3) restrictions operating to limit the effectiveness of actions and the options available for limiting the impact of those restrictions, 4) key resources to be acquired and utilized to permit effective execution of planning actions, and 5) critical negative events to be avoided in plan implementation (Mumford, Schultz and Osburn, 2002).

The information obtained through this extended environmental search provides the basis for modifying prototype cases to fit the situation at hand (Hammond, 1990). In this phase of plan development, analogical reasoning mechanisms are used to structure planning actions to address key causes and minimize the constraints imposed by key resources, resource restrictions, and negative outcomes events (Langholtz, Gettys and Foote, 1994; Holyoak and Thagard, 1997). In turn, development of a template plan provides a basis for a critical cognitive planning process—forecasting the positive and negative outcomes associated with planning action sequences. Prior studies by Noice (1991), Saariluoma and Hohlfeld (1994) and Doerner and Schaub (1994) indicate that forecasting the outcomes of template plans plays a critical role in subsequent plan refinement. Specifically, forecasts may be used to anticipate outcomes of template plan action sequences and identify alternative action sequences that might facilitate goal attainment, determine interdependencies and conflicts among planning actions, and organize and structure planning activities (Serfaty, MacMillian, Entin and Entin, 1997).

Based on the knowledge obtained through forecasting, the template plan may be revised to maximize the probability that the plan will reach significant goals. These revisions and extensions serve to integrate the final plan selected with the various

alternative planning actions considered in forecasting. However, this first step in plan implementation does not simply involve revising and executing the template plan. More accurately, plan revision entails progressive refinement of the template plan in order to exploit emerging situational opportunities to obtain planning goals. Moreover, prior to implementing the revised plan, marker events should be specified for evaluating progress toward significant goals, as should potential problems in plan execution (Xiao et al., 1997). These error management processes form the basis for developing contingency plans to address significant errors and markers for the necessary implementation of these plans when primary plans prove ineffective (Serfaty et al., 1997). As a whole, these revision processes facilitate the integration of template plans, forecasted alternatives, potential execution errors, and contingency plans into a comprehensive framework for obtaining significant planning goals through opportunistic execution (Mumford, Schultz and Osburn, 2002).

Types of Plans

Based on the model presented above, it becomes clear that effective planning does not involve generating just one plan, but three types of plans. Moreover, each of these three plans serves a unique and critical role in the process of developing and implementing effective solutions to complex problems. In the following paragraphs, each type of plan is discussed, as is its particular application in effective plan development and implementation.

Template plans, although primitive, provide an overarching structure for guiding subsequent plan development through detailed information search (Noice, 1991). By providing this framework, the template plan specifies what information should be sought

out in order to detail the plan and apply it to a given scenario (Xiao et al., 1997). As such, the template plan provides a seed point for downstream plan development and revision (Simons and Galotti, 1992). The initial plan applying to the situation at hand develops through identifying and incorporating these search elements into the template plan (Hayes-Roth and Hayes-Roth, 1980; Hammond, 1990). Although this initial plan does not specify how all action sequences should proceed, it includes critical material gleaned from information searches, and facilitates forecasting and analysis of the plan as a basis for further refinement (Doerner and Schaub, 1994).

This forecasting and analysis of the initial plan facilitates development of a revised plan to be implemented based on the local conditions applying in a given planning context (Xiao et al., 1997). Specifically, discrete planning actions and action sequences may be refined substantially following these prognoses to maximize the probability that the plan will obtain significant goals once implemented (Serfaty et al., 1997). In addition to facilitating refinement prior to execution, revised plans also identify events that should be monitored to signal progress towards goal attainment (Saariluoma and Hohlfeld, 1994).

Finally, refining the revised plan prior to implementation also provides the basis for developing contingency plans. Specifically, in addition to applying planning activities to the situation at hand, plan refinement also involves identifying alternative actions that may obtain desired planning goals given situational constraints (Serfaty et al., 1997). As such, contingency plans specify alternative actions that may be taken to reach planning goals, and specify the marker events or conditions under which their implementation is necessitated (Xiao et al., 1997).

From the foregoing discussion, it becomes evident that planning requires considerable attention to detail in searching for information needed to detail the plan, refining the plan to maximize its success, and attending to monitoring events while implementing the plan. During information searches, several key content variables should be identified for application in subsequent plan development. Moreover, key cognitive processes are involved in refining and revising plans in preparation for execution. Below, these critical content and process variables are presented, and their particular importance in plan development and execution is discussed.

Key Content Variables

As previously discussed, the first stages of planning involve searching the environment for critical pieces of information to be used in detailing and refining the plan (Mumford et al., 2002). Typically, similar cases drawn from past experience provide a model from which this critical content is drawn (Hammond, 1990; Xiao et al., 1997). However, in order to facilitate effective plan development and execution, information bearing on three key content variables is required: 1) key goals to be obtained through appropriate actions in plan execution, 2) key causes operating in the situation that must be addressed to attain those goals, and 3) key resources (and any imposed restrictions on the acquisition and usage of those resources) needed to execute planning actions (Mumford, Schultz and Osburn, 2002). Below, each of these key content variables, as well as how these variables are used to influence planning, is described.

Key goals are the relevant and significant outcomes the individual desires to obtain given an appropriate set of actions within the environment (Early and Perry, 1987). However, specifying the key goals to be obtained through planning involves more

than the simple identification of desired outcomes. Information bearing on key goals may also pertain to goal: 1) clarity, 2) ambiguity, 3) complexity, 4) coherence, 5) salience, and 6) temporal stability (Mumford et al., 2002). Moreover, specification of key goals also requires recognition of any imposed contingencies on goal attainment (Gaerling, 1994, 1996). Because information bearing on key goals is gathered during initial plan development, understanding of key goals may exert a substantial impact on the content and quality of plans subsequently developed and implemented. Given these considerations, it is not surprising that successful planners spend more time than their less successful counterparts analyzing goals and goal constraints prior to plan generation (Goldin and Hayes-Roth, 1980).

Key causes, or the primary operators acting on a problem, represent the most important components to address through planning actions to obtain goals (Mumford et al., 2002). Gathering information about the most critical elements driving a problem allows the individual to develop a highly precise definition of precipitating conditions, thereby facilitating the construction of plans to affect those causes (Mumford, Schultz and Van Doorn, 2001). However, as many ambiguous problems may have numerous potential causes, specification of key causes necessarily involves identifying the most critical causes that may actually be controlled through planning actions (Doerner and Schaub, 1994). Like key goals, identification of key causes may have a substantial effect on the content and quality of subsequent plans. In fact, previous research has demonstrated that identifying key causes facilitates development of template plans (Thomas and McDaniel, 1990).

Finally, information about key resources is needed to specify the critical personnel, time, material, and financial resources needed to effectively implement and carry out planning activities (Holyoak and Thagard, 1997). However, specification of key resources also involves identification of any imposed restrictions or constraints on the acquisition and usage of these resources during plan execution (Langholtz, Gettys and Foote, 1993). This information is especially important in planning contexts where resources are either scarce or must be shared (Langholtz, Gettys and Foote, 1995). Similar to key goals and key causes, understanding of key resources and resource restrictions may significantly impact the content and quality of subsequent plans. However, unlike key goals and key causes, the impact of key resources information may be more evident in plan revisions and contingency plans where actions taken to minimize the effects of resource restrictions and constraints are likely to be present (Xiao et al., 1997).

Through the specification of the key content information outlined above, an individual may develop a highly effective initial plan applying to a given situation. However, in order to further specify this plan and prepare it for implementation, the planner must apply two key cognitive processes prior to plan execution. In large part, the generative planning framework of mental simulation of future action sequences is based on these two critical cognitive processes. In the following section, these two key process variables, as well as their impact on planning performance, are described.

Key Process Variables

As previously noted, identifying key goals, key causes, and key resources and resource restrictions plays a significant role in developing feasible initial plans. Though

specification of these key content variables is necessary in plan development, it is not sufficient in refining plans in preparing them for implementation. More accurately, the specification of these content variables provides a basis for the next major planning activities. In these activities, the planner submits his or her plan to two key cognitive processes discussed below—forecasting and error management—in order to effectively revise and elaborate upon the initial situated plan.

Forecasting is the process by which the planner analyzes his or her initial plan in order to 1) predict the positive and negative outcomes of the plan if implemented in its current form, 2) identify possible alternative planning actions that might be taken to attain significant planning goals, 3) organize major action sequences and determine any interdependencies or conflicts between them, and 4) identify events to monitor during plan implementation signaling progress towards significant planning goals (Serfaty et al., 1997; Xiao et al., 1997). Previous research indicates that these processes play a central role in subsequent plan revision and elaboration prior to execution. In fact, the integration of these projections with the initial situated plan often represents an optimal strategy in preparing a plan for implementation (Noice, 1991). As such, application of the forecasting process to the initial situated plan may exert significant influence over the content and quality of subsequent plan revisions.

The second cognitive process critical in plan refinement, error management, involves analyzing the initial plan after it has been subjected to forecasting and revised in preparation for execution (Xiao et al., 1997). Specifically, prior to implementation, the planner analyzes his or her revised plan in order to identify potential errors likely to occur in execution. Like forecasting, this process involves 1) predicting potentially negative

planning outcomes, 2) identifying alternative planning actions, or contingency plans that might be taken to attain significant planning goals, and 3) identifying events signaling the necessary implementation of these contingency plans (Serfaty et al., 1997). By proactively managing these errors, the individual develops a comprehensive framework capable of effectively managing likely errors in plan execution in route to obtaining significant planning goals. Thus, error management may significantly impact the content and quality of subsequent plan revisions and contingencies.

Taken as a whole, the identification of key content variables and application of key cognitive processes represent critical influences on the effective development, refinement, and implementation of successful plans. However, the precise manner in which these content and process variables influence template, revised, and contingency plans has not yet received attention in the literature.

Improving Planning Performance

As might be suggested from the foregoing discussion, planning is an extremely difficult and complex process fraught with potential pitfalls (Doerner and Schaub, 1994). In addition, it is not the simple occurrence of planning, but rather the quality of plans developed, that contributes to successful performance (Greave, 1998; Miller and Cardinal, 1994). This situation becomes increasingly untenable when one considers that the need for planning increases dramatically as the potential costs of unsuccessful performance rise (O'Hara and Payne, 1998, 1999). In light of these observations, it becomes apparent that effortful training may be necessary in order to improve planning performance. In the following paragraphs, the major applied approach to improving

performance through training is described, and an alternative model of training is proposed.

Process training. In previous efforts to improve performance through training, most attempts have concentrated instruction on enhancing the effectiveness of cognitive and metacognitive processing of instructional content (Schwenk, 1995). The popularity of this applied approach results largely from its inclusion of cognitive processes, including forecasting and error management in planning performance, into training content and activities (Patalino and Seifert, 1997). For example, Vandergrift (2003) attempted to improve the planning strategies of seventh-graders for learning French by using instruction on cognitive and metacognitive processes. Findings were mixed, but indicated that higher skilled learners were more likely than less skilled learners to make use of metacognitive strategies such as predicting task objectives, monitoring, and advanced organization. In an earlier effort, Fallesen and Pounds (2001) tested an approach to training cognitive process skills to U.S. Army officers for the purpose of improving problem-solving strategies in naturalistic settings. In general, results supported the proposition that training cognitive processing may enhance problem solving.

Although this approach to improving performance through training remains popular as an instructional methodology, results from these studies in terms of incremental performance improvements are, in general, mixed to weak. Given the complex nature of planning and high potential for error previously discussed, these mixed findings suggest that cognitive process training may be inadequate as an instructional methodology for substantially improving planning performance. Therefore, an alternative approach to improving performance through training may be needed.

Content training. A feasible alternative to cognitive process instruction for improving performance through training may be found in formats based on identifying and working with particular features of problems. These features have typically included key goals, key causes, and key resources and resource restrictions. Unlike cognitive process training, this content-based form of instruction may be readily applied across a number of educational settings, and may be significantly easier to train than cognitive and metacognitive strategies. Also unlike cognitive process training, content training programs can be implemented without the inclusion of cognitive processing. Cognitive process training, on the other hand, requires the inclusion of content to be processed during training.

For example, Moertl, Canning, Dougherty, Johansson, Mills, and Gronlund (2002) designed a device as a part of a training program to improve the performance of air traffic controllers. This aid perceptually represented key resources and resource constraints including the integration of spatial information on a radar screen with discrete planned sequences of air traffic. Results indicated that training air traffic controllers to identify key resources and resource constraints led to increased planning performance through integrated information retrieval and decreased workload. In a similar effort, Seamster and Kaempf (2001) presented and tested a framework for identifying and training resource management skills in a sample of airline pilots in order to improve their performance in the areas of decision making, team coordination, and planning. Extending the traditional instruction system development process beyond job tasks to the job performance context, the authors found that instruction in resource management led to improved job performance in the contexts described above. Finally, in a study designed

to investigate the resource allocation performance of Coast Guard personnel, Langholtz, Gettys, and Foote (1993) identified several strategies to allocate resources under conditions of 1) certainty, 2) risk, and 3) uncertainty. Through instruction on resource allocation strategies, the authors found that U.S. Coast Guard personnel learned to perform a resource allocation task with surprising success, performing best under conditions of certainty and worst under uncertainty. Interestingly, the authors also noted that participants allocated more resources earlier in a time period, and preferred to hold some resources in reserve in case of unanticipated needs (Langholtz, Gettys and Foote, 1993).

From the above discussion, it becomes evident that significant performance improvements have been observed across a number of settings as a result of content feature training. Moreover, these prior research efforts indicate that training articulation of case content features may be more feasible in applied performance contexts than training improvements in cognitive processing. Therefore, it appears that content training represents a viable and promising alternative strategy for improving planning performance through training. However, the effectiveness of this approach may be moderated by the impact of several relevant individual difference constructs.

Role of Individual Difference Constructs

Although content-based training programs have proven feasible as an alternative to methodologies based on cognitive processing in other performance domains, recent research demonstrates that the effectiveness of these protocols varies along several individual difference constructs. Specifically, a range of individual difference variables

may moderate the effect of content-based training on motivation, learning and incremental performance improvements.

For example, Allen (2004) investigated the roles of case content features and individual difference constructs in improving strategic planning performance through case- or principle-based instruction. Prior to completing a learning and application task, participants completed measures assessing verbal intelligence, goal orientation, self-efficacy, divergent thinking, and planning skills. Subsequent analyses illustrated a significant interactive effect of mastery goal orientation and case reflection for affective satisfaction. A second interaction on affective satisfaction was noted for performance avoid goal orientation and presence of key causes and consequences. Significant intercorrelations were also noted between the above individual difference constructs and training outcomes. Taken as a whole, these results demonstrate the interactive effects of individual difference variables and case content features on the effectiveness of training manipulations.

In a similar effort, Osburn (2004) compared the effectiveness of case- and principle-based training methods for improving leadership planning. Prior to being trained in articulating key causes or forecasting processes, participants completed measures assessing verbal intelligence, divergent thinking, goal orientation, need for cognition, educational history, and planning skills. Following training, participants completed a leadership planning task. This task placed participants in the role of a secondary school principle tasked with planning a new educational program to increase academic achievement in students. In general, results supported the proposition that the

most appropriate training process and content depend on the type of outcome desired and the type of individual being trained.

In this study, however, median split analyses were conducted to directly investigate the effects of training protocols and individual difference constructs on leadership planning. These analyses revealed significant interactions between training and individual difference constructs described above on learning, motivation to learn, performance, and motivation to perform. Specifically, verbal intelligence and divergent thinking interacted with training on learning outcomes. Motivation to learn, however, was impacted by both training and need for cognition and performance avoid goal orientation. Interactive effects of training and goal orientations were also noted for performance motivation. Both training manipulations and divergent thinking impacted leadership planning performance. In sum, results indicated that learning and performance criterion measures are likely moderated by various individual difference constructs.

Based on the foregoing discussion, the intent of the current study, as broadly writ, is to examine the feasibility of improving planning performance through content training. Specifically, the influence of training different forms of content (e.g., key causes, key resources, and key goals) on the development of template, revised, and contingency plans will be investigated. The potential interactive effects of training manipulations and relevant individual difference constructs on planning performance will also be investigated.

Method

Participants

185 undergraduate students attending the University of Oklahoma participated in the study. These participants were assigned to one of eight experimental conditions or a control condition. The 78 males and 107 females who agreed to participate each received two to four hours of research credit towards fulfilling course requirements in undergraduate psychology classes. The mean age of participants was 19 years of age. Participants had an average of 3 years of business experience.

General Procedures

Participants completed the study in one session. During this session, each participant was given a folder containing covariate measures, training modules, the experimental task, and a short manipulation check survey. These packets also randomized subjects to conditions and operationalized the training manipulation vis-à-vis various heuristics used in effective planning.

After completing covariate measures, participants began self-paced instruction in training materials appropriate for their condition included in the folder. These training materials, designed to instruct participants how to identify and articulate particular case content features, included four sections: 1) basic planning familiarization, which operationally defined planning as the mental simulation of future actions and explained the importance of planning to performance; 2) case content feature introduction, which precisely defined the case content feature and explained its importance in planning; 3) detailed information on the case content feature, which provided specific information on how to identify and articulate the case content feature in planning, and; 4) case analysis

exercises, providing participants with five one-half page-long scenarios requiring identification of case content features and explanation of how addressing those features would benefit planning efforts.

Following completion of training materials, participants completed a five-part, open-ended experimental task. This task required participants to assume the role of the CEO of a car manufacturing company facing significant business crises. Participants were asked to read through this scenario and develop a plan to address those problems. Finally, after finishing this planning task, participants completed a short manipulation check survey assessing their reactions to training materials.

Covariates

For the first hour of each session, participants completed seven covariate measures, providing controls for basic psychological characteristics thought to have potential impact on dependent measures. These included a demographics measure including items assessing participants' prior exposure to business activities. As prior exposure to business activities may influence the quality of plans subsequently developed in the experimental task, this measure was included to control for any such effects.

A cognitive measure of verbal reasoning, drawn from the employee aptitude survey (EAS), was also included. The EAS verbal reasoning test assesses intelligence based on 30 analogical reasoning items. This test has been shown to demonstrate adequate predictive validity (Ivancevich, 1976; Ruch and Ruch, 1980). The EAS measure was utilized in this study to control for the potential influence of verbal intelligence on the quality of written plans developed in the experimental task. This measure yielded a

coefficient alpha of .73 in the study sample, evidencing adequate reliability for research purposes.

Christensen, Merrifield, and Guilford's (1958) consequences "A" measure of divergent thinking was also included. The consequences test was scored for fluency (e.g., total number of unique responses), and flexibility (e.g., total number of generated categories of ideas for each item). This measure was included in the covariate battery for the potential impact of divergent thinking on the originality of plans developed in the experimental task. The reliability of participants' total scores across the five question measure was .87, as evidenced in the study sample using coefficient alpha.

Two planning covariates were also included in the present study to control for pre-existing differences in planning skills on the experimental task. First, a measure of planning skills developed by Marta, Leritz, and Mumford (2003) was included. The six scenarios included in this measure were based on a variation of the low fidelity simulation approach recommended by Motowildo, Dunnette and Carter (1990) and Mumford, Baughman, Supinski, and Anderson (1998) for the assessment of complex cognitive skills. These scenarios measured planning-relevant skills including: 1) identification of key causes, 2) identification of restrictions, 3) identification of downstream consequences, 4) use of opportunistic implementation strategies, and 5) effective environmental scanning. After reading each scenario, participants were asked to respond to five or six questions about the case, each question bearing on the use of a planning skill to address a critical aspect of the case. These questions were followed with eight to twelve response options, reflecting poor, neutral, or good planning responses. For each of these questions, participants were asked to select the best two to four options

provided. In the study sample, the reliability of participants' total score across the six scenarios was .88, as evidenced using coefficient alpha.

The other planning covariate included in the study, Guilford's (1950) "identifying deficiencies" test, required participants to read through 20 short descriptions of plans that, for some reason, will not lead to the desired result. Participants were asked to read each short description and identify the deficiency with each plan. As with the Marta, Leritz, and Mumford (2003) measure, this covariate was included in the study because pre-existing differences in various planning skills may influence the quality of plans developed in the experimental task. This measure yielded a coefficient alpha of .66 in the study sample, evidencing adequate reliability for research purposes.

Finally, two non-cognitive individual difference covariates were included in the present study for potential influences on training effectiveness and the quality of subsequent plans. First, a variation on Elliot and Church's (1997) measure of achievement motivation was included to control for potential influences of participants' various achievement motivations (e.g., performance approach, performance avoidance, mastery) on the effectiveness of training. This measure assesses participants' goals for the experiment by examining their responses to 18 statements (e.g., "It is important to me to do better than the other participants") on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In the study sample, the reliability of this measure was .85, as evidenced using coefficient alpha.

A variation of Pintrich and de Groot's (1990) measure of self-efficacy was also included as participants' beliefs about their ability to develop effective plans may impact subsequent performance on the experimental task. This measure requires participants to

respond to nine statements assessing their perceived ability to effectively perform experimental tasks, indicating the extent to which each statement is characteristic of him or her on a 5-point Likert scale ranging from 1 (not at all true of me) to 5 (very true of me). This measure demonstrated a coefficient alpha of .85 in the study sample.

Training Manipulations

As described above, training manipulations were operationalized through four separate 30-minute modules of self-paced instruction on various heuristics used in planning. Specifically, the folders distributed at the beginning of the experimental session randomized participants to one of eight experimental conditions or a control condition based on the training modules they received. Participants in the control condition received no training materials, and proceeded directly from covariate measures to the experimental task.

The general format of instruction was identical across all experimental conditions. Specifically, participants first completed training on planning familiarization and the importance of planning to performance. Building on this foundation, participants assigned to training in various planning heuristics then completed training modules on identifying and articulating the case content feature(s) appropriate to their condition. This training was separated into two sections. The first section operationally defined the case content feature and explained its importance in planning in terms of performance costs and benefits of ignoring or attending to the case content feature, respectively. The second section provided detailed information about the case content feature, including recommendations for identifying case content features in planning and specific considerations to bear in mind when extracting critical information from cases.

Across all training modules, all learning points were underscored with examples salient to a sample of college undergraduates—planning for a winter break ski trip vacation and planning for homecoming week activities. Moreover, key learning points were summarized at the end of each training module in bullet points, and space was provided for participants to take notes on instructional content. Finally, once participants finished the instructional content of each training module, they were required to complete a short, multiple-choice knowledge test taken directly from training content. Figure 2 provides an example of one such knowledge test used in training. This test provided reinforcement of training content through the opportunity to practice (Schmidt and Bjork, 1992), and scores from these tests were subsequently used as an additional covariate to control for differences in training comprehension. Answer keys explaining all correct responses immediately followed these knowledge tests. Figure 3 illustrates the answer key used for the knowledge test in Figure 2.

Participants in the “basic planning familiarization” training condition received only one training module. This training module first operationally defined planning, as described by Simons and Galotti (1992) and Patalino and Seifert (1997), as the mental simulation of future action sequences. The importance of planning to organizational performance was then explained in terms of financial outcomes, future growth, profitability, and new business ventures as previously noted by Schwenk and Shrader (1993). Third, in accordance with the model of planning proposed by Mumford Schultz, and Osburn (2002), the specific processes involved in the development of effective plans were described, including construction of a template plan, prediction of likely positive and negative outcomes of that plan, revision of the template plan based on forecasts,

specification of likely execution errors, and development of contingency plans. Figure 4 provides a sample of the content included in basic planning familiarization.

Participants in the “key causes training” condition, in addition to receiving basic planning familiarization, completed training in identifying and articulating key causes in two parts. The first part of this training operationally defined key causes as the primary operators and central parts of an issue (Mumford, Schultz and Osburn, 2002). The importance of key causes in effective planning was then explained in terms of developing a more precise definition of problems, facilitating more useful solutions to problems (Thomas and McDaniel, 1990). Third, the outcomes of ignoring or attending to key causes in planning were described in terms of development of plans that focus on minor or critical parts of a problem, respectively (Xiao, Milgram and Doyle, 1997).

The second section of the key causes training module provided specific recommendations about how to extract a situation’s key causes from multiple potential causes. Specifically, participants were instructed to consider 1) whether a cause operates by itself or in concert with other potential causes, 2) how closely a cause is connected with other potential causes, 3) how large an impact addressing a specific cause might have on planning goals, and 4) how hard addressing a cause might be. Based on these considerations, participants were instructed to focus on critical and controllable causes of a problem to be affected through planning. Figure 5 provides a sample of the content included in key causes training.

Participants in the “key goals training” condition also received familiarization with basic planning prior to completing training in identifying and articulating key goals. The first part of this training operationally defined key goals as the critical outcomes that

planning efforts focus on reaching (Simons and Galotti, 1992). The importance of key goals in the development of effective planning was then described in terms of outlining an appropriate sequence of activities to execute to obtain a desired outcome. However, this process involves also specifying any imposed restrictions on those goals and taking actions to remove or work around those obstacles (Gaerling, 1994, 1996). Third, the outcomes of attending to key goals in plan development were described in terms of a focus on critical goals and removing restrictions on reaching those goals (Goldin and Hayes-Roth, 1980).

The second section of the key goals training module provided specific recommendations about extracting a situation's key goals and goal contingencies. Specifically, participants were instructed to consider 1) which goal or goals are absolutely critical to reach through plan execution, 2) how closely a goal is connected to other potential goals, 3) how reaching smaller, incremental goals might impact the most important planning goal, and 4) how hard it might be to obtain a goal. Based on these considerations, participants were instructed to focus on the critical and operable goals that may actually be affected through planning actions, and to attend to any imposed restrictions on reaching critical goals through planning. Figure 6 provides a sample of the content included in key goals training.

Participants in the "key resources and restrictions training" condition also received basic planning familiarization prior to completing self-paced instruction in articulating key resources and restrictions. The first part of this module operationally defined key resources as the necessary resources (e.g., human, time, material, financial resources) needed to reach planning goals (Holyoak and Thagard, 1997). Key restrictions

were defined as any limitations on key resources or constraints on their usage in obtaining planning goals (Langholtz, Gettys and Foote, 1995). The importance of key resources and resource restrictions was then described in terms of the efficient and effective acquisition and use of critical resources to affect important planning goals. Third, the outcomes of attending to key resources and resource restrictions in plan development were described in terms of the performance benefits of direct inclusion of resource acquisition, usage, and removal of resource restrictions in planning (Xiao et al., 1997).

The second half of the key resources and restrictions training module provided specific recommendations about determining which resources are necessary to reaching planning goals and identifying and negotiating any imposed restrictions on the acquisition and usage of those resources. Specifically, participants were instructed to consider 1) whether a resource is needed by itself or together with other important resources, 2) how independent different resources are in affecting a problem to be solved, 3) how large an impact obtaining and using one resource will have on reaching planning goals, and 4) the difficulties involved with obtaining and using a particular resource. Based on these considerations, participants were instructed to focus on resources deemed critical to reaching planning goals, and to remove or negotiate any imposed restrictions on those critical resources in planning sequences. Figure 7 provides a sample of the content included in key resources and restrictions training.

Participants in various training combination conditions (e.g., key causes and key goals, key causes and key resources, key goals and key resources, key causes and key goals and key resources) completed the training modules described above as appropriate

for their condition. These conditions required one to one and one-half hours to complete training modules, which were counterbalanced within conditions to prevent order effects.

Following training in articulation of case content features, participants in these conditions were given a multiple-choice review test assessing their learning of all training materials appropriate for their condition. This review test presented participants with a planning scenario based on the winter break ski trip examples used throughout training. The scenario was tailored to address the case content feature appropriate for each condition, and required participants to respond to questions examining the specific need for planning, the most critical causes, goals, or resources and restrictions to address, and how the ski trip might be affected if those features were ignored or carefully attended to. As with the previous knowledge tests, an answer key providing explanations for correct responses also followed these review tests. These tests provided additional reinforcement of training content through practice (Schmidt and Bjork, 1992), and scores were subsequently used as an additional covariate to control for differences in training comprehension. Figure 8 illustrates the content used in this multiple-choice review test.

Finally, before proceeding to the experimental task, participants in case content feature articulation conditions completed open-ended case analyses appropriate to their condition as an application of learning. Five public policy case scenarios were presented, each requiring planning to address a significant issue. Specifically, these scenarios required identification of problems to be solved through planning, articulation of relevant case content features, and specification of the critical features in each scenario. After identifying these features, participants explained how addressing them would assist

planning efforts and how ignoring them would adversely affect the plan. Figure 9 provides an example of a case analysis exercise used in key causes training.

Following each scenario, feedback was given in the form of general effective strategies that might be used to address the scenario (Kluger and DeNisi, 1996). The feedback strategies presented followed a general pattern of determining why planning was needed, developing a list of potential case content features, determining which features were critical to address, and predicting the likely outcomes of addressing those features in planning. This feedback was given as a final attempt to guide participants in identifying and articulating case content features in developing effective plans. As with knowledge and review tests, scores on these case analysis exercises were used as a supplemental covariate to control for differences in training comprehension. Figure 10 illustrates the feedback given for the case analysis exercise presented in Figure 9.

Experimental Task

The organizational change and development task used in this study asked each participant to assume the role of a CEO of a car manufacturing company that developed the first official “sports car” model in the United States. The context provided for the scenario was as follows: for many years the company thrived, largely on the popularity of the “Divinchi” showcase car, a strong dealership network, product exports, brand name loyalty, and numerous innovations in car manufacturing. However, in recent years the company has lost product quality, product improvements, and dealer and customer connections. As a result of these events, the automotive company is currently approaching bankruptcy.

Based on the context provided in this scenario, each participant was asked to develop an open-ended template plan for how to address these significant business problems. After developing this plan, participants then predicted both the likely positive and negative outcomes of that plan if it were implemented as broadly writ, being as specific as possible. Participants then used these forecasted outcomes to revise their template plan and prepare it for execution. Part four of the task required participants to closely examine the plan they revised for execution in order to predict unanticipated problems that might occur during implementation of that plan. Finally, in order to manage the execution errors identified in part four, participants were required to prepare contingency plans to negotiate each of those potential problems. For each of these contingency plans, participants were also required to explain the conditions under which the contingency plan should be carried out. Once participants finished all five parts of this experimental task, they completed a short manipulation check measure assessing their affective and utility reactions to training materials.

Dependent Variables

As participants were required to develop three separate plans—a template plan, a revised plan, and contingency plans—in the completion of the experimental task, planning performance was assessed using benchmark rating scales for each of these types of plans. Three graduate students in industrial-organizational psychology served as judges to evaluate each plan provided by participants on various benchmark rating scales. Judges made their ratings independently of each other. Additionally, judges were blind to all study hypotheses and conditions.

To score each type of plan, five-point benchmark rating scales were developed by the experimenter. In the development of each of these scales, illustrations of poor (1), average (3), and excellent (5) performance were given for each rating, respectively. Definitions of each rating scale were also included to guide raters in judging the specific attributes of each type of plan. Once these benchmarks were developed, a psychologist with twenty years experience in organizational planning reviewed them for coverage and clarity.

All plans (e.g., template, revised, contingency plans) were rated on: 1) quality, or the extent to which the plan uses all information presented in stimulus materials to develop a plan and is likely to solve problems and accomplish goals, 2) originality, or the extent to which the plan is novel, descriptive, and expanded beyond stimulus materials, 3) realism, or the extent to which the plan is feasible, logical, and coherent, and 4) adaptability, or the extent to which the plan is flexible to changing circumstances and generalizable to a number of different situations. In addition, template plans were rated on: 5) definition of criticalissues, or the extent to which the plan clearly defines critical issues to be addressed to solve problems and reach objectives, 6) direction of planning activities, or the extent to which the plan clearly organizes, directs, and sequences planning activites, 7) framing of information search, or the extent to which the plan clearly frames what information will be needed in order to detail and execute the plan, 8) abstraction of critical case information, or the extent to which critical and broad information is extracted from case materials and included in the template plan, and 9) comprehension of planning objectives, or the extent to which the plan illustrates

comprehension and clear understanding of the overarching objectives of planning action sequences.

Revised plans were rated on: 5) articulation of key actions, or the extent to which the plan clearly states key actions to address causes through planning, 6) resource acquisition and restriction management, or the extent to which the plan states how key resources should be obtained and managed to reach important planning goals, as well as how resource restrictions should be removed, 7) achievement of objectives, or the extent to which the plan is likely to accomplish key goals and objectives, 8) structuring of activities, or the extent to which planning steps are effectively organized and sequenced, and 9) minimization of potential errors, or the extent to which planning activities take into consideration and make attempts to minimize potential errors associated with plan execution. A count score was also used to assess the number of components in participants' revised plans.

Contingency plans were rated on: 5) identification of contingencies for likely errors, or the extent to which contingency plans needed for likely execution problems are identified and described, 6) ease of contingency plan implementation, or the extent to which identified contingency plans can be easily implemented to handle potential execution problems of the revised plan with minimal disruption, 7) integration of contingencies with the revised plan, or the extent to which contingency plan features (e.g., identified causes, resources, planning objectives, activities and sequences) correspond with features in revised plans, 8) identification of markers for implementing contingencies, or the extent to which events are clearly identified and described that signal implementation of contingencies to replace primary plans, and 9) integration of the

various contingency plans, or the extent to which contingency plans form a comprehensive system for effectively addressing a variety of potential execution problems. A count score was also used to assess the number of contingency plans developed.

In addition to these dependent measures, participants' forecasts and execution errors were also examined as process variables influencing the development of subsequent plans. As such, in addition to quality, originality, realism, and adaptability, participants' forecasts were rated on: 5) novelty of outcomes, or the extent to which stated outcomes of the template plan are imaginative, unpredictable, or innovative, and 6) criticality of outcomes, or the extent to which stated outcomes of the template plan represent critical factors for plan revision in order to reach the goals of planning. Count scores were also used to assess the number of positive and negative outcomes, as well as the number of short-term and long-term forecasted outcomes. Potential execution errors identified by participants were also rated on 5) articulation of likely errors, or the extent to which errors address problems that are likely as a result of features present in the participant's revised plan, 6) criticality of errors, or the extent to which errors represent significant obstacles to successful plan implementation in solving problems, and 7) range of errors, or the extent to which errors cover a broad range of planning activities and their associated problems. A count score was also used to assess the number of execution errors identified.

To maximize the reliability and validity of these ratings, a variation of Hennessey and Amabile's (1988) consensual rating technique was used. In initial rater meetings, examples of high, medium, and low quality solutions were discussed with judges. After

variables were discussed, each rater judged performance examples on template plans, revised plans, and contingency plans independently. After these judgments had been made, the group reconvened and discussed ratings. Once a minimum 75% agreement criterion had been reached, the judges proceeded with the entire rating task.

After judges completed the benchmark ratings of plans developed by participants, intraclass correlation coefficients were calculated by using the suggestions provided by Shrout and Fleiss (1979). These average interrater agreement coefficients were calculated for all planning and process variables. These reliability coefficients, and planning variable intercorrelations, may be referenced in Table 1. Reliability coefficients and intercorrelations for planning process variables may be referenced in Table 2.

Analyses

Analysis of Controls for Non-Randomization

As a result of the time required to complete training modules across conditions, experimental sessions were scheduled according to these constraints. As a result, assignment of participants to conditions was not completely random. Specifically, participants were not randomly assigned to one of nine total conditions, but rather a subset of conditions requiring the same amount of time to complete training. Due to these limitations, an analysis of variance (ANOVA) was conducted between conditions to investigate possible differences in demographic and individual difference variables. The results of this ANOVA may be referenced in Table 3.

In this analysis, no individual difference variables produced statistically significant effects. However, four variables produced effects that neared statistical significance. Specifically, participants' gender ($F(8, 176) = 1.93$; $\underline{p} = .07$), prior business

experience (F (8, 176) = 1.84; p = .07), mastery achievement motivation (F (8, 176) = 1.91; p = .09), and planning skills (F (8, 176) = 1.82;p = .08) produced effects that were nearly statistically significant. Thus, although no systematic, statistically significant differences were noted between conditions, these individual difference variables were included in subsequent analyses to investigate potential effects on dependent variables.

Analysis of Task Performance

In preliminary analyses, three sets of multiple analyses of covariance (MANCOVAs) were run to assess the effects of training manipulations on participants' performance on template, revised, and contingency plans. The first set of MANCOVAs examined the effects of training on planning performance after statistically controlling for potential effects of demographic and individual difference measures on the effectiveness of manipulations or the quality of plans developed following training. Specifically, two measures of planning skills were included for their possible inflation effects on ratings of participants' plans. Verbal intelligence was included to control for potential impact on the quality of plans developed following training. Likewise, divergent thinking was included as a covariate for its possible influence on the originality of participants' plans. Finally, measures of self-efficacy and achievement motivation were included to control for potential influences on comprehension of training materials and subsequent planning performance.

Of these variables, participant's hometown population (F (9, 157) = 2.06; $p \leq .05$) and planning skills (F (9, 157) = 3.94; $p \leq .001$) made significant contributions towards predicting template plan performance. In addition, mastery achievement motivation made a significant contribution towards predicting revised plan performance (F (10, 152) =

2.08; $\underline{p} \leq .05$). Finally, supervisory experience on a prior job made a significant contribution towards predicting contingency plan performance ($F (10, 140) = 2.07$; $\underline{p} \leq .05$).

A second set of MANCOVAs was run to assess the effects of training comprehension on participants' planning performance. Specifically, scores on training module knowledge tests, review tests, and case analysis exercises were used as covariates in planning performance MANCOVAs across the three types of plans. Of these variables, scores on key resource knowledge tests made significant contributions towards predicting template plan ($F (9, 157) = 5.41$; $\underline{p} \leq .001$) and revised plan ($F (10, 152) = 2.74$; $\underline{p} \leq .05$) performance. In addition, scores on tests examining key causes made significant contributions towards predicting contingency plan performance ($F (10, 140) = 1.91$; $\underline{p} \leq .05$). Finally, scores on key causes case analysis exercises made a significant contribution towards predicting contingency plan performance ($F (10, 140) = 4.92$; $\underline{p} \leq .001$).

The third set of preliminary MANCOVAs was run to control for differences in planning performance due to differences in forecasting and error management performance. Specifically, ratings of forecasted outcomes and predicted implementation errors were used as covariates in revised and contingency plan MANCOVAs, respectively. Novelty of forecasted outcomes also made a significant contribution towards predicting revised plan performance ($F (10, 152) = 4.73$; $\underline{p} \leq .001$). Adaptability of predicted implementation errors made a significant contribution towards predicting contingency plan performance ($F (10, 140) = 5.90$; $\underline{p} \leq .001$). Finally, the number of implementation errors predicted made significant contributions towards predicting contingency plan performance ($F (10, 140) = 9.39$; $\underline{p} \leq .001$).

Median-Split Analyses

Based on the results of preliminary analyses, the decision was made to run an additional set of MANCOVAs to examine the interactive effects of training manipulations and individual difference median-split variables on planning performance. To run these analyses, median scores were first calculated for all individual difference covariates. Specifically, median scores were calculated for planning skills (X_{50}=38.00), identifying deficiencies (X_{50}=15.00), verbal intelligence (X_{50}=34.50), self-efficacy (X_{50}=3.67), performance approach achievement motivation (X_{50}=2.67), performance avoid achievement motivation (X_{50}=2.50), mastery achievement motivation (X_{50}=3.67), fluency and flexibility scales of divergent thinking (X_{50}=5.00 and 2.60, respectively), and forecasting and error management planning processes (X_{50}=3.13 and 2.89, respectively). After median scores were calculated, variables were created that divided participants into low- and high-performing groups. Based on these variables, the additional set of MANCOVAs was run to examine potential interactions between training manipulations and median-split variables.

Results

Manipulation Checks

Responses to manipulation check items in the post-task questionnaire indicated positive participant reactions to training materials. Participants across experimental conditions were asked to respond to 15 statements about various components of training materials (e.g., “Key learning points at the end of training sections were useful in developing my business plan”), application of training materials to planning processes (e.g., “Lessons learned in training materials helped me forecast likely outcomes of my

initial business plan"), and application of training materials to each distinct type of plan (e.g., "Lessons I learned in training helped me develop my initial business plan"). Specifically, participants rated each statement on a 5-point Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree"). Across these questions, experimental participants indicated that training materials prepared them to develop plans to address the experimental task (M = 3.26, SD = 1.12).

Since participants in the control condition did not receive case content feature training, these participants did not respond to the above 15 questions. However, all participants were asked to respond to two additional statements at the end of the manipulation check survey. These statements were, "I found the forecasting worksheet helpful in predicting how my template plan would work," and "The error management worksheet helped me identify potential problems to focus on in developing contingency plans." Participants rated these statements on the same 5-point Likert scale described above. Across these two questions, participants indicated that planning process materials were effective in facilitating plan development (M = 3.56, SD = 0.79).

Median-Split MANCOVA Findings: Task Performance Variables

Template Plan Findings. As defined previously, template plans were rated on 1) quality, 2) originality, 3) realism, 4) adaptability, 5) definition of critical issues, 6) direction of planning activities, 7) framing of information search, 8) abstraction of critical case information, and 9) comprehension of planning objectives. Overall, participants given basic planning familiarization and those trained to articulate key causes developed more adaptable template plans than participants trained to articulate other case content features. The results of the MANCOVAs examining performance differences in these

variables across training manipulations and individual difference variables are presented in Table 4. All means and standard deviations for significant effects may be referenced in Appendix A.

Planning Skills. In the MANCOVA examining training manipulations and planning skills, participants' prior planning skills produced significant effects ($F(9, 151) = 2.71$; $p \leq .05$) such that participants identified as more adept at planning developed more highly rated template plans than participants less skilled in planning. Participants' scores on knowledge tests examining key resources and restrictions also produced significant effects ($F(9, 151) = 6.40$; $p \leq .001$). An examination of the means associated with this variable indicated that participants with higher performance on key resources and restrictions knowledge tests developed more highly rated template plans than participants with lower performance on these tests.

Training condition produced a significant ($F(9, 158) = 7.28$; $p \leq .001$) main effect in these analyses. Specifically, participants who received key causes training ($M = 3.40$, $SD = 0.38$) and those who received basic planning familiarization ($M = 3.35$, $SD = 0.45$) outperformed other participants in developing highly adaptable template plans. In contrast, participants trained to articulate key causes and key resources ($M = 3.09$, $SD = 0.49$), key causes and key goals ($M = 3.07$, $SD = 0.34$), or key goals and key resources ($M = 3.08$, $SD = 0.52$) developed template plans more rigid to changing circumstances and situations.

In these analyses, a significant multivariate interaction was observed between training condition and planning skills ($F(9, 158) = 3.66$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and

planning skills on template plan realism. Specifically, participants with low planning skills developed the most realistic template plans when they received training in key causes, key goals, and key resources and restrictions (M = 3.38, SD = 0.47), whereas participants with high planning skills developed highly realistic template plans when they were trained in articulating key goals and key resources (M = 3.67, SD = 0.24). This finding demonstrates that individuals who lack planning skills require more intensive training in key planning concepts than more skilled individuals in order to generate effective template plans. Individuals more adept at planning, however, require less rigorous instruction to sketch out a preliminary planning framework.

A significant effect for training condition and planning skills was also observed for framing template plan information search. Specifically, participants with fewer planning skills most effectively framed the template plan search for information when they were trained in articulating key causes and key resources (M = 3.30, SD = 1.17), whereas participants more skilled in planning most effectively framed the information search when they received training in articulating key causes (M = 3.17, SD = 0.74). Consistent with the above finding, this effect indicates that individuals who lacking planning skills require more intensive training than more skilled individuals to specify the search for critical information in the template plan. Instruction in key causes is sufficient for more proficient planners, however, as knowledge of key causes, actions to be taken to address those causes, and any restrictions on those actions helps to specify the search for information to be refined in subsequent plans.

Verbal Intelligence. In the MANCOVA examining training manipulations and verbal intelligence, participants' prior planning skills produced significant effects (F (9,

149) = 3.98; $\underline{p} \leq .001$) such that participants identified as more adept at planning developed more highly rated template plans than participants less skilled in planning. Participants' scores on knowledge tests examining key resources and restrictions also produced significant effects (F (9, 149) = 5.85; $\underline{p} \leq .001$). An examination of the means associated with this variable indicated that participants with higher performance on key resource knowledge tests developed more highly rated template plans than participants with lower performance on these tests.

Training condition produced a significant multivariate (F (9, 156) = 7.10; $\underline{p} \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key causes (M = 3.35, SD = 0.32) and those who received basic planning familiarization (M = 3.35, SD = 0.45) outperformed other participants in developing highly adaptable template plans. In contrast, participants trained to articulate key causes and key resources (M = 3.09, SD = 0.49), key causes and key goals (M = 3.07, SD = 0.34), or key goals and key resources (M = 3.08, SD = 0.52) developed template plans less adaptable to changing circumstances and situations.

In these analyses, a significant multivariate interaction was observed between training manipulations and verbal intelligence (F (9, 156) = 5.67, $\underline{p} < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and verbal intelligence on template plan adaptability. Specifically, participants with low verbal intelligence developed highly adaptable template plans when they received training in key causes, key goals, and key resources and restrictions (M = 3.37, SD = 0.35), whereas participants with high verbal intelligence developed the most adaptable template plans when they were given basic planning familiarization(M = 3.57, SD =

0.39). From this effect, it appears that individuals with lower analogical reasoning abilities require more explicit and in-depth instruction in key planning content areas in order to effectively articulate their initial planning ideas. Individuals with higher verbal intelligence, however, require only conceptual planning familiarization to develop effective template plans.

Self-Efficacy. Analysis of training conditions and self-efficacy yielded two covariates with significant effect. Participants' prior planning skills produced significant effects ($F(9, 150) = 4.11$; $p \leq .001$) such that participants more adept at planning developed more highly rated template plans than participants less skilled in planning. Participants' scores on knowledge tests examining key resources and restrictions also produced significant effects ($F(9, 150) = 4.09$; $p \leq .001$). An examination of the means associated with this variable indicated that participants with higher performance on key resource knowledge tests developed more highly rated template plans than participants with lower performance on these tests.

Training condition produced a significant multivariate ($F(9, 157) = 5.24$; $p \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key causes ($M = 3.40$, $SD = 0.38$) and those who received basic planning familiarization ($M = 3.35$, $SD = 0.45$) outperformed other participants in developing adaptable template plans. In contrast, participants trained to articulate key causes and key resources ($M = 3.09$, $SD = 0.49$), key causes and key goals ($M = 3.07$, $SD = 0.34$), or key goals and key resources ($M = 3.08$, $SD = 0.52$) developed template plans more rigid to changing circumstances and situations.

In these analyses, a significant multivariate interaction was observed ($F(9, 157) = 3.37$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and verbal intelligence on template plan quality. Specifically, template plan quality was highest for participants with low self-efficacy when they received no training ($M = 3.41$, $SD = 0.83$), whereas participants with high self-efficacy developed high quality template plans when they were given training in articulating key causes, key goals, and key resources and restrictions ($M = 3.70$, $SD = 0.51$). From this effect, it appears that training materials had a counterintuitive effect on participants with low self-efficacy. Specifically, instead of making these participants feel more efficacious about their ability to complete the task, the complexity and bulk of training materials actually overwhelmed these individuals, making them feel even less able to prepare effective template plans. As expected, however, training materials had a positive impact on participants with high self-efficacy, increasing perceptions of their ability to address the problem at hand and facilitating their planning performance.

Performance Approach Achievement Motivation. Examining the effects of training condition and performance approach achievement motivation, two covariates produced significant effects. Participants' prior planning skills produced significant effects ($F(9, 151) = 4.40$; $p \leq .001$) such that participants identified as more adept at planning developed more highly rated template plans than participants less skilled in planning. Participants' scores on knowledge tests examining key resources also produced significant effects ($F(9, 151) = 4.94$; $p \leq .001$). An examination of the means associated with this variable indicated that participants with higher performance on key resource

knowledge tests developed more highly rated template plans than participants with lower performance on these tests.

Training condition produced a significant multivariate ($F(9, 158) = 6.24$; $p \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key causes ($M = 3.40$, $SD = 0.38$) and those who received basic planning familiarization ($M = 3.35$, $SD = 0.45$) outperformed other participants in developing highly adaptable template plans. In contrast, participants trained to articulate key causes and key resources ($M = 3.09$, $SD = 0.49$), key causes and key goals ($M = 3.07$, $SD = 0.34$), or key goals and key resources ($M = 3.08$, $SD = 0.52$) developed template plans less adaptable to changing circumstances and situations.

In this analysis, a significant multivariate interaction was observed ($F(9, 158) = 2.94$, $p < .01$). Examination of the associated univariate effects indicated a significant effect of training condition and performance approach achievement motivation on template plan originality. Specifically, participants low on the performance approach scale developed the most original template plans when they received training in articulating key goals and key resources ($M = 3.30$, $SD = 0.55$), whereas participants higher on the performance approach scale developed highly original template plans when they were given training in articulating key causes and key resources ($M = 3.33$, $SD = 0.54$). This finding illustrates that individuals with low motivation to perform develop highly original template plans only when they are confident that the plan will reach important goals. Individuals more motivated to perform, however, develop most original template plans when they are reasonably certain that the plan addresses key causes.

Performance Avoid Achievement Motivation. Investigation of training conditions and performance avoid achievement motivation produced three covariates with significant effects. One demographic variable, participant's hometown population, produced significant effects ($F(9, 148) = 2.25$; $p \leq .05$). Participants' prior planning skills also produced significant effects ($F(9, 148) = 3.69$; $p \leq .001$) such that participants identified as more adept at planning developed more highly rated template plans than participants less skilled in planning. Participants' scores on knowledge tests examining key resources also produced significant effects ($F(9, 148) = 5.13$; $p \leq .001$). An examination of the means associated with this variable indicated that participants with higher performance on key resource knowledge tests developed more highly rated template plans than participants with lower performance on these tests.

Training condition produced a significant multivariate ($F(9, 155) = 6.42$; $p \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key causes ($M = 3.40$, $SD = 0.38$) and those who received basic planning familiarization ($M = 3.35$, $SD = 0.45$) outperformed other participants in developing adaptable template plans. In contrast, participants trained to articulate key causes and key resources ($M = 3.09$, $SD = 0.49$), key causes and key goals ($M = 3.07$, $SD = 0.34$), or key goals and key resources ($M = 3.08$, $SD = 0.52$) developed template plans less flexible to changing circumstances and situations.

In these analyses, a significant multivariate interaction was observed ($F(9, 155) = 4.09$, $p < .001$). Examination of the associated univariate effects indicated a significant interaction for both template plan originality and direction of template plan activities. Specifically, participants with low motivation to avoid performance developed the most

original template plans when they received key goals and key resources training (M = 3.42, SD = 0.56), whereas participants with higher motivation to do so developed highly original template plans when they were trained in articulating key resources and restrictions (M = 3.33, SD = 0.70). From this effect, it appears that individuals with low motivation to avoid performance develop the most original template plans when they can clearly articulate key goals. Individuals with higher motivation to avoid performance, however, are better able to develop original template plans when they can rely on more concrete key resources.

With regard to directing template plan activities, it was observed that participants with low motivation to avoid performance most effectively directed template plan activities when they were trained to articulate key causes, key goals and key resources and restrictions (M = 3.53, SD = 0.95). However, participants with higher motivation to avoid performance directed template plan activities most effectively when trained to identify and articulate key resources and restrictions (M = 3.44, SD = 1.00). This finding demonstrates that, to effectively direct planning activities, individuals with low motivation to avoid performance require intensive training in key planning content areas. Individuals more motivated to avoid performance, however, rely more on concrete instruction on resource acquisition and usage to effectively direct template plan activities.

Summary of Template Plan Findings. The results described above demonstrate that instruction in fundamental planning concepts and processes facilitates development of highly adaptable template plans. Because this type of plan is meant to serve only as a seed point from which to build more detailed subsequent plans, this instruction may be sufficient to enable effective planning by actually preventing individuals from over-

specifying plans during an early stage in the process. Moreover, by formulating a rough planning framework at this stage based on a generative planning schema, instead of an over-prescribed and rigid sequence of activities based on a structural schema, planners may drastically reduce the number and extent of revisions necessary to prepare the template plan for implementation following forecasting. In this manner, basic planning familiarization provides a foundation for the development of plans highly flexible to changing circumstances and situations.

The above findings also illustrate that articulation of key causes facilitates the development of adaptable template plans. Prior research has concluded that identifying key causes and actions to address those causes represents the first step in template plan development (Thomas and McDaniel, 1990). Consistent with this observation, the current research demonstrates that, although template plans serve only as rough frameworks from which more detailed plans are generated, these plans necessarily frame how key precipitating causes will be addressed in those plans. In short, where familiarization with planning concepts and processes lays the foundation for developing effective plans, identification and articulation of key causes provides a framework for how those plans should be built.

Revised Plan Findings. As previously discussed, revised plans were rated on 1) quality, 2) originality, 3) realism, 4) adaptability, 5) articulation of key actions, 6) resource acquisition and restriction management, 7) achievement of objectives, 8) structuring of activities, and 9) minimization of potential errors. A count score was also used to assess the number of revised plan components. Across these analyses, participants trained to articulate key causes, key goals, and key resources and restrictions more

effectively prepared revised plans for implementation than other participants. Specifically, the revised plans developed by these participants were rated higher in quality, adaptability and articulation of key planning actions than those developed by participants in other training conditions. In addition, participants who received basic planning familiarization and those trained to identify and articulate either key causes or key goals more effectively structured revised plan activities than participants trained to articulate other case content features. The results of the MANCOVAs examining performance differences in these variables across training manipulations and individual difference variables are presented in Table 5. As previously stated, all means and standard deviations for significant effects may be referenced in Appendix A.

Identifying Deficiencies. In the MANCOVA examining training manipulations and seeing deficiencies, only the mastery achievement motivation covariate produced significant effects ($F(10, 146) = 1.91$; $p \leq .05$). An examination of the means associated with this variable indicated that participants more motivated to master experimental materials developed more highly rated revised plans than participants less motivated to do so.

In these analyses, a significant multivariate interaction was observed ($F(10, 153) = 3.91$, $p < .001$). Examination of the associated univariate effects indicated a significant interaction between training condition and identifying deficiencies for acquisition of resources. Specifically, participants least able to identify deficiencies most effectively addressed resource acquisition in their revised plans when they received basic planning familiarization ($M = 2.67$, $SD = 0.83$), whereas participants more adept at identifying deficiencies most effectively addressed resource acquisition in their revised plans when

they were trained to articulate key goals and key resources (*M* = 2.75, *SD* = 0.83). From this effect, it appears that individuals least able to identify flaws in existing plans require more fundamental instruction in planning concepts and processes to effectively address resource acquisition in revised plans. More skilled individuals, however, most effectively address resource acquisition when they can focus on how acquiring and utilizing those resources will help them obtain significant planning goals.

Self-Efficacy. Examining training manipulations and self-efficacy, two covariates produced significant effects. Participants' mastery achievement motivation produced significant effects ($F(10, 144) = 2.85$; $p \leq .01$) such that participants highly motivated to master experimental materials developed more highly rated revised plans than participants less motivated to do so. Novelty of forecasted outcomes also produced significant effects ($F(10, 144) = 5.69$; $p \leq .001$). An examination of the means associated with this variable indicated that participants who predicted more imaginative outcomes of their template plans subsequently developed more highly rated revised plans than participants who forecasted more predictable outcomes.

Training condition produced a significant multivariate ($F(10, 151) = 3.21$; $p \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key causes, key goals, and key resources (*M* = 3.24, *SD* = 0.81) and those who received basic planning familiarization (*M* = 3.23, *SD* = 0.64) outperformed other participants in articulating key actions to address causes in plan implementation. In contrast, participants trained to articulate key causes and key resources (*M* = 2.60, *SD* = 0.99), key causes and key goals (*M* = 2.83, *SD* = 0.89), or key goals and key resources (*M* = 2.84, *SD* = 0.80) developed revised plans that did not clearly articulate key planning actions.

In these analyses, significant multivariate interactions were observed ($F(10, 151) = 3.54$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and self-efficacy on revised plan quality. Specifically, participants with low self-efficacy developed high quality revised plans when they were trained to articulate key causes, key goals, and key resources ($M = 3.37$, $SD = 0.88$), or key resources alone ($M = 3.24$, $SD = 0.40$). Participants with high self-efficacy, however, developed high quality revised plans when trained to articulate key causes, key goals, and key resources ($M = 3.54$, $SD = 0.59$), or key goals alone ($M = 3.50$, $SD = 0.67$). This finding first demonstrates that preparing effective plans for implementation requires understanding of all key planning content areas. Unlike preliminary template plans developed based on an understanding of basic planning processes and key causes, effective revised plans must also account for which key resources are necessary to affect key causes in order to achieve key goals. Concerning individual differences, an understanding of resource acquisition and usage may lead to improved planning in individuals with low self-efficacy by increasing their perceived ability to develop effective plans. Individuals with higher self-efficacy, however, are better able to develop revised plans when they can effectively identify and articulate key goals.

Significant interactions were also observed between training condition and self-efficacy for revised plan originality and acquisition of key resources. Specifically, originality was highest for participants with low self-efficacy when they were trained to articulate key causes, key goals and key resources ($M = 3.40$, $SD = 0.66$), whereas participants with higher self-efficacy developed more original revised plans when trained to articulate key goals ($M = 3.42$, $SD = 0.71$). Unlike template plan findings, this effect

indicates that for individuals with low-self efficacy, more intensive training enhances perceived efficacy and frees these individuals to develop more original plans. Development of original revised plans is facilitated for individuals with higher self-efficacy when these individuals receive training in articulating key goals. This instruction likely provides a framework, but allows these individuals the autonomy to reach goals through a number of possible pathways.

With regard to the interaction of training manipulation and self-efficacy on acquisition of key resources, participants with low self-efficacy most effectively addressed key resource acquisition in their revised plans when they received basic planning familiarization ($M = 2.56$, $SD = 0.88$), whereas participants with higher self-efficacy most effectively addressed resource acquisition when trained to articulate key causes and key resources ($M = 2.50$, $SD = 1.03$). This interaction demonstrates that basic instruction in planning concepts and processes enhances perceived ability in individuals with low self-efficacy, enabling them to more effectively address resource acquisition and usage in their revised plans. These perceptions are enhanced for individuals with higher self-efficacy when they receive instruction in articulating key causes and key resources. It is likely that this understanding of key causes and resource acquisition facilitates the development of plans explicitly designed to address causes by acquiring and making use of important resources.

A fourth significant interaction was observed between training condition and self-efficacy for achieving revised plan goals and objectives. Specifically, participants with low self-efficacy developed revised plans most likely to achieve stated goals and objectives when they were trained to articulate key causes, key goals and key resources

(*M* = 3.50, *SD* = 0.57). Participants with higher self-efficacy, however, developed revised plans most likely to achieve stated goals when trained to articulate key causes (*M* = 3.48, *SD* = 0.47). This effect indicates that individuals with low self-efficacy require more intensive training to enhance their perceived ability and facilitate development of plans likely to achieve stated goals. These perceptions are enhanced for individuals with higher self-efficacy when they receive training in articulating key causes. This training, in turn, facilitates development of plans likely to achieve stated goals by addressing those key causes.

Significant interactions between training condition and self-efficacy were also observed for structuring plan activities and minimizing implementation errors. Specifically, participants with low self-efficacy most effectively structured planning activities and minimized potential implementation errors when they were trained to articulate key resources (*M* = 3.00, *SD* = 0.68 and *M* = 2.76, *SD* = 0.52). Participants with higher self-efficacy, however, most effectively structured plan activities and minimized potential implementation errors in their revised plans when trained to articulate key causes (*M* = 3.44, *SD* = 0.50) and key goals (*M* = 2.79, *SD* = 0.59), respectively. From these effects, it appears that individuals with low self-efficacy more effectively structure planning activities to minimize potential errors when they receive instruction in more concrete dimensions of planning. Individuals with higher self-efficacy, however, are better able to benefit from less rigid instruction in precipitating causes in structuring planning activities to address those causes. Likewise, training in articulating key goals and goal pathways enables these individuals to effectively minimize potential errors in their revised plans.

Mastery Achievement Motivation. Examining the effects of training condition and mastery achievement motivation, participants' mastery achievement motivation produced significant effects ($F(10, 145) = 2.82$; $p \leq .01$) such that participants more motivated to master experimental materials developed more highly rated revised plans than participants less motivated to do so. Novelty of forecasted outcomes also produced significant effects ($F(10, 145) = 6.00$; $p \leq .001$). An examination of the associated means indicated that participants who predicted more inventive outcomes of their template plans subsequently developed more highly rated revised plans than participants who forecasted more predictable outcomes.

In these analyses, a significant multivariate interaction was observed ($F(10, 152) = 3.51$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and mastery achievement motivation for revised plan originality. Specifically, participants with low motivation to master experimental materials developed highly original revised plans when they were trained to articulate key causes, key goals and key resources ($M = 3.41$, $SD = 0.57$), whereas participants with more motivation to do so developed highly original revised plans when trained to articulate key goals ($M = 3.67$, $SD = 0.60$). From this effect, it appears that individuals with low motivation to master instructional materials require more intensive training to develop original revised plans. Individuals more motivated to do so, however, require only instruction in identifying and articulating key goals to develop and prepare highly original plans for implementation.

Performance Avoid Achievement Motivation. Examining the effects of training condition and performance avoid achievement motivation, four covariates produced

significant effects. One demographic variable, English as the participant's first language, produced significant effects ($F (10, 142) = 1.98$; $p \leq .05$). Participants' mastery achievement motivation also produced significant effects ($F (10, 142) = 1.97$; $p \leq .05$) such that participants more motivated to master experimental materials developed more highly rated revised plans than participants less motivated to do so. In addition, participants' scores on knowledge tests examining key resources also produced significant effects ($F (10, 142) = 2.63$; $p \leq .01$). An examination of the associated means indicated that participants with higher performance on key resource knowledge tests developed more highly rated revised plans than participants with lower performance on these tests. Finally, novelty of participants' forecasted outcomes also produced significant effects ($F (10, 142) = 4.27$; $p \leq .001$). An examination of the associated means indicated that participants who predicted more imaginative outcomes of their template plans subsequently developed more highly rated revised plans than participants who forecasted more predictable outcomes.

Training condition produced a significant multivariate ($F (10, 149) = 3.42$; $p \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key causes, key goals, and key resources ($M = 3.44$, $SD = 0.75$ and $M = 3.24$, $SD = 0.81$, respectively) outperformed other participants. In contrast, participants trained to articulate key causes and key resources ($M = 2.67$, $SD = 0.97$), key causes and key goals ($M = 2.83$, $SD = 0.89$), or key goals and key resources ($M = 2.84$, $SD = 0.80$) developed revised plans that did not clearly articulate key planning actions.

In these analyses, a significant multivariate interaction was observed ($F (10, 149) = 2.48$, $p < .01$). Examination of the associated univariate effects indicated a significant

effect of training condition and performance avoid achievement motivation on articulation of key planning actions. Specifically, participants with low motivation to avoid performance most effectively articulated key planning actions in their revised plans when they were trained to articulate key causes, key goals and key resources (M = 3.63, SD = 0.59), whereas participants with higher motivation to avoid performance effectively articulated key planning actions when trained to articulate key resources (M = 3.61, SD = 0.65). This effect demonstrates that individuals with low motivation to avoid performance most effectively articulate key planning actions when those actions are organized around a comprehensive framework of key planning content areas. Individuals more motivated to avoid performance, however, articulate planning actions most effectively when those actions are framed in terms of more concrete resource acquisition and utilization activities.

Divergent Thinking Flexibility. Investigation of training manipulations and divergent thinking flexibility produced one covariate with significant effects. Participants' mastery achievement motivation produced significant effects (F (10, 145) = 1.91; $p \leq .05$) such that participants with higher motivation to master experimental materials developed more highly rated revised plans than participants less motivated to do so.

In these analyses, a significant multivariate interaction was observed (F (10, 152) = 3.74, $p < .001$). Examination of the associated univariate effects indicated a significant interaction between training condition and divergent thinking flexibility for structuring of revised plan activities. Specifically, participants who demonstrated least flexibility in divergent thinking most effectively structured planning activities when they received

basic planning familiarization (*M* = 3.80, *SD* = 0.65), whereas participants with higher divergent thinking flexibility most effectively structured revised plan activities when trained to articulate key causes and key goals (*M* = 3.24, *SD* = 0.60). From this effect, it appears that individuals with more rigid patterns of thinking effectively structure planning activities when they have a prescriptive process model of planning to follow. Individuals with higher flexibility, however, more effectively structure planning activities when those activities are less constrained around a process and more designed to address key causes in reach key goals.

A second significant interaction was observed between training condition and divergent thinking flexibility for number of revised plan components. Specifically, participants demonstrating low flexibility of thinking developed revised plans with the highest number of components when they received basic planning familiarization (*M* = 4.67, *SD* = 0.94), whereas participants with higher flexibility of thinking developed revised plans with the highest number of components when trained to identify and articulate key goals (*M* = 7.50, *SD* = 2.12). This effect also demonstrates that individuals with more rigid thinking patterns plan most effectively when they have a basic prescriptive model of planning to follow. Individuals with more flexible thinking, however, plan more effectively when articulation of key goals provides a less constrictive framework in developing sequences of revised plan activities.

Summary of Revised Plan Findings. The findings described above demonstrate that intensive instruction in all key planning content areas (e.g., key causes, goals, and resources) promotes the development of high quality, adaptable revised plans with clearly articulated action sequences. Identifying and articulating these key content areas is

necessary to substantiate the rough planning framework obtained through template plan development through extended information search. More specifically, effective revision and elaboration of initial plans prior to implementation involves applying resource acquisition and usage to address previously identified key causes in order to obtain significant planning goals. These revisions are necessary to both maximize positive outcomes and remediate negative outcomes of template plans identified during forecasting. Where basic planning familiarization and instruction in articulating key causes helped focus attention and narrow the scope of planning during template plan development, instruction in all key content areas is necessary during plan revision to ensure that implemented planning action sequences are clearly articulated and flexible to changing circumstances and situations.

In addition, these findings illustrate that instruction in fundamental planning concepts and processes, key cause articulation, and key goal articulation facilitates effective structuring of planning activities. It is likely that this instruction benefits revised plan development by helping individuals structure activities around a generative planning process. Moreover, understanding of key causes and key goals assists the planner in structuring activities around addressing critical and controllable causes en route to attaining significant planning goals. Thus, it appears that instruction in planning concepts and processes and understanding of key causes and goals facilitates development of effective revised plans by further organizing planning schemas and retaining the focus of planning activities on the most critical content areas.

Contingency Plan Findings. As discussed above, contingency plans were rated on 1) quality, 2) originality, 3) realism, 4) adaptability, 5) identification of contingencies for

likely errors, 6) ease of contingency plan implementation, 7) integration of contingencies with the revised plan, 8) identification of markers for implementing contingencies, and 9) integration of the various contingency plans. A count score was also used to assess the number of contingency plans developed. Across these analyses, participants who received basic planning familiarization developed contingency plans rated higher in quality, realism, and ease of implementation given the revised plan than participants trained to articulate case content features. However, participants trained to articulate key goals developed more realistic contingency plans more easily implemented and integrated with the revised plan than participants trained to articulate other case content features. Finally, participants trained to identify and articulate key causes developed significantly more contingency plans than participants trained to articulate other case content features. The results of the MANCOVAs examining performance differences in these variables across training manipulations and individual difference variables are presented in Table 6. As previously stated, all means and standard deviations for significant effects may be referenced in Appendix A.

Identifying Deficiencies. In the MANCOVA examining training manipulations and seeing deficiencies, four covariates produced significant effects. Participants' scores on both key causes knowledge tests ($F (10, 132) = 2.23$; $p \leq .05$) and case analysis exercises ($F (10, 132) = 4.79$; $p \leq .001$) produced significant effects such that participants with higher performance on these exercises developed more highly rated contingency plans than participants with lower performance. Of the error management process variables, adaptability of predicted implementation errors made a significant contribution towards predicting contingency plan performance ($F (10, 132) = 5.72$; $p \leq .001$). Finally,

the number of predicted implementation errors also made significant contributions towards predicting contingency plan performance ($F(10, 132) = 9.64$; $p \leq .001$).

Training condition produced a highly significant multivariate ($F(10, 139) = 5.21$; $p \leq .001$) main effect in these analyses. Specifically, participants trained to articulate key goals ($M = 3.15$, $SD = 0.65$) and those who received basic planning familiarization ($M = 3.14$, $SD = 0.71$) developed more feasible contingency plans based on logical constraints than other participants. In contrast, participants trained to articulate key causes and key resources ($M = 2.90$, $SD = 0.63$), key causes and key goals ($M = 2.72$, $SD = 0.71$), or key goals and key resources ($M = 2.88$, $SD = 0.57$) developed contingency plans that did not effectively address these practical constraints.

Across these analyses, a significant multivariate interaction was observed ($F(10, 139) = 3.82$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training manipulation and seeing deficiencies on contingency plan integration. Specifically, participants least able to identify deficiencies developed integrated sets of contingencies when they received basic planning familiarization ($M = 2.57$, $SD = 0.79$), whereas participants more adept at identifying deficiencies most effectively integrated contingencies when trained to articulate key resources and restrictions ($M = 2.89$, $SD = 1.02$). This effect illustrates that individuals least able to identify flaws in existing plans require more fundamental instruction in planning processes to effectively integrate contingency plans. Individuals more adept at identifying these deficiencies, however, effectively integrate contingencies when these plans are structured around acquiring and utilizing key resources to obtain significant goals.

Performance Approach Achievement Motivation. Examining the effects of training condition and performance approach achievement motivation, three covariates produced significant effects. Participants' scores on key causes case analysis exercises ($F(10, 134) = 4.60$; $p \leq .001$) produced significant effects such that participants with higher performance on these exercises developed more highly rated contingency plans than lower performing participants. Of the error management process variables, adaptability of predicted implementation errors made a significant contribution towards predicting contingency plan performance ($F(10, 134) = 5.06$; $p \leq .001$). Finally, the number of predicted implementation errors made significant contributions towards predicting contingency plan performance ($F(10, 134) = 10.93$; $p \leq .001$).

In these analyses, training manipulation produced a significant multivariate ($F(10, 141) = 6.31$; $p \leq .001$) main effect. The associated univariate effects illustrate significant effects on contingency plan realism, ease of implementation given the revised plan, and integration with the revised plan. Specifically, participants trained to identify and articulate key goals ($M = 3.15$, $SD = 0.65$; $M = 3.04$, $SD = 0.44$; and $M = 3.13$, $SD = 0.72$, respectively) and those who received basic planning familiarization ($M = 3.14$, $SD = 0.71$; $M = 3.02$, $SD = 0.73$; and $M = 3.07$, $SD = 0.70$) outperformed other participants. In contrast, participants trained to articulate key causes and key resources ($M = 2.86$, $SD = 0.62$; $M = 2.53$, $SD = 0.65$; and $M = 2.75$, $SD = 0.75$, respectively) developed contingency plans that were less realistic and more difficult to implement or integrate.

An additional main effect for training condition was observed for the number of contingency plans developed such that participants who received key causes training ($M = 3.17$, $SD = 2.33$) and those who received basic planning familiarization ($M = 3.02$, SD

= 1.56) developed more contingency plans than participants in other training conditions. Specifically, participants trained to articulate key causes, key goals and key resources (*M* = 2.31, *SD* = 1.05), key causes and key goals (*M* = 2.19, *SD* = 1.14), or key goals alone (*M* = 2.31, *SD* = 1.33) subsequently developed fewer contingency plans.

In the MANCOVA examining experimental manipulations and performance approach achievement motivation, a significant multivariate interaction was observed ($F(10, 141) = 3.54$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and performance approach achievement motivation on the number of contingency plans developed. Specifically, participants with low motivation to perform developed the highest number of contingencies when trained to articulate key causes (*M* = 3.61, *SD* = 2.67), whereas participants with higher motivation to perform developed numerous contingency plans when trained to articulate key resources and restrictions (*M* = 3.33, *SD* = 2.87). From this effect, it appears that individuals with low motivation to perform will develop a large number of contingencies only in the unlikely event that the key causes of planning have not been addressed. Individuals more motivated to perform, however, are more likely to develop numerous contingencies when they perceive that effective resource acquisition, utilization, and removal of resource restrictions have not been effectively incorporated into existing plans.

Performance Avoid Achievement Motivation. Analysis of training manipulations and performance avoid achievement motivation produced two covariates with significant effects. Participants' scores on key causes case analysis exercises ($F(10, 135) = 3.60$; $p \leq .001$) produced significant effects such that participants with higher performance on these

exercises developed more highly rated contingency plans than lower performing participants. Of the error management process variables, number of predicted implementation errors made significant contributions towards predicting contingency plan performance ($F(10, 135) = 11.45$; $p \leq .001$).

Training manipulation produced a significant multivariate ($F(10, 142) = 5.15$; $p \leq .001$) main effect in these analyses. The associated univariate effects indicated significant effects for contingency plan quality, realism, ease of implementation given the revised plan, and integration with the revised plan. Specifically, participants trained to articulate key goals ($M = 2.89$, $SD = 0.95$; $M = 3.15$, $SD = 0.65$; $M = 3.04$, $SD = 0.44$; and $M = 3.13$, $SD = 0.72$, respectively) and those who received basic planning familiarization ($M = 2.96$, $SD = 0.82$; $M = 3.14$, $SD = 0.71$; $M = 3.02$, $SD = 0.73$; and $M = 3.07$, $SD = 0.70$) outperformed participants trained to articulate other case content features. In contrast, participants trained to articulate key causes and key resources ($M = 2.69$, $SD = 0.98$; $M = 2.86$, $SD = 0.62$; $M = 2.53$, $SD = 0.65$; and $M = 2.75$, $SD = 0.75$, respectively) developed contingency plans that were lower on these variables.

In these analyses, a significant multivariate interaction was observed ($F(10, 142) = 3.12$, $p < .001$). Examination of the associated univariate effects indicated a significant interaction between training condition and performance avoid achievement motivation for identifying contingency plans for likely implementation errors. Specifically, participants with low motivation to avoid performance most effectively identified contingencies for likely implementation errors when trained to articulate key causes ($M = 3.03$, $SD = 1.10$), whereas participants with higher motivation to do so developed contingency plans for likely implementation errors most effectively when they received

basic planning familiarization (M = 2.80, SD = 0.57). This finding demonstrates that individuals with low motivation to avoid performance develop contingencies for likely implementation errors most effectively when they perceive that precipitating causes have not been addressed in existing plans. Individuals more motivated to do so, however, develop contingency plans for likely implementation errors most effectively when they receive explicit instruction in identifying those errors through training in basic planning concepts and processes.

Summary of Contingency Plan Findings. The results previously described demonstrate that instruction in fundamental planning concepts and processes facilitates development of high quality, realistic contingency plans easily implemented with the existing revised plan. This finding parallels similar results observed for template plan development. Namely, it appears that generating contingencies essentially entails construction of new plans based on the occurrence of critical negative monitoring events identified through forecasting and error management processes. Such events signal that critical key causes have not been adequately addressed and that key goals cannot be obtained from existing plans. In this context, familiarization may enable development of contingencies as a rough planning framework to supplement existing revised plans to redirect action sequences to more successful outcomes. In this manner, basic planning familiarization provides a foundation for the development of high quality, realistic contingencies easily implemented with the revised plan.

However, the above findings illustrate that instruction in identifying and articulating key goals also facilitates the development of realistic contingency plans both easily implemented and integrated with the existing revised plan. By taking into account

potential alternative pathways to goal attainment and likely implementation errors identified in forecasting and error management processes, this form of instruction facilitates development of realistic contingencies by providing information bearing not only on goals, but on goal contingencies and other practical constraints and limitations. In the same manner, although instruction in articulating key goals helps the planner identify alternative pathways to goal attainment, it is logical to assume that the end goals of these alternative pathways should be consistent with, if not the same as, the existing revised plan. As a result of this alignment, contingency plans should be easily implemented and integrated with the existing revised plan. Thus, it appears that instruction in articulating key goals helps the planner integrate realistic contingencies with existing plans by promoting consistency in end goals.

Finally, results obtained for contingency plan generation illustrate that training in articulation of key causes facilitates the development of significantly more contingency plans than instruction in other case content features. This outcome likely stems from instructions given in this training protocol that suggest that planners consider multiple potential key causes before developing plans. Specifically, instruction in articulating key causes directs planners to consider whether a cause operates in concert with other potential key causes, the proximity with which potential key causes are connected, the impact addressing a cause might have, and the difficulty of addressing a potential key cause. Consistent with these instructions, findings demonstrate that individuals trained to articulate key causes are better able to generate numerous contingencies to respond to a range of key causes and critical negative marker events than individuals trained to articulate other case content features. Additionally, by directing planners to consider a

range of possible key causes, this training may help redirect contingency planning when existing plans prove ineffective at controlling or addressing these critical causes.

Median-Split MANCOVA Findings: Cognitive Process Variables

A final MANCOVA was executed to investigate possible interactive effects between training conditions and performance in forecasting and error management planning processes. The results of the MANCOVAs examining performance differences in these variables across training manipulations and planning process variables are presented in Table 7.

Forecasting Performance. Examining training manipulations and forecasting performance, three covariates produced significant effects. Participants' scores on key causes case analysis exercises ($F (10, 134) = 4.32$; $\underline{p} \leq .001$) produced significant effects such that participants with higher performance on these exercises developed more highly rated contingencies than participants with lower performance. Of the error management process variables, adaptability of predicted implementation errors made a significant contribution towards predicting contingency plan performance ($F (10, 134) = 4.42$; $\underline{p} \leq .001$). Finally, the number of predicted implementation errors made significant contributions towards predicting contingency plan performance ($F (10, 134) = 9.17$; $\underline{p} \leq .001$).

In these analyses, training condition produced a significant ($F (10, 141) = 5.73$; $\underline{p} \leq .001$) main effect. The associated univariate effects illustrated significant effects for contingency plan realism, ease of implementing contingency plans with the revised plan, and integration of contingencies with the revised plan. Specifically, participants trained to articulate key goals ($M = 3.15$, $SD = 0.65$; $M = 3.04$, $SD = 0.44$; and $M = 3.13$, $SD = 0.72$)

outperformed participants trained to articulate other case content features. In contrast, participants trained to articulate key causes and key resources (*M* = 2.86, *SD* = 0.62; *M* = 2.53, *SD* = 0.65; and *M* = 2.75, *SD* = 0.75, respectively) developed contingency plans that were less realistic and more difficult to implement or integrate.

An additional main effect was observed for the number of contingency plans developed such that participants trained to articulate key causes (*M* = 3.17, *SD* = 2.33) and those who received basic planning familiarization (*M* = 3.02, *SD* = 1.56) developed more contingency plans than participants in other training conditions. Specifically, participants trained to articulate key causes, key goals and key resources (*M* = 2.31, *SD* = 1.05), key causes and key goals (*M* = 2.19, *SD* = 1.14), or key goals alone (*M* = 2.31, *SD* = 1.33) developed fewer contingencies.

In the MANCOVA examining training manipulations and forecasting performance, a significant multivariate interaction was observed ($F(10, 141) = 3.17$, $\underline{p} < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and forecasting performance on the number of contingency plans developed. Specifically, participants least able to predict the outcomes of template plans subsequently developed the most contingency plans when they received basic planning familiarization (*M* = 3.11, *SD* = 1.19), whereas participants more adept at forecasting template plan outcomes developed the most contingencies when trained to identify and articulate key causes (*M* = 4.41, *SD* = 2.70). This finding demonstrates that individuals unable to predict outcomes of initial plans require a prescriptive model of planning concepts and processes to develop contingency plans to address potential implementation errors. Individuals more skilled at predicting these outcomes, however, are likely to

develop a number of contingencies when they perceive that key precipitating causes have not been adequately addressed in existing plans.

Error Management Performance. Analysis of training manipulations and error management performance yielded four covariates with significant effects. One demographic variable, supervisory experience on a previous job, produced significant effects ($F(10, 133) = 2.24$; $p \leq .05$). Participants' scores on key causes case analysis exercises ($F(10, 133) = 3.41$; $p \leq .001$) also produced significant effects such that participants with higher performance on these exercises developed more highly rated contingency plans than lower performing participants. Of the error management process variables, adaptability of predicted implementation errors made a significant contribution towards predicting contingency plan performance ($F(10, 133) = 4.76$; $p \leq .001$). Finally, the number of predicted implementation errors made significant contributions towards predicting contingency plan performance ($F(10, 133) = 8.41$; $p \leq .001$).

In the MANCOVA examining training manipulations and error management performance, a significant multivariate interaction was observed ($F(10, 140) = 4.19$, $p < .001$). Examination of the associated univariate effects indicated a significant effect of training condition and error management performance on the number of contingency plans developed. Specifically, participants least able to predict likely implementation errors developed the highest number of contingency plans when they received no training ($M = 2.58$, $SD = 0.94$), whereas participants more adept at predicting likely errors developed most contingencies when trained to articulate key goals and key resources ($M = 4.43$, $SD = 2.54$). This finding demonstrates that individuals least able to predict likely implementation errors develop the highest number of contingencies when they receive no

training. Because these individuals cannot identify and articulate key causes, goals, or resources, nor predict likely implementation errors, they logically have the highest number of possible contingencies to develop. Individuals more adept at predicting such errors, however, develop more contingency plans when trained to identify and articulate key resources and goals. As a result, these individuals develop numerous contingencies to handle situations in which key resources have not been acquired or utilized effectively, or when key goals have not been obtained.

Summary of Cognitive Process Findings. The results described above illustrate that, as might be expected, effective forecasting and proactive management of potential implementation errors facilitate development of revised and contingency plans, respectively. However, the interactive effects noted between forecasting and content-based instructional materials speak to a need to understand not only cognitive processes, but key content areas in developing effective plans. Consistent with previous findings, these effects illustrates that a prescriptive model of planning benefits individuals least able to predict the outcomes of template plans in developing a number of potential contingencies. Individuals more skilled at predicting these outcomes, however, benefit most from instruction in articulating precipitating causes. In this context, familiarization and instruction in key causes enable development of contingencies by directing planners to consider a range of possible causes when existing plans prove ineffective.

Moreover, the observed interaction between error management processes and content-based instructional materials demonstrates that instruction in identifying and articulating key goals and key resources facilitates the development of numerous contingency plans. By providing end states and alternative pathways to those end states,

these forms of instruction facilitate development of numerous potential contingencies by offering alternative pathways to reach significant goals when existing plans prove ineffective. Thus, it appears that instruction in articulating key goals and key resources helps the planner develop numerous contingencies by identifying alternative pathways to goal attainment.

Discussion

Planning represents a critical influence on effective performance in many complex settings, and the key findings of this study provide valuable information for how individuals may more effectively use content-based training protocols to improve planning performance. This enhanced planning may, in turn, facilitate more effective organizational performance. However, before turning to these key findings, a discussion bearing on the external generalizability of results is warranted.

Limitations

One constraint on the current study is the use of a college student sample to investigate planning in an organizational context. However, the primary purpose of this research was to examine the effects of content-based training on the development of plans to solve an ill-defined and complex organizational problem. In this setting, a college student sample represents a group of novice individuals unfamiliar with planning definitions, concepts and processes. As such, the planning performance of this sample is most likely to be facilitated by content-based training. Moreover, the experimental task is as ill-defined for the current sample as it would be in an organizational setting. However, while college students working on an organizational planning task might reflect similar performance to inexperienced organizational personnel working on an ill-defined

organizational planning effort, caution is warranted in generalizing the results of this study.

Furthermore, while this laboratory-based study enabled us greater control over psychological and individual difference constructs not easily constrained in organizational settings, the external validity of results warrants further examination in future research. Given that there are still relatively few empirical studies examining incremental performance improvements resulting from content-based training, a laboratory study seemed appropriate. Based on the design of this study, it seems likely that the same effects of content training would be observed in both laboratory and organizational settings. In fact, effects may be even stronger in organizations where there is potentially more at stake for planners. Additionally, correlations between effect sizes observed in the laboratory and in field studies have been estimated at .70 (Anderson, Lindsay, and Bushman, 1999).

Key Findings

As previously discussed, planning represents a critical influence on effective performance in complex and ill-defined performance domains. The impact of effective planning is seen in numerous hard organizational performance criteria (Armstrong, 1982; Yukl, 1998) including financial outcomes (Schwenk and Shrader, 1993), growth and profitability (Miller and Cardinal, 1994), and successful entrepreneurial ventures (Castrogiovani, 1996), as well as in softer criteria as teamwork (Weldon, Jehn and Pradhan, 1991) and task motivation (Smith, Locke and Barry, 1990). The critical findings of this research provide valuable information for how individuals can utilize content-based training to facilitate organizational performance through planning.

First, the current research demonstrates that a sound understanding of planning definitions, concepts, and processes provides a foundation for effective planning. By helping individuals operationally define planning as the mental simulation of future action sequences (Simons and Galotti, 1992; Patalino and Seifert, 1997) and outlining a process for effective planning (Mumford, Schultz, and Osburn, 2002), this instruction under girds effective planning across plan types. In fact, results from the current research indicate that this form of instruction proves especially helpful in template and contingency planning. Specifically, basic planning instruction facilitates initial planning efforts by encouraging the planner to avoid over-specifying template plans, instead leaving them as seed points from which to grow more detailed subsequent plans. In turn, this rough framework may reduce the extent of revisions necessary to prepare the plan for implementation following forecasting. Likewise, basic planning instruction facilitates contingency planning by encouraging development of new frameworks to supplement and redirect existing revised plans. In both contexts, this instruction assists the development of rough planning frameworks to address significant problems. With template plans, the problem centers on the opportunity to attain significant goals given an appropriate set of actions (Early and Perry, 1987). With contingency plans, however, the problem centers on the occurrence of a critical negative marker event signaling that key goals cannot be obtained from existing plans. As these results illustrate, in contexts where a rough planning framework is needed, either to be detailed in subsequent plans or to supplement existing plans, basic planning instruction may be sufficient to facilitate effective planning.

The current study also demonstrates the importance of understanding key causes in developing effective plans. Building on the foundation of understanding planning concepts and processes, these key content areas provide the framework within which fully substantiated plans are built. Consistent with prior research (Thomas and McDaniel, 1990), results from the current study illustrate that, although template plans serve only as rough frameworks from which more detailed plans are generated, the development of these plans is greatly enhanced by identification and articulation of key causes. Likewise, results illustrate that identification and articulation of key causes facilitates the development of adaptable revised plans with clearly articulated action sequences and effectively structured planning activities. In this context, clear understanding of the situation's precipitating causes allows the planner to more effectively structure planning activities around addressing those causes (Doerner and Schaub, 1994; Mumford, Schultz, and VanDoorn, 2001) in preparation for implementation.

The current research also demonstrates that understanding key causes facilitates the development of numerous contingency plans to address a variety of implementation errors. By encouraging planners to consider a range of potential causes, this instruction prepares individuals to develop a number of potential contingencies to respond to critical negative marker events (Xiao, Milgram, and Doyle, 1997). Thus, understanding key causes represents one key component of the planning framework in that, across plan types, understanding key causes is necessary to develop unambiguous and structured plans likely to address causes through changing circumstances.

The importance of understanding and articulating key goals is also borne out in the current study. As an understanding of key causes allows the planner to focus on

precipitating conditions, understanding key goals allows the planner to identify significant objectives and work towards them, given an appropriate set of actions. Simultaneously, understanding key goals allows the planner to identify and remove imposed contingencies on obtaining valued goals (Gaerling, 1994). In the current research, understanding key goals promoted development of adaptable revised with clearly articulated action sequences and effectively structured planning activities. In this context, clear understanding of significant objectives allows the planner to more effectively direct planning activities towards obtaining those outcomes (Early and Perry, 1987) while removing any imposed constraints on attaining them (Gaerling, 1996). Likewise, understanding key goals facilitated development of realistic contingency plans easily implemented and integrated with the existing revised plan. By taking into account potential alternative pathways to goal attainment (Daft, Sarmunen, and Parks, 1988), this instruction provides information bearing not only on goals, but on goal contingencies and other practical constraints and limitations. It appears that instruction in articulating key goals helps the planner integrate realistic contingencies with existing plans by promoting consistency in end goals. Thus, understanding key goals represents the second key component of the planning framework in helping the planner identify significant outcomes plans should work to achieve.

Bridging the gap between these two key components of planning is an understanding of key resources. This understanding is especially critical in the development of revised plans, which substantiate earlier plans by acquiring and utilizing key resources to build towards obtaining key goals. In the current research, identification and articulation of key resources facilitated the development of adaptable revised plans

with clearly articulated action sequences. Identifying and articulating these key resources, as well as any imposed restrictions on their acquisition and usage, is necessary to substantiate the rough planning framework obtained through template plan development through extended information search (Langholtz, Gettys, and Foote, 1993, 1994, 1995). More specifically, effective revision and elaboration of initial plans prior to implementation involves applying resource acquisition and usage to address previously identified key causes in order to obtain significant planning goals (Holyoak and Thagard, 1997). These revisions are necessary to both maximize positive outcomes and remediate negative outcomes of template plans identified during forecasting (Xiao et al., 1997). Thus, while understanding of key causes and key goals represent opposite ends of the planning framework, identification and articulation of key resources helps the planner navigate one of several pathways between them.

More importantly, this research illustrates the interactive effects of content-based training manipulations and various individual difference constructs on effective planning. In general, these aptitude-treatment interactions indicate that more intensive training is needed to facilitate planning performance in individuals who lack requisite planning skills. First, significant interactions between instructional protocols and planning skills on template plan realism and framing information search speak to this conclusion. Specifically, individuals with fewer pre-existing planning skills required more extensive training in key planning content to generate realistic template plans that effectively framed the search for planning information. Individuals more adept at planning, however, required only instruction in articulating key causes to do so. Thus, the most appropriate training protocol to facilitate planning performance may vary by individuals depending

on particular individual difference constructs (Kanfer and Ackerman, 1989; Goska and Ackerman, 1996).

In sum, the current study makes four vital points for how content-based training may be used to improve planning performance in organizational settings. First, a sound understanding of planning definitions, concepts and processes is necessary for developing rough planning frameworks in template and contingency plan development. Second, understanding of key causes and key goals provide a framework for developing effective plans, regardless of plan type. Third, articulating acquisition and usage of key resources builds a bridge between key causes and key goals. Finally, this research illustrates the interactive effects of content-based training manipulations and individual difference constructs, including various planning skills, verbal intelligence, achievement motivation, and divergent thinking, on effective planning. In general, individuals lacking requisite planning skills require more intensive training to develop effective plans.

Future Research Directions

The current study demonstrates the effectiveness of content-based training as a feasible alternative to cognitive process-based training in improving planning performance in organizational settings. Future research efforts examining these constructs should focus on three main issues. First, future research should examine how content-based training impacts alternative samples. Specifically, investigation of the feasibility of content-based training using samples of content experts and organizational incumbents should be conducted to establish the generalizability of findings from the current study to these samples. These efforts should also further investigate aptitude-treatment

interactions to help determine the most appropriate content-based training programs for individuals based on discrete individual difference constructs.

In addition, based on the results of the current study, future investigations should examine the feasibility of content-based training to improve performance in other instructional or high-stakes performance domains. For example, building on the earlier process-based training research of Fallesen and Pounds (2001), future studies might examine the application of content-based training to military performance. Specifically, content-based training could be used in such a context to help soldiers quickly and accurately identify particular characteristics of threats to determine which is most critical to address. Likewise, future research might examine the impact of content-based instruction on performance in the complex and ambiguous domain of financial speculation. Building on research examining financial performance (Schwenk and Shrader, 1993; Miller and Cardinal, 1994), content-based training could be applied to help individuals and organizations identify particular features of potential financial investments. Based on this instruction, investment choices could be made based on the presence or absence of critical features. As these examples illustrate, future research would benefit from investigating the impact of content-based training on performance in instructional and performance domains other than organizational planning.

Third, additional research is needed to investigate the possible benefits of integrating content- and process-based training into a comprehensive plan of instruction. Specifically, a replication of the current study could be conducted in which participants are randomly assigned to 1) content-based instruction focusing on basic planning concepts, key causes, key resources, or key goals, 2) process-based instruction focusing

on forecasting or error management processes, or 3) a combination of these two approaches. Such a study would clearly illustrate the possible benefits of an integrated program of instruction. Alternatively, results from the current study could be compared to those from similar research efforts using process-based training to examine the relative effectiveness of each approach. This comparison would also provide insight as to which program of instruction best facilitates planning performance.

Theoretical Implications

By providing evidence for an alternative to improving planning performance through content-based training, the current study offers several implications for planning theory. First, the study supports generative definitions of planning as an adaptive, conscious construction of future action sequences to obtain significant goals (Berger, Carol, and Jordan, 1989; Simons and Galotti, 1992; Patalino and Seifert, 1997), as opposed to structural definitions that constrain planning to the rigid and prescripted chunking of activities required to obtain goals (McDermott, 1978; Wilensky; 1983; Read, 1987).

Secondly, the present research supports the model of plan development proposed by Mumford, Schultz and Osburn (2002), emphasizing planning as a selective information processing activity pursued in response to environmental demands. Specifically, the development of template plans was strongly supported by instruction in planning concepts and processes, supporting the knowledge pathway in the Mumford, Schultz and Osburn (2002) model. Moreover, identification and articulation of key causes greatly enhanced template plan development as identified in the model.

Results obtained for plan revision also support the Mumford, Schultz, and Osburn (2002) planning model. Specifically, based on the predictions made during forecasting, template plans were revised to maximize positive outcomes and minimize negative outcomes once plans were implemented. In keeping with this model of planning, these revisions were based on a comprehensive understanding of key causes, key resources and resource restrictions, and key goals. Clear articulation of these critical content areas facilitated the development of effective revised plans, consistent with the prior planning model.

Moreover, likely implementation errors and marker events for evaluating progress toward planning objectives identified during error management formed the basis for developing contingencies to address these significant errors. The development of these contingencies was facilitated by an understanding not only of the general planning process, but unambiguous articulation of precipitating causes and key goals. As a whole, understanding of these key content areas facilitated the integration of template plans, forecasted alternatives, revised plans, potential execution errors, and contingency plans into a comprehensive planning framework consistent with the generative planning model offered by Mumford, Schultz, and Osburn (2002).

The third major theoretical implication offered by the current study concerns the feasibility of content-based training to improve planning performance. As this research demonstrates, content-based models of training represent a promising alternative to cognitive process-based training programs. Similar results have previously been observed in other performance domains (Langholtz, Gettys and Foote, 1993; Seamster and Kaempf, 2001; Moertl et al., 2002). This finding is especially critical when one considers

the complex nature of planning and the high potential for error. Specifically, by instructing articulation of key causes, goals, and resources and resource restrictions, rather than cognitive strategies, performance across a number of settings can be facilitated with ease. However, the appropriateness of these models varies based on individual difference variables.

Cognitive process training, on the other hand, is largely focused on forecasting and error management processes (Patalino and Seifert, 1997). Although this approach to improving performance remains popular as an instructional methodology, results from studies examining this method, in terms of incremental performance improvements, are in general, mixed to weak. Moreover, these research efforts indicate that training articulation of case content features may be more feasible in applied performance contexts than training improvements in cognitive processing. Therefore, it appears that content training represents a viable and promising alternative strategy for improving planning performance through training.

Practical Implications

Three significant practical implications may be extracted from this study, especially for those interested in improving planning in organizational settings. These practical inferences demonstrate the relevance of using content-based training to improve planning performance in organizational settings. Moreover, the current study illustrates that the most appropriate content-based training programs for improving planning performance may vary according to individual difference constructs and current stage of the planning process.

First and foremost, the current study illustrates the effectiveness of improving planning performance through administration of content-based training. Specifically, this research demonstrates that, in such settings, content-based training programs should be strongly considered as an alternative to cognitive process-based programs. Although this research did not directly test the effectiveness of content- versus cognitive process-based training programs, it illustrates some highly salient benefits of content-based training. First, implementing training programs based on improving individuals' ability to identify and articulate planning content is significantly easier to implement than implementing protocols based on improving forecasting or error management processing. Moreover, based on prior incremental performance improvement results from content- and process-based training programs (Moertl et al., 2002; Vandergrift, 2003), it appears that improved planning performance is significantly more likely following content-based training. Thus, trainers, managers, and other instructors interested in providing training to improve planning performance in organizational settings should consider content-based training protocols as a feasible and effective alternative to process-based training programs.

A second practical implication offered by the current study for trainers and other instructional design specialists bears on the impact of individual difference constructs on content-based training. In general, more intensive training is needed to improve the planning performance of individuals with fewer requisite skills. More specifically, results from the current research illustrate that individuals less proficient in planning or identifying deficiencies in existing plans require more intensive training than individuals more adept in planning efforts. Other results illustrate that the most appropriate content-based training program for improving planning performance varies by self-efficacy and

achievement motivation constructs. Thus, trainers and instructional design specialists may consider assessing requisite skill levels and individual difference constructs of trainees to determine the appropriate content-based training program.

Third, this research demonstrates a new avenue for improving planning performance in organizational settings throughout the planning process. Specifically, organizational trainers, instructional design specialists, and other instructors may use content-based training programs to facilitate development of effective plans prior to template plan generation by delivering conceptual instruction in planning concepts and processes and attending to identification and articulation of key causes. Likewise, following forecasting of template plan outcomes, plan revision may be facilitated through in-depth instruction on identifying and articulating key causes, key goals, and key resources and resource restrictions. Development of revised plans may be further enhanced during plan implementation through focused instruction on planning concepts and processes, as well on key causes, key goals, and key resources and resource restrictions. Finally, once plans have been implemented and significant marker events noted, development of contingencies may be facilitated by instruction in planning concepts and processes and focused training in articulating key causes and key goals to integrate contingencies with revised plan previously implemented.

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Table 1: Reliability Coefficients & Correlations for Planning Variables

	r_{tt}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Template Plan																														
1. Quality	.89	1.0	.69	.72	.40	.83	.75	.56	.87	.90	.61	.49	.47	.39	.59	.39	.54	.56	.53	.43	.42	.42	.41	.36	.41	.31	.38	.23	.37	.22
2. Originality	.85		1.0	.46	.07	.58	.60	.36	.63	.62	.42	.45	.24	.13	.44	.35	.40	.42	.42	.35	.28	.32	.23	.21	.32	.23	.28	.21	.23	.18
3. Realism	.74			1.0	.54	.74	.56	.54	.69	.74	.53	.41	.51	.39	.51	.42	.47	.52	.47	.25	.41	.31	.38	.30	.37	.31	.38	.18	.33	.18
4. Adaptability	.57				1.0	.44	.25	.35	.44	.39	.38	.16	.37	.37	.31	.20	.31	.36	.24	.12	.30	.27	.30	.23	.22	.19	.22	.09	.25	.12
5. Define Issues	.87					1.0	.60	.58	.89	.87	.58	.48	.52	.40	.58	.41	.57	.53	.50	.36	.39	.37	.38	.30	.36	.29	.34	.15	.34	.21
6. Direct Activities	.82						1.0	.66	.67	.72	.46	.40	.32	.24	.45	.30	.44	.49	.41	.33	.29	.29	.24	.17	.30	.17	.29	.27	.36	.20
7. Information Search	.88							1.0	.62	.61	.42	.36	.35	.30	.40	.28	.39	.40	.37	.30	.30	.30	.24	.29	.29	.17	.22	.12	.32	.20
8. Abstract Information	.88								1.0	.88	.63	.48	.50	.37	.61	.42	.59	.58	.57	.40	.49	.46	.44	.36	.48	.33	.40	.19	.38	.29
9. Comprehend Objectives	.85									1.0	.61	.51	.51	.39	.58	.41	.57	.57	.53	.35	.44	.42	.41	.35	.44	.30	.36	.19	.37	.22
Revised Plan																														
10. Quality	.86										1.0	.74	.76	.55	.86	.60	.85	.76	.80	.68	.61	.52	.54	.43	.54	.48	.54	.27	.48	.38
11. Originality	.78											1.0	.54	.30	.76	.61	.70	.63	.67	.56	.48	.56	.41	.18	.48	.36	.40	.25	.40	.35
12. Realism	.80												1.0	.62	.70	.46	.72	.65	.64	.44	.49	.39	.50	.34	.47	.35	.45	.21	.43	.35
13. Adaptability	.53													1.0	.45	.29	.54	.43	.51	.33	.34	.17	.33	.35	.29	.20	.28	.15	.30	.23
14. Articulate Key Actions	.88														1.0	.69	.84	.81	.79	.70	.56	.49	.52	.32	.53	.51	.55	.32	.52	.39
15. Acquire Resources	.75															1.0	.65	.60	.62	.47	.36	.39	.29	.14	.39	.34	.38	.24	.36	.30
16. Achieve Goals	.86																1.0	.78	.77	.64	.51	.47	.46	.35	.47	.40	.48	.32	.50	.33
17. Structure Activities	.80																	1.0	.73	.55	.52	.49	.48	.34	.51	.45	.49	.34	.51	.35
18. Minimize Errors	.80																		1.0	.56	.55	.48	.47	.40	.54	.45	.50	.26	.43	.32
19. Number of Components	.96																			1.0	.41	.33	.37	.29	.41	.44	.42	.26	.43	.39
Contingency Plan																														
20. Quality	.90																				1.0	.62	.83	.54	.84	.68	.74	.40	.70	.57
21. Originality	.84																					1.0	.45	.36	.59	.33	.36	.20	.55	.51
22. Realism	.82																						1.0	.61	.78	.73	.69	.30	.55	.41
23. Adaptability	.63																							1.0	.54	.45	.40	.14	.41	.29
24. Identified for Likely Errors	.88																								1.0	.72	.73	.42	.73	.56
25. Ease of Implementation	.71																									1.0	.78	.38	.56	.36
26. Integration with Revised Plan	.79																										1.0	.52	.65	.39
27. Implementation Markers	.92																											1.0	.47	.04
28. Integration of Contingencies	.78																												1.0	.60
29. Number of Contingencies	.97																													1.0

*NOTE: r ≥ .16 significant at .05 level

Table 2: Reliability Coefficients & Correlations for Planning Process Variables

	r_{tt}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Forecasting Process																			
1. Quality	.86	1.0	.64	.73	.47	.53	.75	.64	.63	.52	.58	.56	.51	.52	.43	.54	.54	.53	.41
2. Originality	.85		1.0	.39	.06	.84	.39	.51	.56	.54	.38	.50	.55	.37	.19	.45	.38	.48	.45
3. Realism	.75			1.0	.54	.25	.72	.48	.44	.31	.50	.50	.45	.50	.38	.50	.48	.47	.35
4. Adaptability	.64				1.0	.02	.54	.24	.26	.10	.35	.29	.18	.34	.39	.29	.30	.23	.19
5. Novelty of Outcomes	.83					1.0	.27	.48	.47	.48	.32	.42	.45	.29	.12	.40	.34	.43	.38
6. Criticality of Outcomes	.75						1.0	.41	.39	.24	.47	.50	.39	.48	.40	.51	.54	.46	.31
7. Number Positive Outcomes	.99							1.0	.65	.71	.72	.34	.34	.30	.23	.35	.27	.34	.47
8. Number Negative Outcomes	.99								1.0	.78	.64	.46	.44	.37	.35	.41	.33	.42	.52
9. Number Short-Term Outcomes	.93									1.0	.23	.34	.34	.25	.23	.27	.22	.31	.43
10. Number Long-Term Outcomes	.91										1.0	.34	.33	.32	.27	.38	.31	.35	.41
Error Management Process																			
11. Quality	.93											1.0	.75	.85	.67	.88	.83	.84	.69
12. Originality	.88												1.0	.58	.44	.65	.55	.79	.72
13. Realism	.83													1.0	.74	.84	.84	.67	.51
14. Adaptability	.77														1.0	.71	.69	.58	.47
15. Articulation of Likely Errors	.89															1.0	.84	.81	.63
16. Criticality of Errors	.88																1.0	.70	.52
17. Range of Errors	.93																	1.0	.76
18. Number of Errors	.99																		1.0

*NOTE: $r \geq .18$ significant at .05 level

Table 3: ANOVA Results for Controlling Non-Randomization

		F	df	p
Training Condition	Age	0.34	8, 176	0.95
	Gender	1.93	8, 176	0.07
	Classification	1.53	8, 176	0.15
	Major	1.22	8, 176	0.29
	Business Hours	1.55	8, 176	0.14
	Prior Business Experience	1.84	8, 176	0.07
	English First Language	1.26	8, 176	0.27
	Work Years	1.29	8, 176	0.25
	Supervisory Experience	0.89	8, 176	0.52
	Number Student Organizations	0.78	8, 174	0.62
	Hometown Population	0.76	8, 174	0.64
	ACT Score	0.25	8, 174	0.98
	SAT Score	1.02	8, 176	0.42
	GPA	0.49	8, 176	0.86
	Self-Efficacy	0.49	8, 175	0.87
	Verbal Intelligence	0.56	8, 174	0.81
	Performance Approach	0.92	8, 176	0.50
	Performance Avoid	0.22	8, 176	0.99
	Mastery	1.91	8, 176	0.09
	Divergent Thinking: Fluency	0.28	8, 175	0.97
	Divergent Thinking: Flexibility	1.02	8, 175	0.42
	Identifying Deficiencies	1.37	8, 176	0.21
	Planning Skills	1.82	8, 176	0.08

*NOTE: F = F ratio; df = Degrees of freedom; p = Significance level

Table 4: Univariate Results for Template Plan Median-Split MANCOVAs

Analysis	Effects	Significant Effects	F	df	p	η^2
Training*Planning Skills	Main Effects	Adaptability	3.10	8, 159	.003	.135
	Interactions	Realism	2.37	8, 159	.020	.106
		Framing Information Search	2.38	8, 159	.019	.107
Training*Verbal Intelligence	Main Effects	Adaptability	3.25	8, 157	.002	.142
	Interactions	Adaptability	2.13	8, 157	.036	.098
Training*Self-Efficacy	Main Effects	Adaptability	2.67	8, 158	.009	.119
	Interactions	Quality	2.28	8, 158	.025	.103
Training*Performance Approach Achievement Motivation	Main Effects	Adaptability	2.81	8, 159	.006	.124
	Interactions	Originality	2.59	8, 159	.011	.115
Training*Performance Avoid Achievement Motivation	Main Effects	Adaptability	3.22	8, 156	.002	.142
	Interactions	Originality	2.11	8, 156	.038	.097
		Directing Planning Activities	2.37	8, 156	.020	.108

*NOTE: F = F ratio; df = Degrees of freedom; p = Significance level; η^2 = Effect size (Eta squared)

Table 5: Univariate Results for Revised Plan Median-Split MANCOVAs

Analysis	Effects	Significant Effects	F	df	p	η^2
Training*Identifying Deficiencies	Interactions	Acquisition of Resources	2.04	8, 155	.045	.095
Training*Self-Efficacy	Main Effects	Articulation of Key Actions	2.00	8, 153	.050	.095
	Interactions	Quality	2.20	8, 153	.030	.103
		Originality	2.65	8, 153	.010	.122
		Acquisition of Resources	2.29	8, 153	.024	.107
		Achieving Goals & Objectives	2.37	8, 153	.020	.110
		Structuring of Activities	2.22	8, 153	.029	.104
		Proactive Minimization of Errors	2.12	8, 153	.037	.100
Training*Mastery Achievement Motivation	Interactions	Originality	2.43	8, 154	.017	.112
Training*Performance Avoid Achievement Motivation	Main Effects	Quality	2.90	8, 151	.005	.133
		Articulation of Key Actions	2.04	8, 151	.046	.097
		Structuring of Activities	2.69	8, 151	.009	.125
	Interactions	Articulation of Key Actions	2.01	8, 151	.048	.096
Training*Divergent Thinking Flexibility	Interactions	Structuring of Activities	2.92	8, 154	.005	.132
		Number of Plan Components	2.25	8, 154	.027	.104

*NOTE: F = F ratio; df = Degrees of freedom; p = Significance level; η^2 = Effect size (Eta squared)

Table 6: Univariate Results for Contingency Plan Median-Split MANCOVAs

Analysis	Effects	Significant Effects	F	df	p	η^2
Training*Identifying Deficiencies	Main Effects	Realism	2.64	8, 141	.010	.130
		Ease of Implementation with Revised Plan	2.48	8, 141	.015	.123
		Integration of Contingencies with Revised Plan	2.35	8, 141	.021	.118
		Number of Contingencies	2.17	8, 141	.033	.110
	Interactions	Integration of Contingencies	2.18	8, 141	.033	.110
Training*Performance Approach Achievement Motivation	Main Effects	Realism	2.71	8, 143	.008	.131
		Ease of Implementation with Revised Plan	3.14	8, 143	.003	.149
		Integration of Contingencies with Revised Plan	2.76	8, 143	.007	.134
		Number of Contingencies	2.00	8, 143	.050	.101
	Interactions	Number of Contingencies	2.07	8, 143	.042	.104
Training*Performance Avoid Achievement Motivation	Main Effects	Quality	2.06	8, 144	.044	.103
		Realism	3.03	8, 144	.004	.144
		Ease of Implementation with Revised Plan	3.42	8, 144	.001	.160
		Integration of Contingencies with Revised Plan	3.04	8, 144	.003	.144
	Interactions	Contingencies Identified for Likely Errors	2.04	8, 144	.045	.102

*NOTE: F = F ratio; df = Degrees of freedom; p = Significance level; η^2 = Effect size (Eta squared)

Table 7: Univariate Results for Contingency Plan Cognitive Process MANCOVAs

Analysis	Effects	Significant Effects	F	df	p	η^2
Training*Forecasting Performance	Main Effects	Realism	2.47	8, 143	.015	.122
		Ease of Implementation with Revised Plan	2.59	8, 143	.011	.126
		Integration of Contingencies with Revised Plan	2.86	8, 143	.006	.138
		Number of Contingencies	2.33	8, 143	.022	.115
	Interactions	Number of Contingencies	2.32	8, 143	.023	.115
Training*Error Management Performance	Interactions	Number of Contingencies	2.47	8, 142	.016	.122

*NOTE: F = F ratio; df = Degrees of freedom; p = Significance level; η^2 = Effect size (Eta squared)

Figure 1. Mumford, Schultz & Osburn (2002) Planning Model

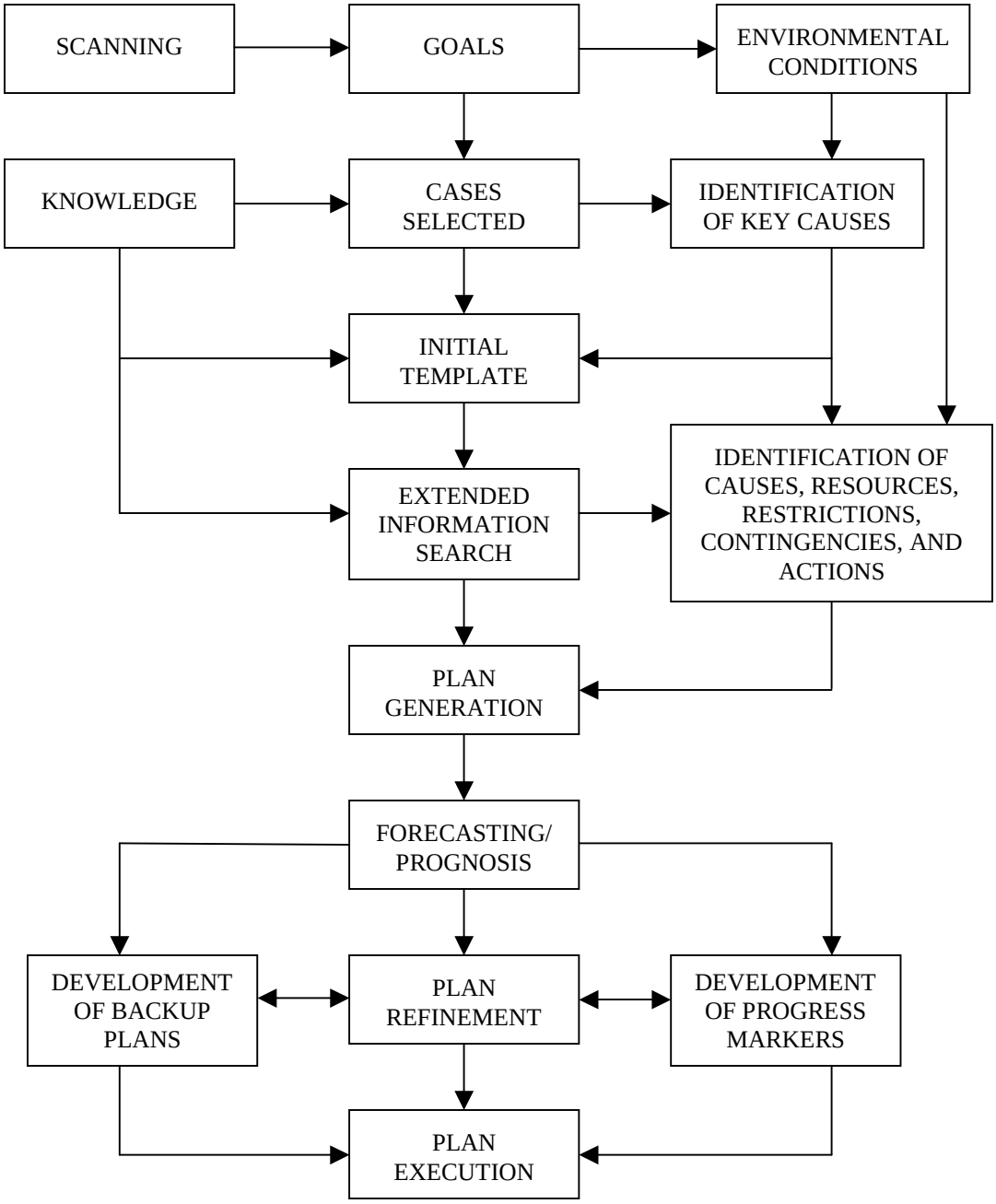

Figure 2. Knowledge Test Used in Training

Below are a few short, multiple-choice questions about the information you just read. Please read each question carefully and respond with the one answer you feel is most appropriate.

1. Planning is:
    a. Not at all important to performance
    b. Something only large groups and organizations do
    c. Mental simulation of future actions
    d. An uncoordinated method for doing something
    e. How anal retentive people do things

2. Planning is important because:
    a. It makes us feel better about ourselves
    b. People who plan perform better than people who do not plan
    c. Even bad plans result in good performance
    d. Planning is *not* important to performance
    e. It leads to less successful results for businesses

3. Planning as a sequence of activities occurs according to the sequence:
    a. Select past cases, refine plan, forecast outcomes of initial plan, identify goals, scan the environment, generate initial plan, execute plan
    b. Execute plan, identify goals, refine plan, scan the environment, forecast outcomes of initial plan, select past cases, generate initial plan
    c. Generate initial plan, refine plan, identify goals, select past cases, scan the environment, forecast outcomes of initial plan, execute plan
    d. Identify goals, scan the environment, select past cases, generate initial plan, forecast outcomes of initial plan, refine plan, execute plan
    e. Execute plan, refine plan, forecast outcomes of initial plan, generate initial plan, select past cases, scan the environment, identify goals

4. Similar past experiences provide which of the following for current plans?
    a. A starting point for developing a plan to obtain goals
    b. An initial idea of the information that will need to be gathered
    c. Necessary actions that will need to take place in order for a plan to attain goals
    d. Key causal events that must occur in order for a plan to be successful
    e. All of the above

5. Forecasting the outcomes of initial plans is important because it helps to:
    a. Identify alternative actions that might obtain goals
    b. Organize planning actions into an event sequence
    c. Specify potential problems that may occur in plan execution
    d. Prepare backup plans to effectively deal with problems
    e. All of the above

Figure 3. Knowledge Test Answer Key

Below are a few short, multiple-choice questions about the information you just read. Please read each question carefully and respond with the one answer you feel is most appropriate.

1. Planning is:
    a. Not at all important to performance
    b. Something only large groups and organizations do
    c. Mental simulation of future actions (This answer is correct because planning is thinking through the things you will have to do before taking actions in order to accomplish a goal. This involves coming up with a series of actions and putting them in proper order, organizing your effort, and make the most of opportunities to reach important goals.)
    d. An uncoordinated method for doing something
    e. How anal retentive people do things

2. Planning is important because:
    a. It makes us feel better about ourselves
    b. People who plan perform better than people who do not plan (This answer is correct because planning represents a significant influence on "bottom line" performance of real-world organizations in financial outcomes, future growth, profitability, and new business ventures.)
    c. Even bad plans result in good performance
    d. Planning is *not* important to performance
    e. It leads to less successful results for businesses

3. Planning as a sequence of activities occurs according to the sequence:
    a. Select past cases, refine plan, forecast outcomes of initial plan, identify goals, scan the environment, generate initial plan, execute plan
    b. Execute plan, identify goals, refine plan, scan the environment, forecast outcomes of initial plan, select past cases, generate initial plan
    c. Generate initial plan, refine plan, identify goals, select past cases, scan the environment, forecast outcomes of initial plan, execute plan
    d. Identify goals, scan the environment, select past cases, generate initial plan, forecast outcomes of initial plan, refine plan, execute plan (This answer is correct because planning involves a series of steps continuously examining the environment for possible things that could be done to reach important goals. This answer is the only response option that allows a planner to do this in order.)
    e. Execute plan, refine plan, forecast outcomes of initial plan, generate initial plan, select past cases, scan the environment, identify goals

4. Similar past experiences provide which of the following for current plans?
    a. A starting point for developing a plan to obtain goals
    b. An initial idea of the information that will need to be gathered
    c. Necessary actions that will need to take place in order for a plan to attain goals
    d. Key causal events that must occur in order for a plan to be successful
    e. All of the above (This answer is correct because selecting episodes from the past that are similar to a current situation is important because past experiences provide a starting point for developing a plan to help reach goals, an initial idea of the information you will need to gather and the necessary actions you will need to complete in order for a plan to reach its goals, and the actions that must be taken to bring about success.)

5. Forecasting the outcomes of initial plans is important because it helps to:
    a. Identify alternative actions that might obtain goals
    b. Organize planning actions into an event sequence
    c. Specify potential problems that may occur in plan execution
    d. Prepare backup plans to effectively deal with problems
    e. All of the above (This answer is correct because forecasting results of plans can be useful in identifying possible alternatives that might also reach goals, organizing planning steps into an event sequence, specifying potential problems that may occur when you actually complete steps, preparing backup plans to solve these problems, and for gathering other useful information.)

Figure 4. Basic Planning Familiarization Excerpt

What is planning?

In the complex world we live in, people sometimes have to coordinate many activities in order to successfully complete important tasks. In other words, people must often plan in advance for an event to be successful. Individuals, groups of people, and even entire organizations take on these planning activities. For example, organizations have to plan their responses to the actions of their competitors. An example of this might be Coca-Cola planning the introduction of Diet Coke with Lemon to compete with Pepsi's similar product, Pepsi Twist. Groups often plan how large projects will be divided among group members. A typical example of this would be a group splitting up work that had to be done to complete a group assignment for a class. Finally, individuals typically plan how they divide their time to address multiple activities.

In these situations, *planning is the mental simulation of future actions*. To put it another way, planning is thinking through the things you will have to do before taking actions in order to accomplish a goal. Planning involves coming up with a series of actions and putting them in proper order, organizing your effort, and make the most of opportunities to reach important goals. From the following two examples, you can easily see that planning can be very important to performance.

- *EXAMPLE 1 (SKI TRIP): Suppose you will be going on a ski trip this winter break. In order to plan for this event, you would have to think through all the things you would have to do before leaving for the trip (e.g., decide on a ski resort, find friends who want to go, book plane tickets or make driving arrangements, find hotel or lodging accommodations, make arrangements to rent ski equipment, buy lift tickets), put those things in the most appropriate order to organize your efforts, and actually complete each of those steps before leaving for your trip. If you did these things, you would most likely reach your goal of having a great vacation with no big problems. However, if you did not complete all of these steps, your vacation might become a complete nightmare! For instance, if you completed all of the above steps except to reserve a hotel or ski lodge, then you might get all the way to your ski resort only to find out that you had nowhere to stay!*

- *EXAMPLE 2 (HOMECOMING): As another example, suppose a campus organization you belong to will be participating in this year's homecoming festivities. In order to plan for this event to be a success, you would have to think through the events you would want to participate in and what would be needed for each event (e.g., window painting, sidewalk chalking, homecoming float, walkabout skit, blood drive, charity activities), put those events in order to make your efforts more efficient, and participate in each of those events during homecoming week. If you did all these things, your homecoming experience would be successful. However, if you did not complete all of these steps, your homecoming experience might be miserable! For instance, if you completed all of the above steps except building a homecoming float, then you might find out too late that your organization could not receive enough points during homecoming to actually win any of the events!*

Figure 5. Key Causes Training Excerpt

Why are key causes important to planning?

In planning situations, defining and paying careful attention to the key causes of a situation allows you to outline, define, and weigh a problem's central parts and primary operators. By doing so, you are able to detail your plan to successfully address these causes on your way to reaching the important goals of your plan. In fact, people who pay attention to the key causes of a problem tend to define those problems in more exact terms than do people whom either ignore or do not carefully consider a problem's key causes. As a result of this more precise definition of problems, the former individuals develop a better and more complete understanding of the problem. This improved understanding of the problem, in turn, leads to higher quality planning and more useful solutions to those problems.

- *EXAMPLE 1 (SKI TRIP): From last year's ski trip, you recall that a key cause of your success in buying lift tickets was your advanced purchase. However, you also remember that a key cause of your problem renting equipment involved your failure to make the same type of advanced purchase. Therefore, a key cause you can use to make this year's trip a success involves advanced purchasing of both lift tickets and equipment rental. This identification of the key causes influencing the success of your vacation allows you to clearly define what you need to do while planning for this year's ski trip in order to make it a success. As a result of defining your planning needs in these specific and detailed terms, you have a better and more complete understanding of the problem you experienced last year, what caused that problem, and how to avoid it through your planning efforts for this year's ski trip.*

- *EXAMPLE 2 (HOMECOMING): Recall that from last year's homecoming, building a homecoming float earned your campus organization a number of points towards winning homecoming week. However, your decision not to participate in any homecoming events except the homecoming float cost you too many points to actually win homecoming week. From this past experience, you know that key causes of your organization's success and problems last year were participation in the homecoming float contest and the choice not to participate in any other events, respectively. This identification of the key causes impacting your organization's homecoming experience allows your group to clearly outline each of the events that you will need to participate in during this year's homecoming to win the overall contest. From this specific and detailed outline of the causes your organization must address during this year's homecoming, you gain a more complete understanding of what caused you to experienced mixed success and failure last year, and how to make this year's homecoming a complete success though your more precise planning efforts.*

Figure 6. Key Goals Training Excerpt

What do I gain in planning performance by paying attention to key goals?

Just as ignoring a problem's key goals leads to plans that do not accomplish them, paying careful attention to a problem's most important goals leads to plans that precisely focus on the critical goals to accomplish through planning efforts. If you attend to the most important goals of a situation, you are led to develop well-formulated plans that focus on reaching important outcomes and removing restrictions and obstacles on reaching those goals. Thus, when you pay careful attention to a problem's key goals, you gain a clear understanding of the problem, develop a plan to obtain the problem's most critical outcomes, and are better able to remove or work around the problem's obstacles and restrictions on reaching those goals.

- *EXAMPLE 1 (SKI TRIP): Just as this year's ski trip might be unsuccessful because of your failure to pay attention to your goal of having a successful and safe ski trip, consider how this year's ski trip might go if you carefully pay attention to this critical goal for your winter vacation. You remember that your trip was made more successful last year because of your advanced reservation of lift tickets. Therefore, one action step that you can use to make this year's trip a success would involve making advanced reservations of <u>both</u> ski equipment and lift tickets. Most likely, if you keep in mind your goal of having a safe and successful winter break ski vacation, then you could take actions while planning this year's ski trip to make sure that you made progress towards this goal while removing or working around potential obstacles to this goal. Specifically, you could make advanced reservations, grab your ski equipment and lift tickets as soon as you arrive, and spend your first day of vacation actually skiing instead of standing in line.*

- *EXAMPLE 2 (HOMECOMING): Now, consider how this year's homecoming week might go for your campus organization if you paid careful attention to the critical goal of winning homecoming week. Recall that from last year's homecoming that your decision to participate in the homecoming float contest earned you several points towards winning homecoming. Most likely, if you remembered the fact that you earned a lot of points from the homecoming float, but did not win homecoming week last year, then your campus group could organize a series of planning steps to execute while planning this year's homecoming week activities to make sure that you participated in enough events to win homecoming! In detail, your campus organization could plan to build a winning homecoming float and send members to participate in all the other homecoming activities so that, at the end of homecoming week, your organization might have enough points to win homecoming week!*

Figure 7. Key Resources & Restrictions Training Excerpt

What, specifically, is involved with examining key resources and restrictions in planning?

Most problems in today's world require using many different types of resources in order to solve a situation through planning. In planning to solve problems, you may need to use various people, time, materials, money, and other resources. In addition, several restrictions may constrain your use of these resources in obtaining goals. Finally, in any situation, some resources may be more important to address than others. Because of this, more is involved in determining a situation's key resources and restrictions than simply identifying the one item that will magically solve the problem and reach planning goals. Instead, in examining a problem's *key*, or most important, resources and restrictions, you must know what to look for as potential resources, make choices about which resources you will need and which ones you won't, and find information you need about how to remove any restrictions or constraints on your use of these important resources.

- *EXAMPLE 1 (SKI TRIP): Consider the winter break ski trip plans we've discussed. You can easily recall from planning last year's ski trip that many different types of resources were needed to transform your initial plans into your actual vacation. These resources included travel companions, time to make reservations for travel, lodging, ski equipment, and lift tickets, plane tickets, ski equipment, lift tickets, phone numbers and addresses of your ski resort and hotel, and spending money for your stay. In addition, you recall that multiple restrictions such as the costs involved, overbooked flights, lack of reservations for ski equipment, and insufficient spending money impacted your trip as well. More importantly, you can clearly see that some of these resources and restrictions are more important than others in planning for this year's winter break vacation. As this example shows, determining the key resources and restrictions for this year's trip involves determining potential resources, figuring out which resources you will need, and figuring out how to remove restrictions and limitations on those resources.*

- *EXAMPLE 2 (HOMECOMING): As another example of finding potential key resources, consider your campus organization's plans for this year's homecoming week contest. Recall that last year you needed resources such as the trailer to build the homecoming float on, lumber, chicken wire, tissue paper, spray glue, money, members of your organization, and time. Also recall that your organization encountered restrictions including lumber shortages, insufficient member participation due to illness, time shortages, and money problems. Clearly, some of the resources listed here are more important than others for making this year's homecoming week plans a success. Likewise, a few of the restrictions given above are more important to work around than others in reaching your organization's goals for this year's homecoming. This example illustrates that determining the key resources your group will need for this year's homecoming week involves identifying a number of potential resources, determining which of those resources you most need, and removing constraints and limitations on the use of those resources.*

Figure 8. Multiple-Choice Training Review Test

After reading the following short scenario carefully, please read each question carefully and respond with the one answer you feel is most appropriate.

You are making plans to go on a winter break ski trip. You have several things that you would like to accomplish during this trip. You'd like to have a safe and successful ski trip, ski down a double black diamond slope, ski through the trees, use the ski jump, try out snowboarding for a day, and teach your friends how to steer and stop by turning their hips instead of using the wedge technique. Based on those hopes, you start to plan for your trip.

1. Various potential key goals for this problem could include:
    a. Have a safe and successful ski trip
    b. Ski down a double black diamond slope
    c. Use the ski jump
    d. Ski through the woods
    e. All of the above

2. The single *most* critical and operable goal to reach in this situation is:
    a. Ski down a double black diamond slope
    b. Have a safe and successful ski trip
    c. Use the ski jump
    d. Ski through the woods
    e. Teach your friends how to steer and stop with their hips

3. The restrictions to reaching these critical and operable goals in this situation include:
    a. The resort you choose to stay at
    b. The lift tickets you arrange to purchase
    c. The hours of operation of the ski jump
    d. The flight reservations you've made to travel to and from your resort
    e. The equipment (e.g., skis, ski poles, ski helmet) you reserved

4. How might your planning efforts be affected if you ignored the critical and operable goals in this scenario, as well as the restrictions on reaching them?
    a. Your plans for your ski trip would be well-focused and able to meet all goals
    b. Your planning efforts for ski trip would be efficient and effective
    c. You will have a better understanding of the situation and
    d. You will develop poor plans based on a poor understanding of the situation that do not reach goals
    e. You will be able to have a safe and successful ski trip

5. How might your planning efforts be affected if you paid careful attention to the critical and operable goals in this scenario, as well as the restrictions on reaching them?
    a. You will develop a plan that focuses on goals and removing restrictions and obstacles
    b. You will develop poor plans based on a poor understanding of the situation that do not reach goals
    c. You will create more problems for your plan than solutions
    d. You will most likely not be able to accomplish any of the goals for your ski trip
    e. You will not be able to remove or work around obstacles that get in your way

Figure 9. Case Analysis Exercise Used in Key Causes Training

In recent years in New York City, the problem of subway graffiti has become more severe. Random scratching of names on transit property has blossomed into a subculture of young people emblazoning entire subway cars and trains with murals, obscuring windows, doors and maps. Getting one's work on trains and having it seen citywide is the motivation behind graffiti. The drive for recognition is strong and the penalties for getting caught are trivial.

Some see this work as colorful folk art. Others, however, see the graffiti as criminal defacement of public property that creates a climate of fear in the city's transit system. Some even argue that subway riders connect the visual assault of graffiti and serious crimes of robbery, rape, assault and murder. In fact, a connection has been made between a youthful graffiti and adult criminal behavior. Studies conducted by the NYCTA Police indicate that 40% of those arrested for writing graffiti move on to commit robberies and burglaries. Riders also associate graffiti with shattered glass, broken doors and vandalized maps that diminish the quality of public transportation. Perhaps most compelling, the graffiti can be construed as evidence that authorities cannot control the environment against offenders. Increased fear of the subway results in diminished ridership, which leads to increased danger to those riders who travel during off-peak hours. The city is now making plans to deal with this problem.

1. What is the purpose of planning in this scenario (e.g., what is the problem?)?

2. What are the key causes of this problem?

3. What are the most critical key causes involved with this problem?

4. Which key causes from this situation may actually be controlled?

5. How would attention to the critical (#3) and controllable (#4) key causes from this situation benefit planning efforts?

6. How would ignoring the critical (#3) and controllable (#4) key causes from this situation harm planning efforts?

Figure 10. Feedback for Case Analysis Exercise

In reading through each case exercise, you can use a wide variety of approaches to address the situation's key causes through planning. These general approaches may be effective or ineffective. As these case analysis exercises are open-ended, your responses may not exactly match those given below. However, your approach to addressing each case analysis should follow the strategy and features outlined here:

Good Strategy

- ✓ **Determine why planning is needed in the case**
  - *Planning is needed in case 1 to resolve the problem of subway graffiti that has created a climate of fear, become associated with serious crime, and decreased the quality of public transportation*

- ✓ **Develop a list of potential causes**
  - *Subculture of young people encouraging defacement of transit property*
  - *Perception of subway graffiti as folk art*
  - *Low subway ridership*
  - *Adult crime*
  - *Drive for public recognition*
  - *Minimal penalties for being caught defacing transit property*
  - *Fear of public transportation*
  - *Lack of control of problem by authorities*

- ✓ **Figure out which causes are most critical**
  - *Subculture of young people encouraging defacement of transit property*
  - *Minimal penalties for being caught defacing transit property*
  - *Lack of control of problem by authorities*

- ✓ **Figure out which causes may be controlled by planning**
  - *Minimal penalties for being caught defacing transit property*
  - *Lack of control of problem by authorities*

- ✓ **Figure out possible effects of addressing those causes on planning**
  - *Decrease fearful perceptions of public transportation*
  - *Decrease association between public transportation and crime*
  - *Increase quality of public transportation*

- ✓ **Figure out possible effects of ignoring those causes on planning**
  - *Continued increase in fear of public transportation*
  - *Increased association between public transportation and crime*
  - *Further decrease quality of public transportation*

Appendix A: Means and Standard Deviations for Significant Effects

Template Plan Task Performance Findings: Main Effects

Template Plan Adaptability	Training Condition	Mean	Standard Deviation
	No training	3.32	0.35
	Basic plan familiarization	3.35	0.45
	Key causes training	3.40	0.38
	Key goals training	3.07	0.32
	Key resources & restrictions training	3.15	0.44
	Key causes & key goals training	3.07	0.34
	Key causes & key resources training	3.09	0.49
	Key goals & key resources training	3.08	0.52
	Key causes, key goals & key resources training	3.23	0.51

Template Plan Task Performance Findings: Individual Difference Variable Interactions

Template Plan Realism	Training Condition	Planning Skills Median	Mean	Standard Deviation
	No training	Low	3.14	0.54
		High	3.44	0.37
		Total	3.33	0.45
	Basic plan familiarization	Low	3.24	0.69
		High	3.36	0.57
		Total	3.32	0.60
	Key causes training	Low	2.93	0.41
		High	3.47	0.32
		Total	3.20	0.45
	Key goals training	Low	3.10	0.35
		High	3.13	0.32
		Total	3.12	0.33
	Key resources & restrictions training	Low	3.03	0.64
		High	3.33	0.42
		Total	3.19	0.54
	Key causes & key goals training	Low	3.09	0.26
		High	3.42	0.24
		Total	3.23	0.30
	Key causes & key resources training	Low	3.26	0.62
		High	2.93	0.47
		Total	3.09	0.55
	Key goals & key resources training	Low	2.93	0.70
		High	3.67	0.24
		Total	3.12	0.69
	Key causes, key goals & key resources training	Low	3.38	0.47
		High	2.83	0.64
		Total	3.27	0.54

Template Plan Framing Information Search	Training Condition	Planning Skills Median	Mean	Standard Deviation
	No training	Low	2.38	0.68
		High	2.72	0.73
		Total	2.60	0.71
	Basic plan familiarization	Low	3.05	0.76
		High	2.85	0.78
		Total	2.92	0.76
	Key causes training	Low	2.23	0.96
		High	3.17	0.74
		Total	2.70	0.96
	Key goals training	Low	2.53	0.45
		High	2.57	0.86
		Total	2.55	0.67
	Key resources & restrictions training	Low	2.77	0.85
		High	2.61	1.00
		Total	2.68	0.91
	Key causes & key goals training	Low	1.97	0.57
		High	2.79	0.69
		Total	2.32	0.73
	Key causes & key resources training	Low	3.30	1.17
		High	2.40	0.99
		Total	2.82	1.15
	Key goals & key resources training	Low	2.11	0.70
		High	3.13	1.39
		Total	2.37	0.98
	Key causes, key goals & key resources training	Low	2.88	1.17
		High	2.33	0.72
		Total	2.77	1.10

Template Plan Adaptability	Training Condition	Verbal Intelligence Median	Mean	Standard Deviation
	No training	Low	3.37	0.31
		High	3.27	0.39
		Total	3.32	0.35
	Basic plan familiarization	Low	3.13	0.42
		High	3.57	0.39
		Total	3.35	0.45
	Key causes training	Low	3.30	0.33
		High	3.41	0.32
		Total	3.35	0.32
	Key goals training	Low	3.04	0.26
		High	3.09	0.37
		Total	3.07	0.32
	Key resources & restrictions training	Low	3.30	0.46
		High	2.93	0.31
		Total	3.12	0.42
	Key causes & key goals training	Low	3.17	0.25
		High	3.00	0.39
		Total	3.07	0.34
	Key causes & key resources training	Low	3.19	0.46
		High	2.90	0.53
		Total	3.09	0.49
	Key goals & key resources training	Low	3.05	0.49
		High	3.17	0.62
		Total	3.08	0.52
	Key causes, key goals & key resources training	Low	3.37	0.35
		High	3.12	0.60
		Total	3.23	0.51

Template Plan Quality	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	3.41	0.83
		High	3.03	0.60
		Total	3.20	0.72
	Basic plan familiarization	Low	3.23	0.64
		High	3.29	0.87
		Total	3.25	0.71
	Key causes training	Low	2.82	0.69
		High	2.93	0.80
		Total	2.87	0.72
	Key goals training	Low	2.69	0.66
		High	3.29	0.68
		Total	2.93	0.71
	Key resources & restrictions training	Low	3.24	0.79
		High	2.93	0.74
		Total	3.10	0.77
	Key causes & key goals training	Low	2.97	0.60
		High	3.15	0.67
		Total	3.05	0.62
	Key causes & key resources training	Low	2.50	0.59
		High	3.30	0.57
		Total	2.96	0.69
	Key goals & key resources training	Low	2.95	0.78
		High	2.48	0.57
		Total	2.78	0.74
	Key causes, key goals & key resources training	Low	2.94	0.84
		High	3.70	0.51
		Total	3.28	0.80

Template Plan Originality	Training Condition	Performance Approach Median	Mean	Standard Deviation
	No training	Low	2.67	0.77
		High	3.31	0.66
		Total	3.08	0.75
	Basic plan familiarization	Low	3.29	0.76
		High	2.72	0.53
		Total	3.12	0.74
	Key causes training	Low	3.00	0.68
		High	2.67	0.67
		Total	2.87	0.68
	Key goals training	Low	2.52	0.64
		High	3.26	0.72
		Total	2.85	0.76
	Key resources & restrictions training	Low	3.06	0.69
		High	3.19	0.65
		Total	3.11	0.66
	Key causes & key goals training	Low	3.06	0.60
		High	3.05	0.52
		Total	3.05	0.56
	Key causes & key resources training	Low	2.83	0.88
		High	3.33	0.54
		Total	3.02	0.80
	Key goals & key resources training	Low	3.30	0.55
		High	2.63	0.71
		Total	2.97	0.71
	Key causes, key goals & key resources training	Low	3.13	0.71
		High	3.14	0.66
		Total	3.13	0.66

Template Plan Originality	Training Condition	Performance Avoid Median	Mean	Standard Deviation
	No training	Low	3.20	0.74
		High	3.07	0.74
		Total	3.14	0.72
	Basic plan familiarization	Low	3.20	0.83
		High	3.03	0.66
		Total	3.12	0.74
	Key causes training	Low	3.07	0.58
		High	2.67	0.74
		Total	2.87	0.68
	Key goals training	Low	2.57	0.72
		High	3.22	0.71
		Total	2.88	0.77
	Key resources & restrictions training	Low	3.02	0.65
		High	3.33	0.70
		Total	3.11	0.66
	Key causes & key goals training	Low	2.96	0.68
		High	3.12	0.48
		Total	3.05	0.56
	Key causes & key resources training	Low	3.06	0.99
		High	2.95	0.30
		Total	3.02	0.80
	Key goals & key resources training	Low	3.42	0.56
		High	2.67	0.65
		Total	2.97	0.71
	Key causes, key goals & key resources training	Low	3.37	0.62
		High	2.90	0.65
		Total	3.13	0.66

Template Plan Directing Activities	Training Condition	Performance Avoid Median	Mean	Standard Deviation
	No training	Low	3.07	0.93
		High	2.48	0.63
		Total	2.79	0.83
	Basic plan familiarization	Low	3.30	0.51
		High	2.93	0.77
		Total	3.12	0.66
	Key causes training	Low	3.00	0.83
		High	2.67	1.05
		Total	2.83	0.94
	Key goals training	Low	2.57	0.45
		High	3.00	0.93
		Total	2.77	0.73
	Key resources & restrictions training	Low	3.07	0.78
		High	3.44	1.00
		Total	3.17	0.84
	Key causes & key goals training	Low	2.83	0.85
		High	2.73	0.68
		Total	2.77	0.74
	Key causes & key resources training	Low	3.11	0.86
		High	2.62	0.49
		Total	2.93	0.77
	Key goals & key resources training	Low	3.25	0.83
		High	2.19	0.46
		Total	2.62	0.81
	Key causes, key goals & key resources training	Low	3.53	0.95
		High	2.77	0.77
		Total	3.15	0.93

Revised Plan Task Performance Findings: Main Effects

Revised Plan Quality	Training Condition	Mean	Standard Deviation
	No training	3.18	0.55
	Basic plan familiarization	3.05	0.71
	Key causes training	3.00	0.69
	Key goals training	3.12	0.77
	Key resources & restrictions training	2.92	0.73
	Key causes & key goals training	2.83	0.75
	Key causes & key resources training	2.75	0.78
	Key goals & key resources training	2.89	0.75
	Key causes, key goals & key resources training	3.44	0.75

Revised Plan Adaptability	Training Condition	Mean	Standard Deviation
	No training	3.13	0.37
	Basic plan familiarization	3.03	0.40
	Key causes training	3.00	0.31
	Key goals training	2.88	0.60
	Key resources & restrictions training	2.95	0.57
	Key causes & key goals training	2.93	0.39
	Key causes & key resources training	3.09	0.47
	Key goals & key resources training	2.91	0.58
	Key causes, key goals & key resources training	3.15	0.40

Revised Plan Articulation of Key Actions	Training Condition	Mean	Standard Deviation
	No training	3.13	0.66
	Basic plan familiarization	3.23	0.64
	Key causes training	3.09	0.74
	Key goals training	3.20	0.78
	Key resources & restrictions training	3.00	0.88
	Key causes & key goals training	2.83	0.89
	Key causes & key resources training	2.67	0.97
	Key goals & key resources training	2.84	0.80
	Key causes, key goals & key resources training	3.24	0.81

Revised Plan Task Performance Findings: Individual Difference Variable Interactions

Revised Plan Acquisition of Resources	Training Condition	Identifying Deficiencies Median	Mean	Standard Deviation
	No training	Low	2.30	0.65
		High	2.33	0.60
		Total	2.32	0.61
	Basic plan familiarization	Low	2.67	0.83
		High	2.22	0.80
		Total	2.47	0.83
	Key causes training	Low	2.37	0.69
		High	2.11	0.60
		Total	2.25	0.65
	Key goals training	Low	2.38	0.55
		High	2.33	0.63
		Total	2.37	0.56
	Key resources & restrictions training	Low	2.39	0.87
		High	1.83	0.43
		Total	2.29	0.83
	Key causes & key goals training	Low	1.92	0.90
		High	2.63	0.71
		Total	2.31	0.86
	Key causes & key resources training	Low	1.85	0.35
		High	2.50	1.21
		Total	2.12	0.86
	Key goals & key resources training	Low	1.91	0.76
		High	2.75	0.83
		Total	2.26	0.88
	Key causes, key goals & key resources training	Low	2.26	0.57
		High	2.67	0.58
		Total	2.46	0.60

Revised Plan Quality	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	3.15	0.60
		High	3.21	0.52
		Total	3.18	0.55
	Basic plan familiarization	Low	3.00	0.73
		High	3.14	0.72
		Total	3.05	0.71
	Key causes training	Low	2.70	0.67
		High	3.33	0.58
		Total	3.00	0.69
	Key goals training	Low	2.86	0.74
		High	3.50	0.67
		Total	3.12	0.77
	Key resources & restrictions training	Low	3.24	0.40
		High	2.52	0.87
		Total	2.92	0.73
	Key causes & key goals training	Low	2.80	0.69
		High	2.88	0.87
		Total	2.83	0.75
	Key causes & key resources training	Low	2.41	0.49
		High	3.07	0.87
		Total	2.75	0.78
	Key goals & key resources training	Low	2.83	0.61
		High	3.00	0.98
		Total	2.89	0.75
	Key causes, key goals & key resources training	Low	3.37	0.88
		High	3.54	0.59
		Total	3.44	0.75

Revised Plan Originality	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	3.07	0.57
		High	3.36	0.53
		Total	3.23	0.55
	Basic plan familiarization	Low	3.26	0.71
		High	3.29	0.65
		Total	3.27	0.67
	Key causes training	Low	2.90	0.79
		High	3.37	0.54
		Total	3.12	0.70
	Key goals training	Low	3.11	0.62
		High	3.42	0.71
		Total	3.23	0.66
	Key resources & restrictions training	Low	3.36	0.57
		High	2.85	0.90
		Total	3.13	0.76
	Key causes & key goals training	Low	3.07	0.68
		High	3.17	0.96
		Total	3.11	0.79
	Key causes & key resources training	Low	2.44	0.58
		High	3.20	0.92
		Total	2.84	0.85
	Key goals & key resources training	Low	3.00	0.53
		High	2.95	0.40
		Total	2.98	0.48
	Key causes, key goals & key resources training	Low	3.40	0.66
		High	3.17	0.47
		Total	3.30	0.58

Revised Plan Acquisition of Resources	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	2.22	0.69
		High	2.39	0.55
		Total	2.32	0.61
	Basic plan familiarization	Low	2.56	0.88
		High	2.29	0.76
		Total	2.47	0.83
	Key causes training	Low	2.03	0.71
		High	2.48	0.50
		Total	2.25	0.65
	Key goals training	Low	2.50	0.54
		High	2.17	0.56
		Total	2.37	0.56
	Key resources & restrictions training	Low	2.39	0.98
		High	2.19	0.69
		Total	2.30	0.84
	Key causes & key goals training	Low	2.30	0.84
		High	2.33	0.94
		Total	2.31	0.86
	Key causes & key resources training	Low	1.70	0.31
		High	2.50	1.03
		Total	2.12	0.86
	Key goals & key resources training	Low	2.33	0.92
		High	2.14	0.86
		Total	2.26	0.88
	Key causes, key goals & key resources training	Low	2.53	0.57
		High	2.38	0.65
		Total	2.46	0.60

Revised Plan Achieving Goals & Objectives	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	2.96	0.63
		High	3.33	0.71
		Total	3.17	0.69
	Basic plan familiarization	Low	3.21	0.73
		High	3.24	0.53
		Total	3.22	0.65
	Key causes training	Low	2.63	0.53
		High	3.48	0.47
		Total	3.04	0.66
	Key goals training	Low	2.81	0.87
		High	3.42	0.53
		Total	3.05	0.80
	Key resources & restrictions training	Low	3.21	0.73
		High	2.81	0.97
		Total	3.03	0.85
	Key causes & key goals training	Low	2.87	0.71
		High	3.04	0.95
		Total	2.94	0.80
	Key causes & key resources training	Low	2.44	0.53
		High	3.17	0.82
		Total	2.82	0.77
	Key goals & key resources training	Low	3.06	0.74
		High	3.00	0.94
		Total	3.04	0.79
	Key causes, key goals & key resources training	Low	3.50	0.57
		High	3.38	0.72
		Total	3.44	0.63

Revised Plan Structuring of Activities	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	2.89	0.87
		High	2.82	0.62
		Total	2.85	0.72
	Basic plan familiarization	Low	2.95	0.86
		High	2.90	0.94
		Total	2.93	0.86
	Key causes training	Low	2.53	0.55
		High	3.44	0.50
		Total	2.96	0.69
	Key goals training	Low	2.83	0.93
		High	3.00	0.71
		Total	2.90	0.83
	Key resources & restrictions training	Low	3.00	0.68
		High	2.59	0.81
		Total	2.82	0.75
	Key causes & key goals training	Low	2.53	0.83
		High	2.75	0.85
		Total	2.63	0.82
	Key causes & key resources training	Low	2.07	0.70
		High	2.70	0.91
		Total	2.40	0.86
	Key goals & key resources training	Low	2.75	0.65
		High	2.62	0.85
		Total	2.70	0.71
	Key causes, key goals & key resources training	Low	2.63	0.66
		High	3.04	0.74
		Total	2.81	0.71

Revised Plan Proactive Minimization of Errors	Training Condition	Self-Efficacy Median	Mean	Standard Deviation
	No training	Low	2.52	0.78
		High	2.76	0.58
		Total	2.65	0.67
	Basic plan familiarization	Low	2.67	0.92
		High	2.52	0.74
		Total	2.62	0.85
	Key causes training	Low	2.27	0.58
		High	2.74	0.52
		Total	2.49	0.59
	Key goals training	Low	2.50	0.83
		High	2.79	0.59
		Total	2.62	0.74
	Key resources & restrictions training	Low	2.76	0.52
		High	2.22	0.91
		Total	2.52	0.75
	Key causes & key goals training	Low	2.43	0.55
		High	2.54	0.87
		Total	2.48	0.69
	Key causes & key resources training	Low	1.96	0.56
		High	2.63	0.94
		Total	2.32	0.83
	Key goals & key resources training	Low	2.42	0.67
		High	2.38	0.85
		Total	2.40	0.72
	Key causes, key goals & key resources training	Low	2.67	0.83
		High	2.75	0.43
		Total	2.70	0.67

Revised Plan Originality	Training Condition	Mastery Median	Mean	Standard Deviation
	No training	Low	3.04	0.45
		High	3.36	0.59
		Total	3.23	0.55
	Basic plan familiarization	Low	3.03	0.53
		High	3.56	0.75
		Total	3.27	0.67
	Key causes training	Low	3.00	0.82
		High	3.29	0.52
		Total	3.12	0.70
	Key goals training	Low	3.05	0.61
		High	3.67	0.60
		Total	3.23	0.66
	Key resources & restrictions training	Low	3.00	0.85
		High	3.38	0.49
		Total	3.14	0.74
	Key causes & key goals training	Low	2.54	0.56
		High	3.57	0.65
		Total	3.11	0.79
	Key causes & key resources training	Low	2.98	0.91
		High	2.47	0.56
		Total	2.84	0.85
	Key goals & key resources training	Low	2.94	0.57
		High	3.04	0.33
		Total	2.98	0.48
	Key causes, key goals & key resources training	Low	3.41	0.57
		High	3.19	0.60
		Total	3.30	0.58

Revised Plan Articulation of Key Actions	Training Condition	Performance Avoid Median	Mean	Standard Deviation
	No training	Low	3.27	0.51
		High	2.96	0.81
		Total	3.13	0.66
	Basic plan familiarization	Low	3.13	0.79
		High	3.33	0.47
		Total	3.23	0.64
	Key causes training	Low	3.03	0.81
		High	3.15	0.71
		Total	3.09	0.74
	Key goals training	Low	3.03	0.88
		High	3.37	0.67
		Total	3.20	0.78
	Key resources & restrictions training	Low	2.76	0.85
		High	3.61	0.65
		Total	3.00	0.88
	Key causes & key goals training	Low	2.67	0.72
		High	2.94	1.00
		Total	2.83	0.89
	Key causes & key resources training	Low	2.86	1.07
		High	2.28	0.65
		Total	2.67	0.97
	Key goals & key resources training	Low	2.96	0.97
		High	2.76	0.70
		Total	2.84	0.80
	Key causes, key goals & key resources training	Low	3.63	0.59
		High	2.85	0.85
		Total	3.24	0.81

Revised Plan Structuring of Activities	Training Condition	Divergent Thinking Flexibility Median	Mean	Standard Deviation
	No training	Low	3.04	0.63
		High	2.72	0.78
		Total	2.85	0.72
	Basic plan familiarization	Low	3.80	0.65
		High	2.64	0.73
		Total	2.93	0.86
	Key causes training	Low	3.12	0.58
		High	2.75	0.81
		Total	2.96	0.69
	Key goals training	Low	2.88	0.85
		High	2.50	0.24
		Total	2.84	0.81
	Key resources & restrictions training	Low	2.78	0.78
		High	3.00	0.54
		Total	2.83	0.73
	Key causes & key goals training	Low	2.24	0.72
		High	3.24	0.60
		Total	2.63	0.82
	Key causes & key resources training	Low	2.29	0.61
		High	2.73	1.38
		Total	2.40	0.86
	Key goals & key resources training	Low	2.81	0.50
		High	2.52	1.00
		Total	2.70	0.71
	Key causes, key goals & key resources training	Low	2.60	0.56
		High	3.08	0.81
		Total	2.81	0.71

Revised Plan Number of Plan Components	Training Condition	Divergent Thinking Flexibility Median	Mean	Standard Deviation
	No training	Low	3.08	2.28
		High	3.56	1.28
		Total	3.37	1.71
	Basic plan familiarization	Low	4.67	0.94
		High	2.44	1.00
		Total	3.00	1.38
	Key causes training	Low	3.27	2.00
		High	2.88	2.50
		Total	3.11	2.17
	Key goals training	Low	3.53	1.94
		High	7.50	2.12
		Total	3.95	2.27
	Key resources & restrictions training	Low	2.96	2.02
		High	2.92	1.10
		Total	2.95	1.86
	Key causes & key goals training	Low	2.27	1.27
		High	3.38	1.70
		Total	2.70	1.51
	Key causes & key resources training	Low	2.50	1.87
		High	3.87	2.93
		Total	2.86	2.20
	Key goals & key resources training	Low	2.47	1.32
		High	2.90	1.07
		Total	2.63	1.22
	Key causes, key goals & key resources training	Low	2.80	1.55
		High	4.46	2.46
		Total	3.54	2.11

Contingency Plan Task Performance Findings: Main Effects

Contingency Plan Quality	Training Condition	Mean	Standard Deviation
	No training	2.72	0.74
	Basic plan familiarization	2.96	0.82
	Key causes training	2.85	0.94
	Key goals training	2.89	0.95
	Key resources & restrictions training	2.65	0.58
	Key causes & key goals training	2.56	0.80
	Key causes & key resources training	2.75	0.98
	Key goals & key resources training	2.63	0.71
	Key causes, key goals & key resources training	2.89	0.75

Contingency Plan Realism	Training Condition	Mean	Standard Deviation
	No training	2.93	0.70
	Basic plan familiarization	3.14	0.71
	Key causes training	3.02	0.80
	Key goals training	3.15	0.65
	Key resources & restrictions training	2.81	0.50
	Key causes & key goals training	2.72	0.71
	Key causes & key resources training	2.90	0.63
	Key goals & key resources training	2.88	0.57
	Key causes, key goals & key resources training	3.09	0.64

Contingency Plan Ease of Implementation with Revised Plan	Training Condition	Mean	Standard Deviation
	No training	2.88	0.66
	Basic plan familiarization	3.02	0.73
	Key causes training	2.94	0.79
	Key goals training	3.04	0.44
	Key resources & restrictions training	2.63	0.50
	Key causes & key goals training	2.74	0.53
	Key causes & key resources training	2.56	0.65
	Key goals & key resources training	2.77	0.59
	Key causes, key goals & key resources training	2.74	0.53

Contingency Plan Integration of Contingencies with Revised Plan	Training Condition	Mean	Standard Deviation
	No training	2.75	0.65
	Basic plan familiarization	3.07	0.70
	Key causes training	3.04	0.85
	Key goals training	3.13	0.72
	Key resources & restrictions training	2.83	0.55
	Key causes & key goals training	2.93	0.70
	Key causes & key resources training	2.79	0.75
	Key goals & key resources training	2.75	0.74
	Key causes, key goals & key resources training	3.04	0.64

Contingency Plan Number of Contingencies	Training Condition	Mean	Standard Deviation
	No training	2.65	0.97
	Basic plan familiarization	3.02	1.56
	Key causes training	3.17	2.33
	Key goals training	2.31	1.33
	Key resources & restrictions training	2.80	2.13
	Key causes & key goals training	2.19	1.14
	Key causes & key resources training	2.88	2.02
	Key goals & key resources training	2.91	2.09
	Key causes, key goals & key resources training	2.31	1.05

Contingency Plan Task Performance Findings: Individual Difference Variable Interactions

Contingency Plan Integration of Contingencies	Training Condition	Identifying Deficiencies Median	Mean	Standard Deviation
	No training	Low	2.33	0.53
		High	2.58	0.63
		Total	2.47	0.59
	Basic plan familiarization	Low	2.57	0.79
		High	2.30	0.70
		Total	2.44	0.74
	Key causes training	Low	2.33	0.75
		High	2.54	0.75
		Total	2.43	0.74
	Key goals training	Low	2.54	0.88
		High	2.07	0.64
		Total	2.41	0.83
	Key resources & restrictions training	Low	2.51	0.76
		High	2.89	1.02
		Total	2.57	0.79
	Key causes & key goals training	Low	2.13	0.62
		High	2.03	0.58
		Total	2.07	0.58
	Key causes & key resources training	Low	1.93	0.72
		High	2.76	1.05
		Total	2.29	0.95
	Key goals & key resources training	Low	2.15	0.75
		High	2.38	0.33
		Total	2.25	0.61
	Key causes, key goals & key resources training	Low	1.78	0.67
		High	2.67	0.75
		Total	2.22	0.82

Contingency Plan Number of Contingencies	Training Condition	Performance Approach Median	Mean	Standard Deviation
	No training	Low	2.38	1.04
		High	2.81	0.94
		Total	2.65	0.97
	Basic plan familiarization	Low	3.18	1.77
		High	2.67	1.03
		Total	3.02	1.56
	Key causes training	Low	3.61	2.67
		High	2.48	1.60
		Total	3.17	2.33
	Key goals training	Low	2.78	1.39
		High	1.85	1.16
		Total	2.31	1.33
	Key resources & restrictions training	Low	2.37	1.29
		High	3.33	2.87
		Total	2.80	2.13
	Key causes & key goals training	Low	1.94	0.92
		High	2.57	1.41
		Total	2.19	1.14
	Key causes & key resources training	Low	2.90	2.00
		High	2.71	2.07
		Total	2.82	1.97
	Key goals & key resources training	Low	2.70	1.83
		High	3.15	2.44
		Total	2.91	2.09
	Key causes, key goals & key resources training	Low	2.29	1.06
		High	2.33	1.10
		Total	2.31	1.05

Contingency Plan Contingencies Identified for Likely Errors	Training Condition	Performance Avoid Median	Mean	Standard Deviation
	No training	Low	2.33	0.77
		High	2.67	0.67
		Total	2.49	0.72
	Basic plan familiarization	Low	2.59	1.15
		High	2.80	0.57
		Total	2.70	0.87
	Key causes training	Low	3.03	1.10
		High	2.25	0.85
		Total	2.69	1.05
	Key goals training	Low	2.78	1.00
		High	2.52	0.94
		Total	2.65	0.95
	Key resources & restrictions training	Low	2.36	0.71
		High	2.58	0.74
		Total	2.41	0.70
	Key causes & key goals training	Low	2.10	0.96
		High	2.42	0.50
		Total	2.30	0.70
	Key causes & key resources training	Low	2.64	0.89
		High	1.78	0.69
		Total	2.33	0.91
	Key goals & key resources training	Low	2.33	0.71
		High	2.55	0.69
		Total	2.46	0.69
	Key causes, key goals & key resources training	Low	2.67	0.68
		High	2.29	0.90
		Total	2.50	0.79

Contingency Plan Task Performance Findings: Cognitive Process Interactions

Contingency Plan Number of Contingencies	Training Condition	Forecasting Median	Mean	Standard Deviation
	No training	Low	2.48	0.89
		High	2.88	1.10
		Total	2.65	0.97
	Basic plan familiarization	Low	3.11	1.19
		High	2.97	1.75
		Total	3.02	1.56
	Key causes training	Low	1.93	0.88
		High	4.41	2.70
		Total	3.17	2.33
	Key goals training	Low	1.59	0.89
		High	3.04	1.34
		Total	2.31	1.33
	Key resources & restrictions training	Low	1.81	0.84
		High	3.42	2.48
		Total	2.80	2.13
	Key causes & key goals training	Low	1.57	0.75
		High	2.96	1.09
		Total	2.19	1.14
	Key causes & key resources training	Low	2.22	1.55
		High	3.50	2.26
		Total	2.82	1.97
	Key goals & key resources training	Low	2.33	2.33
		High	3.43	1.81
		Total	2.91	2.09
	Key causes, key goals & key resources training	Low	2.44	1.18
		High	2.19	0.96
		Total	2.31	1.05

Contingency Plan Number of Contingencies	Training Condition	Error Management Median	Mean	Standard Deviation
	No training	Low	2.58	0.94
		High	2.70	1.04
		Total	2.65	0.97
	Basic plan familiarization	Low	1.92	0.71
		High	3.82	1.54
		Total	3.02	1.56
	Key causes training	Low	1.62	0.80
		High	4.15	2.47
		Total	3.17	2.33
	Key goals training	Low	1.71	0.88
		High	2.80	1.47
		Total	2.31	1.33
	Key resources & restrictions training	Low	1.59	0.62
		High	4.00	2.44
		Total	2.80	2.13
	Key causes & key goals training	Low	1.80	1.00
		High	2.67	1.18
		Total	2.19	1.14
	Key causes & key resources training	Low	1.87	1.15
		High	4.19	2.15
		Total	2.82	1.97
	Key goals & key resources training	Low	2.03	1.14
		High	4.43	2.54
		Total	2.91	2.09
	Key causes, key goals & key resources training	Low	2.03	0.74
		High	2.67	1.31
		Total	2.31	1.05