# Conversation Theory in Context

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## Abstract

Gordon Pask's personal and professional life was dominated by his passion for understanding and influencing learning processes in diverse systems including roles within people, artificial agents, and organizational structures including people and artificial agents. He was a system developer responsible for innovations in industrial training systems and educational technology, and an experimenter responsible for new models of human learning phenomena developed through incisive scientific investigations. He was also a theoretician with an eclectic interest in any developments in cybernetics, mathematics, logic, philosophy, psychology, anthropology, sociology, artificial intelligence, and so on, that might provide insights into the nature of learning and tools for modeling it. Pask distilled his practical and experimental experience and these diverse sources into his own theoretical framework for learning and education that he termed *conversation theory*. This article provides an exposition of conversation theory, focusing on links to major related work, and exemplifying the theory through some examples of results that may be derived from it.

## 1 Introduction

It is a pleasure to have the opportunity to contribute to a memorial issue for Gordon Pask, a friend and colleague who has influenced our work and our lives. Although he is gone, Gordon's persona will always be present as one of those highly influential *voices of the mind* to use Wertsch's (1991) evocative terminology from his exposition of Bakhtin's (1981) *dialogic imagination* as a model for the embedding of mentality in the social milieu. Pask's (1975) own notions are relevant in this context since he saw the *psychological individual* (P-Individual) as potentially distributed across multiple minds, and there is no necessary connotation that all those minds still exist in their original bodies or *mechanical individuals* (M-Individuals). Our mental processes subsist through collective social processes that arise through the dramaturgical *roles* we play in a variety of groups, teams, organizations and other collective intelligences (Gaines, 1994). These processes take place in what Giddens (1986) terms a *locale*, a combination of physical locations, supportive artifacts, social conventions, and individual and mutual knowledge, including the reconstruction that we term memory of the voices and influences of those not present, the voices in our minds.

Gordon Pask's voice continues to echo in our minds as an ongoing influence on our research as it has been in our interactions with him over the past thirty years. It is difficult to convey the nature of that influence to those who have not been part of his network of colleagues, since it lies not only the intellectual content but also in the lived experience of being part of Gordon's activities, his seminars, workshops, conference sessions, and other productions. His personal and professional life was dominated by his passion for understanding and influencing learning

processes. This was not just an academic, analytic interest, but a way of being that influences every activity in which Gordon took part. All of his scholarly activities went beyond the norms in providing a forum for developing and sharing the understanding of learning which was also a means for experimenting with and facilitating learning. Pask lived his theories and investigated his hypotheses through his existence and that of all those who became involved in it. His life was an ongoing study of facilitating the learning of himself and all those associated with him, a multi-faceted experience of learning how to learn about learning.

Gordon injected himself into the learning process much as he injected the variety of ingenious automata that he invented to facilitate learning, themselves adapting through their participation in a social experience that made little distinction between natural and artificial agents, or between those agents and their evolving environment. For him Wiener's (1948) notion of cybernetics as the study of *communication and control in humans and machines* that focused on the fundamental similarities rather than the superficial differences was a natural mode of thought. He never reduced the human to the machine, but rather raised the status of the machine to be that of a conversational partner to the person. Gordon loved his automata and took great joy in their construction. Life was an experiment that he lived to the full, in the process enriching the intellectual and emotional lives of his many associates including his automata, and continuing to do so through processes he initiated which will probably never come to an end.

This article seeks to present some of the key notions of Paskian conversation theory in the context of the work of others including our own. It adumbrates and instantiates Pask's central notions of P-Individuals and strict conversations and reports recent results on the management of learning.

## 2 Conversation Theory

Pask's attempts to deconstruct the essential features of learning led him to single out the interaction between an instructable system and an instructor as being composed of what he termed *strict conversations* having the following characteristics (Pask, 1976, p.4):-

> (a) The participants, as part of a contract, agree to obey the rules of the conversational language L and the participating agent makes sure that the L syntax is respected.
>
> (b) The conversation is focussed, or anchored, upon a conversational domain: typically, a representation of the topics in a subject matter.
>
> (c) The conversational domain involves a particular and canonical type of representation, both of what may be known and what may be done or discussed: hence, conversation theory has an epistemological commitment, and about half of this book is devoted to an exploration of what this commitment is.
>
> (d) Each topic, said to be learned or assimilated in a strict conversation, is understood.
>
> (e) In this connection understanding is given a theory specific and technical connotation though the imputed meaning tallies with and probably amplifies the usual meaning. We say that a topic T is understood by a participant if and only if T is explained and if T can also be derived from other topics in the conversational domain, i.e., a derivation is an explanation or systematic justification, of an explanation. It is crucial that understandings can be detected.
>
> The explanation need not be verbal. If not, then it is called a model-building operation and is a satisfactory explanation insofar as the model can be executed in an external facility to bring about the formal relation underlying topic T. Nor need the derivation be verbal. If not, it is a learning strategy (a concrete depiction of one or more topic derivations).
>
> (f) A strict conversation is punctuated by understandings and the intervals occupied in reaching an understanding are called occasions.

The primary feature of a strict conversation is how the participants come to an *agreement over an understanding*. In this emphasis and analysis Pask made significant contributions to epistemology, sociology and education. He discards notions of truth and its absolute verification and develops instead the pragmatic notion that it is up to the participants to decide that a conversation is completed. It can be terminated when they have an agreement over their understanding of whatever was the object of conversation. However, the participants can continue their conversation indefinitely and on whatever basis they deem relevant until they have what they regard as adequate evidence of understanding. In this Pask reflects Wittgenstein's notion that the meaning of a term is determined pragmatically through its use, but extends it to include the processes whereby understanding is explored until agreement is reached. Pask's notion of agreement as that which allows one conversational occasion to terminate and allow another to commence corresponds to Wittgenstein's exhortation in the collection of fragments from the 1940's that was published posthumously as *Zettel* (Wittgenstein, 1967):

> 446. But don't think of understanding as a 'mental process' at all.—For that is the way of speaking that is confusing you. Rather ask yourself: in what kind of case, under what circumstances do we say "Now I can go on," if the formula has occurred to us?

It is this action orientation of Wittgenstein's analysis that Pask addresses, that the instructor has no direct access to the student's mental process but has to come to agreement over an understanding that enables the occasion of one conversational interaction to terminate and another to commence. In his expositions Pask emphasizes that the student being able to *produce* material transmitted by the instructor, or to *reproduce* it through a particular derivation, is generally inadequate evidence of understanding. The student has to explain the material in such as a way as to *teach back* to the instructor, who may assume a variety of roles involving different background knowledge such that a single derivation is insufficient. It is this indefinite richness of exploration of the material which provides evidence leading to an agreement over an understanding.

Habermas' (1979) notion of *communicative action* involves similar notions in its distinction between strategic uses of language to influence behaviour and communicative uses to come to sufficient mutual understanding to coordinate behaviour (Habermas, 1981, p.86):

> Finally the concept of *communicative action* refers to the interaction of at least two subjects capable of speech and action who establish interpersonal relations (whether by verbal or extra-verbal means). The actors seek to reach an understanding about the action situation and their plans of action in order to coordinate their actions by way of agreement.

Habermas (1979, p.209) developed a taxonomy of social action which is shown in Figure 1. A strict conversation in Pask's terminology is an "action oriented to reaching understanding" as shown on the right of this taxonomy. In later work Habermas (1990, p.87) sees communicative action as providing foundations for *moral consciousness* manifested through *discourse ethics* which may be operationalized through rules such as those proposed by Alexy (1990, p.163):

- No speaker may contradict himself.
- Every speaker who applies predicate F to object A must be prepared to apply F to all other objects resembling A in all relevant aspects
- Different speakers may not use the same expression with different meanings

These conditions of logical consistency, semantic consistency and terminological consistency may be seen as essential in instructional interactions. From Pask's *cybernetic* perspective, any learning system faced with violation of these rules in the information presented to it would have

major difficulties in learning. The amount of data required to form correct hypotheses from data contaminated by errors increases by orders of magnitude even for low levels of error (Gaines, 1989). Irrelevant information has a similar effect corresponding to some of Grice's (1975) rules such as "do not make your contribution more informative than is required" that extend Alexy's formulation.

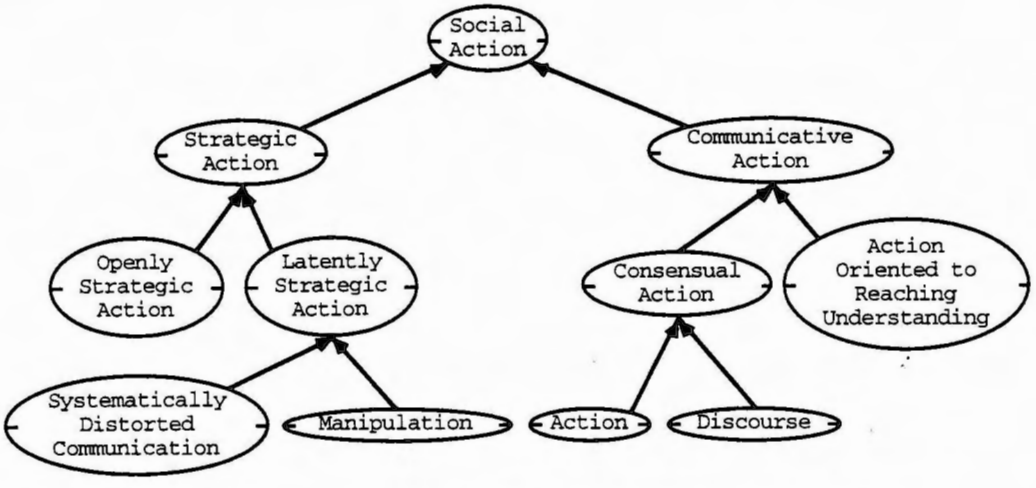


**Figure 1 Semantic network for a taxonomy of social action**

It is interesting to draw these threads together and note that the conditions for communicative action that Habermas presents as the ethical basis for an effective society are those which Pask presents as the learning environment for effective instruction. An ethical, open society is one which most effectively supports learning, or, conversely, an environment which emphasizes effective learning leads to moral consciousness based on discourse ethics. Fukuyama's (1995) analysis of the economic value of *trust* as reducing transaction costs is based on similar cybernetic arguments, and similar values emerge in normative recommendations for facilitating organizational learning (Argyris and Schön, 1996). All these factors together support the arguments for the economic strengths of liberal democracies as optimal learning environments (Fukuyama, 1992) when excess resources fuel growth and evolution, and hence give prominence to the value of adaptibility (Vanhanen, 1997).

The major leaps among disciplines and the synthesis of disparate ideas in the preceeding paragraph are typical of Gordon Pask's seminars. No literature was too remote for him, and he would take us all on bewildering journeys that invariably led to new insights and new interests. He would delight in pushing any argument to its limit and beyond, and in piling idea upon idea to create an edifice whose collapse always seemed breathtakingly imminent but which somehow survived and transformed into the foundations for the next stage in the argument.

## 3 Psychological Individuals

A valuable distinction that Pask makes in conversation theory is that between the agents in a conversation as *psychological individuals* (P-Individuals) and their embodiments as *mechanical individuals* (M-Individuals). Pask's notion of a P-Individual encompasses what we conventionally term a *role* within a person but goes beyond it to encompass social structures in that a P-Individual itself be composed of a number of roles coming together to form a unity that we conventionally term a *group* or *organization* (Pask, 1975, p.302)

> "a P-Individual...has many of the properties ascribed by anthropologists to a role, in society or industry, for example. A P-Individual is also a procedure and, as such, is run or executed in some M-Individual, qua processor. However, it is quite exceptional to discover the (usually assumed) one to one correspondence between M-Individuals and P-Individuals."

Pask's notion of a P-Individual capures in one integrative concept the inter-relation of wholes and parts that Simmel made the center piece of his sociology (Simmel, 1950, p.58-59):

> "Society strives to be a whole, an organic unit of which the individuals must be mere members. Society asks of the individual that he employ all his strength in the service of the special functions which he has to exercise as a member of it; that he so modify himself as to become the most suitable vehicle for this function....man has the capacity to decompose himself into parts and to feel any one of these as his proper self."

Simmel's insight that the group member is always a fragment of a person, a role created precisely to enable the person to enter the group has been developed extensively by Wolff with his notions of *surrender* and *catch* (Wolff, 1976, p.162-163):

> "From the standpoint of the world of everyday life, the mathematician, as we often put it, lives in the 'world of mathematics', dealing with 'nonreal' elements, notably numbers, whose relation to 'real' things, to 'reality', is not part of his concern. Analogously for the logician. What makes our subject-object approach to this attitude misleading is the fact that the subject, the student of mathematics or logic—his or her individuality, including motives and attitudes—is irrelevant for our understanding; the only thing that counts is the pursuit, with its results and questions."

He makes the key point that not only does the real world, the object, disappear to be replaced by the world of mathematics, but also that in entering into this world the person doing mathematics, the subject, also disappears to be replaced by a new entity, the mathematician. P-individuals as coherent psychological processes capable of engaging in conversations provide a useful representation of the results of Simmel's decomposition and Wolff's surrender, particularly when we note that several P-individuals may execute within a single processor. Thus *the mathematician* may engage in conversation with *the physicist* or *the statesman* all of whom happen to use the same brain for their processing.

Wolff's *object* corresponds to Popper's (1968) concept of a world 3 of *statements in themselves*, and his *subject* to world 2 of *human experience*, both of which contrast with that contrasts with world 1 of *physical things*. World 3 is a useful representation of that which we *catch*, particularly when we note its distinct ontological status (Popper, 1974, p.148)

> "I regard the third world as being essentially the product of the human mind. It is we who create third-world objects. That these objects have their own inherent or autonomous laws which create unintended and unforeseeable consequences is only one instance (although a very interesting one) of a more general rule, the rule that all our actions have such consequences."

Shaw (1985) has developed Pask's notions within the framework of Kelly's (1955) *personal construct psychology* to account for the psychological processes not only of individual people but also for that of functional groups such as a nuclear family or a product executive. Figure 2 illustrates these ideas through an example that combines all the various notions described above. In this figure Popper's three worlds are described in the conversation-theoretic terminology of Sections 2 and 3 of this article: world 1 is that of *mechanical systems*, of the causal systems that characterize the physical world; world 2 is that of *psychological systems*, of the intentional agents that characterize the world of human experience; and world 3 is that of *linguistic systems*, of the symbolic representations that characterize discourse—by-products of discourse that become autonomous *memes* (Dawkins, 1982) in their ongoing influence upon human experience.

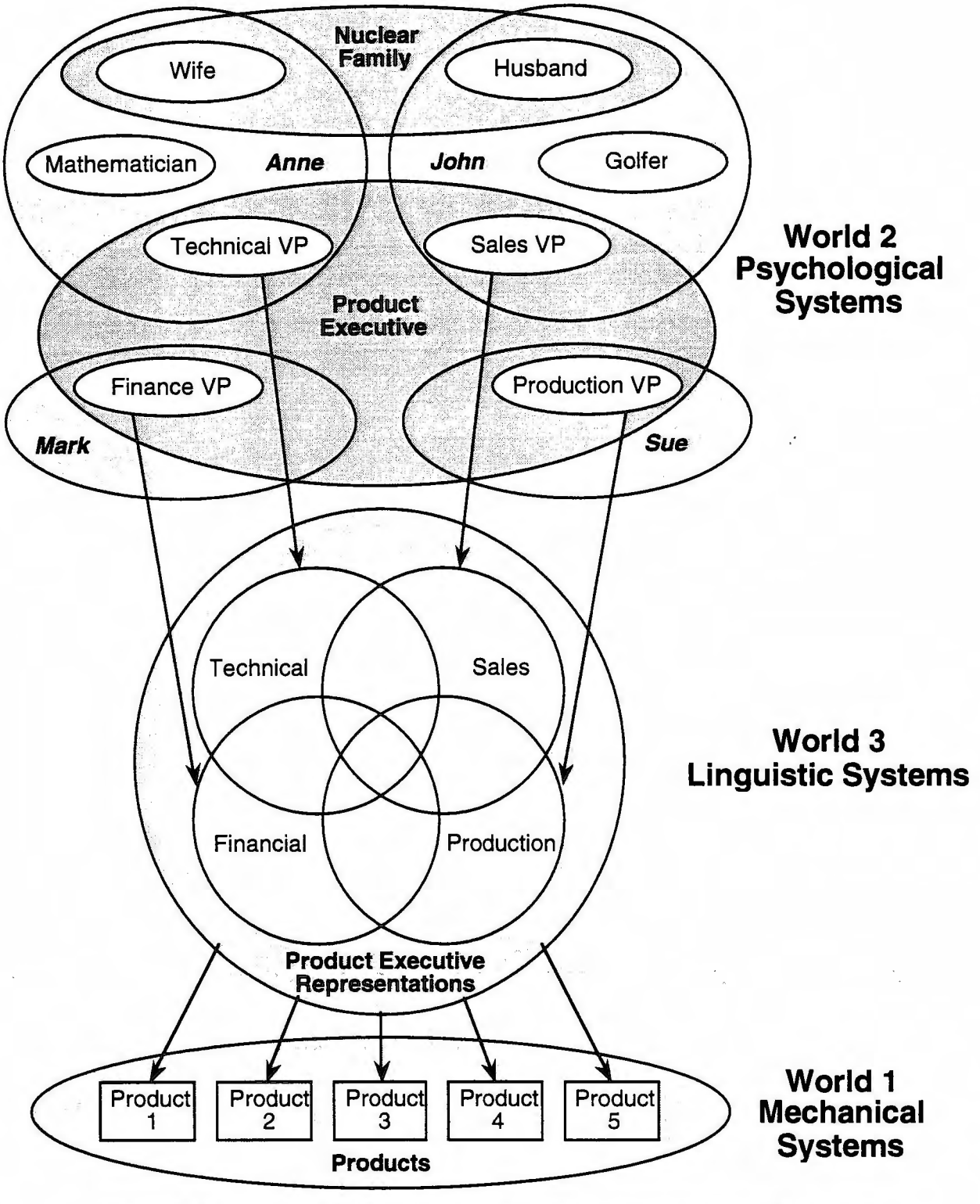


**Figure 2 A compound P-Individual combining representations of a domain**

In the upper part of the figure, Anne is shown as having three roles, wife, mathematician and technical vice president. John is also shown as having three roles, husband, golfer and sales vice president. The wife role in Anne together with the husband role in John are part of a new P-

Individual, a *nuclear family*. This has behavior, language, legal rights, and a model of the world, that are distinct from those of Anne and John in their other roles, and goes beyond those of the participating roles in Anne or John alone (Shorter, 1975). Similarly, the technical VP role in Anne, the sales VP role in John, the finance VP role in Mark and the production VP role in Sue are part of another P-Individual with behavior, language, rights and models within a *corporate culture* (Deal and Kennedy, 1982). The center part of Figure 2 shows the linguistic systems generated as by-products of the discourse between the roles within people constituting the product executive, and applied by them in in the lower part of Figure 2 to represent a world of products.

## 4 Conversational Locales for Learning

Pask delighted in building large-scale, physically embodied learning environments. His favorite impressive opening for a keynote address was to commence with a slide showing a massive structure of equipment and state that this was "the minimum environment for the study of learning." In his early work Pask used systems of electrical actuators to build such environments and in his later work created similar environments through networks of microcomputers. Whatever the technology his objective was always to create a multi-level experiental learning environment in which students had access to a wide range of resources including the capabilities to build operational exemplars of theories and to conceptualize their own learning states.

Pask's learning environments contrasted with the impoverishment of early *teaching machines* and the prescriptive control of much *computer-assisted learning*. His automata facilitated learning by supporting the student at many levels, providing access to a wide diversity of resources, but also providing maps and other navigational aids to support the meta-processes of knowing what has been learnt and learning to learn.

The link between Paskian practice and Paskian theory is nicely captured in Giddens' (1986) notion of a *locale*, a combination of physical locations, supportive artifacts, social conventions, and individual and mutual knowledge that provides the framework for social interaction. Pask built locales for learning that provided a place for students and instructors to interact, but a place that was richly overloaded with an *ecology of affordances* for learning (Gibson, 1979). Goffman's (Goffman, 1974) *frame analysis* shows how social interaction is structured through a combinations of physical artifacts and psychological conventions, and his *forms of talk* (Goffman, 1983) applies a similar analysis to conversations. Giddens generalized Goffman's frames into the notion of a locale and other researchers have generalized Gibson's ecological theory of perception to view an locale as providing affordances for desired behaviors within the environment constituted by that locale (Flach, Hancock, Caird and Vicente, 1995).

Figure 3 uses Popper's three worlds model discussed in the previous Section to deconstruct Pask's conversational locales for learning systems.

At the lower left is World 1 of physical systems. It corresponds to an intuition that there are distinctions arising from actuality that are necessary to represent it. Analysis of this world is an epistemological problem in which truth is a matter of correspondence with actuality and inference is based on the causal models appropriate to mechanical systems.

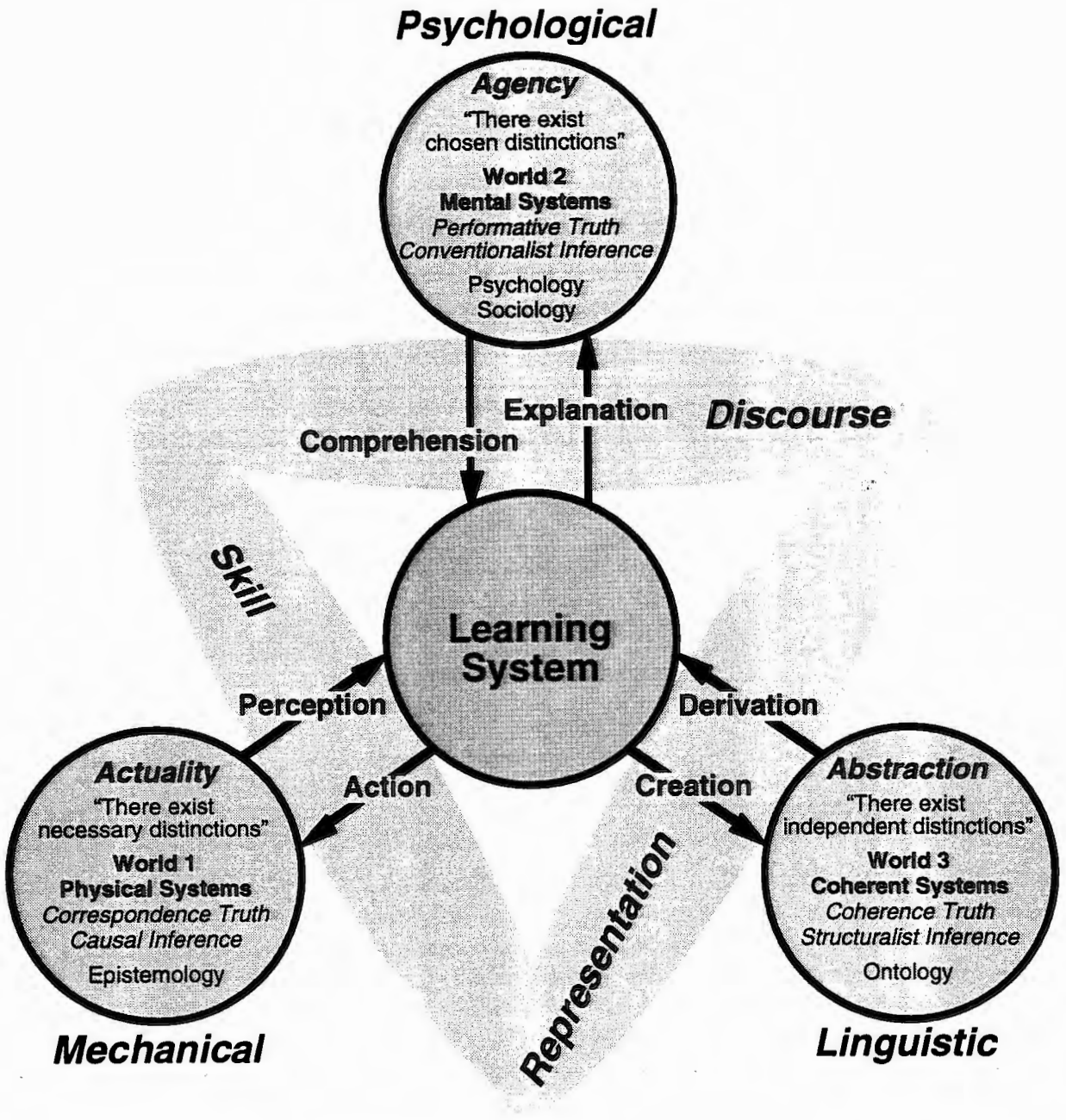


**Figure 3 Deconstructing the conversational locale of a learning system**

At the top is World 2 of mental systems. It corresponds to an intuition that there are distinctions arising from agency that represent the choices of agents. Analysis of this world is a psycho-social problem in which truth is a matter of performance through agency, the *role integrity* of agents, and inference is based on the conventionalist models appropriate to psychological systems.

At the bottom right is World 3 of coherent systems. It corresponds to an intuition that there are distinctions abstracted from actuality and agency that can exist independently of their source. Analysis of this world is an ontological problem in which truth is a matter of coherence through abstraction, and inference is based on the structuralist models appropriate to abstract systems.

At the center is a learning system interacting with each of the three worlds through: perception and action to exhibit the capability for skilled behavior in World 1; through comprehension and explanation to exhibit the capability for discourse behavior in World 2; through derivation and creation to exhibit the capability for representational behavior in World 3.

As noted in the quote from Pask at the beginning of Section 2, strict conversations punctuated by agreement over an understanding encompass all these different ways of exhibiting behavior relevant to understanding. Pask's conversational locales for learning were designed to provide the scope for all these different forms of behavior, and also to manage the relationships between them and the records of what had occurred.

It is interesting to analyze Pask's notions of individuals within this framework. His M-Individuals are embodied in World 1 and his P-Individuals in World 2, and one may see the cybernetic constructs of feedback leading to self-organization as enabling automata constructed in World 1 to function in World 2. In our last interactions with him in seminars in Montréal in the late 1980s we proposed to extend conversation theory to encompass individuals in World 3 that represented the detachment of discourse from its orginating participants. Such representational individuals (R-Individuals) would correspond to the autonomy of representations that outlast the interests or lives of their originators but continue through their indepedent existence to influence the experience and conversations of others. This corresponds to Popper's arguments for the autonomy of World 3 and to Dawkin's notion of the role of memes in cultural evolution. The growth of the World Wide Web may be modelled as a memetic process of positive feedback between its support of R-Individuals and the development of R-Individuals that ehance that support (Chen and Gaines, 1997), and it affords a rich environment to support learning and investigate conversation theory and its applications.

Pask's notion of compound P-Individuals can be extended to provide foundations for a *collective stance* (Gaines, 1994) in which the human species is viewed as a single organism recursively partitioned in space and time into sub-organisms that are similar to the whole. These parts include societies, organizations, groups, individuals, roles, and neurological functions. Notions of organizational learning arise because the organism learns as a whole through the learning of its interacting parts. The phenomena of organizational learning correspond to those leading to distribution of tasks and functional differentiation of the parts. The mechanism is one of positive feedback from parts of the organism allocating resources for action to other parts on the basis of those latter parts past performance of similar activities. Distribution and differentiation follow if performance is rewarded, and low performers of tasks, being excluded by the feedback mechanism from opportunities for performance of those tasks, seek out alternative tasks where there is less competition. Higher-level phenomena such as meaning and its representation in language and overt knowledge, arise as by-products of the conversation-theoretic processes of coordinating learning. An example of the power of managing learning through controlled access to tasks is given in the following Section.

## 5 Cybernetics of the Acceleration of Learning

Pask's early research on training systems such as SAKI, the keyboard trainer that he developed for Solartron, was based on fundamental principles of conversation theory that underpinned the dynamics of learning in all his later educational systems. He describes it in these terms (Pask, 1961, p.93):-

A brain is modified by its history, but, like any other evolutionary network, *it* does not learn. The student who *does* learn is a system developed *in* the brain. The 'conversation' that leads up to this state entails two formally distinct activities:

1. The controller must 'keep the student's attention' which is a special case of 'requisite variety'.
2. Problems must be matched to the student.

These basic principles were applied to the development of training systems in the 1960s (Gaines, 1967) and proved very powerful in accelerating learning (Gaines, 1968). Theoretical foundations for these systems were also developed (Gaines, 1972a; Gaines, 1972b), and recently new quantitative results have been derived that enable the impact of Pask's strategy on linearizing learning curves from their normally sigmoidal form (Stoneman, 1983) to be demonstrated for very general situations (Gaines, 1997). The basic analysis is reported in this Section.

The two features of Pask's conversation generating strategy described above are to provide what Ashby (1952) terms requisite variety in the tasks given to the learner and to match the level of difficulty of these tasks to the learner's capabilities. Requisite variety can be generated through random selection from a rich enough universe of tasks. Capability matching can be done through selection of a level task difficulty that keeps the learner's performance constant. These notions, and the impact of the strategy, can be modeled usimg very weak general assumptions about the realtions between tasks and capabilities.

Consider a universe of *tasks* and a universe of *capabilities* such that an agent can perform a task if it has some, not necessarily unique, collection of capabilities. Assume that:-

- the *difficulty* of a task can be estimated in terms of the cardinality of a set of capabilities that allows an agent to perform it;
- when an agent is given a task for which its capability is inadequate that the probability of it guessing each missing item of knowledge is q and that if it guesses all the missing items it performs the task and acquires the capabilities, but otherwise learns nothing;
- the training system can select a task at a given level of difficulty but does not know either the capabilities required to perform it or the state of the agent's capabilities;
- the probability that the agent has a randomly selected capability is p, and that the probability that it learns a missing capability during a task necessitating it is q.

Then the probability that an agent will perform a task of difficulty d is:

$$P(n) = \sum_{0}^{d} \binom{d}{i} p^{d-i}(1-p)^{i} q^{i} = \left(p + (1-p)q\right)^{d} \tag{1}$$

and the expected rate of learning is:

$$L(n) = \sum_{0}^{d} \binom{d}{i} i\, p^{d-i}(1-p)^{i} q^{i} = d(1-p)q\left(p + (1-p)q\right)^{d-1} \tag{2}$$

If one selects a task difficulty that optimizes the rate of learning by maximizing L(n) with respect to n then:

$$d_{opt} = -1/\ln(p + (1-p)q) \tag{3}$$

and the expected performance to achieve this is:

$$P_{opt} = 1/e \approx .37 \tag{4}$$

and the expected maximum rate of learning is:

$$L_{opt} = -(1-p)q/(e(p+(1-p)q)\ln(p+(1-p)q)) \tag{5}$$

which is such that as agent learns and p approaches 1:

$$\lim_{p \to 1} L_{opt} = q/e(1-q) \tag{6}$$

The implication of equation (4) is highly significant because it implies that a system that adjusts the task difficulty to keep performance constant will achieve a linear rate of learning that is the fastest possible.

One can also deduce from equation (4) that the optimum performance involves the learning agent being correct 37% of the time—i.e. an error rate of 63%. However, this result is misleading unless one does a sensitivity analysis. Such an analysis shows that the learning rate drops to half optimum when the error rate decreases to 20% or increases to 80%—i.e. that the optimum learning performance is relatively insensitive to the performance set-point chosen. The reason for this is that there is a lower chance of learning more with tasks of higher difficulty, and a greater chance of learning less with tasks of lower difficulty. Thus a system that adjusts task difficulty to maintain performance constant can induce optimum learning, and achieve something close to this even if the performance fluctuates over a 5 to 1 range.

What happens if an adaptive agent is given tasks to perform of constant difficulty. One would expect the learning rate to be sub-optimal initially because the task is too difficult, become optimal for a period as the performance improves to a level where the difficulty is optimal, then decline again as the performance improves to a level where the task is too easy. Figure 2 shows this results of integrating equation (2) for fixed n compared with the results of integrating (5), with q = 0.5 and full capability being 25 items. It can be seen that performance feedback achieves a speedup in learning by a factor of 2 compared with the best fixed-difficulty approach, that the learning curves have the expected sigmoidal shape, and that learning on tasks of high difficulty involves very long learning periods.

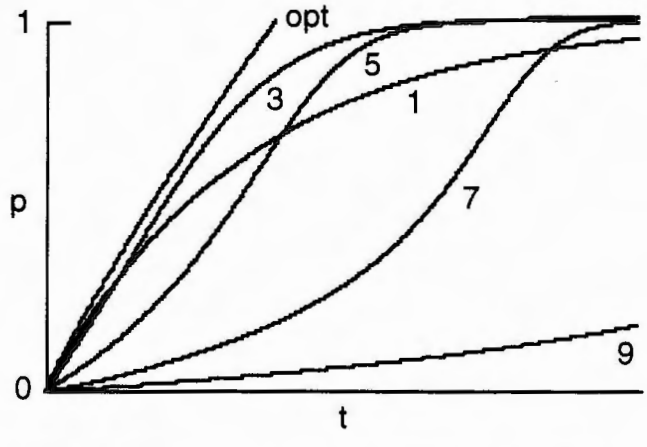


**Figure 4 Learning curves for learning agent under various conditions**

In practice there may be complications that make the effects shown even more pronounced. For example, the universe of simple tasks may be incomplete in that some capabilities may only be brought into use in relation to more complex tasks.

Csikszentmihalyi's (1990) concept of *flow* as the phenomenon underlying the psychology of optimal experience provides a model of the learner dynamics described above. Hoffman and Novak (1995) summarize the concept as:-

> "Flow has been described as 'the process of optimal experience' achieved when a sufficiently motivated user perceives a balance between his or her skills and the challenges of the interaction, together with focused attention."

The likeability of a task correlates with a flow state in which a motivated user undertakes a task whose level of difficulty is at some particular level that suits their individual needs. Too low a level results in boredom and too high a level in anxiety, and the optimal level results in the intense satisfaction with the activity that Csikszentmihalyi terms *flow*.

As the agent learns a flow state can be maintained only by increasing the task difficulty to keep the performance constant. As shown above, this also maximizes the rate of learning, and this suggests that the flow process may have evolved phylogenetically as a mechanism reinforcing an agent which is maximizing its rate of learning. If the reinforcement center in the brain is stimulated by conditions that optimize learning, then individuals will be attracted to socially created learning environments that have the characteristics that Pask describes at the beginning of this Section. Gordon would have no difficulty in accepting the notions of designing for likeability and creating flow conditions for the learner as being at the heart of conversation theory. They correspond to the conditions he attempted to create for himself, his colleagues and his students.

## 6 Conclusions

This article has provided an overview of conversation theory, focusing on links to major related work, and exemplifying the theory through some examples of results that may be derived from it. Writing it has reminded us of our intellectual debts to Gordon Pask and of the rich vein of scholarship that exists in his many writings on conversation theory. We hope the article will encourage others to explore Pask's writings and ideas, and provides, together with the others in this memorial volume, an initial road-map to some of the most interesting aspects of his work.

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