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Is expertise a necessary precondition for creativity?

A case of four novice learning group facilitators

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Abstract

Many North American theorists conceptualize expertise as preceding creativity. The rationale is, that in order to be truly creative, one must master a field so remarkable contributions can be made. Therefore, in order to be truly creative one must be an expert in a structured and codified domain. This inquiry attempted to examine the relationship between expert thinking skills and creativity in an ill-defined domain, embedded in the community of practice of group facilitation whose goal was to support learning. Using an instrumental case study approach to explore a unique system embedded in a naturalistic context, the case was comprised of a team of four female novice group facilitators, functioning as teaching assistants for learning task groups of university students. Various sources were drawn upon in order to map this group as a coherent knowing system. Debriefing sessions and interviews were transcribed and coded using a category string method in order to retain a holistic sensibility to the analysis. The codes revealed that the system displayed characteristics of shared expertise and social creativity. The overall pattern of creative response closely followed those of expertise. The codes for expertise generally preceded those instances of creativity, suggesting that creativity does need to rely on expert thinking skills. However, this inquiry suggests expanding the notion of expertise, in that it need not be situated in a single person, but can emerge from a system of shared expertise.

Keywords: Expert thinking skills; Shared expertise; Social creativity; Group facilitation; Collective zone of proximal development

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1. Introduction

A fundamental tenet found within the North American literature on creativity is that one must be an expert in order to be creative. This standpoint, however, reflects inherent assumptions about creativity and its nature. In order for something to be truly creative, it must be unique in the entire world and advance a particular field (Csikszentmihalyi, 1996). This view renders invisible the creativity of the ordinary, which may involve multiple small moments of discovery that are only original for the individual involved. Those who are interested in the phenomenon are then blind to the way in which these little creative acts weave and reweave the fabric that makes social life possible. We all create capacities, strategies, or processes that are "new to us" to allow us to navigate and resolve the unique responsibilities, problems, tasks, and concerns of our daily lives. This is how we create "compositions" of lives as improvisational art forms (Bateson, 1999). Generally, everyday, or ordinary, creativity is seen as a "craft" activity, rather than a technical one (Aquila & Parish, 1989). In addition, this perspective tends to obscure the dynamics of social or collective creativity, since the path from initial preparation to illumination (Wallas, 1926) may pass through two or more people over an extended period of time. As well, creativity in ill-defined, loosely structured domains that involve process, e.g. domains whose focus is on creative responses to external situations or to individuals (Torrance, 1988), may be hidden since the problems in ill-defined domains lack definitive solutions, which are heavily dependent upon the initial conception (Ashley, Chi, Pinkus, & Moore, 2004). A loosely structured domain implies a lack of gatekeepers who regulate the knowledge construction within the field. Who then would adjudicate whether a particular act advanced the field?

2. Literature review

2.1. Major themes and characteristics of expert thinking

An expert is someone who has been working for a decade within a domain, and has achieved a high level of competence, irrespective of her or his novel or original contributions (Gardner, 2000). Expertise involves the acquisition, storage, and utilization of at least two kinds of knowledge: explicit knowledge of the domain (facts, major ideas, principles, and formulae within a specific domain) and tacit knowledge of the field (Ericsson & Smith, 1991; Sternberg, 1998). Sternberg (1998, 2000) has argued that abilities are flexible, not fixed, which allows for a continuum conceptualization of expertise. In particular, expertise can be seen as a process of continual, life-long development. Some of the characteristics of expert thinking are: the ability to perceive and reproduce large meaningful patterns in the expert's particular 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; Glaser & Chi, 1988; Johnson, 1988). Expert approaches to problem solving are characterized by additional dimensions such as the use of data-driven reasoning when solving well-defined problems. However, with ill-defined problems, experts change their strategy to hypothesis-driven reasoning (Hmelo, 1998; Lesgold, 1988). They also tend to represent problems at a deeper (principled) and more semantic level (Glaser & Chi, 1988). Experts also tend to work forward from given information to implement strategies for finding unknowns, while monitoring their own problem-solving strategies and processes. They solve well-defined problems quickly with little error. In addition, experts spend a great deal of time analyzing problems qualitatively and tend to retrieve a solution method as part of the comprehension of the task (Ericsson & Smith, 1991; Glaser & Chi, 1988; Sternberg, 1998).

2.1.1. Differences between experts and novices

Though there is a clear definition of "expert" within cognitive psychology, there is no consensus about what a novice is or how one becomes a novice within a domain (Shore, 2000). Novices tend to be described in relation to experts, and therefore, tend to be portrayed as having more superficial knowledge networks, not picking up the salient features of the problem, and therefore failing to develop an appropriate schema for consideration. Novices tend not to apply additional tests to the proposed schema to either confirm or refute the initial problem assessment; details about the proposed mental model are also less complete with little fine-tuning in response to additional information. Novices are also likely to be rigid in following their initial appraisal, sometimes force fitting abnormal or unusual features into a normal schema. However, it is not always the case that the expert outperforms the novice. Although expert performance is superior to that of novices in well-defined problems, Johnson (1988) has demonstrated that in behavioral decision research in domains of much 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 based on the outcome of a single case. It is therefore quite possible, that in order to compensate for the ill-defined nature of a particular task, a pooling of expertise of several individuals could compensate for a novice's performance shortcomings. The consideration of multiple cases by a group of experts, or even experts-in-training, could allow 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) might be able to collectively identify a more accurate representation of the problem, inferring relations and then adding constraints (Glaser & Chi, 1988), thereby reducing the inherent uncertainty to a more manageable level.

2.1.2. Expertise in the ill-defined domain of group facilitation

Expertise in ill-defined domains, like group facilitation, tends to be a more difficult phenomenon to detail. This may be because facilitation slips into the pitfall of a fleeting enterprise that is difficult to research and substantiate (Rogers, 1999). The practices of group facilitation rely on four main areas of expertise:

- concepts – theories and models about personality, group dynamics and development, systems, intervention, etc.;
- skills – listening, observing, identifying problems, diagnosing, responding, questioning, intervening, and the ability to be collaborative;
- personal self-awareness – self knowledge about values and ethical frameworks, attitudes, beliefs, motivations, and personal needs; and
- personal qualities – empathy, acceptance, congruence, flexibility, and caring (Hunter, Bailey, & Taylor, 1995; Phillips, 2002; Schwarz, 1994).

Within group facilitation, problem identification and problem finding (Getzels & Csikszentmihalyi, 1975) become extremely important expert activities. Research has shown that the generation of high-quality problems tends to generate effective solutions (Mumford, Reiter-Palmon, & Redmond, 1994). Three types of problems comprise the major preoccupation of group facilitators: a *presented* problem (it and its salient features are defined by others, e.g. a group participant feels excluded from the social aspect of the group); a *discovered* problem (derived from information presented from the individual, e.g. a diagnosis of the group's stage of development); and a *created* problem (the individual defines the nature of the problem and pertinent information generating a problem where none existed before, e.g. hypothetical possibilities of pitfalls to a group's growth and the development of preventative facilitative actions). The ability to successfully formulate and address these three core problem areas would hallmark the expert group facilitator.

2.2. Social creativity and dialogue

Recently, social creativity has come to mean the functional and dialogic relationships between persons concerning a task embedded in a specific environment, which is nested in a socio-historical frame (Barrett, 1999). Therefore, creativity emerges from a context in which practices and discourses play a key role (Montuori & Purser, 1999). Language, then, becomes a tool of creativity, shaping and shifting meaning and cognition with its linguistic and symbolic forms; the space between those in dialogue within which interactions happen is the crucible of creativity. "Language is a change creating force and therefore, to be feared and used. . . with great care, not unlike fire" (Lakoff, 1990 as cited in Barrett, 1999, p. 133). Language creates, maintains, and transforms the conventions by which individuals constitute their lives, and coordinates the on-going relations members have with one another. Language also shapes not only how individuals talk about experiences, but also how they actually have them. Therefore, within this framework, creative activity does not lie in the private recesses of the individual mind, or only in the actions of skillful and creative execution. Creativity also resides within the dialogical interaction in the contexts of relational endeavors nested in a larger "conversation."

Investigations into groups functioning in professional contexts have made links between dialogue and creativity. Gibbons and Grey (2004) determined that dialogue and creativity synergistically contributed to developing critical thinking, a skill seen as essential in preparing students for the ambiguities and complexities of social work practice. Dunbar (1995) found that teams which included members from different disciplines and with different perspectives were the most inventive and effective. Diversity enabled a team to maintain curiosity about those occurrences, which did not fit with the dominant hypotheses and ideas, and thus led to the development of important new thinking. Diversity was a useful resource only if effective group dialogue processes were in place. This may be because creativity is closely related to spontaneity. Spontaneous thoughts may seem strange at first, and individuals may not express them if they take time to think critically (Hansen, 2004). Members of a team must trust the dialogical space, and know that it is safe, no matter what they might suggest. At a larger system level, Walshok (1999) found that the institutional mechanisms of dialogue and collaboration gave rise to creativity and innovation capable of addressing emerging knowledge needs in the new networked economy. In examining the effects of the CONNECT program, a web of talent linking university and community partners, she found that collaboration became possible when there was a belief in the notion that unexpected ideas and solutions grow out of genuine conversations between groups of otherwise distinct individuals.

2.2.1. Group facilitation as a socially creative act

Group facilitation, as in any activity whose main focus is on operational actions that involve working with people, is about process, rather than content (Hunter et al., 1995). A facilitator essentially is a guide, whose predominant focus is on how (process) things are done between people and in groups, not merely on what (content) is done. Proponents contend that facilitative practices play central roles in development, change, and the learning processes of individuals and systems (Schein, 1999; Senge, 1990). Since facilitation is inherently situated in a group setting, it is intrinsically social and interactional.

Because group facilitation is ecological in nature, in that each group is an idiosyncratic environment with unique cultural properties that shape and determine the individuals' responses to the context (Bion, 1961; Dimock, 1993; Hunter et al., 1995), Wakefield's two-dimensional classification model (1989) can be applied to assess the degree of potential for creativity within the field of group facilitation. His two-dimensional classification model focuses on the process of problem identification (open problem versus closed problem) and type of solution (open solution versus closed solution). Group facilitators enter settings not knowing the specific learning styles, personal goals, knowledge networks, motivational stances, interpersonal and social needs, stages of life, skills and hidden resources of the participants (an open or undefined problem). They are armed with a multitude of interpretive frameworks, some of which overlap, others of which are very distinct. As they become more familiar with participants, the group learning or systemic change environment becomes more defined (gravitating toward the closed or defined end of the continuum). However, group observation, diagnosis and intervention is dependent upon point of view and attributed meanings. A group facilitator must decide which behavioral manifestations are considered salient to diagnose the group and the interpretation of their significance. This interpretation rests on which framework fits best with the unique trajectory of the group's developmental path. This diagnosis then prompts a decision about what intervention would address the group issues and promote positive growth, as well as identifying which method is best to implement that intervention (Reddy, 1994). Within this undertaking, there are no clear-cut or defined solutions; there are myriad ways to facilitate that emerge out of assorted frameworks.

Potentially, facilitation strategies that are responsive to the emerging context are anchored in both quadrants I and II, which are positively correlated with originality and psychometric tests of creativity. Given the process definition offered by Taylor (1988) that everyday creativity is an internal restructuring of one's own universe of understandings and insights, group facilitation encompasses the paradigm shift of being able to continually view group process from a systemic and developmental process that guide intervention actions (Schwarz, 1994). As with any domain, individuals may fail to capitalize on the creative potential within the field by continually using the same techniques disregarding the demands of the emerging context.

2.3. Must one be an expert facilitator in order to be a creative one?

Many North American theorists conceptualize expertise as preceding creativity (Fraser & Mathews, 1999; Simonton, 1985). The justification is that in order to be truly creative, one must master the field, so that remarkable contributions can be made. Herzberg (1987) found that subject matter expertise was a fundamental quality associated with innovation. Weisberg (1988) has demonstrated that when examining the think-aloud protocols of all subjects in a closed problem/open solution task, there was an interaction between the individual's knowledge and the problem itself. The strongest proponent of this position is Csikszentmihalyi (1996). "A person who wants to make a creative contribution... must learn the rules and the content of the domain, as well as the criteria of selection, the preferences of the field" (p. 47). He contends that an individual must fully internalize the knowledge and conventions of the field before one can change some aspect of it. This creative contribution must pass through the gatekeepers of the field, experts whose "job [it is] to decide whether a new idea or product should be included in the domain" (p. 28). The underlying principle is the perspective that since the cognitive functions indicative of experts operate smoothly and efficiently, experts have a greater potentiality to be creative in their field and a greater likelihood to extend their domain. Proponents of the position that expertise is a necessary precondition for creativity might suggest that it is the superficial approach characteristic of novices' thinking that is most likely the dynamic responsible for novices not being creative. This outlook of creativity is strongly influenced by the themes of "eminence", "single creator", and "unique in all the world" found in the literature on creativity (Reilly, 2005). Inherent in this formulation is the exclusion of collective or social creativity, everyday or local creativity (Craft, 2005), and creativity in loosely organized, ill-defined fields, such as facilitation. Domains of everyday creativity are rendered invisible, since recognition by others of the creative act is an integral component of its essential nature.

Then again, not all streams of research about creativity make such strong statements about expertise. A body of empirical and theoretical work focusing on small "c" creativity is growing (Amabile, 1983; Bateson, 1999; Cropley, 1997; Richards, 1996; Runco & Bahleda, 1989). Craft (2005) has argued that since all people, from early childhood onward, are capable of creativity, we need to accept a spectrum of knowledge. This echoes the formulation of creativity of Cohen (1989) who proposed a continuum of adaptive creative behaviors. He suggested that creativity ranges from the first level (products or processes that are new to the individual) to the seventh level (products or processes that are transformational to the world). At each of the seven levels, Cohen begins with the local, the creative action has a personal impact on the creator. It then proceeds in ever-widening ripples of influence until it reaches the largest system of world-wide cultural impact. No matter what the level of effect, the action is deemed creative.

However, some level of expert thinking may come into play, even in local creativity. Craft (1998) found that a significant theme for educators about their perceptions of fostering creativity in learners revolved around self-confidence, which has been linked to expertise development

(Johnson & Johnson, 1987). As well, Craft (2002) has described possibility thinking as a desirable strategy in order to cultivate creativity for both teachers and learners. Possibility thinking involves the posing of questions, which can assist in the exploration of a problem space, as well as having an exploratory attitude. Both of these dimensions reflect the expert thinking skill of problem representation. Possibility thinking also involves problem-solving, seeking solutions with an outcome-focused approach. Solutions are posed, discussed, experimented with, and evaluated. This mirrors the expert's rich repertoires of strategies for problem-solving along with appropriate mechanisms for assessing and applying these strategies. Possibility thinking also involves making comparisons (Jeffrey & Craft, 2004). In order to make comparisons, one must have a problem represented in the form of a mental model, another expert thinking skill. Even the more recent inclusion of the concept of wisdom as fostering creativity (Craft, 2006) implies a level of expertise, since wisdom is defined as an expert knowledge system ". . . in the fundamental pragmatics of life [which] entails insight into the quintessential aspects of the human condition" (Baltes & Staudinger, 1993, p. 76). These considerations prompt interesting questions about expertise and creativity, and necessitate an examination of the relationship between the two. Since Voss and Post (1988) established the ability of a community of problem-solvers to more accurately represent ill-defined problems, investigating this connection in the context of collaborative learning relationships among novices may provide interesting insights regarding these associations.

3. Problem statement

The research question emerged from gaps and assumptions within the literature concerning the required presence of expertise in order to generate creativity. This inquiry attempted to:

- ascertain if shared expertise is a phenomenon that can be demonstrated in a system of rank novices; and
- illuminate the relationship between expert thinking skills and social creativity in the ill-defined domain of group facilitation whose function was to support student learning.

4. Methodology

I selected a qualitative methodology, since this method is more conducive to understanding meaning attributed by participants to certain events, how context influences actions, and the process by which events and actions take place, while also identifying unanticipated phenomena and generating initial theory propositions (Maxwell, 1996).

4.1. Methods

This project used an instrumental case study approach (Meador, Hunsaker, & Kearney, 1999; Yin, 1993, 1994), to explore the uniqueness of a system embedded in a naturalistic context (Gruber &Wallace, 1999). The case was defined as the group (Stake, 1994), while individual participants were seen as subsystems.

4.2. Participants

The participants were a team of four female novice group facilitators, functioning as teaching assistants for learning task groups of university students. The participants had no practical experience facilitating groups, though they had followed a university program in facilitation. These women, aged 23–45, were selected on the basis that they expressed a desire to become professional group facilitators. As a member of the team, I assumed the stance of complete member-researcher (Adler & Adler, 1994; Spradley, 1980), which allowed me to grasp the depth of the subjectively lived experiences. Because of my multiple roles, I adopted shifting situational identities (Angrasino & Mays de Perez, 2000) that were harmonious with the social interaction and context. I was particularly mindful of issues of power, status (Marshall & Rossman, 1999) and cognitive authority, given my position, and attempted to continually rebalance interaction in favor of equanimity.

4.3. The context of the inquiry

Since the development of expert thinking is linked to creativity in the conceptual frame of the field, and since both expertise and creativity is pivotal to the solving of real world problems (Runco & Chand, 1994), I conducted my inquiry in an authentic setting, novice group facilitators whose function was to support the learning of groups of university students. Groups are a common format for teaching skills within a practice area, such as working in groups. The facilitative abilities of the group leader have a substantial impact on the ability of the participants to engage in critical reflection (Pavlovic & Friedland, 1997). Therefore, the introductory class in group dynamics for undergraduate students provided a natural environment. The four participants in this inquiry were to facilitate and guide the students' learning while they were engaged in their group work. The course met twice a week for 3 hours, over a six and a half week period.

4.4. Data collection procedures

Various sources were drawn upon in order to map this group as a coherent knowing system (Gruber, 1988). Since expertise and creative work occurs over time (Gruber, 1988; Gruber & Wallace, 1999; Sternberg, 1998), a developmental approach was taken.

4.4.1. Debriefing sessions

Directly after each class, the team debriefed in order to make meaning of the novices' experiences using the process of public reflection (Raelin, 2000) as a way to promote professional reflective dialogue. This process involves 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. The focus was on: creating a reflective dialogue where stories and understandings were shared; encouraging problem finding; and engaging in retrospective sense making. These are all key features of expertise and creative thought (Barrett, 1999; Jausovec, 1994; Mumford, Baughman, & Sager, 2003; Neçka, 2003;Wakefield, 2003). This format was designed to transform storied experiences into unified meaningful knowledge, in an effort to practice "expert thinking" (Posner, 1988). Sessions were video taped in order to create a full record of a social event (Adler & Adler, 1994).

4.4.2. Individual and group interviews

Each team member was first interviewed individually in week three. This was done in order to explore participants' life worlds and lived experience (Kvale, 1996). The interview was approached as a collaborative and interactive process, minimizing hierarchical relationships (Oakley, 1981). Using an open-ended conversational format in order to facilitate the development of trust, rapport, and maximum exploration (Fontana & Frey, 1994), I attempted to elicit stories from the participants, since this would be reflective of their consciousness (Vygotsky, 1987). Questions also attempted to elicit feelings, thoughts, intentions, and meanings.

At the final meeting of the team, a group interview (Fontana & Frey, 1994) was conducted in order to give the participants an opportunity to sum up the facilitation experience. This format tends to create a rich data set, since group interviews are likely to have a synergistic effect, generating more associations and insights than individual interviews (Morgan, 1997).

4.4.3. Addressing issues of understanding and trustworthiness

The criteria that guided my work to insure trustworthiness (Erlandson, Harris, Skipper, & Allen, 1993) of the data were: credibility, transferability, dependability, and confirmability. 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, debriefing by peers, triangulation in order to verify findings, prolonged engagement and persistent observation, thick description (Geertz, 1973), a reflexive journal, and an independent audit.

5. Data management and analysis

5.1. Data transformation

Debriefing sessions, the individual, and the group interviews were transcribed and rendered into text for analysis, and were considered as a form of collective “think-aloud protocol”, a common approach for illuminating cognitive performance (Chi, 1997; Young, 2005). This text was then input into a computer software program for the coding process. I employed the Hyper Research program, a code-and-retrieve computer data analysis program developed by Research Ware for a Mac OS.

5.2. Data analysis

Before proceeding to coding, I employed the use of sensitizing concepts (Blumer, 1954, 1969). Sensitizing concepts provide a functional pool of readily activatable coding pegs (Miles & Huberman, 1994). I created coding pegs for the key expert thinking skills and the characteristics of creative activity based on an extensive review of the literature. Coding was then done at the level of units of meaning, using a process coding procedure (Strauss & Corbin, 1998). Rather than coding in disconnected, parsed categories, I generated “category strings” in order to retain a holistic sensibility to the analysis (Dey, 1999). The strings signified the relationships of primary representations linked to major categories, differentiated by subcategories, still connected through meaning. Characteristics of each category string, strand, and knot were delineated and defined through unitizing the data by provisionally categorizing the statements that seem to relate to the same representation. I devised definitional statements to characterize their properties based on definitions of the concepts and skills in the literature. I developed rules for inclusion of units into the strings based on similarity of meaning in order to keep the category internally consistent. I reviewed all the coded data to check for consistency and relevance, until the criteria proposed by Lincoln and Guba (1985) were fulfilled: exhaustion of data sources, emergence of regularities, and overextension. Theoretical saturation (Dey, 1999) of categories was deemed achieved when no further properties or relationships were generated.

6. Results

In an effort to illuminate the relationship between expertise and creativity, I first had to establish the levels of expertise in the system. I then determined whether the system displayed the characteristics of creativity. The codes revealed that the system displayed many characteristics of both expert thinking and creativity.

6.1. Thinking processes and shared expertise

Since I wanted to see if the novices were able to create a state of shared expertise, I coded separately for Novice and Expert in order to differentiate who enacted the cognitive function.

The coding for Novice denotes that the thinking skill was performed by one of the participants. The expert thinking skills that emerged within this inquiry were delineated as:

- *Thinking-description.* These statements in narrative form described events in the learning group. Two knots were developed differentiating between *superficial* descriptions, a simple retelling of the chronology of events, as compared to *structural/organizational* descriptions that focused on the inherent, implicit, intrinsic or process structure of the surface events;

- *Thinking-perception of meaningful patterns.* These statements conveyed the individual's perception of a significant pattern or structure revealed over time;

- *Thinking-problem representation.* These statements focused on how a participant identified, understood, constructed, or interpreted the problem space. Three additional knots were:

    - *simple problem representation* – explanations of facilitations and learning interactions at a principled level or an attempt at structuring or restructuring the problem space;

    - *problem representation using a mental model* – attempts to create a holistic coherent understanding and interpretation of the problem, bridging the gap between abstraction and application; and

    - *problem representation using a metaphoric image* – private representations of domain knowledge, concepts, representations, and relations distilled into an image.

- *Thinking-solution generation.* These statements proposed solutions to problems or suggested avenues for action.

The frequency of the coding for these specific expert processes can be seen in Table 1.

Table 1. Frequency Table of Code String for the Process Categories of Expertise

Code String	Sessions												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Thinking processes													
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**

As well, Figures 1–5 show a comparison between some key expert skills demonstrated collectively by the novices as compared to that of the expert.

Figure 1. Comparisons between the Expert's and Novices' Collective Demonstration of Simple Problem Representation

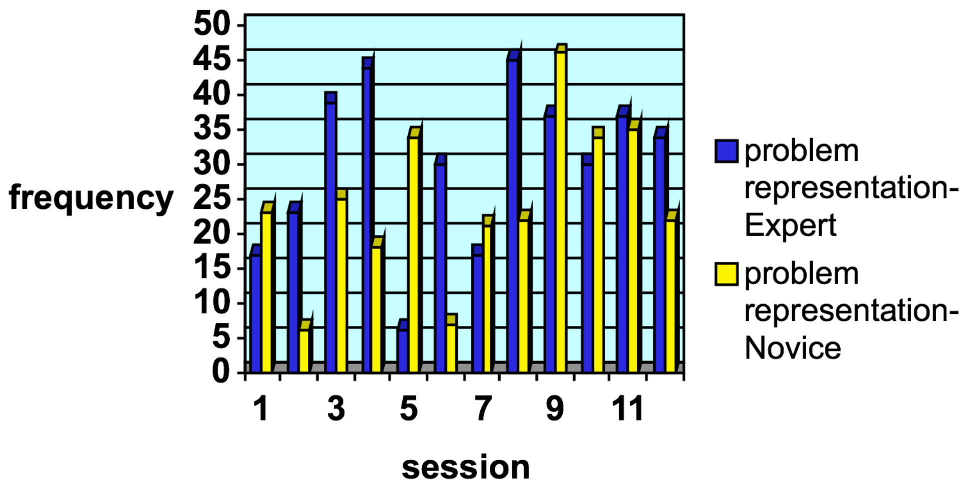


Figure 2. Comparisons between the Expert's and Novices' Collective Demonstration of Problem Representation Using a Mental Model

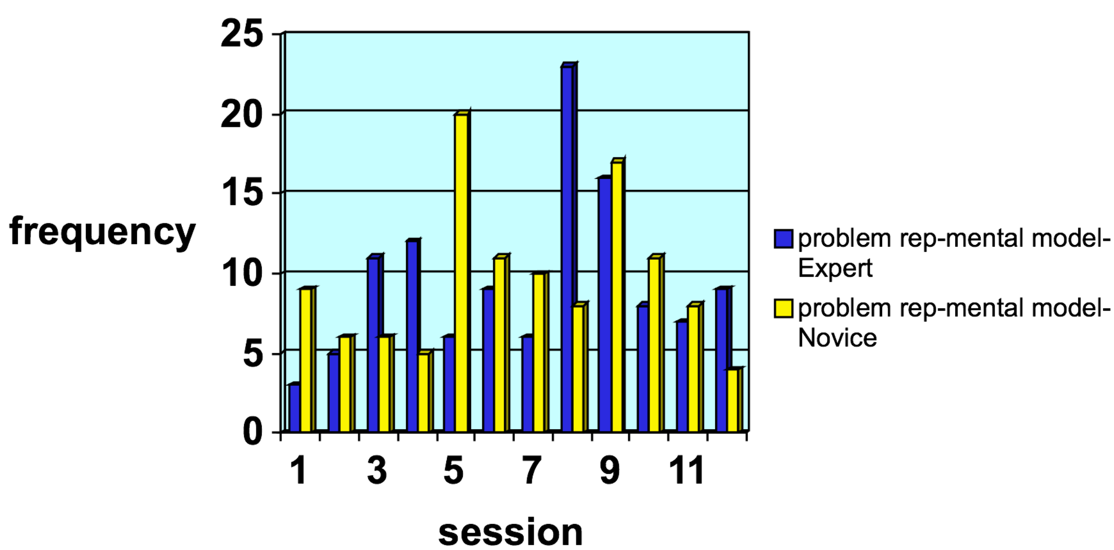


Figure 3. Comparisons between the Expert's and Novices' Collective Demonstration of Problem Representation Using a Metaphoric Image

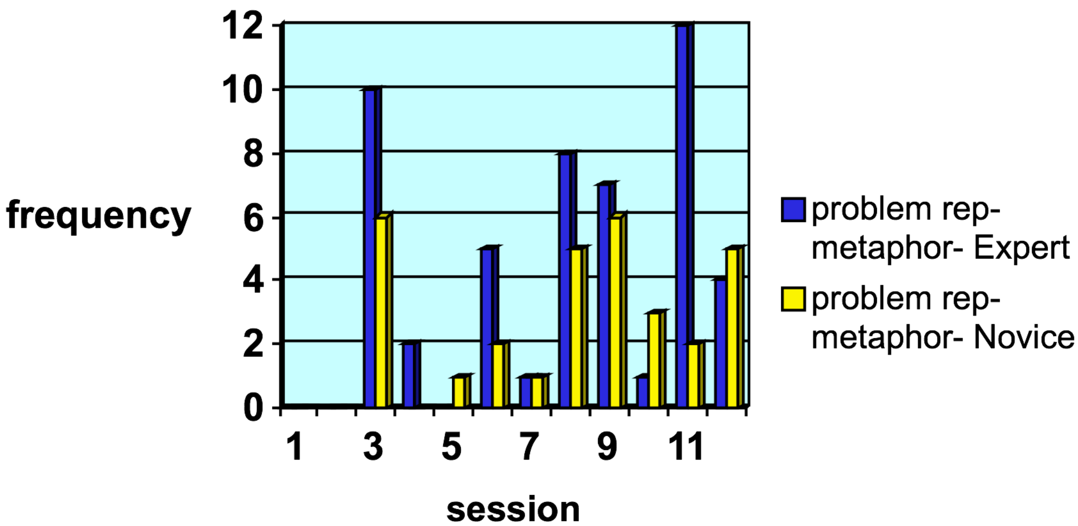


Figure 4. Comparisons between the Expert's and Novices' Collective Demonstration of Perception of Meaningful Patterns

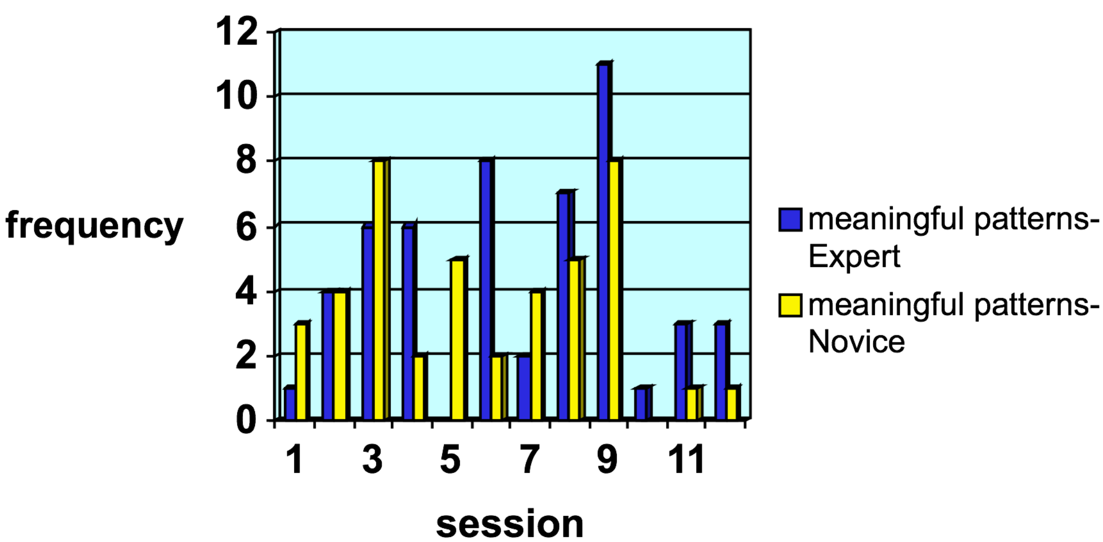
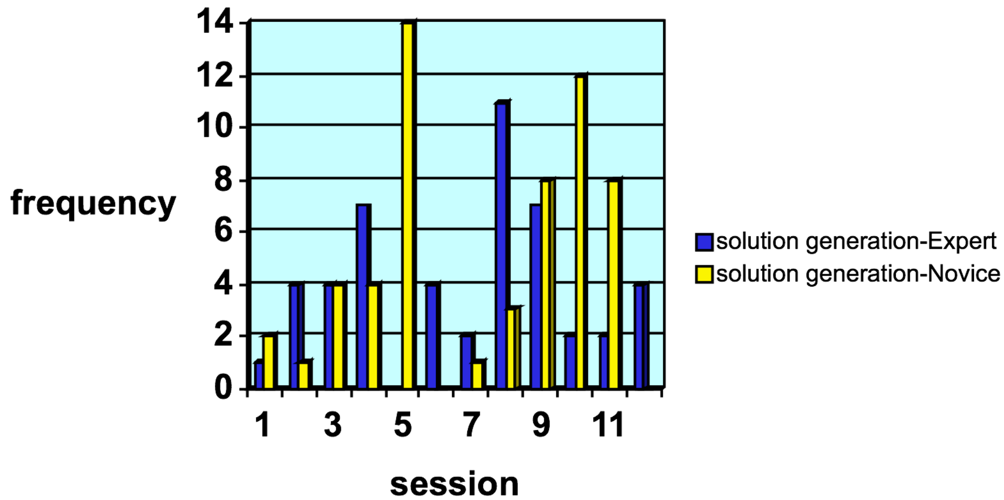


Figure 5. Comparisons between the Expert's and Novices' Collective Demonstration of Solution Generation



What clearly stands out when examining the results is that the sum of the collective responses of the rank novices either equals that of the expert with 12 years experience (*problem representation using a mental model*) or compares quite favorably (*perception of meaningful patterns*; *simple problem representation*; and *problem representation using a metaphoric image*). Collectively, the novices were able to generate similar frequencies to the responses displayed by the expert. The expert thinking skills seemed to become an interactional frame shaping the dialogue. Shared expertise developed as a result of a process of "collaborative emergence" (Sawyer, 2003). Given time, dialogical space, and the right conditions of open and sincere collaboration, shared expertise among novices can be created, building a solid foundation for expert thinking. These participants, who had no previous practical experience, were able to combine their emergent expert thinking skills into a synergistic cognitive strength that rivaled that of an established expert.

Some responses were more frequently seen as being performed by the novices than by the expert, such as *Thinking-solution generation*. This was also true for *Thinking-description*. What is particularly interesting is that during the first session of the inquiry, the number of codes in the knot *Thinking-description-superficial-N* is almost twice the number for that of *Thinking-description-structural/organizational-N*. This pattern 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 *Thinking-description-structural/organizational-N*, a more expert-like approach to description, rose sharply, and for the last 50% of the sessions was at a level generally two to three times higher than it was initially. The stabilized frequency of this skill 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* learning dynamics from a process level, picking up subtle verbal and visual cues. 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 within their groups. Listening to the descriptions of others, and their own observations, alerted the audience members to aspects of process to attend to in the future that might illuminate their own understanding. It also created collaborative, multiple expert-like lenses with which to view and interpret learning and facilitation dynamics.

Though the main focus of this inquiry is on the novices, it is important to mention the patterns that were evident within the knot *Thinking-problem representation-E*, since it had a powerful impact on their behavior. This was, by far, the most frequent code of any within problem representation, 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 of the actual statements reveals that the majority of these comments were phrased in the form of open questions to the teams of novices. Wegerif (2005) found that for dialogue to ferment creativity it had to open up creative space by turning language back upon itself in the form of open questions. Open questions can trigger a shift to an exploratory attitude. In this social context, the expert's questions served to act as a spotlight on darkened areas of the problem space, generally at the edges of the conversation. These questions served to expand the specifics under discussion. It functioned as a highlighter for gaps, pointing to missing pieces in the descriptions offered by the novices.

6.2. Social creativity processes

Since social creativity is an interdependent systemic process, it was impossible within the confines of this inquiry's methodology to tease out where one person's creativity ended and another's began based purely on roles and external responses. Though one person in the system may have made a creative response, its origin may have been in the comment of another. Who then is the creator: the one who creates the conditions and initiates a train of thought or the one who verbalizes it? Generative ideas that emerge from explicit joint thinking arise from significant and meaningful dialogue, which reflects sustained, shared struggles with problem spaces (John-Steiner, 2000). Therefore, I conceptualized social creativity as the mutual and joint yield of every member of the system. However, only those strands or knots that showed a clear strength with more than 100 codings with the vast majority of the coded responses being from the novice group facilitators were included in this analysis. Four major category strands, reflecting the prime characteristics of creativity identified in the literature, emerged describing the processes of social creativity within this system:

- *Problem finding*. This code represented statements that formulated questions, within the team's public reflection, in an effort to generate ideas that needed to be raised in order to more effectively or elegantly deal with an existing situation. There were two dominant knots in this strand:
  - *raising new questions* were statements that raised a new problem or exhibited curiosity about a situation by generating important questions that were original or emergent about an existing situation in the learning group; and
  - *hypothesizing/envisioning/imagining* were comments generated in the team dialogue that imagined or posed potential open-ended problems that may occur in the future, though the preexisting elements are present and are identified.

- *Flexibility-alternate perspectives/redefinitions*. This code represents statements that promoted seeing a situation from different points of view or classifying an event into different categories.

- *Fluency-elaboration of suggestions or solutions*. This category reflected statements that built on or expanded on an existing suggestion or solution under discussion or added an extra illustration, clarification, or additional information.

- *Useful.* Comments were coded within this strand when they were labeled constructive and appropriate by the participants, met the demands of the context and stage of group development, were doable and relevant to the goals of the class.

Table 2 illustrates the frequency and rhythm of the code string for the process category of social creativity.

Table 2. Frequency Table of Code String for Process Category of Social Creativity

Code String	Sessions												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Social Creativity-problem-finding													
raising new questions	8	9	19	24	17	13	18	21	24	14	31	23	**221**
hypothesizing / envisioning /imagining	4	2	21	16	9	7	4	7	19	3	6	4	**102**
Social Creativity-useful	8	14	20	19	28	17	19	29	40	19	24	14	**251**
Social Creativity-fluency													
elaboration of suggestions or solutions	1	5	6	9	15	8	7	17	21	8	6	4	**107**
Social Creativity-flexibility-alternate perspectives / redefinitions	1	9	17	7	12	21	14	21	24	13	22	18	**179**

As can be seen, the system exhibited many characteristics of creativity, some of which increased over time (*Problem finding-raising new questions*, *Flexibility-alternate perspectives/redefinitions*, and *Useful*) and some of which showed a sensitivity to the demands of the context (*Problem finding: hypothesizing/envisioning/imagining* and *Fluency-elaboration of suggestions or solutions*), with the peaks and valleys reminiscent of the patterns of group development.

Two dimensions of the definition of creativity, *purposefulness* (Gruber, 1988, 1989; Gruber & Wallace, 1999) and *novelty* (Csikszentmihalyi, 1996; Gruber, 1989; Mumford & Gustafson, 1988; Perkins, 1988; Sternberg & Lubart, 1999; Thurstone, 1952, as cited by Torrance, 1988), are seen as central. These were initial sensitizing concepts; however, these characteristics were, surprisingly, virtually nonexistent in this system. Since they are key to the field of creativity, there is a need to comment on this absence. It is very possible that the reason *purposefulness*, i.e. statements that communicated the explicit desire to do something in a new way, was not a characteristic of this system is because this internal motivational state was explicitly expressed at the time when the participants entered into this situation. They engaged in being teaching assistants in order to explore their desire to facilitate groups professionally. It therefore became implicitly understood as a norm of the group as the sessions progressed.

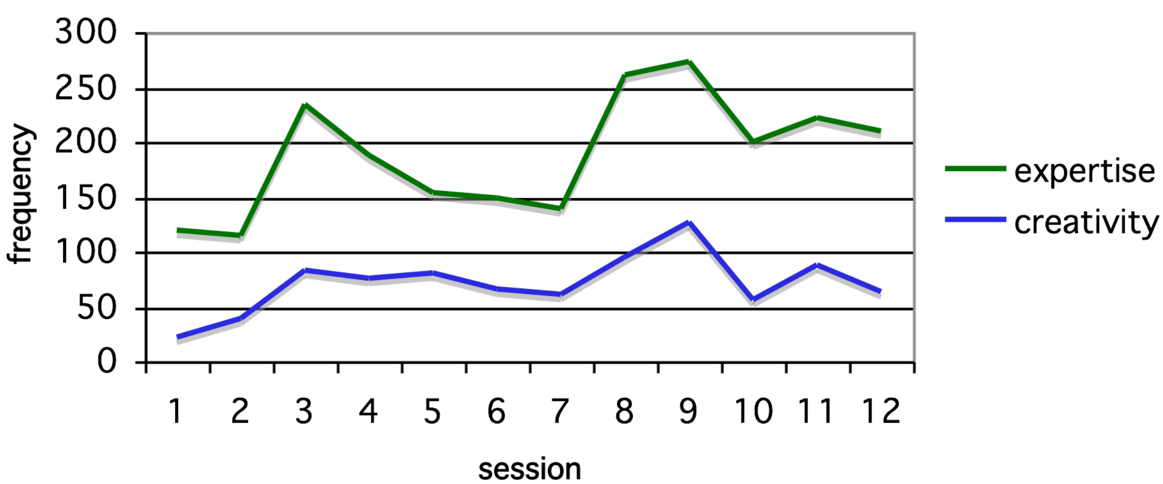
Statements that explicitly made note of the fact that the point under discussion was surprising, innovative or new to the listeners were deemed to be *novel*. Some theorists have seen novelty and usefulness as intimately entwined. Both Sternberg (1988) and Barron (1995) noted that unique or novel ideas had to be deemed useful to be creative. Perhaps novelty, in this context, was a less desirable characteristic for the participants than usefulness. When a novice wants to become expert, he or she is seeing how creativity can help in this quest. This would express itself as using the criteria of *useful* ways of behaving and responding as something that would be an important consideration and a desired goal. Therefore, the statements coded as *useful* can be seen as a reflection of the state and level of creativity within the system. As well, since the novice facilitators were engaged in the co-creation of a learning community (Wenger, 1998), characterized by cooperation, reciprocity, and the synthesis of various perspectives, they were engaged in an extrapsychic relational creative process (Gruber, 1997). So, even though the participants did not acknowledge the presence of a novel product, an outside observer can see that new ways of responding, new identities, and new external patterns of relating were formed by this socially interactive creative process. It is clear from examining these results that this system was able to become a creative one since the five dominant knots or strands reflect basic and primary characteristics of creativity, and that an important and significant contribution was made by the novices on the team.

Creative work shapes life, and in turn is shaped by life (Wallace, 1989); therefore previous experiences can play a major role in the expression of creativity. Generally, each of the socially creative processes first entered the system through the venue of an individual's sharing of her own personal experience as applied to the here-and-now example of her own facilitating and learning situation. Personal experience was the richest source that the novices could draw on. They compared and contrasted their own life experience with what they were observing in their groups in order to make meaning. The social creative processes that then developed allowed them to expand their pool of understanding of both past and present experience by creating new and useful representations. As these representations or lenses entered the public reflection space, the other participants were able to learn them and incorporate the lens into their own internal worlds, illustrating the dialogic nature of creativity and learning in this inquiry.

6.3. The relationship between expertise and creativity

When examining process variables in human interaction, it is also important to examine the interplay of the various processes identified with each other. Table 3 illustrates a simple comparison of the presence of expert thinking skills in relation to the social creativity processes. The frequency of the expert thinking skills far outstrips the frequency of the social creativity codes. However, this comparison does not illuminate the nature of the possible relationships between the two. Fig. 6 attempts to explore this relationship between the observed instances of collective expertise and social creativity in terms of their growth and movement over time. As can be seen, there is startling similarity in the movement of these processes over the life of the team. Though the expert thinking codes consistently surpass the creativity codes, they tend to rise and fall in very similar patterns, suggesting that there might be some sort of link between the two processes.

Figure 6. The Pattern of Relationship between Creativity and Expertise



In an effort to further unfold a pattern, I explored the proximity of the most dominant strands and knots within the two code strings of expert thinking and social creativity. I wanted to be able to examine the order of appearance of each skill in relations to the other. I was able to assess code connections using the program's Code Proximity function. Using this function within the software program, I formulated a series of connections based on the relationship of "equals" (code 1 in the chunk exactly matches code 2) or "overlap" (code 1 in the chunk overlaps or intersects code 2). I set a minimum number of 10 connects as a foundation for positing an association, since this was enough of a frequency to merit consideration as a pattern. "Equals" excluded any "overlaps"; if there were insufficient numbers to warrant notation, the "equals" connects were subsumed into the "overlap" category. Strength of association was determined a priori using the following criteria:

- 10–13 connects – a weak association;
- 14–19 connects – a low association;
- 20–29 connects – a moderate association; and
- 30 or more connects – a strong association.

Table 4 displays all of the associations between the novices' shared expertise and social creative processes, as well as the strengths for those that met the consideration criteria. In approximately 85% of all of the instances when the code for the expert thinking process was connected to a socially creative process, the expert thinking code directly preceded those of the creativity code. This suggests that social creativity may indeed rely on expert thinking skills to trigger its occurrence. But expertise need not only mean an expert. Expertise, in this instance, was embedded in a system of shared expertise. Therefore, though expertise may need to be

Table 4. Association Table for Process Category of Social Creativity and Expertise

Code String	**Problem finding-raising new questions**	**Problem finding-hypothesizing / envisioning /imagining**	**Fluency-elaboration of suggestions or solutions**	**Flexibility-alternate perspective/ redefinitions**
Thinking processes				
description-structural/ organizational-N	**26 moderate**	**13 weak**	**11 weak**	**38 strong**
description-superficial-N	**13 weak**	3	--	6
perception of meaningful patterns-N	7	5	4	5
problem representation-N	**60 strong**	**37 strong**	**11 weak**	**28 moderate**
problem representation-N-mental model	**10 weak**	**13 weak**	**13 weak**	**24 moderate**
problem representation-N-metaphoric image	--	3	2	5
solution generation-N	--	5	**13 weak**	2

present, it does not need be situated in a single person. Expertise can emerge from a condition of shared expertise that is the result of dialogical collaboration. This has extremely important implications regarding novices and local creativity or creativity in ill-defined domains. Novices can be creative when they engage in collaborative relationships with others in order to make sense of their experiences. According to the patterns in this inquiry, the most important skills to cultivate within the dialogical space that are most consistently associated with social creativity are (in rank order of most associated):

1. *Thinking-problem representation*

2. *Thinking-description-structural/organizational*

3. *Thinking-problem representation-mental model*

Other important skills to cultivate which had a weaker influence were: *Thinking description-superficial* and *Thinking-solution generation*. Each of these expert thinking skills are reflected in the traditional notions of solo expert functioning. However, we can expand our notion of “expert” to include a system or collective, which displays the same cognitive functioning.

7. Discussion

From this inquiry, shared expertise can be understood as the knowledge of a collaborative group, somewhat beyond the level for each individual member, which is created, then recreated through self-correction and mutual disclosure in a safe dialogical space. This can be a powerful path to learning; students in a physics class significantly improved their physics knowledge by developing the processes of shared expertise (Novemsky, 1998). Stough (1994) has suggested that “socially shared expertise” is a way of fostering social cognition by distributing the cognitive load through the group. In educational settings, shared expertise has been seen as a by-product of cooperative learning (Duran & Szymanski, 1993), in the use of explicit reciprocal teaching techniques (Garner, 1992), and in the building of collegiality in school settings (Timperley & Robinson, 1997). This inquiry clearly demonstrates that rank novices collectively can demonstrate levels of cognitive functioning that surpass the individual’s solo performance and compare favorably to an expert.

7.1. Shared expertise as socially shared cognition

An important concept to emerge from this analysis of cognitive activity and creativity is the notion of shared expertise as socially shared or distributed cognition, in that cognition, and expertise, is not just a product of one head, but also a product of several heads in interaction with one another. We, when in relationship, actively mold and influence each other's knowledge and reasoning processes, also building epistemology on the basis of what we are told by others (Resnick, 1991) and are, therefore, not bound by the limitations of any one person's cognitive capacity or experience.

The patterns evident within this inquiry point to the likelihood that expertise, when shared, is a product of social cognition. Through the dialogical format of public reflection, each member of the team would shape each other's interpretive processes (Resnick, 1991) with their verbal contributions, since discussion had a transactive property (Teasley, 1997). Each individual used her conversational "turn" to examine, operate, and shape the reasoning of the other novices in an effort to clarify ideas (an intrapersonal process) or create common understandings and meanings (an interpersonal process). Different prior knowledge of the novices generated initial differences in their perspectives and interpretations. Differences of personal interest and observational inclinations or strengths prompted the novices to attend to different aspects of the told events. Connections and extensions were made within the dialogic interchange based on the wealth of resources and perspectives to create expanded networks of cognition. As well, dialogue also allowed increased access (Lave & Wenger, 1991) to how experts and novices think, decide, and translate into action their conceptions of group development and intervention.

While common ground created mutual knowledge (Krauss & Fussell, 1991), differences created multiple open possibilities, which constructed a portal for social creativity to enter the system. Organized multivocality (Resnick, 1991), vicarious participation engineered by listening to each other's narrative constructions, and comprehension as a private achievement were realized, but through collective interaction. The individual's private comprehension was then shared. This then introduced it back into the collective space, allowing information proposed and skill demonstrated by one to be observed and assimilated by all. This then created the collective comprehension (Hatano & Inagaki, 1991) indicative of social cognition. Not only did this collective comprehension create distributed cognition that allowed for a common interpretive framework to emerge, it also allowed the novices to simultaneously hold and use a multidimensional perspective lens, approaching the open problem space with a tool necessary for generating creative open solutions. Sharing the cognitive load (Stough, 1994) or the division of cognitive labor (Hutchins, 1991) in this instance meant not only sharing the knowledge and cognition produced by expert behavior that also functioned as a foundation for social creativity, but also engendered sharing the actual cognitive skills themselves. Expertise, then, become an attribute (Sternberg & Frensch, 1992) of the system, not just of the individual, becoming a descriptive property of the whole, rather than merely one of the subsystems. There is, also, a relational effect. The qualities of the system were absorbed by its parts through observation, reflection, intention, and skilled or situated practice.

7.2. Creating a collective zone of proximal development: fertile ground for creativity

Within the context of this inquiry, the presence of shared expertise suggests that a collective zone of proximal development [ZPD] was created within the group of individuals (Cole, 1985; Lee, 1985). The bounded area of the ZPD was expanded tenfold when a mutual pooling of independent performances and multiple ways of assisting performance were created in an interdependent social system such as this. Intersubjectivity was transformed into multisubjectivity [1], where multiple realities and possibilities inherent in ill-defined domains were held to exist in the relational space at the same time, synthesizing thinking into a kind of cognitive pluralism (John-Steiner & Meehan, 2000).

Since cognition is mediated by the psychological tools and signs of language (Wertsch, 1991) using dialogue led to the creation of shared multiple perspectives. Combining the various expertise cognitive tasks within this format allowed the novices to collectively scaffold each other's expert performances. Scaffolding behaviors are uncritically assumed to go from most experienced member of a culture to a novice (Levine, 1993). However, in a mutually interactive system this relation is subject to flux. Roles concerning most experienced member of a culture and those in need of scaffolding shifted and changed as the interactions unfolded. Each time an expert cognitive function was performed within the confines of the public problem space, that is the collective zone of proximal development, it was observed, used, and then internalized by all other members of the team. The gap inherent within the zone was bridged collaboratively. In turn, in the next interactional encounter, these internalized functions were expressed externally and used to further bridge performance gaps creating a re-cyclical dynamic. In this way, the dynamics necessary to evoke a culture of social creativity were able to piggyback onto this communal expression of expertise. Since the need for the presence of expert cognitive skills was successfully scaffolded collectively, the group of novices were then able to deeply transform the internalized knowledge and skills from multiple sources (John-Steiner & Meehan, 2000) into a socially creative venue. The most immediate and visible expression of effective scaffolding

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[1] Intersubjectivity refers to the shared understanding created by two individuals who begin a task with differential levels of understanding and expertise. Multisubjectivity, then, becomes collectively created and shared understanding constructed by a group of individuals who are working on a task with multiple and differential levels of understanding and expertise.

would be improved performance on a task at hand (Levine, 1993). The equitable levels of expertise behavior by the novices and the rising levels of social creativity in the four dimensions representing core characteristics attest to this suggestion.

7.3. 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, limited transferability may be warranted. At the very least, this case study expands and enriches the repertoire of social constructions about shared expertise and social creativity. Certain trends, especially regarding the promotion of specific expert thinking skills, 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.

8. Conclusion

This inquiry supports the notion that creativity relies on expertise, especially specific expert thinking skills such as *Thinking-problem representation*, *Thinking-description-structural/organizational*, and *Thinking-problem representation-mental model*. However, this inquiry also demonstrates that we need to expand our notion of "expert" into the realm of collaborative and socially shared expertise. Expertise need not be embodied in a single individual, but can be collectively created through processes of reflective dialogue. Thus created and shared, these skills then become the foundation for socially creative approaches.

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