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The Use of Public Reflection to Promote Workplace Learning and Expert Thinking Skills

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Abstract: Public reflection is the practice of periodically stepping back in order to ponder and make explicit the meaning, to self and others in the immediate environment, what has recently transpired, been planned, observed, and achieved in practice (Raelin, 2000). It illuminates what has been experienced by both the self and others, providing a basis for future action. It is a means of transferring individual learning into team learning into organizational learning (from the intrapersonal to the system); uncovers "theories-in-use", those implicit assumptions and beliefs that guide actions; creates shared meaning and knowledge, which is the foundation for practice-based learning; and promotes reflective practice by developing a metacognitive perspective. This paper will discuss the research results of an instrumental case study that charted the impact of the use of the format of public reflection on a system of four novice group facilitators / process consultants. The participants engaged in an intensive collaborative process of meaning making which promoted qualitative changes in the levels of expert cognitive and metacognitive thinking skills. Data sets included videotaped debriefing and planning sessions, individual and group interviews, and written reflection diaries, covering the entire lifespan of the team.

Keywords: public reflection, workplace learning, expert thinking skills, triple loop learning

GROUPS ARE A common format for supervision when teaching skills within a practice area (Craft, 1998; Pavlovic & Friedland, 1997). Within these circles, public reflection is a key tool for illuminating the inner world of individuals under supervision. Public reflection is the practice of periodically stepping back in order to ponder and make explicit the meaning, to self and others in the immediate environment, what has recently transpired, been planned, observed, and achieved in practice (Raelin, 2000). It also provides a basis for future action.

In-depth studies have been undertaken in such group-based apprenticeships as tailoring (Lave & Wenger, 1991), but none have been done in the area of group facilitation. Research often does not detail the dynamic mechanisms involved, focusing more on products and outcomes. Little has been done to chart the precise evolution of the cognitive processes encouraged within such a social environment or how groups bridge the gap between novice-expert levels of cognitive functioning. Group facilitation as an open-ended field depends on open-ended solutions (Wakefield, 1989). Expert cognition becomes an extremely important resource for the practitioner.

Literature Review

Major Themes on the Nature of Expert Thinking

Expertise involves the acquisition, storage, and utilization of at least two kinds of knowledge: explicit knowledge of the domain and tacit knowledge of the field (Ericsson & Smith, 1991; Sternberg, 1998). Sternberg (1998; 2000) has argued that abilities are flexible, which allows for expertise to be seen as a process of continual, life-long development.

Characteristics of Expert Thinking

Characteristics of expert thinking are: the ability to perceive and reproduce large meaningful patterns in a domain; rapid performance of procedures; extensive, rich, well-organized, interconnected, and easily accessible knowledge structures; superior short-term and long-term memory and rich repertoires of strategies for problem-solving along with appropriate mechanisms for assessing and applying these strategies (Ericsson & Smith, 1991; Johnson, 1988; Glaser & Chi, 1988). Expert approaches to problem solving are characterized by the use of data-driven reasoning when solving well-defined problems, changing strategies to hypothesis-driven reasoning with ill-defined problems (Hmelo, 1998; Lesgold, 1988). They tend to represent problems at a deeper (principled) more semantic level, spending a good deal of the time analyzing the problem qualitatively (Glaser & Chi, 1988). Experts tend to work forward from given information to implement strategies for finding unknowns, while monitoring their own strategies. Additionally, experts tend to retrieve a solution method as part of the comprehension of the task (Ericsson & Smith, 1991; Glaser & Chi, 1988; Sternberg, 1998).

Differences between Experts and Novices

Novices tend to have more superficial knowledge networks, not pick up the salient features of the

problem, and therefore fail to develop appropriate schema for consideration. They tend to not apply additional tests to confirm or refute the initial assessment. Details about the proposed mental model are less complete with little fine-tuning. Novices tend to be rigid in following their initial appraisal, sometimes force fitting abnormal or unusual features into the schema.

Weisberg (1988) demonstrated, when examining the think-aloud protocols of all subjects in a closed problem / open solution task, individuals start out the same way by attempting to apply their knowledge directly to the problem; once these attempts are deemed inadequate, more creative solutions emerged for experts than novices in attempting to correct for inadequacies. Therefore, there is an interaction between knowledge and the problem itself in a means-end analysis.

However, the expert does not always outperform the novice. Though expert performance is superior in well-defined problems, Johnson (1988) demonstrated that in domains of uncertainty, expert judges fail to do significantly better than novices. Since no single correct procedure exists, there is no definitive way of assessing the correctness of a decision rule (i.e. any directive that is established to make decisions in the teeth of uncertainty) based on a single outcome. Therefore, the phenomenon of shared expertise could compensate for performance shortcomings in domains of uncertainty, such as facilitation. The consideration of multiple cases by a group of experts-in-training allows for a more meaningful and accurate identification of the various ways of "being right", and the numerous ways of "being wrong". A community of creative problem-solvers (Voss & Post, 1988) is then able to collectively identify a more accurate representation of the problem, inferring relations and adding constraints (Glaser & Chi, 1988), reducing uncertainty to more manageable levels.

Expertise in the Process Domain of Facilitation

Group facilitation is ecological in nature. Each group is an idiosyncratic environment with unique cultural properties that shape and determine the individuals' responses to the context (Bion, 1961; Dimock, 1987; Hunter, Bailey, & Taylor, 1995). Within this field, problem identification, an expert thinking ability, becomes an extremely important skill. Research has shown that the generation of high-quality problems tends to generate effective and creative solutions (Mumford, Reiter-Palmon, & Redmond, 1994), a characteristic of master facilitation. Being an ill-defined domain, problem construction becomes even more important as the degree of a priori structure decreases (Mumford et al., 1994). Three types of problems comprise the major preoccupation of group facilitators: a *presented problem* (salient features are defined by others, e.g. a participant feels excluded from the group); a *discovered problem* (derived from information presented from the facilitator, e.g. a diagnosis of the group's stage of development); and a *created problem* (the facilitator generates a problem where none existed before, e.g. hypothetical pitfalls to a group's growth and development) (Mumford et al., 1994). The ability to successfully formulate and address these 3 core problem areas would hallmark the expert group facilitator.

Shared Expertise

Shared expertise is knowledge that is somewhat beyond the level for each individual member of a group, which is created and recreated through self-correction and mutual disclosure, and then shared amongst members. This can be a powerful path to learning; students in a physics class significantly improved their knowledge by developing the processes of shared expertise (Novemsky, 1998). Stough (1994) suggested that "socially shared expertise" is a way of fostering social cognition by distributing the cognitive load through the group. Research demonstrates that people collectively can demonstrate levels of cognitive functioning that surpass the individual's solo performance. But can it reach expert levels?

Theoretical Frameworks that Guide this Inquiry

The primary theoretical framework underlying this inquiry is a theory of learning and cognition that emphasizes social and cultural interactions (Vygotsky, 1978; 1987). Learning is knowledge construction within the context of social interaction with significant others. Vygotsky saw external conditions as the place where cognition is co-created with culture, as represented by more experienced members, before being internalized within the individual's consciousness. Cognition is an active adaptation of the individual's consciousness to social and cultural interactions with the learner as an active agent in relation with other active agents. Meanings are the links between experience and consciousness.

Situated learning (Lave & Wenger, 1991) anchors learning squarely in the process of co-participation and social engagement as a feature of practice in authentic contexts. Knowledge does not just reside in the heads of human beings, but also in the meanings, relations, activities and skillful executions of praxis. Learners participate in communities of practice (Wenger, 1998) and the mastery of knowledge and skill requires newcomers to move from the periphery of the system towards full participation in

the socio-cultural practices of the community. Learning is a process of becoming an expert member and a way of being in the social world (Lave & Wenger, 1991). Thus expertise is seen as embedded in social relationships situated in authentic contexts and nested and negotiated within a culture of practice. Engagement in social practice is the fundamental process by which we learn, and so become who we are.

The Research Questions

The research question emerged from the gaps within the literature, which contrasted with the standard way of working with individuals under supervision in the field of group facilitation. The fundamental questions were: Can a group of novices build and establish shared expertise? What cognitive processes are involved?

Methodology and Methods

Design

A qualitative methodology was selected, using an instrumental case study approach (Meador, Hunsaker, & Kearney, 1999; Yin, 1993; 1994). This method is conducive to understanding meaning attributed by participants about certain events, how context influences actions, and the process by which events and actions take place (Maxwell, 1996).

Participants

The case was defined as a group of four novice group facilitators, women aged 23 to 45, who were teaching assistants for a university course in group dynamics (Stake, 1994). Individual participants were seen as subsystems within the case. I assumed the stance of complete member-researcher (Adler & Adler, 1994; Spradley, 1980), since I was already a full member of the environment, having taught this course since 1992. Being a complete member allowed me to grasp the depth of the subjectively lived experiences and give an insider view.

Practice Context

In order to position the development of expert thinking skills as a support for praxis, the inquiry is situated in the natural world of practice (Denzin, 2002). The novice facilitators were involved in a course that attempted to teach the knowledge and skills associated with facilitating groups. The course was an introductory course for undergraduate students in group dynamics. Goals were to provide experiences that help to: develop observational and diagnostic skills; acquire skills in competent participation and intervention; and acquire an understanding of the theoretical concepts of group development. The course used a "learning-by-doing laboratory method" (Kolb, 1976; 1984). Learning was accomplished by the active application of theoretical concepts during involvement in a small group. The course was delivered in an intensive format, meeting twice a week for three hours, over a six-and-a-half-week period.

Summary of Data Collection Procedures

Various sources of data were drawn upon in order to map this group of novices as a coherent knowing system (Gruber, 1988). Since the progression of expert thinking is an on-going process (Sternberg, 1998), a developmental approach was taken. The data sources were divided into two main components: the primary source of data, the processing sessions, and secondary sources of data, the individual and final interviews and reflection / observation diaries, to provide triangulated evidence (Erlandson, Harris, Skipper, & Allen, 1993; Lincoln & Guba, 1985).

Processing sessions. Stories are the closest we can come to experience as we tell others of our experiences (Clandinin & Connelly, 1994). It is a way of sharing our internal world and is such an intrinsic facet of our human culture that we forget that these stories shape our experience. One function of the processing sessions was to engage in retrospective sense making (Barrett, 1999) in the form of telling stories.

Since expert thinking skills are modifiable, the metaformat of public reflection (Raelin, 2000) was used in order to surface and make explicit some of these processes and their relationship, as well as to transform storied experiences into knowledge. Public reflection

- is a means of transferring individual learning into team learning into organizational learning (from the intrapersonal to the system);
- uncovers "theories-in-use", implicit assumptions and beliefs that guide actions; and
- creates shared meaning and knowledge, which is the foundation for practice-based learning.

In essence, public reflection strongly resembles a collective "think-aloud protocol", a common approach for illuminating cognitive performance (Chi, 1997).

Directly after class, the team convened to debrief and conceptually process the time each facilitator spent with her task group. The focus was on creating a reflective dialogue in which the participants could share their observations, stories, and understandings of the group process. It was a time when the novices could identify interventions they took and subject

them to critical consideration. This activity functioned as a way for participants to act as audience to the stories of the others, co-constructing a conceptual understanding of each unfolding group process. It provided an opportunity to determine a range of possible alternative responses for the next meeting of the task group. The focal process of the discussion was on molding the salient features of the group's development into a unified meaningful whole, in an effort to practice "expert thinking" (Posner, 1988).

These sessions were video taped in order to allow the voices and perspectives of the participants to be clearly recorded, and to create a fuller record of a social event that could not be done with audio alone (Adler & Adler, 1994). The processing times were opportunities for the team to open the black box of the mind and transform it into glass (Lave & Wenger, 1991). The team tried to practice transparency in understanding how the groups and the class were progressing, how the development of each group was evolving, and what the groups and the class as a whole system needed in order to learn more effectively.

Individual interviews. Each team member, except one who did not have time due to life commitments, was interviewed individually. The interviewing process was approached as a collaborative, interactive process, minimizing hierarchical relationships in favor of a joint-enterprise approach (Oakley, 1981). Using an open-ended conversational format in order to facilitate the development of trust, rapport, and maximum exploration (Fontana & Frey, 1994), stories were elicited, reflective of their consciousness (Vygotsky, 1987).

Final group interview. A group interview format was also used. This is the systematic questioning of all the participants simultaneously (Fontana & Frey, 1994), in order to give the participants an opportunity to sum up the experience of the inquiry. Group interviews tend to have a synergistic effect, generating more associations and insights than individual interviews (Morgan, 1997; Vaughn, Schumm, & Sinagub, 1996).

Observation and reflection diaries. Each participant was asked to keep a journal of observations of their task group's progression and insights into their experiences as task group facilitators. This was done in order to record the evolution of their thinking processes. After the experience ended, the participants were asked to review their journals and write down in a different color ink any insights, changes, or thoughts that occurred to them. This was done as part of an effort to triangulate the data in order to provide trustworthiness. In addition, I kept methodological, theoretical, and personal notes (Richardson, 1994) in order to track data collection methods, hunches or hypotheses I might have, and my feeling statements.

Data Analysis

The videotapes were then transcribed and rendered into text for analysis. Coding was done using an open coding procedure (Strauss & Corbin, 1998) with a special focus on process, i.e. the underlying thinking skill, how it was used, what other skill preceded and / or followed the skill, repeated references to examples, etc. However, rather than coding in disconnected, parsed categories which would need to be reconnected later, the technique suggested by Dey (1999) was used, in that a "category string" was generated in order to retain a holistic sensibility to the analysis. The string [major representation] contains particular knots along a strand that was later plaited into the thread [subcategories linked to the major categories linked to representations], still connected through meaning. An example of this would be the string *Expert thinking skills* connected to the strand *problem representation-Novice* connected to the knot on the strand *metaphoric image*. These were statements that represented a private representation of everything a participant has learned about a domain distilled into an image.

Addressing Issues of Trustworthiness

In order to promote the trustworthiness of the data, several safeguards suggested by Lincoln and Guba (1985) and Erlandson et al. (1993) were built into the project in order to provide a series of checks and balances:

- member checks: Category descriptions, along with the selections from the transcripts and their interpretations, were circulated to the participants. Three of the four respondents reviewed the document, and all commented on how well this mirrored their experiences;
- debriefing by peers: I regularly reviewed the process of implementation of this inquiry with my dissertation circle, and engaged in discussions during the analysis with my supervisor;
- triangulation: Several sources of data were used to substantiate the claims;
- prolonged engagement and persistent observation: The total amount of time devoted to data collection was approximately 15 hours of processing and approximately 6 hours of interviews;
- thick description (Geertz, 1973): A very detailed and evocative accounting of the codes for the processes within the inquiry was drawn;
- independent audit: A colleague who is experienced with qualitative methodology and facilitation critically examined the codebook.

Results

After intensive engagement with the data, 5 major strands with a total of 14 knots emerged from the data. These codes represented remarks that displayed the cognitive functions that are characteristic of expert thinking that are not rooted solely in any one domain.

What cognitive processes are involved when novice facilitators engage in developing shared expertise? The classification of expert thinking skills that emerged within this inquiry were broken down into the following strands and knots:

- *Expert thinking-description*-- These are statements that are in narrative form that describe the events of the session. Two knots were developed differentiating between *superficial* descriptions, a simple retelling of the surface events, as compared to *structural / organizational* descriptions that focused on the inherent, implicit, intrinsic or process structure of the surface events or comments on the salient characteristics of the unfolding events on multiple levels;
- *Expert thinking-perception of meaningful patterns*-- These verbalizations conveyed the individual's perception of a significant pattern and revealing structure over time or a theoretical model which linked present events to previous experiences in order to create parallels;
- *Expert thinking-problem representation*-- These were comments that communicated how an individual identified, understood, constructed, or interpreted the problem space. Three additional knots were developed:
- *simple problem representation*-- These included explanations of what was going on in the group at a principled level or an attempt at structuring or restructuring the problem space;
- *problem representation using a mental model*-- These were statements that attempted to create a holistic coherent understanding and interpretation of the problem, forming a diagnosis, explicitly linking theoretical concepts and principles to practice, bridging the gap between abstraction and application; and
- *problem representation using a metaphoric image*-- These were utterances that represented a private representation of everything a participant had learned about the domain, organized by concepts, representations and relations but distilled into an image.
- *Expert thinking-solution generation*-- These were verbalizations that addressed the solution of problems, suggested avenues for intervention, and needs for the group to enhance its development.

The frequency of the coding for thinking processes can be seen in Table 1.

Can a group of novices build and establish shared expertise? Since I wanted to see if the novices were able to create a dynamic of shared expertise, I coded separately for *Novice* and *Expert* to differentiate who performed the cognitive function. Since this inquiry is focused on the novices' ability to create a space of shared expertise, each novice knot will be discussed in turn. It is important to note there is a certain amount of overlap within these categories since statements can reflect multiple layers of cognitive functioning.

What clearly stands out when examining the strand *Expert thinking-description*, is the overwhelming frequency of the novice responses. This, however, is to be expected since the novice facilitators were in the student groups the entire time, while the "expert" was able to spend a fraction of the time observing. What is particularly interesting is that during the first session of the inquiry, the number of codes in the knot *Expert thinking-description-superficial-N* is almost twice the number for that of *Expert thinking-description-structural / organizational-N*. This is in line with the literature outlining novices' thinking patterns. Descriptions of their initial encounters with the group tended to focus on what actually happened using narrative detail. This is to be expected since novices tend to focus on surface characteristics rather than structural ones.

However, the frequency of codes for *Expert thinking-description-structural / organizational-N* rose sharply, and for the last 50% of the sessions was at a level generally two to three times higher than it was initially. This stable occurrence suggests the establishment of an important expert thinking skill. The utterances demonstrated a progression, at first focusing on the salient process characteristics in just a phrase or two mixed in among the superficial detail in early sessions. The next step was characterized by more extended deeper structural descriptions, exhibiting more expert-like attributes. By the end of the experience, the novices were able to construct long and complex conceptually focused storied narratives, weaving in salient process features. The increase in the frequency of this thinking skill points to a shift not only in *how* the novices observed, but also in their ability to interpret and evaluate group dynamics from a process level, picking up subtle verbal and visual cues. What facilitated this shift?

This shift may be due to two particular influences. The first was the focus of the activity using public reflection, and the nature of intentionally setting out to gain expertise in this domain. This expert thinking function was often preceded by a question, usually phrased as a way of representing the problem. This points to the powerful influence of social interaction

in cultivating this expert thinking skill. The hunches or observations of others prompted team members to further examine their memory for these deeper process characteristics. The novices in this inquiry became more aware of and mentally recorded the process structures of each of their groups. Listening to the descriptions of others, and their own process observations, alerted the audience members to aspects of process to attend to in the future that might illuminate their own understanding of group process. This, then, was a collaborative building of multiple expert-like lenses with which to view and interpret the dynamics of their groups.

Frequency levels were still rather stable for the superficial description. In examining the patterns it is possible that this process of outlining "what is happening" is not necessary when reviewing a videotape classroom interaction (Sabers, Cushing & Berliner, 1991) or an X-ray (Lesgold et al., 1988); but these novices were engaged in mutually co-constructing reality and co-creating knowledge about events not all of them had directly witnessed. It was necessary to some degree to share some of the surface details since this seemed to allow the audience to vicariously "view" the event as if by remote, and then shift into and out of structural descriptions of process. This provided a window of understanding so that their process observations made sense and had some concrete "hook" on which to hang the concepts. The process patterns in Figure 1 show that this key expert thinking skill can flourish over time with the aid of public reflection.

Overall, for the other three strands *Expert thinking-meaningful patterns*, *Expert thinking-problem representation*, and *Expert thinking-solution generation*, except for the knots of *Expert thinking-problem representation-E* and *Expert thinking-problem representation-E-metaphoric image,* the collective frequency counts for the novices and the one for the expert are remarkably similar (see Table 1). This suggests the development of shared expertise within the team of novices. Collectively, they were able to generate similar frequencies to the responses displayed by the expert. Given time, space, and the right conditions, shared expertise among novices can be created, building a solid foundation of expert thinking.

In terms of the knot *thinking processes-perception of meaningful patterns*, one must have a repertoire of exemplars with which to make comparisons. These novices had a small reservoir of these on which to associate events, since they had little experience facilitating groups. So they drew on what was most accessible: their own individual experiences in groups as members. The pattern that emerged was for them to make initial comparisons with their own history as participants in groups, and in courses like this, as a basis for comparison. As they shared their stories about what was happening in their groups, they were able to collectively pool and vicariously enlarge the examples on which they could draw comparisons. The novices began to quickly shift from a personal history focus to a comparison of their groups with others' experiences in the here-and-now of this inquiry. By session 5, they were able to begin to build a sense of meaningful patterns within the group they were observing. They were able to track patterns in the groups of the other novices. The process patterns in Figure 2 demonstrate that this expert thinking skill can increase over time using public reflection.

Though the main focus of this inquiry is on the development of shared expertise among novices, it is important to mention the patterns that were evident within the knot *Expert thinking-problem representation-E*, since it had a powerful impact on the behavior of the novices. This was, by far, the most frequent code of any within problem representation, a key dimension of expert functioning, and the most frequent expert coding. On the surface, it may appear as if the designated expert was doing the vast majority of the problem representation. However, a closer process examination reveals an interesting trend. The majority of these comments were phrased in the form of a question, which served to act as a spotlight on darkened areas of the problem space, which were generally at the edges of the conversation, and served to expand the specifics under discussion. It functioned as a highlighter for gaps, pointing to missing pieces in the descriptions offered by the team members. These statements were attempts to, indirectly, get the novices to consider events on a more structural, principled level.

Much of this may be due to my philosophy and approach to teaching, and the implicit commitment made to these teaching assistants to take on a mentor role. I was mindful from the very beginning that I would need to adopt a particular stance with regards to my participation in the public reflection sessions. I did not want to be the "know-it-all" and provide all the answers. I also did not want them to fumble in the dark. It was important to me that they gain something from this experience. So, in an effort to balance both, I adopted a more conditional [1] approach to my contributions.

On the other hand, early codes for *Expert thinking-problem representation-N*, though numerous, tended to be statements that represented problems only within the novice's own group, and represented them on a surface level. They tended to be rather limited in scope. They did not venture far into more submerged processes of the group's life. The novices'

[1] Conditionality is a state where what is generally regarded as fact represents a probability statement rather than absolute truth.

ability to represent problems at a more principled level began to emerge during session 5, and became much more pronounced in later sessions. It stimulated the consideration of the influence of more elaborate conceptual dimensions on the group's dynamics and development, such as issues of culture, both ethnic and family systems. By the group's midpoint, they began to see more overarching dynamics like power struggles and status hierarchies. As well, they considered the balancing of behaviors that address the task dimension of the group's functioning and the group organizational structure. They became aware and discussed more covert processes, such as scapegoating, which are perhaps the most challenging for any facilitator to uncover, because they only are evident over time, and masquerade as other dynamics (Marshak & Katz, 1998).

Even though they were able to represent sophisticated processes, the majority of the verbalizations were statements, rather than pointed questions. It is only during session 11 that questions began to emerge a little more strongly. Using questions in problem representation implies a more conditional approach, and fosters flexible formulations and reformulations of problems. This is a parallel to the extended time experts spend qualitatively analyzing problems, in an effort to construct mental models of the problem space. Questions and the atmosphere of conditionality that they cultivate allow for the coexistence of multiple representations of the problem all at the same time as the expert considers which representation is most fitting. Particularly in ill-defined domains where the unexpected is always to be expected, conditionality allows an individual the opportunity to refine expert skills. This was one area that these novices needed much more practice doing, as well as a much deeper repertoire of mental models on which to draw. The process patterns in Figure 3 suggest that this key expert thinking skill can thrive over time using public reflection.

The codes for the knot *Expert thinking-problem representation-N-mental model* display the same frequencies as the expert category, again establishing the evolution of shared expertise in this system. At the beginning, the novices start with quite simple mental models with a minimum of input from the concepts and models of the domain or display a pronounced reliance on a framework from their own training, even citing a particular text. There was minimal use of the language of the domain, or basic formulations of interventions based on theoretical frameworks. As they began to work more intensively together, and the dynamics became more complex, the novices began to approach the construction of their mental models in an elaborate, richer way. They began to increase their use of domain language. They proposed alternate models, turning them round and round in dialogue to gauge their fit. Use of this cognitive skill allowed them to deeply question surface appearances. They began to engage in the creation of new terminology for mental models or to import concepts from other domains, adapting them to this context, in order to make meaning of their experiences. The process patterns in Figure 4 illustrate the rise of this important expert thinking skill over time with the aid of public reflection.

Though the knot for *Expert thinking-problem representation-N-metaphoric image* took a bit of time to appear, it displayed the same shift from a surface, simplistic formulation to something more complex. At first, the metaphors were rather limited in scope, capturing only a portion of the group dynamics involved, and tended to be framed in stereotypic images. Around session 8, the metaphors, though still standard, took on a bit more elaboration with regards to the group dynamics they were intended to represent. Reflective practitioners tend to constantly create new mental models, using metaphoric images and schemata as starting points for transformation as they encounter new experiences and environments (Pressley & McCormick, 1995). These novices were able to extend previous metaphors, and create new ones to describe the dynamics, going beyond the usual confines of group imagery. Metaphor served to encapsulate expression, communicating the essence of the novice's understanding about the events, bringing together elements in an effort to make the "strange, familiar", with a new "problem", that is the dynamics they were facing in their groups. They served as personal icons (e.g. identifying personal emotional pitfalls), distillations of learnings into a single evocative image to carry forward as they progressed in their development towards expert thinking. The process patterns in Figure 5 reveal the evolution of this expert skill over time.

The final knot was *Expert thinking-solution generation-N*. Noteworthy about this one is the remarkably small numbers of solutions generated. Since the focus of the public reflection was on problem solving, it is reasonable to expect many more instances of solution generation. In examining the frequencies, it is possible that this pattern did not emerge because the group spent a major portion of its time exploring the problem space and representing and restructuring it from many angles. This added effort in problem representation suggests that they were working in an expert-like way. The type of solutions generated did show a pattern of change over time. During the early sessions, solutions were offered, but only as a direct response to questioning. However, in session three, as learning relationships solidified, they began to share their own strategies as possible solutions for the dilemmas of others. Most notable is the following interchange when Ann asked Catherine's permission

when offering a solution concerning the group's dependency on Catherine, rather than relying on each other.

> Ann: Can I give you a tip?
> Catherine: Sure.
> Ann: *You know what I did this time? It's not just the sitting back, out of the group, it's... I didn't make eye contact with them* (session 3)

> Once it was explicitly clear that individuals were open to suggestions, solution generation took on the appearance of script creation. This was the crafting of the exact wording the novice could use in the group to avoid stumbles. Novices began by offering word-for-word examples of their own coping scripts. Sometimes it entailed giving suggestions so the novice could create her own script.

Solutions for interventions then shifted in the latter half of session 5 and became less script specific, but more structurally focused. It is possible that as their confidence and expertise grew, their reliance on and need for a script was lessened, since they could trust themselves more readily to be able to do what needed to be done in an effective way. The process patterns in Figure 6 show the development of this expert skill over time using public reflection. Novices can, for the most part, pool together expertise skills that can collectively compare favorably to those of an expert.

Support from triangulated sources. Public reflection functioned as a large space of possibilities where participants could explore salient characteristics of the problem and identify possible solutions and their repercussions as they strove to reach new knowledge states. In examining the reflection diaries, there is a difference between the kind of meaning the novices created at the time, and how they interpreted them at the end of the experience. This may be due to the fact that hindsight is 20/20 vision; but there is more to it than that. They demonstrated a richer, deeper questioning of the surface appearances of the group's functioning and wrestled with the open problems at a more principled level than at the beginning. They posited quite sophisticated hypotheses about what dynamics may be operating and displayed a new appreciation for what participants may have experienced.

The novices' statements in their final interview confirmed this growing shared expertise. They attributed their cognitive changes to the effect of processing this experience in a group collaboratively using public reflection. Though these novices did not become solo experts, they did demonstrate a qualitative difference in their ability to engage in expert thinking as a result of their building shared expertise.

Boundaries of the Inquiry

Since this inquiry occurred in a particular time, and place, under particular circumstances with unique individuals (Wolcott, 1990), the emergent themes and dynamics should be viewed as atypical; however, using the criteria of thick description, limited transferability may be warranted.

At the very least, this case study expanded and enriched the repertoire of social constructions about expert thinking skills and shared expertise. Certain trends, especially regarding the setting of collaborative public reflection norms could be formulated into working hypotheses and carried over to new situations (Donmoyer, 1990), assessing a degree of fit with a changing context with different constituents. An attempt was made to render this account as vivid as possible in order to facilitate the ability of the reader to immerse into this experience vicariously, much as these novices did. In this way one can imaginatively take on the role of a novice, expanding cognitive understandings about these processes, and muse about how these processes could play out in the system in which the reader is engaged in practice.

Discussion

Expertise shared and constructed on the social plane seen in this inquiry was achieved by offering multiple perspectives and insights, which became part of the consciousness *and* experience base of the other novices in the social system. This may be because stories are co-created through questioning and answering. Questioning triggers memories, which allow for taken-for-granted incidents to be subjected to reinterpretation and restructuring (Barrett, 1999). Public reflection created virtual, vicarious experiences, which drew on the strengths of case-based learning (Donmoyer, 1990). It took the novices to places they have not yet been, expanding their range of interpretive options. It fostered perspective taking, enhancing the skill of conditionality. Elaborating cognitive structures and knowledge connections allowed them to develop different perceptual and theoretical lenses. Creating a collaborative climate of learning defused feelings of defensiveness and resistance when basic assumptions were challenged.

Within the reflective dialogue, participants, through joint cognitive action, were able to create a common set of meanings to understand group dynamics. Each participant imaginatively took on the role of the others in vicariously living the experience yet constructing significant and unique meaning from it. Certain descriptions and assertions in narrative form provided opportunities for vicarious experience; listeners extended their memories through the creation of parallel experiences, and thereby added to their propositional and experiential knowledge

(Geertz, 1983; Polanyi, 1983). The listener then came to know some things, told within another's narrative, as if she had experienced them, creating a living case on which to draw (Stake, 1994).

Links to previous experience, both their own history and events with their groups, mirrored the recursive memory search to generate hypotheses to account for the stimulus information characteristic of solution finding in ill-defined domains (Mumford et al., 1994). These significant personal experiences acquired complex, idiosyncratic emotional associations, which facilitates the generation of emotion-based solutions for problems (Getz & Lubart, 1999). Theory to practice links functioned to apply, reshape, and reform extant knowledge to the specific context in order to foster novel responses (Mumford et al., 1994) for future consideration. The sharing of multiple perspectives allowed the participants to create multiple packages of situated knowledge (Lave & Wenger, 1991) that could later be activated or reformulated. These multiple packages of a "borrowed" prior exposure to a problem could be used in order to abstract salient features in representing new problems (Mumford et al., 1994). If direct analogs are unavailable, the developing expert can then draw on the multiplicity of problem representations shared from processing sessions. This involves the building of expertise on two levels: productive (solving a problem in an authentic context) and reproductive (mentally stimulating what one might do when facing a problem) (Sternberg, 2000).

Conclusion

The patterns evident in this inquiry suggests that multiple expert thinking skills, that supercede the practice domain, are required for facilitating groups. Given the right conditions, a collaborative group environment and a climate of conditionality, novices can develop different perceptual and theoretical lenses with which to interpret experience, and *collectively* can reproduce similar thinking patterns as that of an expert. This provides some important evidence regarding shared expertise, and the associated cognition, to substantiate the use of reflection or learning circles in certain practice domains (Connelly & Clandinin, 1995; McHargue, 1994; Uduari-Solner & Keyes, 2000).

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Table 1: Frequency Table of Code String for the Process Category of Expert Thinking.

Expert Thinking Code String	Sessions												Total
	Early Sessions 1-3			**Middle Sessions 4-9**						**Late Sessions 10-12**			
	1	2	3	4	5	6	7	8	9	10	11	12	
description-structural/ organizational-E	2	3	8	-	-	1	4	2	8	12	4	6	**50**
description-structural /organizational-N	21	30	49	51	40	39	44	61	63	36	63	66	**563**
description-superficial-E	1	4	8	4	-	5	8	16	13	15	9	13	**96**
description-superficial-N	37	25	49	32	28	27	17	44	25	36	32	38	**390**
perception of meaningful patterns-E	1	4	6	6	-	8	2	7	11	1	3	3	**52**
perception of meaningful patterns-N	3	4	8	2	5	2	4	5	8	-	1	1	**43**
problem representation-E	17	23	39	44	6	30	17	45	37	30	37	34	**359**
problem representation-N	23	6	25	18	34	7	21	22	46	34	35	22	**293**
problem representation-E-mental model	3	5	11	12	6	9	6	23	16	8	7	9	**115**
problem representation-N-mental model	9	6	6	5	20	11	10	8	17	11	8	4	**115**
problem representation-E-metaphoric image	-	-	10	2	-	5	1	8	7	1	12	4	**50**
problem representation-N-metaphoric image	-	-	6	-	1	2	1	5	6	3	2	5	**31**
solution generation-E	1	4	4	7	-	4	2	11	7	2	2	4	**48**
solution generation-N	2	1	4	4	14	-	1	3	8	12	8	-	**57**

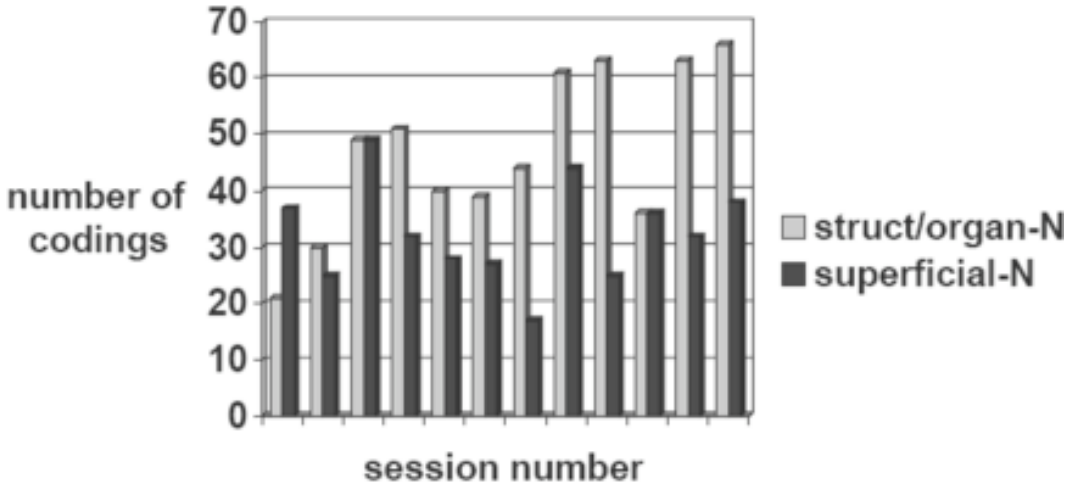

Figure 1: Process Pattern for the Novice Categories of Expert Thinking-description

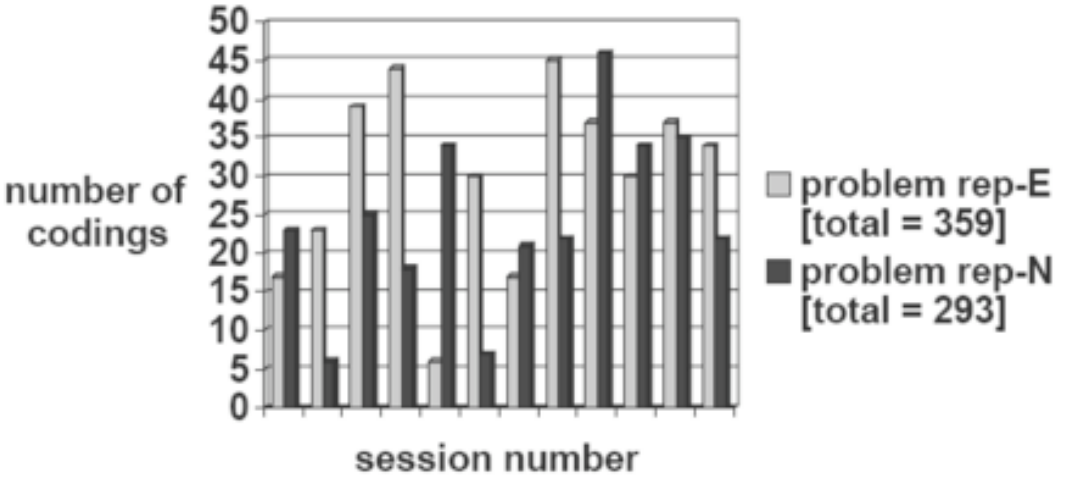

Figure 2: Process Patterns for the Category of Expert Thinking-perception of meaningful patterns.

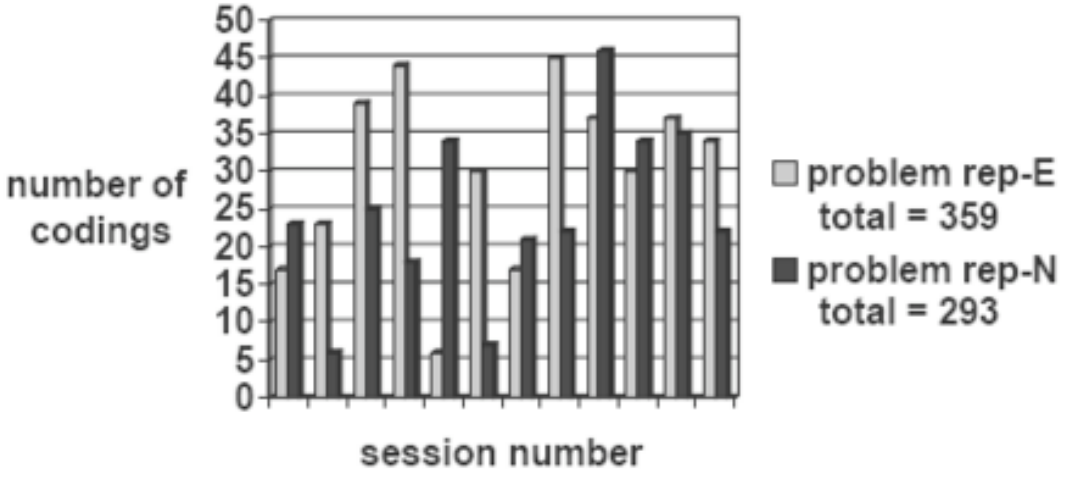

Figure 3: Process Patterns for the Category of Expert Thinking-problem representation.

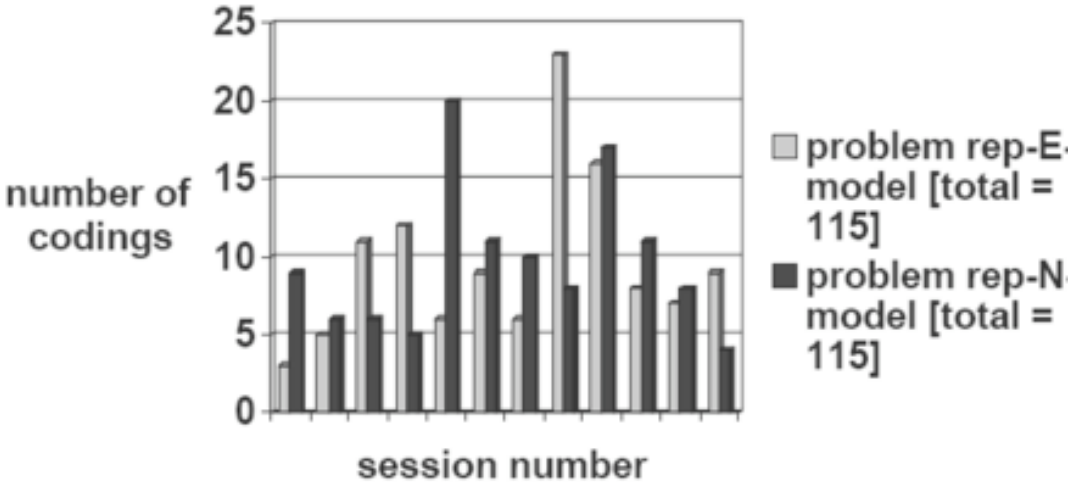

Figure 4: Process Patterns for the Category of Expert Thinking-problem representation-using a mental model.

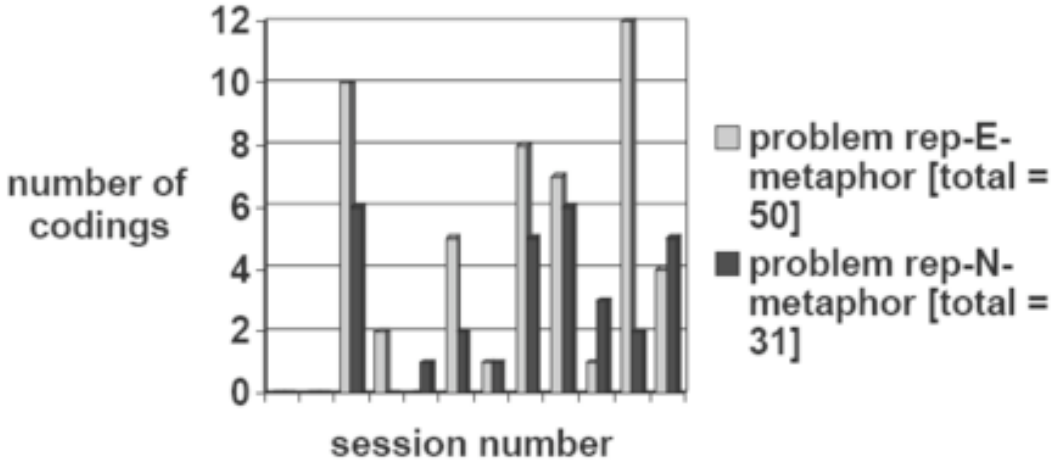

Figure 5: Process Patterns for the Category of Expert Thinking-problem representation-metaphoric image.

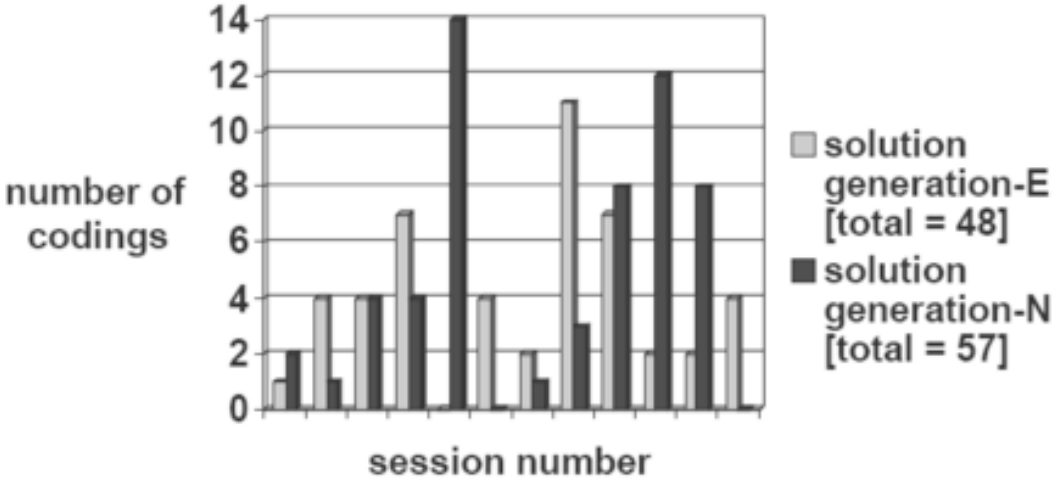

Figure 6: Process Patterns for the Category of Expert Thinking-solution generation.

About the Author

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Dr Reilly has an interest in the development of social creativity and shared expertise, as well as learning and change processes in the workplace.

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