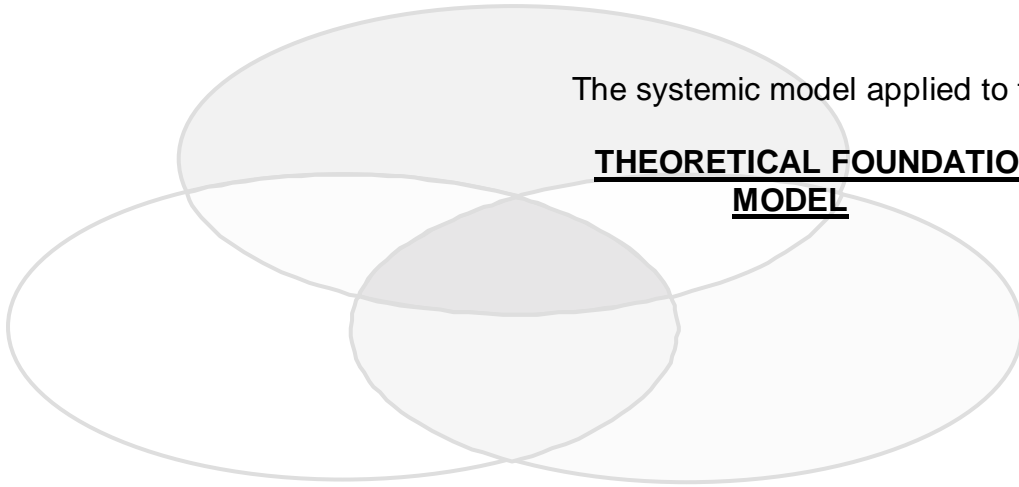


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The systemic model applied to the educational field”

**THEORETICAL FOUNDATIONS OF THE SYSTEMIC
MODEL**



THEORETICAL FOUNDATIONS OF THE SYSTEMIC MODEL

➤ Introduction

The conceptual paradigm of science since Galileo to the present day has been reductionist, and reality has been subject to a growing fragmentation. Scientists such as Newton and Descartes favoured the consolidation of this determining paradigm as opposed to the ideas of totality and globality that now and then timidly have appeared since the times of Aristotle.

After World War II, and as a reaction to that fragmentary trend of science that could no longer offer plausible answers to certain complex problems a thought that is more and more global and totalising begins to settle in certain scientific fields. An example of this is the apparition of the Group Theory, the Gestalt Theory, the Game Theory, the Information Theory, and the General Systems Theory (G.S.T.).

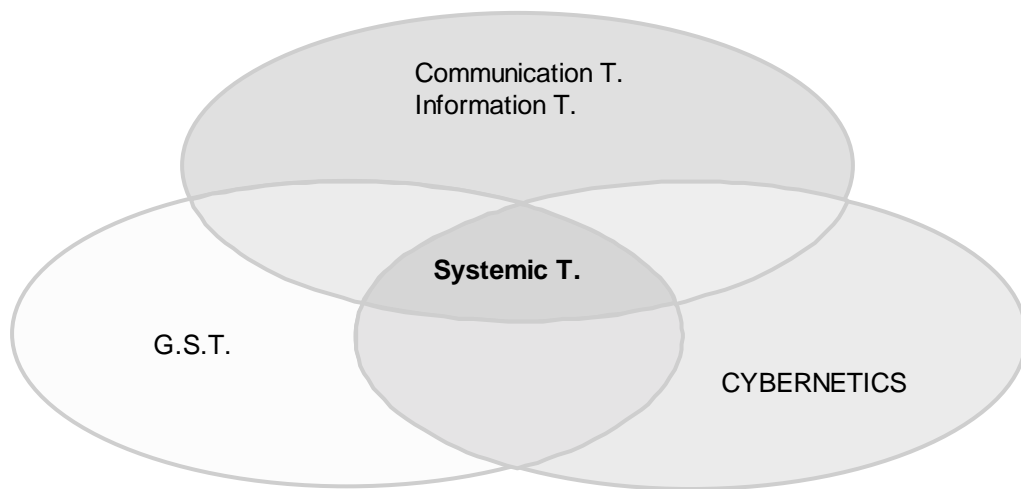
➤ The Systemic Model and the General Systems Theory

In the 1920s and 1930s continuous discussions were held on the regulating processes of live beings. The Austrian biologist L. Von Bertalanffy, theorising on these phenomena, formulated the hypothesis of open and closed systems and their substantial differences.

Influenced by the criticism that then existed on the theorising trend of many biologists Bertalanffy presented his theory in a seminar in Chicago in 1937 and did not publish it until the World War II ended, when there already was a change of attitude in the scientific community and the resistance was less.

In a few years the studies on this theory (G.S.T.) were multiplied in most fields of knowledge (physics, chemistry, biology, psychology), and in 1967 it was presented in the field of psychiatry in the APA Symposium celebrated in Chicago.

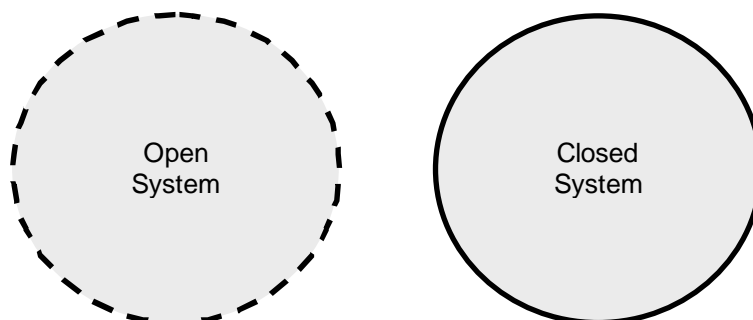
In 1954 was founded the Society for the Research of General Systems, whose main purpose was to promote the development of theoretical models and the search of isomorphisms and correspondences between different disciplines to promote scientific union. Reductionism, the linear and the individual, gave way to the global, the circular, and the interdisciplinary, where the GST was adding concepts of other related disciplines that were developing in parallel (feedback, communication, information) until establishing what is known today as Systemic Theory.



➤ **Definition of Systems**

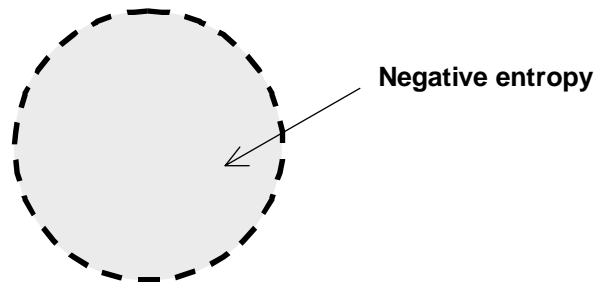
The G.S.T. defines Systems “as complexes of interrelated elements” and establishes the differences between closed systems (of the world of physics and chemistry) and open systems (live, biological, and social beings).

Open systems, which would keep an exchange of matter, energy, and information with the environment, would tend to a constant evolution and an order in their structure, as opposed to Closed Systems, where there would be no permeability with the environment, with a tendency to indifferenciation and disorder in their elements.



All systems would be subject to the 2nd law of thermodynamics, according to which there would exist a magnitude called entropy that would co-relate with the decrease of the order and free energy of the system. In Closed systems this entropy would progressively increase until it reached what is known as Thermodynamic Equilibrium. That magnitude enunciated by the 2nd law, the so called entropy, gave sense to the direction of the processes of life and introduced the time factor. Entropy then was the energy that dissipated as a consequence of the internal processes of the system and that could not be used again to produce work. Open systems would compensate that production of internal entropy, incorporating matter, energy, or information of the environment, that is, negative entropy or negentropy (term coined by Schrödinger).

All biological and social systems would be more or less open and would be capable of conserving a more or less constant state of entropy by incorporating inputs of matter, energy, and information through its limits or boundaries to achieve a constant dynamic equilibrium. This incorporation of energy or information would correspond with an increase of order and a progressive differentiation of the parts, but when those exchanges with the environment would not produce changes and transformations in the system, but would “leave things as they were”, we would say that the system would work “as closed”, with a progressive tendency to the increase of entropy and to the indifferenciation as a consequence of the rigidity of its limits, its poor interaction with the environment, or the apparition of repetitive consequences that would prevent any change or novelty.



If we managed to isolate a biological or social system and we left it to its own devices denying it any exchange with the environment the 2nd principle would apply, reaching the Thermodynamic Equilibrium and the death of the system.

In the Systems Theory we can differentiate several postulates:

A – Totality: The fact that “the whole is more than the sum of the parts” would sum up the idea of totality. The elements of a system would only be understood as functions of it. Each element would influence the rest and would be influenced by them and by the system itself.

B – Protection and Growth: Based on the ideas of Cannon on homeostasis, there would exist in the systems two types of forces, one in charge of keeping stability (homeostatic) and the other in charge of adapting to new situations (morphogenetic), allowing a constant dynamic equilibrium.

C – Circular Causality: This concept is an epistemological change, as the idea of totality and the possibility of obtaining feedback where the elements of the system influence each other discards linear causality where the past would no longer be so important. The important thing would be the vicious circles that would feed themselves back and would block other possible ways.

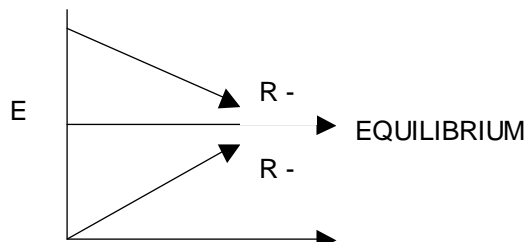
D - Equifinality: This principle would include the idea that “beginning at different initial states the systems could achieve the same final goals”. Open systems could not be explained in terms of linear causality as the initial circumstances would not determine them.

➤ **Cybernetics and systems**

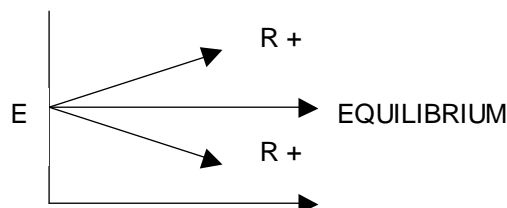
Cybernetics is a word that was first suggested by Wiener in 1947 to define the Science of control and information. The central concept of the new epistemology was the idea of Circularity, which included all those aspects related to feedback. Circularity and feedback were then common elements to all the systems and Wiener, father of cybernetics, called them “anti-entropic local phenomena”. The concept of Feedback broke the idea of traditional causality, where the effects were linked linearly, inevitably taking us to the description of circular processes.

In every system we could distinguish two types of Feedback:

- A. Negative Feedback (R -) (Feedback -) whose function would be to control the deviations of the system and to support stability. It would correspond to the homeostatic forces (concept developed by Wiener).



- B. Positive Feedback (R +) (Feed-back +); whose function would be to facilitate the change and the transformation of the system producing a disequilibrium in it and would correspond to the morphogenetic forces (concept developed by Maruyama).



At the same time the Systems could change in two ways:

- A. Substituting individual patterns or functions and keeping inalterable their structure (1st order change)
- B. Qualitatively transforming the rules and the structure (2nd order change).

The systems capable of accomplishing qualitative changes (of 2nd order) would find it easier to adapt to the variations of the environment and thus to learn than the systems that only would admit changes of 1st order where they would prevent the negative Feedback.

The changes of 2nd order would be related to the apparition of the positive feedback that would try to take the system away from equilibrium (according to Prigogine) with the subsequent increase of the fluctuations and of the possibility that one of them produced a new structure.
(Dissipative Structures).

According to Von Foerster we could divide the history of cybernetics in two parts:

A. 1st order Cybernetics, which itself would have two stages:

- The 1st Cybernetics, where the studies focused on the homeostasis processes.
- And the 2nd Cybernetics, whose objective of study was the processes of deviation and their relation with morphogenesis, change, and disequilibrium.

B. 2nd order Cybernetics or of the observing systems, where the act of observing influenced the observed and the observer formed a part of the system. A change in the model was produced where knowledge did not imply a correspondence with reality.

➤ **Communication Theory**

The study of communication, understood as an exchange of significances and symbols between individuals, has been an element of worry for many centuries, but it is also after World War II when many researchers of different disciplines dedicate themselves to the study of the varied processes and modes of communication. As a consequence of this, Shannon and Weaver proposed in 1949 a model of communication that focused on the linear and quantitative aspects of it, considering that for communication to be produced we had to take into account elements such as: sender, channel, content, and receiver, later incorporating two concepts: firstly, the concept of "Noise" (which made reference to the distortion in

the clarity of the transmission of the information), which was associated to the notion of entropy of the 2nd law, as it decreased the integrity of the communication and produced disorder in the messages; and finally the concept of Redundancy (repetition of elements in a message) which tried to avoid the failure in the transmission of information and could be assimilated with negative entropy, favouring the effective communication.

In 1950 Bateson gathers a group of pioneer scientists in the studies of Feedback to be able to introduce the concepts of Cybernetics in social sciences and to obtain a greater understanding of the processes of communication, passing from the quantitative and linear conceptions of Shannon to more circular and complex visions.

In 1951 Bateson and Ruesch publish "Communication: The Social Matrix of Psychiatry", a predecessor of the book of Watzlawick and Jackson "Pragmatics of Human Communication", where they presented the new ideas on communication based on Cybernetics and the G.S.T., and whose fundamental change resided in taking the unit of study and analysis to the relational field. In this book different axioms were proposed, the first of which referred to the "Impossibility of not communicating". We would always be communicating something; the "No communication" would be as impossible as the "No behaviour". If we took this first axiom to the relation between doctor and patient they would always be mutually and constantly influencing each other in said process. If we applied it to the didactic relation produced in the classroom between teacher and student the influence between both of them would not be unidirectional, teacher→ student, but it would also be retroactive and both elements would mutually be affected in the learning process. One could not not teach and the other could not not learn.

Another axiom refers to the types of language:

a) Digital, that would be transmitted by linguistic or written symbols and would be the vehicle of the content of communication.

b) Analogical, that would be determined by the non-verbal behaviour (tone of voice, gestures, etc.) and would be the vehicle of the relation in communication.

A third axiom would refer to and would clarify to us that all communication would have a Content (what we say), whose vehicle we have seen previously which would be the digital language, and Relation (how and to whom we say), which would use the analogical as a support. Thus, as the therapists can transmit, and in fact do so, unconscious messages to their patients, likewise would the teachers do so with their students. Hence much more than is consciously intended would be transmitted. Not only would contents or disciplines be transmitted, but values, beliefs, ways of seeing life, etc.

Through communication we all can express our way of being and our relation with the other, which would imply a compromise both for he/she who sends

a message and for he/she who receives it, with a greater or lesser amount of elements of acceptance or disqualification.

As the 1st axiom reminded us that “it was impossible to not communicate”, also “it would be impossible to not define the relation”. The healthier a relation between two parts the lesser the energy would be wasted in defining the relation, and the more dysfunctional it would be the more fighting would be produced about the nature of the relation, having no importance its content.

That process of defining the relation, both therapeutical and didactic, would be shared and reciprocal, and it would be produced both at the unconscious level and at the conscious one, with a determined number of elements of acceptance or disqualification. In a relational process both parts will recognise their disqualification or their acceptance. If the teacher disqualifies or disconfirms the student he/she will be recognising his/her incapacity as a teacher, and sooner or later all this will affect the relation and the problems of discipline. The disqualification of the teacher towards the student may have as an answer both the acceptance of said disqualification, whereby the student becomes incapable (school failure), and the non-acceptance and the fight for the nature of the relation, appearing problems of discipline. Content and relation will always be united, and problems of one level may affect the other. A relation of confidence and empathy, as that produced in medicine at the therapeutical level, with capacity to place oneself in the other's place and to accept his/her ideas, would be desirable to discover the true didactic relation, that would pass from being rigidly complementary in the first phases of learning to become gradually symmetric depending on the degree of autonomy and differentiation of the student (a phenomenon similar to that produced in the clinic between the therapist and the patient).

Finally we should point out that the nature of the relation will depend on the “marks of the communication sequence between the elements”. These marks will organise the facts of behaviour, and the lack of agreement regarding these sequential marks will be the cause of conflict in the relations. Each of the participants in the interaction will mark the events and behaviours in such a way that one will seem to have the initiative and the other will be passive. Each will have a different vision of the sequence, but both will conserve the vicious circle. At the therapeutical level what is important is to discover how the circle is conserved (circularity), not who begun it (linearity).

Communication, as a relational behaviour, may oscillate between the agreement clearly expressed and the double bind (pathological and paradoxical communication which resulted in a theory on Schizophrenia).

As a summary, the systemic perspective, mixing concepts derived from the G.S.T. and the Communication Theory, would imply understanding the problems and conflicts as relational perturbations between the elements of a system and its environment, transforming the symptom in a relational metaphor. This model, with its circular perspective can allow a new form of discovering the dynamic and evolutionary complexity of the systems (family, classroom, schools, etc.) different to all those linear models that continue to have great validity at present and that we inherited many centuries ago.