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ABSTRACT

The point is made that systems thinking should be combined with dialectical thinking and constructivist thinking for effective systems design and systems change. To establish a context, a set of assertions on "How the World Works" in regard to systems design and systems change in education is laid out, as value assumptions undergirding these assertions are also articulated. Then, the Configurations, Linkages, Environments, Resources (CLER) Model for developing systems designs and for enabling the implementation of systems change is offered as a useful parsing and procedural tool. (38 references) (Author/DB)

DESIGNING FROM THE HEART OF AN EPISTEMIC TRIANGLE: SYSTEMIC, DIALECTICAL, AND CONSTRUCTIVIST STRATEGIES FOR SYSTEMS DESIGN AND SYSTEMS CHANGE[1]

By

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Abstract

The point is made that systems thinking should be combined with dialectical thinking and constructivist thinking for effective systems design and systems change. To establish a context, a set of assertions on "How the World Works" in regard to systems design and systems change in education is laid out, as value assumptions undergirding these assertions are also articulated. Then, the CLER Model for developing systems designs and for enabling the implementation of systems change is offered as a useful parsing and procedural tool.

Key Terms: Systems design, Systems change, epistemic triangle, CLER Model.

The point will be made that in the process of systems design and systems change one must act from the heart of an epistemic triangle consisting of the systemic, the dialectical and the constructivist. The CLER Model (Bhola 1965, 1977, 1978, 1982, 1984, 1986, 1988) for inventing systems designs as well as for enabling the implementation of such designs will be presented as a useful parsing and procedural tool for accomplishing these two interrelated tasks.

All that needs to be said about the processes of systems design (for example, the design of an educational plan) and systems change (that is, the implementation of such a plan) can not be contained within the formal structure of one single conceptual model, howsoever synoptic and comprehensive. Before presenting the CLER Model, therefore, we begin with a set of statements on "How the World Works"; and, thereby, provide historical and theoretical contexts as well as a value frame for the educational enterprise today:

1. The process of educational design is not merely a professional-technical process but indeed has two equally important dimensions: (i) intellectual-technological, and (ii) social-ideological. Unfortunately, the first dimension is over-emphasized to the neglect of the second. The fact, however, remains that the process of design per se can not be engaged in, independently of the politics of differential allocations of educational resources to multiple groups, communities and classes; nor separated from questions of distribution of life chances among those who are being educated, miseducated, undereducated or simply bypassed by the system of education.

2. As designers of educational systems we must, at the outset, make clear articulations and honest declarations of our political ideologies, our conceptions of the good society, and our values governing means and ends of educational and social change.

3. Having projected our images of the future society for public examination and having clarified our social values governing means and ends, we must understand that in a "living system", under multiple and contradictory pressures, we can not make strictly deductive uses of either our images or our values as projected but that we need to resonate and respond to these images and values in ways unique to each particular context, at each particular historical time.

4. In consulting and working with various "design communities", we must engage them in discussions at the levels of both means and ends, that is, both technology and ideology should enter the calculus of design. Questions of instructional development must be joined with those about allocation of educational resources; and concern with educational quality must be joined with that for equality.

5. Human institutions such as schools can seldom, if ever, be simply junked and a new set of institutions installed in the place vacated by old institutions. Societies can never be cleared of all their historical and policy debris in one big scoop. Even cataclysmic change in power relationships brought about by bloody revolutions, is followed by relatively slow and contested systemic change within political, social, economic and

educational institutions. The strategies of "planned" institutional (that is systemic) change, by definition, can not be substitutive -- in the sense of plucking out one institution and putting in a brand new alternative -- but rather such change must be incremental in the sense of Braybrooke and Lindblom (1963). The innovations must be generative and cumulative, and thereby evolutionary. The challenge for the systems designer and enabler of systems change is not to insert one module for another, but to accelerate the emergence of a new system built on the debris of an old one.

6. The capacity for the design and change of systems is limited by the social location of the systems' designer, that is, by the particular "vantage point" of those engaged in the design process. That means that truly system-wide change will require interventions by multiple agents at all the various system levels, within all the subsystems, within a reasonable frame of time. Thus, the new educational systems design will mean orchestrating images and actions of parents, learners, teachers, preachers, principals, superintendents, board members, legislators, administrators, businessmen and federal bureaucrats, cabinet members and presidents, working within a network of overlapping groups. International actors will be involved as well, directly or indirectly, depending upon the set of existing international relationships.

7. At the stages first of systems design and then while enabling implementation of design, we must draw systems boundaries that are truly comprehensive to reflect social, economic and political systems surrounding the educational system. The relationship between school and society must not be missed. The analysis of instructional problems within schools should not be conducted merely in term of internalities (instructional materials, learner motivations, instructional organization, etc.) but also in terms of externalities (social and structural context of the school). Otherwise, we will be completely off the mark and misconstrue both problems and solutions.

8. The theoretical analysis of processes both intellectual-technical and social-ideological should be conducted from the heart of the epistemic triangle (discussion follows) with the systemic (meaning that social entities and social processes are interdependent and emergent), the dialectical (meaning that these social entities and processes are in a relationship of mutual shaping), and the constructivist (meaning that the world is both found and made) as its three corners.

9. It should be understood that systems are layers of the formal and informal, that formally stated goals, needs and objectives -- and, therefore, our systems designs -- are in a state of flux and continually emerging.

10. The traps of false dichotomies between centralization and decentralization, between national purposes and local objectives, between normative testing and criterion-referenced testing should be avoided; and the dialectics between the global and local, between leadership and followership, between the expert and the citizen, and between choice and guidance should be understood.

11. In the technical-professional aspects of design of educational systems, learning should be seen as an open-ended encounter between the learner in the school or in the community and his or her environment filled with educational media and trained educational roles; and the learner should be seen not only as a psychological being but also as a social and cultural being.

12. Models of systems design and for enabling implementation of such designs must include "the logic of processes" but must go farther than mere deductive logic or technical rationality to be able to anticipate and include the learner as a social being and the structural characteristics of learning contexts.

WHY THE EPISTEMIC TRIANGLE?

The theoretical content in the statements above needs to be fully articulated. We will suggest in the following that in he processes of social transformation and institutional change, systems thinking is necessary but not sufficient. Systems thinking should be combined with dialectical thinking and constructivist thinking. Hence the following epistemic triangle[4]:

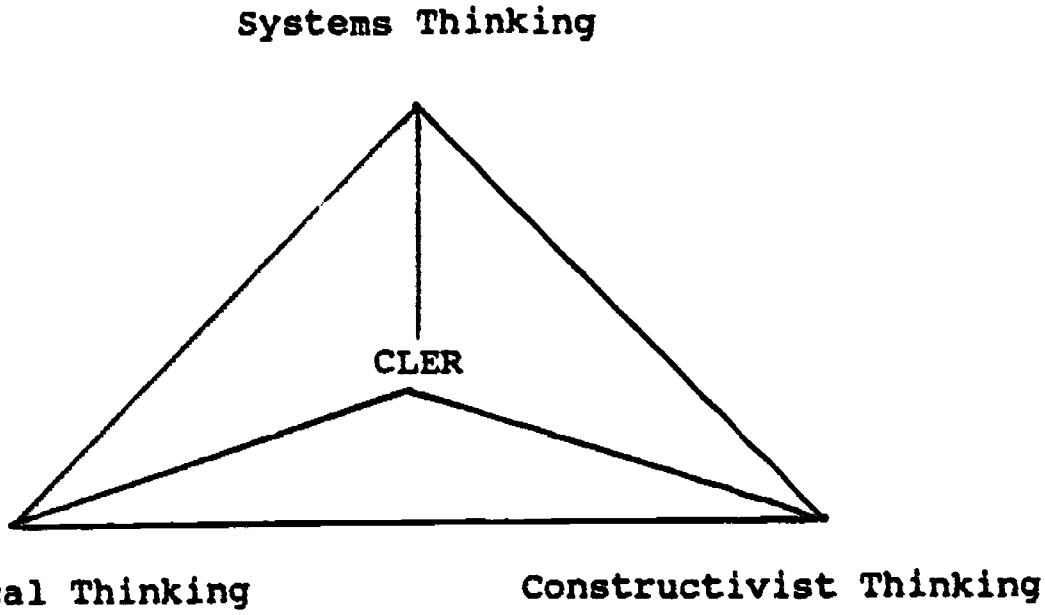

Figure 1: The CLER Model in the epistemic triangle.

The concept of the epistemic triangle presented here arose from the confluence of working with such ideas as systems theory (Bertalanffy 1968, Checkland 1981), dialectical thinking (Kvale 1976, Mitroff and Mason 1981, Olafson 1979) and discussion of the so-called paradigm shift (Berger & Luckmann 1967, Guba 1990, Polkinghorne 1983, Reason 1988). At the pragmatic level, it became clear that systems thinking without dialectical thinking was insufficient and that the two modes of the systemic and the dialectical were incomplete without interfaces with thinking and acting in the constructivist mode. The CLER Model had been developed as a parsing and procedural tool for both systems design and systems change.

The epistemic congruence among these three modes of conceptualizing reality will become abundantly clear from the following:

THE ESSENCE OF SYSTEMS THINKING

Systems theory is about relationships among parts and wholes. Systems thinking goes farther than merely seeing smaller parts "adding" into wholes. It sees parts and wholes as interdependent and having properties of hierarchy and emergence. Parts and wholes are interdependent, in that, change in the part affects the whole, and the change in the whole effects all parts. There is an organized complexity within systems and this complexity is organized by "a hierarchy of levels of organization, each more complex than the one below" (Checkland 1981:78). Again, in systems, the whole is more than the sum of the parts. Properties emerge that can not be explained in terms of the properties of the parts, nor can emergent properties be reduced in explanation to lower levels. This is what is implied in the assertion that systems are holistic. Indeed, systems thinkers consider the whole primary and its parts secondary. For them "the whole exists first."

A second set of properties associated with systems is communication and control. Indeed, this pair of concepts is connected with the pair of concepts of hierarchy and emergence discussed above. The "imposition of constraints upon activity at one level which harnesses the laws at that level to yield activity meaningful at a higher level, is an example of regulatory or control action" (Checkland 1981:81) which, in turn, depends on exchange of information or communication.

One of the most important features of the systems theory is that all systems -- open or closed, mechanical, biological or social -- can be described in terms of the same four parameters: inputs, processes, outputs and contexts. Systems analysis is often conducted in terms of structure and process (Bhola, 1990).

THE ESSENCE OF DIALECTICAL THEORY

Dialectics is a world view that subscribes to the "coherence theory of truth" through constructivist verification. S. Kvale (1976) has listed the essential characteristics of dialectical thinking which have been summarized below:

Dialectics involves the study of human behavior as related to its context, both social and historical. It focusses on qualitative changes emerging through internal contradictions. Both change and stability are emphasized. The status nascendi (what is to come) has priority over the status quo (what is).

Dialectics accepts conflicting and interdependent conceptions of a phenomenon. Both internal relations and external interrelationships are studied. What is mutually implied and what is mutually excluded between phenomena are both considered.

Dialectics looks for changes wherein one quality changes into another quality thus leading to qualitative transformations. Dialectics notes that quantities have qualities, that is, quantitative changes may lead to qualitative changes.

Dialectics emphasizes the interdependence of the observer and the observed, of the knower and the known. Dialectics seeks the essence of a phenomenon through long and concrete experience with or within such a phenomenon and its study from multiple aspects. Value-neutral descriptions and theories are considered impossible. The criterion of goodness of knowledge is praxis.

Finally, dialectics is descriptive and interpretive and is itself a synthesis of empiricist observation and speculative rationalism.

THE ESSENCE OF CONSTRUCTIVISM

Egon G. Guba (1990:23) describes the essence of constructivism in having relativist ontology, subjectivist epistemology, and hermeneutic, dialectic methodology.

In being relativistic, constructivism does not accept one single reality existing out there for everyone to see, but accommodates the concept of multiple realities constructed by individual persons in terms of their own social experiences. This extreme position is already being modified. Constructivists do realize, of course, that we come into a world that is already half constructed through processes of socialization and enculturation. Thus, the world is both found and made.

In being subjectivist, it does not separate the knower from the known. Thus, the method of knowledge creation or of

developing findings is a process of interaction between the inquirer and the inquired. In being hermeneutic and dialectical, constructivism uses methods of inquiry that involve elicitation of individual constructions and their successive refinement through a dialectical process of comparing, contrasting and moving towards some collective construction(s) that can be warranted in particular contexts.

THE NATURALNESS OF THE EPISTEMIC TRIANGLE

Systemic thinking, dialectical thinking and constructivist thinking do indeed make a natural epistemic triangle. As can be seen from descriptions of their essences above, their relationship is organic. Hegel in talking about holism, and internal relations had suggested that "emergences" could not be explained in terms of deductive relationships between different things (Polkinhorne 1983:136). Thus, he had in fact talked of emergences (that is, systems) and dialectics in the same breath. He had pointed out that the concept of emergences, that the whole is more than the sum of its parts, could be understood only through dialectical thinking. Mere logical analysis would not help (Polkinghorne 1983: 137). Again, constructivist thinking is inseparable from dialectical thinking, both being in the descriptive and the interpretive mode.

While the relationship among the three is theoretically natural, their kinship has too often been violated in practice. Systems theory has sometimes been forced into the mold of logical positivism (meaning that reality can be experienced through the senses and that knowledge can be expanded through logic) and thereby the systemic has been confused with the systematic. Others, while using systems thinking authentically, have yet failed to join their systemic conceptions of the world with dialectical conceptions. Yet others have changed dialectical thinking into protocols that read like the logic of negotiation between adversaries rather than taking constructivism seriously enough to engage in dialogic action and authentic search for multiple realities. It is for this reason that the relationship among the systemic, the dialectical and the constructivist has been articulated in the above.

THE ESSENTIAL CLER MODEL

The CLER Model is a model for all purposive action -- to define, to design, to implement and evaluate, in all cultures, in all sectors and at all levels, in conditions of consensus and conflict. It has been dismissed by some as too general, or as too complex and time-consuming to use. It has sometimes been derided as being a cosmology rather than a model.

In its simplest form the CLER Model asserts that change is a function of Configurations and configurational relationships

between planners and adopter systems; Linkages among and between them; Environments surrounding the planner system and the adopter system; and Resources available to planners to promote change and for adopters to incorporate it. Thus,

$$\text{Change [C]} = f[C,L,E,R].$$

Elaboration of C.L.E and R categories

The four categories of the CLER Model can be elaborated as follows (Bhola, 1965):

Configurations and configurational relationships. The CLER Model identifies four types of configurations: individuals (I), groups (G), institutions or organizations (IS) and communities, subcultures and cultures (CL). All these four can either be in the planner or the adopter roles. Thus, sixteen different types of planner-adopter relationships can be identified:

	I	G	IS	CL
I	I-I	I-G	I-IS	I-CL
G	G-I	G-G	G-IS	G-CL
IS	IS-I	IS-G	IS-IS	IS-CL
CL	CL-I	CL-G	CL-IS	CL-CL

Figure 2: The sixteen configurational relationships between planners and adopters.

Molar configurational relationships (G-IS, IS-CL, for example) are, of course, mediated by molar-molecular (G-I, I-IS, for example) and purely molecular (I-I) relationships (Bhola 1965). These concurrent and overlapping relationships can be used to develop configurational maps of various planner and adopter systems (Bhola 1986). Configurational analysis need not, however, be confined to scope and hierarchy within systems and subsystems. Configurational maps can drawn to reflect social, political, economic and educational aspects of a system undergoing change.

Linkages. Linkages have been defined as formal or informal and as existing between or within the two systems of planners and adopters. Linkage-typing -- a process of articulating the social circuitry of a system -- can, and in fact should, be undertaken concurrently with the process of configuration-mapping (Bhola 1986).

Environments. Environments may be supportive, neutral or inhibitive; and all the configurations involved in a change episode may not be responding to the same one environment (Bhola 1965, 1982).

Resources. Finally, resources were identified to be of six kinds: CIMPIT -- cognitive, of influence and goodwill, material, of personnel, institutional and of time. An important point introduced in the model was that resources were needed both by the planner system to promote change and by the adopter system to incorporate change (Bhola 1965, 1982).

The {P} x {O} x {A} ensemble

To understand the dynamics of system design and its implementation, the CLER Model should be seen as rooted in an ensemble as in the following (Bhola 1984):

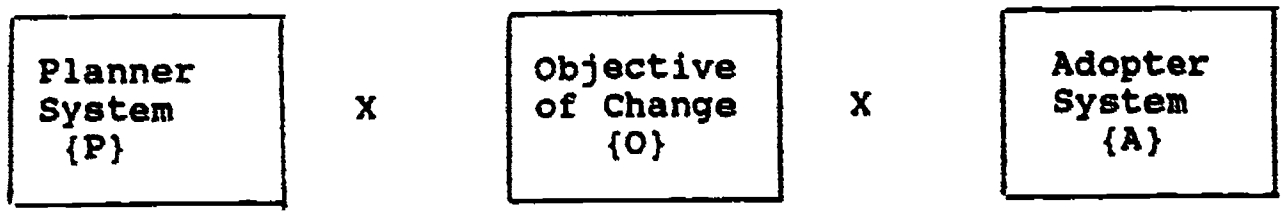

Figure 3: The {P}, {O}, and {A} ensemble of plannd change.

The {P} and {A} in the ensemble should be elaborated and described in CLER terms as defined above. In other words, the following questions should be asked: What are the various configurations involved and in what kinds of discreet or overlapping relationships do they exist? What types of linkages exist within and between them? What resources each of the configurations have and of what kinds? Finally, what environments -- internal and external -- are these configurations responding to? The {O} in the ensemble may be described as follows:

Describing the objective {O} in the ensemble

By definition, the objective {O} will be purposive. It may involve systems design (such as envisioning and scripting,

futurism, policy formulation, planning, instructional development, etc.); or it may involve systems change (such as diffusion, installation, implementation, restructuring, institution building or evaluation, etc.). In some real-world instances, the two processes of conception (systems design) and action (enabling systems change) will be integrated and may have to be analytically separated in two phases. A matrix of objectives can be constructed as follows:

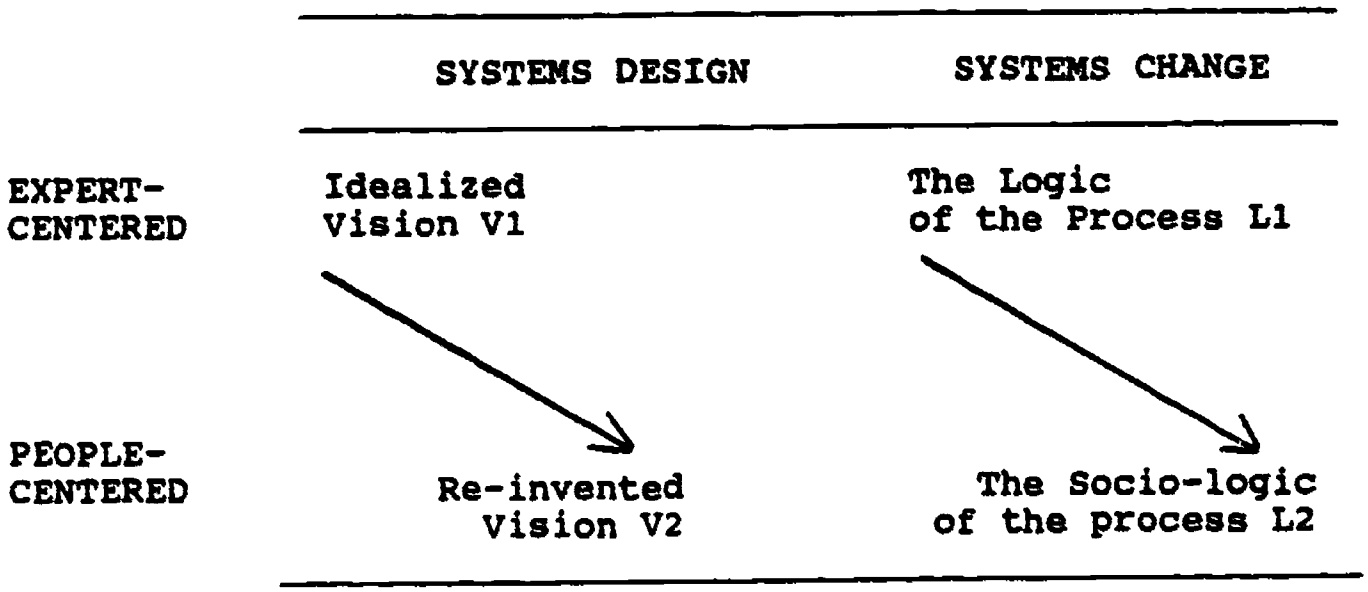

Figure 4: A matrix for understanding negotiation of objectives within a planned change ensemble.

It is assumed that the content of all objectives whether packaged-and-sealed or open-ended will undergo some adaptations in context. The processes of inventing systems designs and then implementing such systems design can involve expert-centered (interventionist) or people-centered (participative) approaches -- the expert need not be banished from the latter.

Once again, we need to be reminded that objectives can not be absolutized. These will be in a process of continued reconstruction. We must, however, start with an "initial" statement of objectives to start the dialectic among and mutual definition of {P}, {O}, and {A}. In the systems design sector of the matrix above, we may start with an idealized vision which should be re-invented through participation with all the stakeholders. In the systems change sector of the matrix, we should start with the known logic of the process in question and, through a dialectical process, change the logic into socio-logic of the process to enable and obtain implementation of change.

It should be clear from the above discussion that the CLER Model accommodates the role the knowledgeable expert and the technical logic of processes.

The CLER Model, working from the heart of the epistemic triangle, is able to accommodate what has come to be called "technical rationality." We do not reject technical rationality to exclusion. We consider technical rationality necessary but insufficient.

Our epistemic position enables us to see that technical-rational organization of experience is a necessity for an intragenerational and intergenerational transfer of knowledge. We can not simply tell children or students or employees to go do something smart, something reflective and creative, and to engage in praxis to construct their world. We need to share with them the logic of processes that surround us, the logic of the processes as we have been able to abstract those processes.

The problem is not with technical rationality per se. The problem is that we do not go beyond technical rationality to socio-technical rationality. The logic of the processes needs to be used as a starting point to serve as the crutch for handling the emerging socio-logic of processes within living systems.

Ideally, our models should include the socio-logic of processes from the very beginning. Yet, these models should be open-ended -- empty sets within which social realities can be reflected as we find them within living systems. This is exactly what the CLER Model is able to do.

The grammar of artifactual action

The CLER Model as elaborated above was further married to a generic grammar of artifactual action (Bhola 1978, 1984). All artifactual action was seen to involve a calculus of means (technology) and ends (ideology). The calculus was actualized through three interrelated processes of: ordering/relating, typifying/expecting, and experiencing/correcting.

In ordering/relating, the buzzing and blooming confusion of the phenomenal world that surrounds us is brought to an initial order. A perceptual net is thrown on the reality which is socially constructed, in the very process of its being caught in the net. A frame is thus put on the flux called reality. Structural ordering is accompanied with some temporal ordering, allocating beginnings and ends to processes. Purposes are attributed to agents and subjects of change; and causes and effects are assigned.

In typifying/expecting, the change agent looks for the typical in the reality "framed" in the ordering/relating process so that some expectations about behavior and about what is likely to happen can be built, based on earlier experiences. This can be seen as the stage of "utilization of knowledge," particularly systematized knowledge.

In experiencing/correcting, the change agent enters existential reality to test products of earlier ordering/ relating and typifying/expecting. Thus, change can become an experiment and an experience in learning.

Planned change as approximations

The graphic presentation of the CLER model in its current form is presented below.

[PLACE GRAPHIC OF THE CLER MODEL ABOUT HERE]

At each level of the grammar of artifactual action, the {P} x {O} x {A} ensemble comes into play; and every time, the CLER terms would be used to make the structure and the dynamics of the change episode transparent. One iteration through the grammar of artifactual action would lead to a particular strategy (S1). A second iteration of the process over time would perhaps suggest another strategy (S2), or at least a somewhat revised strategy. Thus, a change relationship between innovators and adopters would move towards objectives through successive approximations to the ideal -- coming closer and closer towards goals initially established, but never perhaps precisely and positively achieving the initial objectives -- which would have changed somewhat themselves in this process.

Strategizing with CLER -- Power is the essence

Power is the essence of strategy in the CLER Model. The CLER Model asserts that power is both the instrument and the definition of change. In other words, power is the instrument for bringing about change; and the result of change is a new network of power relationships.

Power, in the context of the CLER Model, is defined in a special way. To be is to powerful. Power can be experienced without having to be exercised on another. There are indeed various currencies of power from brute force to total acceptance and submission. Thus seen, power can explain a whole range of human behaviors from competition, conflict and control to detachment, renunciation, affection, altruism, and creativity (Russell, 1938; Bhola 1982).

THE CLER MODEL IN THE EPISTEMIC TRIANGLE

The CLER Model is located at the heart of the epistemic triangle in that it does make systemic, dialectical and constructivist assumptions.

THE SYSTEMIC IN THE CLER MODEL

The CLER Model is essentially a systemic model. The four parameters of the systems theory -- inputs, processes, outputs and contexts -- are translated into another set of four terms -- configurations, linkages, environments, and resources --that are both more dynamic and more differentiated.

Instead of everything getting into a system as "inputs" and coming out at the end as "outputs", social units become configurations and are thus separated from materials and non-material resources as inputs. The use of the concept of resources also introduces a managerial orientation. Linkages as communication circuits as well as carriers of education and influence cover for "processes". Environment is equivalent to the "context".

C, L, E, R differentiated. As has already been shown above, the CLER Model has gone on to differentiate among three different environments, and six different categories of resources. It has also differentiated among typical system change processes as mobilizational, socializational, educational, organizational and enculturational as various manifestations of the dynamics of power.

System space made multi-dimensional. The most important feature of the CLER Model is its ability to construct configurational maps using the sixteen configurational relationships we have listed earlier. The use of configurational maps enables the systems designer to reconceptualize the flat system space as multi-dimensional social space, peopled with individuals, groups, institutions and subcultures interlocked in multiple and complex horizontal and vertical relationships.

With consensus or in conflict. The CLER Model does not assume a benign environment for systems design or systems change. Configurational mapping can account for configurations both pro and con, and, thus, can handle situations both of consensus and conflict.

DIALECTICAL IMPLICATIONS OF THE {P}, {O}, and {A} ENSEMBLE

The dialectical implications of the {P}, {O}, {A} ensemble are that the mutual shaping of each by the other in the ensemble is accepted. It has to be understood that {O} will change after

we have begun with a primitive description of {O} to be able to start the dialectical process. {P} and {A} will change as well because the boundaries of the two systems will keep on adjusting and adapting to the new limits and possibilities.

The dialectics in the grammar of artifactual action. The concept of the grammar of artifactual action further articulates the dialectical nature of the model. The various types of knowledge in dialectical relationships generate strategies of change -- strategies do not emerge from a linear process of knowledge utilization.

The concept of approximations. The concept of approximations built into the change process is clearly a dialectical idea. We can never really absolutize a change objective at the front end, and then fully achieve it, with invariance, in one step.

The integrity of an innovation in context. The preceding discussion should by no means suggest that anything goes and wherever we arrive we will have arrived at the "right" place. We need to keep our initial calculus of means and ends in mind. We have to make sure that the changes wrought in the calculus of means and ends through negotiations are such that the integrity of the original intent is not compromised through default but has indeed been agreed upon through conscious agreement.

THE CONSTRUCTIVIST IN THE CLER MODEL: ACCOMMODATING PARTICIPATIVE-COLLABORATIVE STRATEGIES

Constructivist assumptions are made in the grammar of artifactual action as well as in the concept of approximations. Most importantly, the constructivist feature of the CLER Model appears in the ensemble itself, assuming that the planner and the adopter must enter a relationship of invention and implementation as equal members in the ensemble. This participative and collaborative aspect of the change model is the most important aspect of the model.

USING THE CLER MODEL IN SYSTEM DESIGN AND SYSTEM CHANGE

We assert that all purposive action has the same structure within its means and ends calculus. Therefore, we assert that the CLER Model is applicable to all actions of systems design and systems change, both micro and macro.

WAYS OF GOING ABOUT USING THE CLER MODEL

In suggesting ways of going about using the CLER Model, the use of words such as steps and procedures can be misleading. The use of the CLER Model that is located within the heart of an epistemic triangle of the systemic, the dialectical and the

constructivist can not be reduced to a formula. Yet the cry -- What do I do? How do I go about doing things? -- must be answered. There must be a way of going about using the CLER Model. Hence the following:

1. When first confronted with a situation of systems design and systems change, begin with a primitive description of the {P}, {O}, and {A} ensemble.

1.1 Do not forget that the boundaries of both {P} and {A} will change more than once because of changes in the reality you face and because of changes in your perceptions and conceptions of the reality.

1.2 Develop an initial description of the objective of change. When doing work on systems design, start with an over-arching vision to be continuously re-invented in local settings in collaboration with the various stakeholders. When dealing with systems change, develop or borrow a "logic of the process" to use as a crutch to start the dialectical process. For example, one could define the logic of the process as: identify system, define needs, build conviction, present or invent solution, implement, evaluate, and recycle. Remember the logic of the process is merely a crutch to start the process of developing a socio-logic of the process. This socio-logic in use will be born out of a process of reflection on the realities as actually experienced.

1.3 At the earliest possible time, engage in the processes of collaboration and participation with some representatives of stakeholders.

1.4 Be mentally and functionally prepared to develop several iterations of the {P}, {O}, and {A} ensemble as individual perceptions are developed into a collective construction.

2. Fill in as many details as possible in {P} and {A} in the ensemble in C,L,E and R terms. Do as detailed a configuration-mapping and linkage-typing of {P} and {A} as possible.

2.1 Convert the initial configurational-map into a map of power relations which project all the various currencies of power -- social, economic and political; coercive, persuasive and moral.

3. Analyze the {O} in regard to its implications to the configurations, environment(s), linkages and resources both for {P} and {A}. At the same time analyze what implications {P}, and {A} have for a redefinition of {O}.

3.1 A redefinition of {O} may involve any or all of the following: (i) translation of technical processes into socio-technical processes; (ii) reorganization of linear and sequential

steps into a chaotic approach involving out-of-sequence and truncated set of steps; phasing of the achievement of objectives over a longer period of time; etc.

4. Go through the "grammar of action" process, checking your analysis of the ensemble {P}, {O}, and {A} in terms of codified knowledge, and existential knowledge acquired within the program as a living system.

5. In collaboration with all possible stakeholders, make lists of statements, suggested by the {P}, {O}, and {A} ensemble read together, in regard to choices that could be made and actions that could be pursued.

5.1 These actions will be in terms of what you can do in regard to manipulating the CLER-nets both of {P} and {A}.

5.2 Questions should also be asked if {O} can be adapted to circumstances, phased or postponed until later.

6. Organize the various discrete actions into a "temporal-generative" network. Such a network is more than a temporal sequencing of activities but chooses and sequences activities in such a way that activities chosen at the outset have consequences above and beyond themselves.

IS THE CLER MODEL COMPLEX AND DIFFICULT TO USE?

The CLER Model is simple in its essence. After all, all it says is that:

in systems design and systems change,
optimize,
in synergy,
the contexture of C,L,E and R within relevant systems,
in relation to a set of change objectives.

Then, through a series of elaborations, the model suggests many differentiations of C,L,E and R; it introduces the concept of configuration mapping to discover points of entry within systems and for exerting influence; it talks of how to use knowledge and how to validate the goodness of strategies. Here things do get complex because the real world is complex and making systems change is no child's play.

The CLER Model is not a turn-key model. It is a model to "think with." Indeed, the model offers empty sets such as C,L,E and R and asks readers and users to make their own situation-specific models to fit their needs. The CLER Model challenges its users to think, it does not dispense with thinking.

This model takes the honest position that making change is not simply a matter of knowing a model. One must have knowledge of one or more change models, but that is not enough. One must have sophisticated knowledge of theory and research in social sciences to be able to understand the behavior of individuals, groups, institutions and communities and cultures. Finally, one must have knowledge of existential realities where systems change will be wrought. These requirement seem to overwhelm people. However, if readers can let go of their search for certainty and of turn-key models that provide instant solutions to their problems of systems design and systems change, they can understand the CLER Model and learn to use it.

NOTES

1. This paper was prepared for the Third Annual Conference of Comprehensive Systems Design of Education organized by the International Systems Institute, at Asilomar Conference Center, Monterey, CA., 1-6 December 1991.

2. The author is thankful to Professor Barry Bull, Professor Luise P. McCarty, and Peter Magolda of the School of Education, Indiana University for their most useful comments on an earlier draft of the paper.

3. Some of the educational systems designers reject the "time-based, group-based, teacher-led system in which a class of 30 students is 'dispensed' the same content at the same time and proceed to the next topic regardless of individual readiness" and wish to install in its place "intelligent tutoring systems, simulations, hypertext systems, interactive video, programmed tutorials, and drill and practice programs." (Charles M. Reigeluth, Bela H. Banathy, and Jeannette R. Olson (Eds.). Comprehensive Systems Design: A New Educational Technology ARW 900 426. NATO ASI Series F Volume, December 1990.) Most educators would perhaps agree with the analysis offered by Reigeluth et al. of the present educational system, but some others would consider this analysis both partial and extreme. Those with a historical perspective would have a lot of positive things to say about the contributions of the public school system on American society. Other educators, even as they generally agree with the criticism of the present system, will vehemently reject the technological solutions that are proposed in the above quote.

4. At first blush, some may see in the proposed epistemic triangle, an "impossible" triangle, since systems epistemology is typically pragmatic, dialectical epistemology is typically absolutist, and constructivist epistemology is typically

relativist. The proponents of these three philosophic positions are, of course, themselves engaged in continuous reanalyses and modifications of their positions. In this paper, we have done selective borrowing from the three positions -- the concepts of interdependence and emergence have come from systems theory; the concept of mutual shaping has come from dialectical theory; and from constructivist theory has come the insight that the world is both found and made. We obtained the warrant and the courage to bring the three epistemic ways of cognizing the world, together in this way, because this is how successful systems design and systems change projects and programs have indeed been implemented in the real world.

5. It must be indicated that the CLER Model was first proposed in 1965 as part of the author's dissertation research at Ohio State University. At that time, Bertalanffy's book on General Systems Theory was still two years away. The categories of the CLER Model came from an analysis of case study materials on planned educational change, particularly Matthew Miles book (1964), and from the author's own experience in community development and adult education in India. Subsequent work on the CLER Model has expanded and elaborated it but the basic conceptualization and assumptions have remained.

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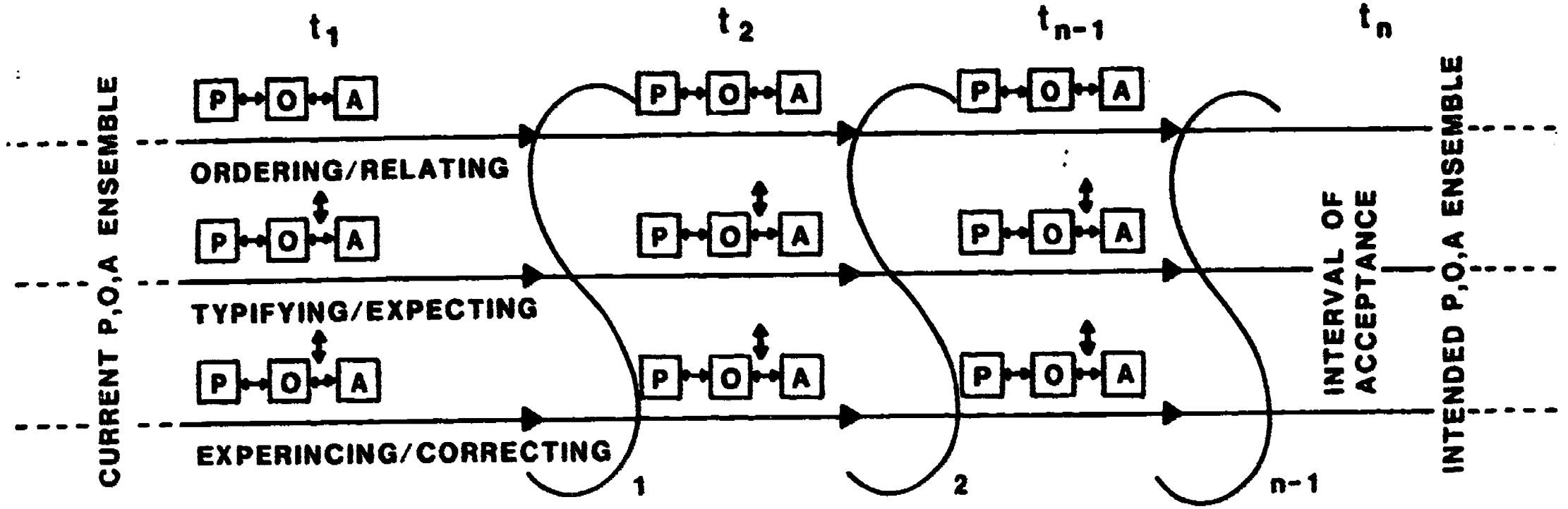

PLANNED CHANGE AS A CONTINUOUS DIALECTICAL PROCESS

P is the planner system
O is the change objective
A is the client system
S is the situation-specific strategy