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Perceptions of Expertise and Transactive Memory in Work Relationships

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People involved in close interpersonal relationships often develop a transactive memory system – a division of cognitive labor with respect to the encoding, storage, and retrieval of information from different substantive domains. The present study examined transactive memory systems using a sample of clerical office workers in a laboratory setting. It tested the general hypothesis that individual learning in work relationships is affected by perceptions of the relative expertise of coworkers. Participants were told that they would work on a task with a partner who had either similar or different work-related knowledge and job responsibilities. The findings supported the hypotheses that (a) people learn and recall more information in their own areas of expertise when their partner has different rather than similar work-related expertise; and (b) this effect reverses for recall of information outside work-related expertise. Taken together, the data showed that transactive memory is a property of work relationships, not just romantic relationships, and that role-based expertise can serve as its basis.

KEYWORDS expertise, groups, learning, transactive memory

MUCH of the world's work is done collaboratively by groups, crews, staffs, committees, teams, and partnerships. In most collaborations, people are interdependent: they have a common purpose, they rely on one another for information, they make joint decisions, and those decisions have consequences for everyone involved (Kelley & Thibaut, 1978). Developing solutions to complex problems, a critical part of many collaborations, involves gathering, exchanging, processing, and using information. Consequently, much group research now focuses on the functioning and effectiveness of work groups often from the perspective of information processing systems (Hinsz, Tindale, & Vollrath, 1997; Larson & Christensen, 1993; McGrath, 1997).

There are several current and important lines of group research that employ this perspective. For example, there is considerable evidence that groups and organizations exhibit processes parallel to those referred to as 'learning' when they occur for individuals. Work on group and organizational learning shows that a group can

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generate considerably more cognitive resources than any one of its members (for a review, see Argote & McGrath, 1993). Some researchers have suggested that group members share both encoding and retrieval processes in ways that suggest a 'transactive' or group memory (Hollingshead, 1998d; Moreland, 1999; Wegner, 1987). This body of research shows that social systems, such as organizations, groups, and relationships, can affect how individuals in those systems learn, store, and retrieve information.

One important finding in the transactive memory literature is that learning in close relationships can be affected by each individual's perceptions of relative expertise: individuals tend to focus on learning information in their own areas of relative expertise, and they expect the other person in their relationships to do the same (Hollingshead, 1998a; Wegner, Erber, & Raymond, 1991). This division of cognitive labor reduces the amount of information for which each person is responsible, yet provides each person access to a larger pool of information across domains. When one person needs information in the other's area of expertise, he or she can simply ask the other person rather than spend time and energy learning that information. When members' beliefs about relative expertise are accurate, groups make better decisions (Henry, 1995; Littlepage, Robison, & Reddington, 1997; Littlepage & Silbiger, 1992).

The objective of the present study was to investigate how individual learning in work relationships might be affected by perceptions of the work-related expertise of coworkers. This study extends previous research that has examined the development and use of transactive memory systems in romantic relationships and in artificial work groups (Hollingshead, 1998a, 1998b, 1998d; Liang, Moreland, & Argote, 1995; Moreland, 1999; Moreland, Argote, & Krishnan, 1996; Wegner et al., 1991).

Expertise and learning in transactive memory systems

Transactive memory is the specialized division of labor with respect to the encoding, storage, and retrieval of information from different substantive domains that develops during the course of many relationships (Wegner, 1987, 1995). Each member in the relationship becomes a specialist in some domains but not others; and all members rely on each particular member to access information in appropriate domains. Members specialize in areas based on their relative expertise, skills, or experiences, formal assignments (by a high status member), or negotiated agreements. Over time, members gain responsibility for the encoding, storage, and retrieval of information in different domains, and knowledge about this division of cognitive labor becomes shared among members. Thus, the transactive memory system becomes more efficient over time, i.e. knowledge becomes more differentiated and less redundant among individuals in the system.

The way the information is distributed in a relationship – which person is responsible for acquiring and encoding information of various sorts – is part of the transactive memory system. If that system is to function effectively, then each person needs an accurate representation of it, so he or she knows who to ask for needed information. The extent to which people in relationships share expectations about who has (or is expected to have) various information can affect coordination, communication, and task performance (Hollingshead, 1998a, 1998b, 1998c, 1998d; Wegner et al., 1991; Wittenbaum, Stasser, & Merry, 1996; Wittenbaum, Vaughan, & Stasser, 1998).

Members can learn what others know or what others should know informally or more formally. Members can learn informally who is the relative expert across knowledge domains through shared experiences and conversations with one another (Hollingshead, 1998b; Wegner, 1987). Wegner et al. (1991) provided the first empirical evidence that people in close relationships, who have many shared experiences and conversations, have an implicit structure for assigning responsibility for learning new information based on their shared conception of each partner's expertise. Dyads composed of either dating couples or strangers of the opposite sex learned and later recalled words in different knowledge categories without communicating. Dating couples agreed more about the relative expertise of each partner than did strangers. They also recalled more words collectively across knowledge categories than did dyads of strangers, and showed less overlap in their individual recall.

Hollingshead (1998a, 1998d) extended that research by examining the role of communication in the development and implementation of transactive memory systems. Both studies employed a similar experimental paradigm as Wegner et al. (1991). Hollingshead (1998a) replicated the findings of Wegner et al. (1991): dating couples had more shared agreement about each person's relative expertise and recalled more words collectively than did strangers. However, when strangers were able to communicate at learning, they assigned responsibility for different knowledge categories to each individual explicitly and thus were able to compensate for the dating couples' transactive memory systems. Hollingshead (1998d) showed that dating couples retrieved and used knowledge more effectively than did strangers, because they were better able to figure out which partner was correct in situations when only one partner knew the correct answer. Process analyses indicated that dating couples made fewer references and assertions about their individual knowledge than did strangers, presumably because the dating couples already knew about one another's relative expertise.

Moreland, Argote, Liang and Krishnan moved empirical research on transactive memory from personal relationships to groups. They conducted a series of laboratory experiments that examined the impact of different individual and group training methods on the development of transactive memory and performance in artificial work groups (Liang et al., 1995; Moreland, 1999; Moreland et al., 1996, 1998). The studies showed that work groups performed better when their members were trained together on a task and that shared knowledge about the abilities, skills, and knowledge of each member (i.e. the development of a transactive memory system) accounted for the improved performance in the group training condition. In addition, members who trained in groups had more complex, accurate, and shared beliefs about the distribution of skills among members and were more likely to view one another as unique individuals, each with special skills that others might not possess. This research also supports the notion that transactive memory systems develop informally as members learn more about one another's knowledge, expertise, and skills and such learning can lead to more effective group performance.

In the context of work relationships, group members can also learn what others know or should know more explicitly through instruction from other people, such as a supervisor, or from procedures in the form of documents, manuals, or other codified reference materials. Some academic departments, for example, distribute an office procedures handbook to all staff, faculty, and graduate students at the start of every academic year. The first section of these handbooks typically are titled 'Who To See About What'. The specific duties of each member of the office staff are provided, so that faculty and students know which staff members to ask for different types of information. Office staff members' responsibility for knowing information is explicitly assigned on the basis of their job descriptions.

Research with ad hoc groups also supports the idea that when group members are instructed about other members' expertise, they use information more effectively. Stasser, Stewart, and Wittenbaum (1995) found that when previously unacquainted groups were explicitly told by an experimenter about each member's specific area of expertise, they were more likely to discuss individually held information and made better decisions. Henry (1995) observed that when groups were instructed to determine their most accurate member, they performed better than when they were not given such instructions.

The present study extends previous research by investigating how instructions about other members' work-related expertise might affect individual learning in the context of work relationships. Even with no social interaction, perceptions of one's own and other members' areas of expertise can affect how individuals decide what information to learn and remember (cf. Hollingshead, 1998a; Wegner et al., 1991). When responsibility for different areas of work-related knowledge are distributed among and known to individuals in a transactive memory system, it should be easy for each member to know what information to learn. Each member should focus on learning information in his or her own unique areas of expertise and expect other members to do the same. Such specialization will increase the group's access to information and reduce the redundancy of information among members.

However, individuals may be motivated to learn information outside their areas of work-related expertise when they perceive that others have similar work-related knowledge. This occurs because individuals anticipate that others will learn information in their common areas of expertise, so they are motivated to maximize the group's access to information, save cognitive labor, and reduce redundancy among individuals.

These considerations led to the following hypotheses.

Hypothesis 1: Individuals will learn and recall more information in their own areas of work-related expertise when they perceive that others have different rather than similar expertise.

Hypothesis 2: Individuals will learn and recall more information outside their areas of work-related expertise when they perceive that others have similar rather than different expertise.

These hypotheses suggest that perceptions of relative expertise affect the degree to which individuals learn and recall information in or outside their areas of expertise. It is also possible that perceptions of relative expertise affect how much individuals recall and how many errors they make during recall. There is evidence that it is easier to learn and to recall familiar than unfamiliar information (Hall, 1954). Information in one's own area of expertise is likely to be more familiar than information in another area of expertise. Learning information outside one's area of expertise that is difficult or unfamiliar may require more cognitive resources. Thus, learning outside one's areas of expertise may lower total recall, and increase intrusion errors. These considerations led to the following hypotheses:

Hypothesis 3a: Individuals will learn and recall fewer words when they perceive that their partner has similar rather than different work-related expertise.

Hypothesis 3b: Individuals will make more intrusion errors when they perceive that their partner has similar rather than different work-related expertise.

Because this is the first study to directly investigate how perceptions of coworkers' expertise affect how individuals learn work-related knowledge, special care was taken to control variables that might have an impact on learning processes among coworkers. The experimental paradigm was similar to that of Wegner et al. (1991) and Hollingshead (1998a). Clerical workers from office staffs memorized words in different work-related knowledge categories with a partner. This task was chosen because it was possible to examine the relation between reported expertise and learning in categories of reported expertise. To isolate the impact of perceptions of relative expertise and to control for the nature of participants' relationships with their partners, participants were assigned a partner who had skills and knowledge similar to those of their coworkers but who was not actually a coworker. Participants were told that their partner was from an office staff in a different department and had either similar or different work-related expertise. The scoring and incentive structure were designed to make participants interdependent, as they might be in work relationships.

Method

Participants

Forty-four office staff members from 24 academic departments at the University of Illinois at Urbana-Champaign participated in the study. This population was chosen for several reasons. The demographic composition of office staffs is similar across departments – most staff employees are women with a high school or associate degree. The duties performed by office staffs are similar across departments, and they involve both individual and group tasks such as photocopying, typing, answering phones, mailing letters and manuscripts, scheduling rooms, recording student grades, managing department finances, and the like. The responsibilities associated with various job titles do not vary much across departments, so it was possible to develop one set of stimulus materials appropriate for all participants.

All participants had the job titles of secretary, clerk, or administrative assistant and were from departments that varied between 3 and 12 staff members. The University Student/Staff directory was used to identify potential participants, and a letter was sent that briefly described the purposes of the study, listed the dates and times of the study, and the compensation for participation (US$10 for 30 minutes).

Procedure

The study was run in two large classrooms on the University of Illinois campus during the lunch hour on four consecutive days. Between 10 and 12 participants attended each session.

The sessions began by explaining that the purpose of the study was to examine how people exchange information in work relationships. Participants were randomly assigned to one of two partner conditions for the word memorization task. The experimenter told participants that they would work on a task with a staff member from another department, but that they would not meet or interact with their partners. In the similar partner condition, the experimenter explained that they would be matched with someone who was most similar to them in terms of their work-related expertise. In the different partner condition, the experimenter explained that they would be matched with someone who was most different from them in terms of their work-related expertise. At that point, participants completed a 'Partner Match' form, which they were told would be used to help select their partner.

The Partner Match form consisted of two parallel columns listing the 10 categories of the memorization task – one for their own areas of expertise and one for their partner's areas of expertise. At the top of the left column, a heading included the participant's experiment ID number (which appeared on all materials) and the words: 'Your areas of expertise'. At the top of the right column, a heading included a blank space for their partner's experiment ID and the words: 'Your partner's areas of expertise'. Participants were asked to circle all categories representing their areas of work-related expertise under the column that said 'Your areas of expertise'. In the similar partner condition, the experimenter reiterated to participants that they would be matched with the person in the study who was most similar to them based on work-related expertise. To help match them with partners, participants were asked to circle the same categories for their partners that they circled for themselves under the column that said 'Your partner's areas of expertise'.

In the different partner condition, the experimenter reiterated to participants that they would be matched with the person in the study who was most different from them based on work-related expertise. To help match them with partners, participants were asked to circle all categories that they did not circle for themselves under the column that said 'Your partner's areas of expertise'. The experimenter walked around to make sure that all participants circled the appropriate categories for their partners based on these conditions. Afterward, the experimenter reminded participants that their partners would be chosen based on the areas they circled on the Partner Match sheet, and that their ID numbers would be used so that neither the researchers nor their partners would know their identities when the partners were selected. The participants did not seem at all confused or suspicious regarding this manipulation.

Next, participants were given a word list and had three minutes to learn the words on that list. To reduce any anxiety that participants might have about learning a large number of words in a short period of time, the experimenter stressed that the task was not an intelligence test, and that researchers were more interested in which words, rather than how many words, the participants learned with their partners. Participants had four minutes to recall and write the words on a sheet that presented the 10 category labels in the same location as on the word list. (Pilot testing indicated that four minutes was ample time to recall words.) At the end of the experiment, participants completed a brief survey that asked closed-ended questions about the categories of words they had tried to learn and the strategy they had used to learn them. Finally, the participants were thanked, paid, and debriefed.

Task

The word memorization task required participants (with their partner) to learn as many work-related words as possible in three minutes. There were eight words in each of the 10 different work-related categories. The words and the category labels appeared on the word list. The work-related categories and words were generated and tested in a pilot study conducted with office staff members from two departments who did not participate in the study. The categories and word list are provided in the Appendix. Examples of words in each of the categories include: ordering desk copies ('publisher'); office supplies ('letterhead'); accounting ('invoice'); computers ('modem'); instructional resources ('overhead'); mailing ('parcel'); word processing ('format'); photocopying ('collate'); inventory ('vendor'); and grades and enrollment ('roster').

The scoring was described to the participants as follows: the words that each participant correctly remembered would be pooled with the words that their partner correctly remembered and a bonus of US$20 would be awarded to the pair that remembered the most words.[1] Dyads would receive one point for every word correctly recalled from the list regardless of whether one or both partners recalled it. In other words, no additional points would be given for words correctly recalled by both partners. Thus, the members of each pair were interdependent and there was an incentive for each person to learn words that his or her partner would not learn. The scoring was explained to the participants several times: before the word list was given, after learning and before the recall phase, and after the recall phase. The experimenter also explained that their partners would receive the same instructions. In other words, both of the staff members in each pair knew that they would perform the task with a similar or a dissimilar other.

Results

Recall

Total words correctly recalled from the list served as the measure of recall. Misspelled words were counted as correct. A one-way analysis of variance was conducted on total recall with partner (similar vs. different) as a between-participants factor. The main effect of partner on recall was not statistically significant (M = 15.05, SD = 4.50) ($F(1,41) = 1.14$, ns). Contrary to hypothesis 3a, participants did not recall fewer words overall (i.e. they did not make more errors of omission) when they perceived that their partner had similar rather than different areas of expertise.

Total recall was divided into expert recall (words recalled in participant's own categories of expertise) and non-expert recall (words recalled in categories not indicated as participant's own expertise) to test hypotheses 1 and 2. To control for differences in the amount of expertise across participants, expert recall was divided by the number of categories in which the participant had indicated expertise. Non-expert recall was divided by the number of categories that the participant did not indicate as areas of expertise. This established the mean number of words recalled per expert and per non-expert category. Participants reported having expertise in 5.9 of the 10 categories on average. This did not vary significantly across the two partner conditions ($F(1,42) = .01$, ns). One participant reported having expertise in all 10 categories, and was thus excluded.

A 2×2 analysis of variance was conducted on mean recall per category, with partner (similar vs. different) as a between-participants factor and category type (whether the category was an area of reported expertise) as a repeated measures factor. The main effect of partner was not statistically significant ($F(1,41) = 1.14$, ns). However, the analysis did reveal a significant main effect of category type ($F(1,41) = 61.67$, $p < .0001$). In both partner conditions, participants recalled significantly more words per category in their own expertise ($M = 2.05$, $SD = 0.86$) than outside their expertise ($M = 0.77$, $SD = 0.73$).

The interaction effect of partner and category type was also statistically significant ($F(1,41) = 11.41$, $p < .001$). When participants believed their partners had different expertise, they recalled significantly more words per expert category ($t(42) = 2.99$, $p < .005$). When participants believed their partners had similar expertise, they recalled significantly more words per non-expert category ($t(42) = 1.71$, $p < .05$). (See Figure 1.) These results support hypothesis 1 and hypothesis 2.

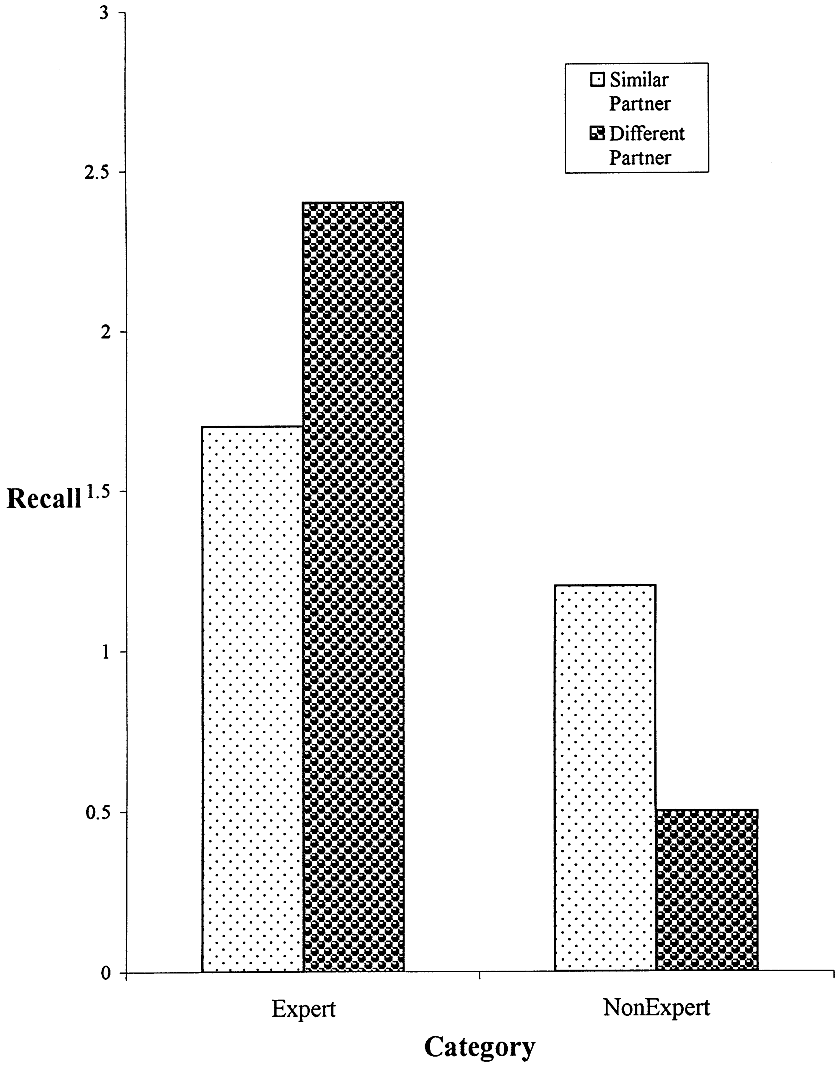

Figure 1. Mean recall by category (expert or non-expert) and partner (similar vs. different expertise).

Intrusion errors

Words recalled that were not on the list were categorized as intrusion errors. A one-way analysis of variance was conducted on intrusion errors with partner (similar vs. different) as a between-participants factor. Contrary to hypothesis 3b, the partner manipulation did not have a significant effect on the total number of intrusion errors (M = 6.00, SD = 4.76) ($F(1,42) = 1.01$, ns).

Intrusion errors were divided into those in the participant's areas of expertise and those outside their expertise. A 2 × 2 analysis of variance was conducted on mean intrusions per category, with partner (similar vs. different) as a between-participants factor and category type (whether category was an area of expertise) as a repeated measures factor. The analysis revealed a significant main effect of category type ($F(1,41) = 23.75$, $p < .001$).

Participants made significantly more errors per category in an area of reported expertise in both partner conditions. On average, participants made .80 errors per expert category, and .30 errors per non-expert category. These results are in the opposite direction of hypothesis 3b.[2] The main effect of partner and the interaction effect of partner and category type were not statistically significant ($F(1,41) = 1.97$, $p >$ .16, and $F(1,41) = 0.19$, ns, respectively).

To summarize, total recall was unaffected by the partner manipulation. However, participants tended to recall more in areas of expertise when they believed their partner had different rather than similar expertise. These results indicate that what information participants learned rather than how much they learned, was affected by the assumed expertise of their partners.

Discussion

This experiment builds upon previous research on learning and transactive memory in close relationships. It simulated learning processes among coworkers with a sample of clerical office workers and a task that involved learning work-related information. The results supported the notion that transactive memory is a property of work relationships, not just romantic relationships, and that role-based expertise can serve as its basis. Even with no social interaction, perceptions of relative expertise can affect the allocation of knowledge responsibilities in work relationships.

Perceptions about the expertise of other people can come from many sources. Stereotypes based on demographic characteristics (such as age, gender, ethnicity, social class) can be used to infer the knowledge of group members in a particular domain and shared group memberships can be used to infer socially shared knowledge (Krauss & Fussell, 1991). Through previous conversations and shared experiences, people may also become more accurate judges about what others know (Hollingshead, 1998d; Wegner et al., 1991). This experiment showed that people also make inferences about what other group members know in work settings based on knowledge they receive from outside sources about other members' expertise. Participants were instructed about the expertise and job responsibilities of their assigned partners, and these instructions had an impact on individual learning.

Participants were more likely to learn information outside their expertise when their assigned partners had similar rather than different work-related knowledge and responsibilities. These results suggest that participants were motivated to maximize collective knowledge. Responses to a post-task questionnaire in which participants described the strategy they used to learn the words indicated that they were often conscious of this process. Participants who were assigned a partner with different expertise often concentrated on learning the words in their own categories of expertise, e.g. 'I memorized words from the categories of my expertise hoping my partner would do the same', 'I paid more attention to the areas I knew'.

Participants who were assigned a partner with similar expertise mentioned using strategies other than specializing in learning words in their expertise, e.g. 'My strategy was mostly random glancing all over the list focusing on the ones I was least familiar with', 'I tried to focus on 4 different groups – not necessarily in my field of knowledge'. The implication is that one way to get group members to learn information in their areas of expertise is to make them believe that they are the only expert on that topic in the group. This finding is consistent with research on criticality in social dilemmas, showing that group members are more likely to cooperate when they perceive that their contributions are critical to the group (Chen, Au, & Komorita, 1996; Kerr & Kaufman-Gilliland, 1997).

Participants tended to remember information better in their own areas of reported expertise regardless of whether their assigned partner had similar or different expertise. One reason for this may be that people use their own expertise as their default strategy for deciding what information to learn. Information in one's own area of expertise may be more familiar and easier to learn. Although there was an incentive for participants to remember different words than their partners, they were not penalized for redundant recall and may have been less concerned about duplicating the efforts of their partner. This may also explain why participants were more likely to make intrusion errors in their own areas of expertise. Participants were not penalized for guessing, and may have been able to generate more plausible guesses in their areas of expertise.

The nature of the work groups and the task employed in this study may account for why total recall and total intrusion errors were not affected by the partner manipulation. The responsibilities associated with different job titles did not vary much, so the words in categories outside participants' expertise may have been familiar. In addition, the words were not technical and did not require any special training or education to be understood. Coworkers who have less overlap of work-related knowledge than the office workers in this sample probably make more intrusion and omission errors when learning highly specialized and technical information outside their areas of expertise. For example, in a group composed of an engineer, a medical doctor, and a computer scientist, members may have significantly more difficulty learning information in one another's areas of expertise.

This was the first experiment to directly investigate how perceptions of coworkers' expertise affect how people learn work-related knowledge. As a result, special care was taken to control variables that may have an impact on learning processes among coworkers. For example, to control the nature of the relationship between coworkers, participants were assigned to work with a partner from another office staff rather than from their own staff. To measure individual learning easily, a word memorization task was used. One would expect the findings of this experiment to generalize and perhaps increase in magnitude for actual coworkers working on tasks intrinsic to their everyday work. Future research should examine this possibility.

Notes

1. At the end of the study, the Partner Match forms were used to compose dyads, and bonuses were in fact awarded to both the highest scoring dyad with similar job responsibilities, and to the highest scoring dyad with different job responsibilities.
2 To control for the higher amount of recall in participants' categories of expertise, one reviewer suggested creating a ratio of intrusion errors per word recalled within expert and non-expert categories. This analysis indicated that the rate of intrusion errors per word recalled did not vary significantly across expert and non-expert categories ($M = 0.43$; 0.30 respectively) ($F(1,41) = 0.83$, ns).

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Appendix

List of categories and words used in memorization task

Ordering desk copies	*Office supplies*	*Accounting*	*Computers*
Author	Tape	Receiving report	Login
Title	Envelope	UFAS	Printer
Enrollment	Post-it-notes	Requisition number	Modem
Book order form	File folder	Invoice	System error
Publisher	Pencils	Paystub	Virus
Instructor	Thesis folders	Transfer	Monitor
Hardcover	Letterhead	Purchase order	Diskette
Edition	Rubber bands	Budget	Microprocessor
Instructional resources	*Mailing*	*Word processing*	*Photocopying*
Head phone	Meter postage	Format	Paper tray
Camcorder	US mail	Menu	Zoom
Audio deck	10×13	Control key	Duplex
Easel	Domestic mail	Edit	Single run
Audiocassette	Parcel	Cut	Collate
Overhead	UPS	Table	Glass
Tripod	Manila envelopes	Copy	Transparencies
LCD Panel	Airborne express	Print	Double-sided
Inventory	*Grades and enrollment*		
Brand	Section		
Property control no.	Contact hours		
Category	Roster		
Account number	Timetable		
Transfer	Instructor		
Vendor	College		
Surplus	AB		
Condition code	Discussion section		