

Avoiding Missed Opportunities in Managerial Life: Analogical Training More Powerful Than Individual Case Training

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We examined the ability of Masters of Management students to transfer knowledge gained from case studies to face-to-face negotiation tasks. During a study phase, students either read two cases and gave advice to the protagonist in each case (“Advice” condition) or derived an overall principle by comparing two cases (“Comparison” condition). Management students in the Comparison condition were nearly three times more likely to transfer the principle in an actual, face-to-face bargaining situation than those in the Advice condition. Further, content analysis of students’ open-ended responses revealed that the quality of the advice given in the Advice condition did not predict subsequent behavior, whereas the quality of the principles given in the Comparison condition did predict successful transfer to the negotiation situation. Perhaps most striking is the fact that not a single person in the Advice condition drew a parallel between the two cases, even though they were presented on the same page. We conclude that the value of examples is far greater if analogical comparisons among examples are encouraged. We propose that this simple and cost-effective method can substantially improve the benefits of professional training and education. © 2000 Academic Press

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One of the more lamentable experiences in life is feeling that you knew something after the fact, but not when the opportunity presented itself. The assumption that we can use what we know underlies much of our intuition about how managers solve problems and make decisions. However, studies of problem solving reveal that people often do not retrieve their relevant knowledge at appropriate times (Bassok, 1990; Bassok & Holyoak, 1989; Gentner & Landers, 1985; Gentner, Rattermann, & Forbus, 1993; Gick & Holyoak, 1980; Ross, 1984, 1987; see Reeves & Weisberg, 1994, for a recent review). Thus knowledge transfer hinges on memory access. Our ability to access knowledge from memory depends crucially upon how we learned it.

Transfer of knowledge is of critical importance to managers who typically spend tens of thousands of dollars for an MBA degree and to companies who invest hundreds of thousands of dollars on the continuing management education of their employees. Typically, investigations of knowledge transfer have focused on dissemination and adoption of practices and knowledge between individuals or firms (e.g., Argote, 1993; Argote & Epple, 1990). A large body of research has examined the generalization of learned material to job behavior and the maintenance of trained skills over time (see Baldwin & Ford, 1988, for a review). The research reported here focused on cognitive processes involved in transfer. Virtually no research has dealt with the question of whether managers can transfer *their own* knowledge to novel-appearing organizational problems and challenges. In fact, the implicit assumption that underlies management training is that once presented and understood, managerial knowledge can be applied to future problems that managers may confront. There may be obstacles to implementing the knowledge, but not to retrieving it from memory. Our research investigation provides evidence that challenges this assumption. We argue that optimal learning processes leading to accessible knowledge available for transfer are not intuitively obvious. This may help explain why knowledge transfer is often so difficult.

Although retrieving previous experiences can help to solve novel-appearing problems, people appear to have limited ability to retrieve appropriate information. For example, Perfetto, Bransford, and Franks (1983) had people judge sentences for their validity (e.g., "A minister marries several people each week") and then had them solve riddles (e.g., "A man . . . married 20 different women of the same town. All are still living and he has never divorced one of them. Yet, he has broken no law. Can you explain?"). Participants who were not told that the initial sentences could help them solve the riddles not only solved fewer riddles but were no more likely to solve the riddles than participants who never read the initial sentences.

Furthermore, actively learning the initial information may not provide much advantage in knowledge transfer. Having solved one problem does not offer much help in solving an analogous problem when the two problems come from different contexts (e.g., Catrambone & Holyoak, 1989; Gick & Holyoak, 1980, 1983; Keane, 1988; Novick, 1988; Reed, Ernst, & Banerji, 1974; Ross, 1987, 1989; Schumacher & Gentner, 1988; Simon & Hayes, 1976; see Bransford, Franks, Vye, & Sherwood, 1989, and Reeves & Weisberg, 1994, for reviews).

For example, Ross taught students mathematical principles by having them solve problems embodying those principles. Students were then given a new set of problems from different contexts that required them to use the same principles they had just learned. Students solved less than 30% of the new problems correctly.

One key problem in knowledge transfer is that people tend to access previous knowledge that bears *surface*, rather than *structural*, similarity to the problem at hand. Consider the following example from Gentner and Schumacher (reported in Gentner & Medina, 1998). Gentner and Schumacher gave participants 100 proverbs, asking after each one if it reminded them of any of the previous proverbs. Very commonly, participants were reminded of proverbs with surface similarities. For example, the proverb “A hair from here, a hair from there will make a beard” reminded participants of “It is not the beard that makes the philosopher.” However, participants were far less often reminded of proverbs with matching relational structure. For example, “Remove the dirt from your own eye before you wipe the speck from mine” is structurally similar to “He who laughs at the crooked man should walk very straight,” but few people recalled these kinds of matches. Subsequently, participants judged the structurally similar pairs as both more sound and more similar than the surface similarity matches—even when they had failed to recall proverbs that were structurally similar to one another. Thus, the very matches judged by participants to be most useful in reasoning were the ones that came to mind least readily.

In another investigation involving more elaborate materials, Gentner, Rattermann, and Forbus (1993) gave students several stories prior to reading a target story. Some of the prior “source” stories bore a surface similarity to the critical target story (e.g., they shared similar characters or objects). In contrast, other stories did not bear much surface similarity, but were structurally equivalent. Stories containing surface feature matches were recalled 55% of the time, as compared with 12% of the time for recall based on purely analogical matches. Yet, when the same participants were presented with the original source stories, they clearly regarded those with structural similarity to be more useful for reasoning about the target story than those bearing only surface similarity. These results point to a striking dissociation between what is most accessible in memory and what is most useful in reasoning: We often fail to recall what is ultimately most valuable for solving new problems (Forbus, Gentner, & Law, 1995; Gentner & Landers, 1985; Gentner, Rattermann, & Forbus, 1993; Gick & Holyoak, 1980, 1983; Holyoak & Koh, 1987; Reeves & Weisberg, 1994; Ross, 1987, 1989).

Are there ways to foster analogical transfer, that is, to encourage knowledge transfer based on retrieving structurally similar, rather than superficially similar, instances? We think so. Successful analogical transfer relies on relational similarity between the current problem and stored experiences. If people abstract general schemas or principles during learning, perhaps these principles can form the basis for experiencing similarities with new cases involving the same principles (Forbus, Gentner, & Law, 1995). If so, it would allow people

to better capitalize on their experiences. One method for promoting schema-abstraction is to draw a comparison between two or more instances (Gick & Holyoak, 1983). People seem to draw such abstractions readily when explicitly asked to compare (e.g., Brown, Kane, & Echols, 1986; Catrambone & Holyoak, 1989; Gick & Holyoak, 1983, Kotovsky & Gentner, 1996; Loewenstein & Gentner, 1997, submitted; Ross & Kennedy, 1990).

According to structure-mapping theory, comparison entails a structural alignment and mapping process that highlights the similar aspects of the two examples (Falkenhainer, Forbus, & Gentner, 1989; Gentner & Markman, 1997; Medin, Goldstone, & Gentner, 1993). Focusing on shared aspects between examples with different surface features promotes the abstraction of a common relational structure that can then be stored as a schema. Such a schema is useful for the learner because it is uncluttered with irrelevant surface information. In this way, judicious comparison can inform the learner as to which aspects of experience are relevant and which are causally irrelevant. Thus, our hypothesis is that comparing two or more instances during learning leads managers to derive a problem-solving schema that can be retrieved and applied to future instances. Analogical encoding fosters subsequent knowledge transfer.

To date, most studies of analogical reasoning of the kind we have described have used mathematical and logic puzzles. Because we were particularly interested in the role of analogical encoding in managerial life, we focused on negotiation, an important and complex managerial skill (Thompson, 1998). Negotiation is not only considered to be an essential skill in the managerial repertoire (Bazerman & Neale, 1992), but one that needs to be accessible in high-stress, cognitively demanding situations. Successful transfer in management situations requires that the principles and strategies underlying successful negotiation be accessed and adapted to vastly different contexts. Therefore, negotiation poses a serious challenge for cross-domain analogizing.

The cost of ineffective negotiation is dramatic. People often settle for suboptimal negotiation agreements, leaving large portions of money on the bargaining table. For example, the incidence of lose-lose outcomes is strikingly high: 50% of negotiators fail to realize that they have perfectly compatible interests with the other party and 20% of the pairs fail to settle on the value that both parties prefer (Thompson & Hrebec, 1996). These findings are particularly disturbing when viewed in light of research that suggests that people—even including managers—do not seem to know when they have negotiated well (Thompson, Valley, & Kramer, 1995). Further, when their mistakes are explained, people often feel that they understand fully, yet go on to repeat their errors in subsequent negotiations that have different surface (but similar deep) structures (Thompson & DeHarpport, 1994).

OVERVIEW OF RESEARCH

We conducted a research investigation to address whether and how analogical encoding during negotiation training promotes subsequent transfer. This experiment was a test of transfer from written case analysis to actual face-to-face

negotiation. We compared the transfer ability of people who received analogical comparisons during learning with that of people who did not. In the learning phase, students read two cases. In the test phase, students had an opportunity to use what they had learned from the cases in a face-to-face negotiation.

We focused on an especially difficult, yet important, negotiation principle—the formation of contingency contracts (Lax & Sebenius, 1986; Bazerman & Gillespie, 1999). Most people tend to resolve negotiations through the use of compromise. However, compromise (or splitting-the-difference strategies) are suboptimal when negotiators have differing beliefs concerning relevant events. For example, suppose that an author is optimistic about book sales and wants a prospective publisher to agree to a high royalty rate. However, the prospective publisher is much less optimistic about book sales and consequently only wants to offer a standard minimal royalty rate. The two parties could compromise on the royalty rate. However, a more elegant solution would involve a contingency agreement, wherein the royalty rate is contingent upon book sales. Such an agreement has the beneficial effects of meeting both parties' interests, maximizing negotiators' profits, and allowing agreements to be reached in situations that might otherwise end in stalemate. As in betting, contingency contracts capitalize on parties' differing expectations regarding the outcome of a future event. Contingency contracts are effective in increasing negotiators' profits (and, hence, increasing joint profits) because they often allow negotiators to avoid impasse. Further, even though one person will eventually be right (and the other wrong) about the future, *at the time negotiators make the agreement*, they each believe in their own predictions.

In some areas of business—compensation, for example—contingent contracts are common, as with the case of book publishing. For example, when a CEO agrees to a salary tied to the company's stock price, that CEO is entering into a contingent contract. Similarly, an actor who takes points in a movie in return for a lower up-front payment is agreeing to a contingent contract. But in many business negotiations, contingent contracts are either ignored entirely or rejected outright for three reasons (Bazerman & Gillespie, 1999). First, many negotiators are simply unaware of the possibility of using contingent contracts. Second, contingent contracts are often seen as a form of gambling and are therefore antithetical to good business judgment. Finally, most companies lack a systematic way of thinking about the formulation of such contracts.

In an initial investigation, we tested the power of comparison in promoting subsequent knowledge transfer for contingent contracts (Loewenstein, Thompson, & Gentner, 1999). In a management class, half of the participants were instructed to compare training cases and draw out their common solution; the other half were asked to draw out the solution in each training case separately. In addition, we orthogonally examined whether providing participants with an explicit reference to a particular principle in the training phase would affect knowledge transfer. The results were dramatic and straightforward: managers who explicitly compared the cases were three times as likely to use contingency contracts in the subsequent negotiation case as those who did not compare the cases. Mentioning the principle during training had no effect.

The goal of the present experiment was to examine the efficacy of case comparison in a more realistic managerial context. Specifically, we contrasted the effectiveness of *comparing cases* versus *providing advice on a case-by-case basis*. Managers and executives, particularly those enrolled in MBA programs and consulting firms, are regularly in the position of giving advice. One view of advice is that it requires deep thinking about a specific case, particularly through an analysis of costs and benefits, and therefore should induce subsequent knowledge transfer. Another view is that giving advice may prevent comparison and abstraction, if the advice-giver becomes too focused on particulars present in a single instance, thereby inhibiting subsequent knowledge transfer.

All participants read two brief cases embodying the principle of contingency contracts prior to engaging in an actual face-to-face negotiation which contained the opportunity to apply this principle. Further, all participants received the two written cases presented on a single page. In the Advice condition, participants were asked to give advice to the protagonist for each of the two cases. In the Comparison condition, participants were asked to compare the two cases and draw out their similarities. We hypothesized that Management students in the Comparison condition would show superior transfer of the contingency contract principle to their face-to-face negotiation in the test phase because comparison entails a structural alignment process that promotes abstraction of a common schema (Gentner, 1983; Gentner & Medina, 1998; Markman & Gentner, 1997). In addition to measuring participant negotiation performance, we content-coded negotiators' responses so we could trace their paths of learning and reasoning.

METHOD

Participants

Participants were 88 Masters of Management students enrolled in a 10-week course in negotiation at Northwestern University's Kellogg Graduate School of Management. For their training in negotiation, the students were given a week to prepare for the face-to-face negotiation before spending up to an hour and a half at the bargaining table working out an agreement. Half of the students were randomly assigned to the Comparison condition ($n = 22$ dyads), and half were assigned to the Advice condition ($n = 22$ dyads). Students in the same condition were paired together to form dyads who negotiated with one another.¹

Materials and Procedure

In the test phase, each student randomly received one of two roles to play in a face-to-face negotiation (buyer or seller) and was matched with a partner

¹ All data are analyzed at the level of the dyad.

who was to play the opposing role. The task concerned a negotiation between a general manager of a theater (buyer) and a producer of a Broadway show (seller).² The issues to be negotiated concerned the profit-sharing among parties, number of shows, salaries for cast and crew, and so on. Each party had different expectations about the profitability of the show—the seller anticipated sell-out performances; the buyer was much less optimistic. A contingency contract could be developed between parties concerning profit-sharing based on the number of ticket sales. For example, negotiators could agree to split profits 60/40 (buyer/seller) if ticket sales were in line with the buyer's conservative estimation; and 40/60 if the seller's optimistic prediction was borne out. This is an example of a contingency contract that is ultimately more beneficial for both parties than is a simple compromise agreement, such as splitting ticket revenues 50/50. For example, say that the producer of the show believes that ticket sales will gross \$1M; however, the theater owner believes that ticket sales will barely gross \$750K. One way to share profits would involve a compromise, wherein the parties agree to split ticket sales 50/50; this would mean an expected value of \$500K for the producer and an expected value of \$375K for the theater owner. However, a more elegant and mutually profitable solution would be for the parties to agree to a 60/40 split in the case of ticket sales over \$1M and a 40/60 split in the case of ticket sales under \$750K. Because the parties have different beliefs, the expected value of their profits is higher—in this case, \$600K for the producer and \$450K for the theater owner. Of course, both parties cannot be right about the future; however, because they each believe that they will be right at the time they form the contingency contract, their subjective value of the deal is greater. In hindsight, contingency contracts seem not only sensible but obvious; however, they rarely occur to the negotiator embroiled in the heat of conflict.

In the study phase, 1 week prior to the test phase, the students received a packet of materials to prepare for the negotiation. There were two pages of questions (all open-ended), the first of which asked students four questions concerning their expectations about the outcome of the negotiation and what strategies they planned to employ to reconcile differences of opinion, preference, and beliefs. The second page contained the training materials: two 225-word summaries of cases involving contingency contracts (see Appendix 1). We deliberately chose the two training cases with little or no surface similarity to the face-to-face negotiation case. Thus, to profit from their training experience, students would need to rely on relational, rather than surface-level, similarities.

In the Comparison condition, the cases were read one after another, and then the participants were asked to respond to the following question: "Think about the similarities between these two cases. What are the key parallels in the two negotiations? In the space below, identify an overall principle that

² The negotiation case *Oceania!* is available upon request through the Dispute Resolution Research Center, Kellogg School of Management, Northwestern University, 2001 Sheridan Road, Evanston, IL 60208-2011. E-mail: drrc@kellogg.nwu.edu.

captures the essence of the strategy of betting on differences.” In the Advice condition, the cases were read one at a time, after which the participants were asked to respond to the following question: “Suppose you are advising [the main character]. What should she do? Why?” Participants’ responses to the Comparison/Advice questions were collected prior to the negotiation and coded for quality of response. Our key hypothesis was that negotiators who engaged in active comparison before the negotiation would be more likely to employ a contingency contract during the actual, face-to-face negotiation.

RESULTS

Negotiated Outcomes

The final contracts negotiated by participants were scored in terms of the inclusion of a contingency contract and also their overall monetary value to each negotiator. The results supported our prediction that making a comparison is crucial for encoding the relational commonalities necessary for analogical transfer. Specifically, only 5 (23%) of the 22 dyads in the Advice condition made contingency contracts; in contrast, 14 (64%) of the 22 dyads in the Comparison condition made contingency contracts. Thus, participants who explicitly compared the cases were nearly three times as likely to use contingency contracts as those who responded to separate cases: $\chi^2(1, N = 44) = 7.503, p < .01$. This held true despite the fact that all participants read the same two cases and both cases were presented on a single page.

A second indication of the influence of comparison is the monetary outcomes of the negotiations. As expected, using a contingency contract resulted in a higher gain than using a compromise solution. Negotiating dyads who compromised on ticket sales grossed, on average, \$691,360 from the negotiation, whereas dyads using a contingency contract grossed, on average, \$761,210 a \$69,850 (9%) gain, $t(42) = 2.484, p < .05$. Greater use of the contingency contract by participants in the Comparison condition meant an average gain of \$29,364 (4%) over the dyads in the Advice condition, a nonsignificant trend.

Content Coding

We examined participants’ answers in the Advice and Comparison conditions. Although all participants in both conditions read the same two cases, the questions asked of them afterwards differed. Thus, we cannot compare the two conditions directly. Therefore, we performed a content analysis within each condition. We had complete data for 19 dyads in each condition. Two trained raters read all of the responses and rated the responses on several dimensions explained below. Although the coders were not blind to conditions (e.g., it was obvious whether a participant was in the Advice or Comparison condition), they had no knowledge of the hypotheses. For those cases in which there was a discrepancy, coders jointly resolved their differences. We report individual reliability statistics for each dimension below.

Advice Condition

Our first analysis concerned whether the quality of advice that participants gave in the Advice condition led to better negotiated agreements. If many people thought it unwise to accept the contingency proposed in the case, for example, then it would not be surprising that these participants did not develop contingency contracts in their actual negotiations. To examine this, we looked at only those participants in our Advice condition and coded their responses to the two cases in terms of whether they advised the protagonist to accept the contingency contract (or, in the language of the mini-case, “to take the bet”) or not. Specifically, two raters coded the advice given on each particular case (0 = not to take the bet; 1 = indeterminate; 2 = to take the bet). The reliability measure was 87%. The results showed that the nature of the advice was unrelated to actual negotiation performance. Those dyads in which both people had advised taking the bet in 75% of the training cases (operationalized as at least one dyad member recommending the bet in both cases and the other member recommending the bet in at least one case) made contingency contracts in the actual face-to-face negotiation 25% of the time (2 of 8 dyads). Those dyads whose members had advised not taking the bet made contingency contracts 18% of the time (2 of 11 dyads). Thus, recognizing that the contingency contract was advisable was not related to transferring the betting principle to the face-to-face negotiation situation subsequently encountered by participants.

A second question is whether people in the Advice condition spontaneously noticed the parallels between the two cases. Not a single person in the Advice condition referenced the first case when talking about the second case in any meaningful way. Had participants noticed this common structure, it is reasonable to assume that they would have responded to the second case by referring to their advice for the first case. However, no suggestion of linking the cases was found among these participants’ responses.

If participants offered what they regarded to be a better solution to the case, this was noted. A total of 85% of the dyads in the Advice condition made at least one suggestion that they considered to be a better solution to the case than the bet. These suggestions were often based on the particular idiosyncrasies of each case. In contrast, only three people in the Comparison condition suggested something they thought would be better than the bet.

Comparison Condition

We examined the quality of the principles articulated by participants in the Comparison condition. Each participant’s response to the directive to “derive a principle that captures the essence of these two cases. . .” was rated on a 3-point scale in terms of depth of understanding, with 0 for little understanding (e.g., “Each party will pay what they think is fair after the event” $N = 2$), 1 for some understanding (e.g., “Both are negotiating with regard to their risks and are willing to pay a price if they are wrong” $N = 10$); and 2 for sophisticated understanding (e.g., “They are similar in that there are uncertain future events and different beliefs about the outcome of those events. The strategy is to

create a bet that hinges on the outcome of uncertain future events" $N = 7$). The reliability measure was 82%. Developing contingency contracts in the negotiation was highly related to the quality of the principles derived by the participants. When only one member of the dyad abstracted a good principle, development of a contingency contract was only moderately likely (45%, or 5 of 11 dyads). However, if one person stated the principle and the other person stated at least elements of it, then making bets was extremely likely—88%, or 7 of 8 of these dyads made bets. As in Gick and Holyoak's (1983) study, better extraction of principles lead to greater tendency to apply the principles, marginal by a Fisher's exact test, $p = .08$.

Despite the fact that the two cases were printed on the same page in both conditions, we found widely different responses between groups. In the Advice condition, there was no evidence that participants spontaneously compared cases. Not one participant mentioned the first case when giving advice about the second. In contrast, only 1 person (of 38) in the Comparison condition failed to discuss the two cases together. What did participants in the Advice condition do? Nearly everyone in the Advice condition attempted to come up with new solutions to the cases, typically appealing to expected values when they were trying to make the case for or against what to do. In contrast, virtually no one in the Comparison condition mentioned expected values. Only 2 people in the Comparison condition talked about the cases separately, and 1 of them first stated an overall principle and then wrote how it played out in each case. Comparing the cases led people to derive and understand the common betting principle; in contrast, for people studying the cases separately, the common principle did not emerge.

DISCUSSION

Management students who compared two cases were more likely to transfer their knowledge to a face-to-face negotiation than students who read the same two training cases but gave advice. In both the Advice and Comparison conditions, participants read the same two cases that were presented on a single page. The cases were presented merely as an addendum to the role participants were learning and in a written format quite unlike the actual face-to-face negotiation scenario. Yet, the simple presence of explicit instructions to compare the two cases and derive a principle led to a large advantage in negotiation performance. Making a comparison enabled students to recognize the principle in common to the cases and carry it forward to the negotiation nearly three times as often as those students giving sequential advice. Moreover, in a related study we found that simply giving instructions to compare two cases without mentioning an abstract principle likewise led to superior performance in the comparison group (54% of dyads transferred the principle to their negotiations) over the advice group (13%) (Loewenstein, Thompson, & Gentner, 1999). Thus the advantage of the comparison group in the current study does not appear to stem from the directive to "derive a principle that captures the essence of

the two cases.” These results support our hypothesis that comparison of instances can promote knowledge transfer.

Professional education in management, law, and medicine is often based on the case method. The traditional case method relies upon the belief that people can and will abstract higher order relations from the analysis of individual examples. The current findings cast doubt on this assumption. The present investigation corroborates and extends the findings of Loewenstein, Thompson, and Gentner (1999). Students showed little transfer of knowledge learned from individual examples. On the basis of the results of our experiments, we conclude that comparing cases does not automatically occur—even when cases are physically juxtaposed. It is not enough simply to be presented with multiple cases; rather, it is *comparing* multiple cases that leads to abstracting their common principles thereby facilitating later memory access and knowledge transfer. Given elaborate proposals for educational innovation and on-the-job training, our technique of simply encouraging people to compare available cases seems refreshingly cost-effective.

We might conjecture that the truly seasoned manager or executive would be able to retrieve appropriate experiences when confronted with a novel-appearing situation. However, an investigation of expertise in mathematics (Novick, 1988) suggests that although experts show somewhat more appropriate retrieval than novices, they too retrieve many surface-similar cases. The experts did show an advantage over novices in their ability to dismiss inappropriate cases quickly. However, although experts performed better than novices, they still failed to retrieve appropriate cases in many instances (Novick, 1988).

The available evidence suggests that although seasoned professionals will show a higher hit rate of accessing genuinely relevant prior experiences, they too are vulnerable to the problem of retrieval by surface similarities. The Management students in our experiment were not experts in negotiation—few people are—but they were not naive and they were highly motivated, intelligent, and competitive. Such people would seem to be an ideal group for recognizing parallels and connections. Yet, even when presented with relevant cases prior to a face-to-face negotiation, few of them drew upon principles embedded in the cases. Their difficulty (in the Advice condition) in transferring principles from a learning situation to a test situation shows that transfer difficulty holds even for highly motivated participants working on problems they find relevant.

Our own qualitative observations of our participants yield further insights about comparison and transfer. In a debriefing of the negotiation case after the fact, we asked participants whether they had thought about the two preceding mini-cases. Many of those in the Comparison condition said they had; fewer in the Advice condition reported doing so. Yet when we revealed the contingency solution to the negotiation case and pointed out the relational parallels to the test cases, participants often expressed regret. The conceptual parallels seemed completely obvious when pointed out to them, yet did not provoke spontaneous recall before the fact, a pattern reminiscent of Gentner, Rattermann, and Forbus' (1993) findings.

Mundane and Creative Analogy

Throughout this article, we have been arguing that managers need to access their relevant knowledge to apply to current problems they face. Many case-based retrievals are highly mundane (Gentner, Rattermann, & Forbus, 1993) and rightly so: If one is preparing an account statement, it is typical (and optimal) to be reminded of last quarter's account statement. Cases that share surface properties often share structural properties as well. But analogical retrieval processes can also yield distant analogies, as happens in scientific discovery. For example, Kepler's proposal that the sun causes planetary motion depended on positing an attractive force analogous to light: Like light, the attractive force diminishes with distance; and most importantly, like light, it shows "action at a distance": it travels unseen between the source and the distant object, yet has clear effects on the distant object (Gentner, Brem, Ferguson, Wolff, Markman, & Forbus, 1997). Reasoning by analogical comparison is most often ordinary, but can be extraordinary.

Analogical Reasoning in Individuals and Groups

There is a great deal of interest in team-based learning and transfer (Moreland, Argote, & Krishnan, 1996). Yet, little is known about analogical training in dyads and groups. Virtually all prior studies have involved individuals. To our knowledge, we are the first to examine the effect of analogical training on dyadic interaction. However, the analogical training in our study did in fact occur at an individual (nondyadic) level. It is interesting to speculate on the efficacy of dyadic versus individual analogical training effects. On the one hand, substantial evidence suggests that groups are poor at discussing noncommon information (Stasser & Stewart, 1992), which might result in poorer transfer of principles if comparison necessitates the discussion of unique examples. On the other hand, groups have access to a potentially richer source of experiences from which to compare. For example, Dunbar's (1994) direct observations of molecular biologists at work demonstrate that comparison is frequently used in the everyday practice of science. Dunbar's observations of the research process suggest three factors that make a lab creative: frequent use of comparison, attention to inconsistency, and heterogeneity of the research group (which contributes to the group's ability to think of many different analogs). Similarly, Hargadon and Sutton (1997) report qualitative evidence that teams of design engineers use analogies quite frequently in brainstorming sessions for new product design. Obviously, there is no connection necessarily between what makes for a creative organization and what makes for a creative manager. Nonetheless, there are some striking commonalities. The microbiology laboratories that showed the most progress were those that used analogies in quantity and took them seriously. Dunbar's analyses of transcripts show that in the successful lab groups, analogies are extended and "pushed" in group discussion.

Summary

We believe that ordinary case-based training may often leave learning on the table. We have introduced a method of training whereby students explicitly

compare examples in order to derive common schemas or principles. Principles learned in this fashion have a greater likelihood of later being accessed and used than principles learned through the common practice of giving advice about individual examples. We suggest that this simple change in training procedures—to promote the opportunity to make fruitful comparisons—can dramatically improve people’s ability to put their learning into practice.

APPENDIX 1

Cases Used in Advice and Comparison Conditions

Case 1: Syd, a recently-promoted head buyer of a major retail store, has bought some wholesale goods from an Asian merchant. All aspects of the deal have been successfully negotiated except the transfer of the goods. The merchant tells Syd that he will pay to ship the goods by boat. Syd is concerned because the U.S. has announced that a trade embargo is likely to be placed on all goods from that country in the near future. The Asian merchant tells Syd not to worry because the boat will arrive at the U.S. dock before the embargo occurs. Syd, however, thinks the boat will be late. Syd wants the merchant to pay to ship the goods by air freight (which is substantially more expensive). The merchant refuses because of the higher cost. They argue about when the boat will arrive.

The Asian merchant suggests that they “make a bet.” The Asian merchant will ship the goods air freight but they will both watch when the boat actually docks in the U.S. If the boat arrives on time (as the Asian merchant believes it will), Syd will pay for all of the air freight. However, if the boat arrives late (as Syd believes it will), the Asian merchant will pay the entire air freight bill.

Advice Condition: Suppose that you are advising Syd. What should she/he do? Why?

Case 2: Two fairly poor brothers, Ben and Jerry, have just inherited a working farm whose main crop has a volatile price. Ben wants to sell rights to the farm’s output under a long-term contract for a fixed amount rather than depend upon shares of an uncertain revenue stream. In short, Ben is risk-averse. Jerry, on the other hand is confident that the next season will be spectacular and revenues will be high. In short, Jerry is risk-seeking. The two argue for days and nights about the price of the crop for next season. Ben wants to sell now because he believes the price of the crop will fall; Jerry wants to hang onto the farm because he believes the price of the crop will increase. Jerry cannot afford to buy Ben out at this time.

Then, Jerry proposes a bet to his brother: They keep the farm for another season. If the price of the crop falls below a certain price (as Ben thinks it will), they will sell the farm and Ben will get 50% of today’s value of its worth, adjusted for inflation; Jerry will get the rest. However, if the price of the crop rises (as Jerry thinks it will), Jerry will buy Ben out for 50% of today’s value of the farm, adjusted for inflation, and keep all of the additional profits for himself.

Advice Condition: Suppose that you are advising Ben. What should he do? Why?

Comparison Condition: Think about the similarities between these two cases. What are the key parallels in the two negotiations? In the space below, identify an overall principle that captures the essence of the strategy of betting on differences.

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