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## **“Good Moves” in Knowledge-Creating Dialogue: Preliminary Sketch of a Model**

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This paper presents a preliminary sketch of a model of the kind of dialogue that could be expected to generate new knowledge. It is not a descriptive model. It is normative, proposing what should go on in a dialogue that has knowledge creation as its purpose rather than what normally goes on; furthermore, it does not represent everything that should optimally go on. It is not intended to include all the kinds of talk that dialogue researchers tabulate. Instead, it represents the abstract structure of a dialogue. In this regard it resembles Toulmin’s famous model of argument (1958), which is also abstract and devoid of the interpersonal aspect. In fact, Toulmin’s model may be incorporated into the present model, to be applied when questions of belief arise.

What is the value of a dialogue model that is not claimed to describe reality and that leaves out the whole interpersonal dimension, which all would agree is that is of vital importance? The value of an abstract normative representation can be clarified by comparing the games of chess and poker. In both games interpersonal relations—for instance, intimidating or deceiving the opponent—play a part. But in chess the logical and the social/personal occupy separate levels. Choices at one level can be made independently of choices at the other. At the logical level are the kinds of strategic choices one would make in playing against a computer—exclusively concerned with moves and counter-moves on the board and the strengthening and weakening of positions. At the social/personal level are self-management strategies for maintaining spirit and concentration and avoiding errors; interpersonal strategies may be aimed at producing the opposite effect on the opponent. But strategies at the social/personal level may be chosen with little or no regard to strategy choice at the logical level. In poker, however, the two levels interact. At the logical level, probabilistic reasoning about the state of the other players’ hands and of the improbability of one’s own hand may be done independently of social/personal considerations, as would be necessary in playing against a computer. But in live play with human opponents, interpersonal perception will play a part in probabilistic reasoning (for example, other players may give out clues to the strength of their hands through body language) and the choice of strategies such as bluffing will be strongly influenced by the strength of one’s hand and the inferred strength of others’ hands. And so the two levels of poker strategy cannot be treated independently.

Is knowledge creation more like chess or more like poker? The realistic answer is “It varies.” Presumably bluffing and deception are rare in knowledge-creating work, but hidden agendas, ego trips, prejudices, and interpersonal rivalries are not. However, in general it can be said that the abstract level of dialogue “moves” and the interpersonal level of interactions can be considered separately, as in chess. Only rarely will personal or interpersonal factors alter the grounds for evaluating moves. An example of such

intrusion of the affective on the logical would be avoiding a certain analogy, even though it is valid and logically relevant, because it would press a hot button and might divert the dialogue from its purpose or offend some group member.

A further justification for a normative model of knowledge-creating dialogue that sticks to the logical or rational level is the relative neglect of this level in dialogue studies. Questions that dominate dialogue research are ones about turn-taking (who gets a turn, how a speaker holds or relinquishes the floor, and so on) and whether various positions and ideas get a fair hearing (e.g., Anderson, Baxter, & Cissna, 2004). To the extent that dialogue content is examined, the focus is typically on the type of speech act (requesting information, providing information, introducing a new idea, criticizing, and so on) rather than on the function of utterances in moving the dialogue toward its goal. In fact, there is a tendency to neglect goals, despite recognizing that the distinctive characteristic of dialogue in comparison to other forms of conversation is its goal-directedness. If a group ostensibly involved in knowledge creation—producing a design, an invention, a strategic plan, or a theory, as the case may be—pauses to evaluate the progress of their dialogue, they are not going to be mainly concerned with whether everyone got a chance to be heard. They are going to be concerned with whether they are making progress toward their goal. If the consensus is that they are not, they are going to need to consider what to do about it. This may include questioning whether any promising ideas have been overlooked, but it can include a number of other possibilities as well. That is where a normative model of dialogue “moves” can have value.

In referring to dialogue “moves,” we are following Conklin (2005), who presents a system for mapping dialogue that distinguishes “moves” along a problem solution path from utterances that are off the path. This is consistent with Walton’s (1998) identification of goal-directedness as what distinguishes dialogue from other kinds of conversation. The notion of “good” moves, however, was inspired by the intriguing finding of Chase and Simon (1973) that chess grand masters do not actually think farther ahead and consider more moves than lesser players, they only consider good moves! How in the world can one identify good moves in advance of considering them? That is the concern of what may be for many be the most obscure component of our model, “promisingness” evaluation.

A normative model might consist of a checklist or a decision tree, but considering the non-reducibility of knowledge creation to a routine, something more in the nature of a flow-chart or a network model of interacting “moves” would be more appropriate. That is the kind of model depicted here in figure 1. Figure 1 represents the *structure* of a knowledge-creating dialogue model. In this it resembles the diagram representing the structure of Hayes and Flower’s widely cited model of the writing process (1980), which contains elements such as “generating,” “organizing,” “translating,” and “reviewing.” Subsequent diagrams consist of flow charts showing how these processes were thought actually to be carried out. Importantly, the overall structural model was not claimed to have empirical content; that is, it was not claimed to constitute a theory or to be testable as to its truth value. That claim was reserved for the more detailed version. As it turned out, however, the writing research community ignored the detailed models, called the

overall structural model the “theory,” and used it mainly as a classification scheme to sort out actions and utterances observed as people produced writing. A similar fate is liable to befall any model of knowledge-creating dialogue, because of the magnetic appeal of classification schemes to researchers looking for a way to turn massive amounts of recorded data into reportable findings of some sort. At this point, because we do not yet have the detailed models that would unpack the boxes in the following diagram, all we can do is enter the caution that this diagram is not a model of knowledge-creating dialogue; it is not a theory; it is not testable. It is only the *structure* of a model yet to be specified.

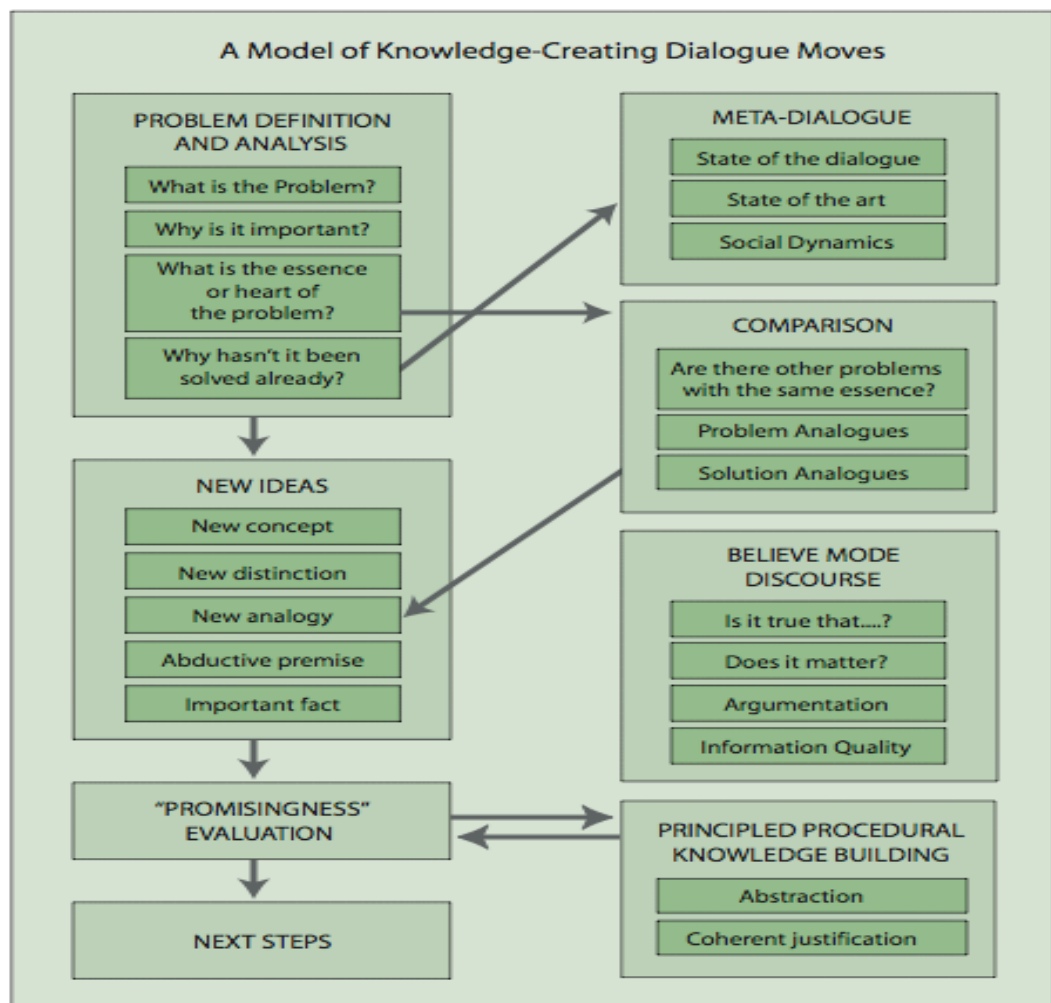


Fig. 1. Preliminary sketch of the structure (not the detailed content) of a model of knowledge-creating dialogue moves.

### **Components of the Structure**

The left-hand side of figure 1 represents the main path of actions leading to a knowledge creation goal. The right-hand side represents activities off the main path, and thus frequently neglected, but that we believe can contribute significantly to success. As indicated by arrows, there is a sequence to the boxes on the left-hand side. Sequential models generally provide a poor fit to actual creative behavior (Visser, 2004), and so the implied linearity should be taken as indicating nothing more than that there is a logic to the sequence. Backward looping is to be assumed as an always available option. Commentary on the eight main boxes and their contents follows:

#### **Problem Definition and Analysis**

Knowledge creation is treated throughout the model as a variety of problem solving. This is problem solving in the Newell and Simon (1972) sense: There is no implication that something is wrong and needs fixing, as in the common expression, “We have a problem.” Problem solving is any goal-directed activity in which the path to the goal is unknown and must be discovered or invented. Treating knowledge creation as problem solving enables us to draw on what is already known about problem solving.

Comparisons of expert and novice problem solvers have shown that experts usually invest more effort in analyzing the problem and casting it in a form that enables them to apply available knowledge, whereas novices are more inclined to skip over this part and plunge immediately into seeking solutions (Glaser & Chi, 1988). Within the “Problem Definition and Analysis” box are four questions. “What is the problem?” is a question that may be revisited during the course of knowledge-creating dialogue as the goal is revised or comes to be seen in a new light. “Why is it important?” will often be obvious as to the main goal, but as sub-problems are identified it becomes a question useful in steering away from trivial or unproductive problems. “What is the essence or heart of the problem?” is a question inspired by Douglas Hofstadter’s (1995) statement that “a sense for essence is truly the essence of sense.” Asking why a problem has not already been solved is a move recommended by Tim Berners-Lee on his website.

#### **New Ideas**

This category includes all discourse moves that are intended as a direct advance toward the knowledge creation goal. The 5 items in the box may be assumed not to exhaust the possibilities. However, they do include the best-recognized types of moves in the knowledge creation literature. Nonaka and his collaborators have characterized knowledge creation as creating a new concept (von Krogh, Ichijo, & Nonaka, 2000). Tsoukas (2009) has identified making a new distinction as the precursor of creating a new concept. Many writers have emphasized the importance of analogies as stepping stones to knowledge creation (Dunbar, 1993; Gassmann & Zeschky, 2008; Holyoak & Thagard, 1995). Abductive premises are conjectures which, if they prove valid or can be realized,

provide the basis for a problem solution: for instance, “If we can find out how ... then we can...” Their role in creative knowledge work has been emphasized by Thagard (1992), Paavola (2004), and Martin (2009). “Important” facts are ones that can be put to immediate use in the knowledge-creating effort, and thus to be distinguished from relevant facts that may or may not prove useful at a later time. As represented in the structural model, “new concept,” “new distinction,” and so on are not discourse moves. They are *achievements*, arrived at through discourse moves yet to be identified. What kinds of moves, for instance, achieve new distinctions or productive analogies? Those are the questions that a detailed discourse model must answer.

### **“Promisingness” Evaluation**

In complex knowledge creation, single ideas seldom constitute problem solutions and neither do simple combinations of ideas. Substantial further work is normally required to develop the ideas into something that fulfills a knowledge creation goal. Whether a particular idea will prove valuable in the end cannot generally be known with certainty. Therefore a significant challenge in all creative work, in both the fine grain and the large, is to identify promising ideas and to avoid wasting time on or becoming entrapped by unpromising ones (Bereiter & Scardamalia, 1993). Judgments of promisingness are based on knowledge—sometimes principled knowledge but more often an accumulation of episodic and impressionistic knowledge (Bereiter, 2002). Whether there are discourse moves that can increase the quality of promisingness judgments remains to be determined.

### **Meta-Dialogue**

This is dialogue about the dialogue—how it is progressing, where it is heading, what is hampering progress, and so on. The bigger picture that may be addressed in meta-dialogue is the state of the art in the domain or domains where the dialogue is taking place. The meta-dialogue may also address the many interpersonal and group dynamics issues that may arise in a dialogue—whether everyone is having a chance to be heard, how turns are being taken, whether people are paying attention to what others say, and so on. Important as these may be, they are in this model subordinate to the over-riding issue of whether the dialogue is progressing.

### **Comparison**

At a sufficiently abstract level, apparently dissimilar problems may be found to be essentially the same. For instance, *checking in* may be found to be essentially the same problem whether it is checking patients into a hospital, passengers on to an airline flight, guests into a hotel, or customers into a car rental. As a result, procedures that have proved to increase the efficiency of one variety of checking in may be applicable to another, or difficulties encountered in one context may be better understood if analogous difficulties are examined in another (O’Dell, n.d.). Such comparisons may be the basis for analogies, both near and remote.

## Principled Procedural Knowledge Building

Principled procedural knowledge (PPK) may be briefly defined as *coherently justified know-how*. Coherence is to be understood in Thagard's expansive sense as being not only internally consistent but also coherent with other knowledge and evaluations (Thagard, 2000, 2006). The construction of PPK requires an investment of effort over and above that devoted to the mainline problem. The result is knowledge that has potential application beyond the immediate problem; but it may also prove crucial for solving the immediate problem or it may result in a solution that has value beyond the immediate goal. For instance, the Wright Brothers' investment in producing a principled solution to the problem of lateral control resulted in an airplane that could not only regain balance if it started to roll (which was their objective) but that introduced a whole new level of navigability that opened the door to aviation as we now know it (Bereiter, 2009). Thus a side trip into PPK building seems worth taking in all but the most urgent circumstances. Building PPK involves some amount of abstraction from the current problem characteristics so as to yield knowledge of wider application, but not necessarily a high level of abstraction. The justification should fit this level of abstraction. The idea of PPK as a way of overcoming barriers between theory and practice will be discussed in a forthcoming paper.

## Belief Mode Discourse

At any point in knowledge-creating dialogue the truth or trustworthiness of some statement may be called into question. Dealing with such a question involves stepping outside of "design mode," in which invention, theorizing, planning, and the like take place, and into "belief mode," which is the mode of evaluating claims (Bereiter & Scardamalia, 2003, 2006). Belief mode differs from design mode in both goals and methods. Belief mode excursions, as represented in the present model, start with some equivalent of the question, "Is it true that...?" The statement brought into question may have been explicitly stated or it may be an implicit underlying assumption. Once a belief issue is raised in a knowledge-creating dialogue, however, it is important to ask whether it matters, lest the dialogue be led off into an unproductive byway. If it is determined that the belief issue does need to be settled, the discourse may move into one or another form of argumentation. Toulmin's argument model may be applied here. However, it presumes a pro and con controversy, whereas there are other kinds of arguments, as elaborated in the writings of Douglas Walton (1998). Often in knowledge-creating dialogue it is not necessary and it is frequently impossible to establish the exact fact of a matter. The issue is whether the available information is good enough for its purpose. Whether the information is an opinion poll result or a handbook datum on the melting point of a certain alloy, there is an explicit or implicit margin of error and the practical issue is whether the intended use can tolerate that margin.

## Next Steps

There are no arrows leading out of the “Next Steps” box, because the next step could be a return to any of the other boxes. It could also be a step outside the dialogue—to conduct empirical research, for instance—the results of which would be fed back into an appropriate box in the dialogue model.

### Uses of the Model

When fully developed, the dialogue model may serve several purposes. It may be useful in analyzing actual dialogues for practical and theoretical purposes; it may be useful instructionally, both in designing learning experiences and as teachable content in its own right; and it may provide direction for efforts to design software supports for knowledge creation.

This model should itself be an example of PPK, and we are conscious that it falls short of coherent justification. However, a coherent justification of the model would constitute a theory of knowledge creation that goes some distance beyond available theories. Producing such a theory is a job for the future and for an enlarged dialogue. Hopefully this preliminary sketch of a normative model will serve some purpose in the enlarged dialogue.

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