How do you know? Students, patients, and discovery

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> "For the real world has inexhaustible splendour, the real life is full of meaning and abundance, where we grasp it, it is full of miracles and glory."
> — N. Hartmann

> "I am myself plus my circumstances"
> — Jose Ortega y Gasset

Knowledge should be useful and provisional.

I think comparing the doctor-patient relationship with the teacher-student relationship can be useful, and it might suggest ways that both of them could be made more productive, with implications for the nature of learning and knowing.

40 or 50 years ago, advocates of student-centered education were encouraged by the popularity of psychologist Carl Rogers' client centered therapy. Rogers was interested in what made some therapists successful, and he found that their personality and attitude, not their theories or techniques, accounted for their success. Successful therapists had three essential traits. They offered their clients acceptance or "unconditional positive regard" and empathic understanding, and they themselves were congruent, not presenting a facade of authority or esoteric knowledge. According to Rogers, "accurate diagnosis" and "specific treatment" didn't have anything to do with helping the client.

Some therapists thought Rogers' approach was impractical, others were sure it was foolish. Medically oriented psychiatrists saw Roger's prestige among psychologists as evidence that psychology wasn't suited for dealing with the "mentally ill," who needed authoritative diagnosis and treatment--such as drugs, convulsive shock, or surgery. Scientifically, however, Rogers' ideas were supported by evidence, and medical psychiatry had no evidence to support many of its diagnostic concepts or their therapeutic usefulness.

Most university professors felt that Rogers' ideas were irrelevant to their educational work, and some clearly saw their own function as being a sort of Malthusian selection of the fittest, and deliberately designed their classes as barriers that only a few could surmount.

When I taught English composition, instructors were told that they must grade according to a standard scoring system for errors of grammar, punctuation, spelling, and diction. Our success was seen in terms of the number of freshmen who had dropped out by the end of the year, as evidence that the department had "high standards." Knowing that system, most students chose to write in the style of the first grade "See Spot run" readers, hoping that they could handle the mechanics of writing if they reduced the complexity and content of their essays. It didn't work, and they didn't improve during the weeks when their mistakes were being brought painfully to their attention. Since I hated reading their meaningless efforts, I told them that I was going to grade them on content, rather than punctuation and spelling, and that they should try to write about something that was important to them. Only their success in communicating something would be graded. Their papers became more readable, and the interesting thing was that the mechanical things improved immediately. (The intention to communicate something is the real source of structure in language.) I had another teacher score some of their compositions, and he confirmed that they had improved according to the department's system. The attempt to steer a person can make it hard for them to move, because it inactivates their own guidance system.

A physics professor would notice that writing classes have a lot in common with psychotherapy, and would dismiss the possibility that such an approach could be used in serious education.

Professors of medicine see themselves as models of the authority that their students will need to apply in dealing with patients, and the physicians trained in the authoritarian style are likely to see their patients as recipients of their medical knowledge, rather than as occasions for listening and learning something new.

Students entering these disciplines must expect to be disciplined. This means that they learn not to ask silly questions about the fundamental assumptions of their profession. Their common sense of meaning, their original guidance system, must be inactivated to keep them from asking questions such as "is that a disease or a theory?" Some patients find that their physician has little patience for their questions, but most patients don't want to ask questions, because they have been taught to respect the authorities.

Our nervous systems are made up of physiology and culture.

That can be a philosophical problem, because our experience is governed by our composition. In people like Heraclitus, physiology was in the foreground, and in people like Plato, culture was in the foreground. (Heraclitus understood that things are always becoming, Plato believed that change wasn't real.) To change someone's mind, it's necessary to change the way they experience themselves and the world, and that requires changing their substance.

In the 1950s a group called "Synectics" was formed to study the creative process. They found that having an expert in the group could be useful, but it could also often stifle the group's ability to find a good solution to a problem. W.J.J. Gordon described their method as "trusting things that are alien, and alienating things that are trusted." They used metaphorical thinking to help them to see the complexity and potentiality of a situation, and to go beyond the existing understanding.

Professors and physicians too often present themselves as having "definitive knowledge" about a subject. For people who

already have “definitive knowledge” about something, anomalous facts (if they are perceived at all) will simply remain anomalous and will be quickly forgotten. The things they produce will be extensions of what already exists. For others, things that aren't easily explained have special interest, and cause them to ask new questions. New perspectives can lead to new possibilities and new realities.

Once during a lecture, Alfred Korzybski offered his students some cookies, which they seemed to enjoy, then he showed them a label on the bag, “dog cookies,” and some of them felt sick. "I have just demonstrated that people don't just eat food, but also words, and that the taste of the former is often outdone by the taste of the latter." Hypnotists have often demonstrated that words can have physiological effects.

Many of our institutions use language as a system for preserving culture, that is, for preventing change. Korzybski wanted to correct the cultural habit of making abstractions seem like objects or “elements,” by making people aware of the degree of abstraction in their words. This can be useful, but his book has been used to promote an extreme linguistic relativism in the theory of knowledge and science, placing “meaning” entirely within the nervous system.

This approach evades the fact that patterns exist objectively, and that they can be perceived as they unfold through time. Although Korzybski thought he was teaching people to overcome the limitations of thinking in the style of Aristotle or Plato, he was supporting an attitude that would make it impossible to perceive in the style of Heraclitus.

If Heraclitus said it's impossible to step in the same river twice, his comment was directed to those who ignore the rich complexity of experience because of stereotyped “elemental” thinking. He was pointing to the abundance of the world, but elemental-concept thinkers have felt that he simply negated their objective meanings.

To perceive another person accurately requires the ability to perceive the person as a pattern unfolding coherently through time, as a potential realizing itself. Carl Rogers' insight was that one's awareness of being perceived in this way encourages the unfolding of potentials.

The refusal of institutions or individuals to perceive others in this way is an imposition of their way of understanding, and is itself a form of oppression. People who think in terms of “professional training” often describe learning in terms of “conditioned reflexes,” producing a desired response to each stimulus.

The terms “conditioned reflex” and “conditioning” were introduced into psychology by the behaviorist J. B. Watson, who mistranslated and misrepresented Pavlov's ideas, and who insisted that the ideas of consciousness, volition, and self should be eliminated from the science of psychology.

The orienting reflex, the alertness provoked by something new, was described by Sechenov in 1863, and explored by Pavlov (who also called it the “what *is* that? reflex” and the “exploration reflex”) who considered it to be our most basic and most powerful reflex. The fact that novelty powerfully arouses our exploratory systems means that we have a mental image of our familiar environment, and that a change in that environment requires us to investigate the properties of the new thing, to see whether it can be explained by the things we already know, or whether it requires us to change our basic ideas about our place in our surroundings. For Pavlov, the study of psychology or physiology without consciousness was simply crazy.

Pavlov said that he studied nutrition to understand consciousness and the nervous system, because eating is our closest interaction with the world. Our brain is part of our digestive system. But eating has become highly institutionalized and influenced by our cultural beliefs. If people begin to think about the meanings of eating, they are beginning a process of cultural and philosophical criticism.

Helping people with physical problems (such as obesity, headaches or joint or nerve pain, or named diseases) and helping people who want to understand something about the world beyond themselves, are structurally similar, but in the issues of health the questions and the potential answers are more clearly present and immediate.

The Synectics group began with the study of artistic creation, but they found that it was easier to evaluate their progress when they concentrated on technical invention. They found, as Pavlov had, that consciousness and meaning could best be studied in concrete situations. The process of goal-seeking was to be studied in action.

I see the therapeutic or educational or productive situation as a goal-directed biological and social interaction, and the goal can be either the creation of something new and better, or simply the preservation and application of something already existing.

Until just about a generation ago, “teleology” (especially in biological explanation) was considered to be metaphysical and inappropriate for science. Norbert Wiener, who coined the word “cybernetics” (from Greek for “proficient pilot” or “good steersman”) helped to change attitudes toward the word when he used the phrase “teleological mechanism” to describe cybernetic control systems.

A goal-directed system is one that senses its actions and makes adaptations so that its actions can be refined to achieve a purpose. Between 1932 and 1935, a student and colleague of Pavlov's, P.K. Anokhin, developed this idea of self-regulating systems, and originated the concept of feedback, in describing the ways organisms guide themselves and their adaptations. Building on Pavlov's work, and investigating the origins of innate reflexes, he found principles that would explain the origin of organs and their functions, and that would also apply to the interactions between individuals. The functional system on any level, in embryology, psychology, or society, is a sequence of interactions with a useful result. Movement towards a goal is adaptive, and the system is shaped by the adaptations it makes in moving toward the goal. Resources are mobilized to meet needs, changing the system as it moves towards its goal.

Since there is always novelty in the real world as contexts change, the exploratory function is causing us to continually revise

our understanding. Every question forms a functional system, and our brain adapts as we find answers.

This kind of systems theory and self-regulation theory developed along with the field theories in embryology, psychology, chemistry, and some branches of physics. Pattern and analogy were central to their approach. The functional systems are processes that occupy time and space.

The “field” idea in biology (wholes shaping themselves) can be understood by considering its opposite, the belief that cells are guided by their genes (producing a mosaic of parts). That idea, in its extreme form, claimed that cells contained an internal map and an internal clock telling them when and where to move and how to change their form and function as they matured and aged. In reality, cells communicate with surrounding cells and with the material between cells. The existence of long-range ordering processes between atoms, molecules, and cells threatened some of the central dogmas of the sciences.

Although Norbert Wiener popularized some aspects of the “teleological” approach to regulatory systems in the 1950s, and saw analogies between the teleological machines and the way the brain functions in Parkinson's disease, by 1950 the digital approach to information processing, storage, and transmission was displacing analog devices in computation and engineering, and was compatible with theories of intelligence, such as neo-Kantianism, that believed that human intelligence can be defined precisely, in terms of discrete rules and operations. Field thinking in embryology, cancer theory, psychology, and other sciences effectively disappeared--or “was disappeared,” for ideological reasons.

Wiener's goal-directed machines, like Anokhin's functional systems, worked in space and time, and the idea of steering or guidance assumes a context of time and space in which the adjustments or adaptations are made. Analog computers and control systems in various ways involved formal parallels with reality. The components of the system, like reality, occupied space and time.

Digital computers, with their different history and functions, for example their use for creating or breaking military codes, didn't intrinsically model reality in any way. Information had to be encoded and processed by systems of definitions. A sequence of binary digits has meaning only in terms of someone's arbitrary definitions.

Parallel with the development of electronic digital computing machines, binary digital theories of brain function were being developed, by people who subscribed to views of knowledge very different from those of Anokhin and Wiener. (Anokhin argued against the idea that nerves use a simple binary code.) These computer models of intelligence justify educational practices based on authoritative knowledge and conditioned (arbitrary) reflexes. Neo-Kantianism has been the dominant academic philosophy in the U.S., turning philosophy into epistemology to exclude ontology. "Operationism" and logical positivism share with neo-Kantianism its elimination of ontology (concern with being itself).

In the 1960s, Ludwig von Bertalanffy developed a theory of systems, defining a system as an “arrayed multitude of inter-linked elements.” Although it was intended as a description of biological systems, it reduced the teleological factors, needs and goals, to a kind of mechanical inner program, such as “regulatory genes.” “Following old modes of thought, some called this orderliness of life 'purposiveness' and sought for the 'purpose' of an organ or function. However, in the concept of a 'purpose' a desiring or intending of the goal always appeared to be involved--the type of idea to which the natural scientist is justly unsympathetic” (von Bertalanffy).

His system theory was highly compatible with programmed digital computers, that could define the interactions of “elements,” but unlike Anokhin's definition of functional systems, it lacked a pattern-forming mechanism. In Anokhin's view, the system is formed by seeking its goal, and perceiving its progress toward the goal.

Carl Rogers' approach to person-centered processes recognized that the interacting therapist and client or teacher and student were a formative system, rather than just an occasion for one to inform the other.

In the Synectics group, they learned to identify the types of deeply involved interaction that would lead to the best inventions. As in Anokhin's functional systems, resources are mobilized or generated as they are needed. Like Anokhin, they showed that the process of creating something new can be understood and controlled.

Every meaningful interaction involves formative systems.

Stimulation of sensory nerves can cause cells to move into the stimulated area, causing the organ to grow. Environmental enrichment causes brains to become larger, and to metabolize at a higher rate. All of these processes, from the level of energy production to the birth of new cells and the creation of new patterns in the brain, are called up in the formation of a functional system.

The studies of organismic coherence by Mae-Wan Ho and Fritz Popp appear to support the idea that even the alignment of molecules in cells is responsive to the state of the entire organism.

The reason this seems implausible to most biologists is that cells are commonly still seen as analogous to little test-tubes in which chemical processes occur as the result of random collisions between molecules floating in water. But Sidney Bernhard's study of glycolysis showed that the reactive sugar molecules are passed individually from one enzyme to the next, in an orderly manner.

In this system, the flow of energy, a series of oxidations and reductions changing glucose into other substances, effectively “pulls” the molecules through the system, contributing to order on a molecular level. Function creates structure, which supports function.

Self-regulating systems are self-ordering systems. When a person is allowed to function freely as a goal-directed, questioning system, the formation of patterns in the brain will be spontaneous and appropriate, and orderly. Knowing is the ability to hold

patterns in awareness. Knowledge, rather than being stored like money in the bank, is something that is regenerated, or generated, as we need it.

When our own steering system is commandeered by the authorities, our patterns of knowledge will be compartmented, and arranged in a fixed pattern. This kind of knowledge either deteriorates, or it seeks more of its own kind.

While self-regulation and the generation of knowledge are pleasurable, having knowledge imposed isn't.

Korzybski was right in warning about the dangers of letting names become “elements.” This perception led Paolo Freire to emphasize the educational importance of critically giving things their appropriate names, rather than just “banking” the names given by an authority. “To exist, humanly, is to name the world, to change it. **Once named, the world in its turn reappears to the namers as a problem and requires of them a new naming.** Human beings are not built in silence, but in word, in work, in action-reflection.” “. . . to speak a true word is to transform the world.” “'Problem-posing' education, responding to the essence of consciousness--intentionality--rejects communiques and embodies communication” (Freire, 1993).

Having the power to assign names is a source of power and wealth. The pharmaceutical industry has been accused of inventing new diseases to sell new drugs for treating them. Old definitions of cancer are hard to change, when the medical profession has invested so much in treatments--radiation and cytotoxic chemotherapy--which conflict with newer biological understanding of cancer.

The person who is learning is critically interacting with both nature and culture, with practical issues and theories.

Applying this to practical problems of health and nutrition, a first step is to begin to think about which things are theories or deductions from theories, which are habits, and which things are felt needs or appetites, and to get in the habit of watching processes or things--such as “signs” and “symptoms”--develop through time.

With practice, people can begin to see themselves as functional systems in their main activities, such as eating, and to watch how their needs influence their actions, and what effects different ways of eating have on their other functions, such as sleeping and working. Do appetites govern the timing of meals and the choice of foods? How does the time of day or time of month affect appetites? People often watch for effects of foods, but usually only for a few minutes or hours after eating. Some foods can produce symptoms days after they were eaten, and the activation of the digestive system by a recent meal can cause a reaction to something eaten previously.

Our traditional cultures, and advertising and schools give us definitions and expectations relating to foods and symptoms and physiology, and they teach us to think of our bodies in terms of an “immune system,” “endocrine system,” “digestive system,” “nervous system,” and “circulatory system,” which are mainly anatomical concepts that are more useful to the drug companies than to the consumer of culture. Both conventional and alternative approaches to medicine and health are likely to let those arbitrary ideas of systems cause them to overlook real, but unnamed, processes.

When the organism is seen as a mosaic of parts, rather than as a system of developing fields, medical treatments for one part, such as the “circulatory system,” are likely to cause problems in other “systems,” because the “parts” being treated don't exist as such in the real organism, with the result that the treatments are seldom biologically reasonable.

Besides learning to perceive one's own physiology and becoming aware of the processes of perceiving and knowing so that they can be improved, it's important to seek information to expand the interpretive framework, and to look for new contexts and implications.

Reading with a critical imagination is as important for science as it is for literature or advertising. Good literature often opens expansive new ways of seeing the world, and good science writing can do that too, but too often scientific publications have ulterior motives, and should be read the way advertising propaganda is read.

Some publications now require authors to state their conflicts of interest (such as receiving money from a drug company while testing a drug), but editors and publishers, who choose which studies will be published, seldom reveal their conflicts of interest. As Marcia Angell showed, editorial choices can turn statistical randomness into statistical significance. Private ownership of science journals permits control of their content.

Besides being aware of the conflicts of interest and the frequent insignificance of “statistical significance,” it's possible to recognize some features of the style of argument which is often used in science propaganda. A deductive style, rather than a descriptive and inductive style is extremely common in technical writing, and it should always lead the reader to question the principle from which deductions are made.

“Membranes are made from Essential Fatty Acids, therefore those fatty acids are nutritionally essential.” But cells can multiply in a culture medium that provides no fats. In biology, the most popular “principles” are simply dogmatic beliefs about genes and membranes.

In physics, where testable inferences can be drawn from arbitrary assumptions or doctrines, predictions that may be made based on different assumptions are often ignored for ideological reasons. This ideological quality of physics can permeate the other sciences when they use reductionist explanations.

Korzybski felt he was helping humanity to escape “word magic” and to advance to a mathematical view of the world. But the same processes that caused people to “confuse words with things” can cause people to confuse mathematical descriptions with reality.

“Chaos theory,” which was a faddish excitement about the ability to generate unpredictable output from a simple rule (which could be endlessly repeated by a computer), has been suggested to explain many things in biology, including heart rate variability. It doesn't. Instead, it has probably had a slightly harmful effect, by distracting attention from real biological pattern- forming processes.

Real substance can sometimes be modeled by descriptions of randomness, but substances at all levels have intrinsic pattern-forming tendencies, and context-dependent histories. Water, for example, has structure and structural memory that can affect even simple chemical reactions, and even gases have internal complexities that are often ignored. Real observations shouldn't be displaced by theories. The ideal and identical atoms of the reductionists are a crude fantasy, invented, more or less consciously, to serve their ideological purposes. One purpose has been to justify their abstract models of reality. A particularly noxious way of modeling reality has been based on the assumption of randomness, justifying a statistical view of all things.

The neo-Kantian philosophy that has dominated US universities for more than a century argues that our senses (even when extended instrumentally) are limited, so our knowledge must be limited--we can only speak of theories or interpretations, not of being. The world we see is, according to them, only an artifact of our senses. A popular example is that the flower a bee sees is different from the flower a human sees, because the bee's eye is sensitive to ultraviolet light. (The triviality of the example is shown by the fact that when a person's lens is removed because of a cataract, ultraviolet light becomes visible, because it is no longer blocked by the tissue that is many times thicker than a bee's lens.) There is a straw-man quality to their arguments against philosophical realism and empirical science**:** No one claims that our senses deliver complete knowledge all at once. What the realists claim is that interacting with the world is an endless source of valid knowledge.

When reading science articles, or listening to lectures, and even while privately thinking about experiences, it can be useful to watch for the improper use of assumptions. Our understanding has been shaped by the assumptions of our culture, and these assumptions present an attitude toward the nature of the world, in some cases even about the ontology that our philosophers have said is beyond our reach. “Evolution is shaped by random mutations,” “nuclear decay is random,” “the universe is expanding,” “entropy only increases,” “DNA controls inheritance,” “membrane pumps keep cells alive,” and all of the negative assumptions that have for so long denied the systematic generation of order.

Every communicative interaction is an opportunity for the discovery of new meanings and potentials.

Aristotelian motto: If the knower and the known form a functional system they are substantially the same.

References

P.K. Anokhin: 1975, **The essays on physiology of functional systems.**

1978, **Philosophical aspects of the theory of functional systems.**

1998, **Cybernetics of functional systems: Selected works,** Moscow, Medicine, 400 p., (in Russian).

Pedagogy of the Oppressed, by Paulo Freire. New York: Continuum Books, 1993.

Synectics, W.J.J. Gordon, Harper & Row, 1961.

Crystals, Fabrics, and Fields : Metaphors of Organicism in Twentieth-Century Developmental Biology, Donna Jeanne Haraway, 1976.

We Make the Road by Walking: **Conversations on Education and Social Change,** Myles Horton, Paolo Freire, 1990.

Science and Sanity, Alfred Korzybski, 1933.

Alfred Korzybski, "The Role of Language in the Perceptual Processes," in **Perception: An Approach to Personality,** edited by Robert R. Blake and Glenn V. Ramsey. 1951, The Ronald Press Company, New York.

Marshall McLuhan: *“...the devil is in the media,”* quoted by Derrick DeKerkhove, Director of the McLuhan Program in Culture and Technology at the University of Toronto.

Biochemistry and Morphogenesis, by Joseph Needham. Cambridge University Press, 1942.

Cybernetics--or Control and Communication in the Animal and the Machine, Norbert Wiener 1948

The Human Use of Human Beings, The Riverside Press (Houghton Mifflin Co.), 1950.

*“...the rules of the war game never catch up with the facts of the real situation.” “The future offers very little hope for those who expect that our new mechanical slaves will offer us a world in which we may rest from thinking. Help us they may, but at the cost of supreme demands upon our honesty and our intelligence.”*Norbert Weiner, **God and Golem, Inc.,** 1964**.**

Digital thinking sees the organism as a mosaic of parts, making rigid and specific naming essential; analog thinking sees the organism as fields in development, making flexibility in naming essential.

PS: When defense lawyers collaborate (collude) with prosecutors, it's considered a crime. What if physicians, instead of covering up for each other, used the adversary system that is supposed to produce the best knowledge in law and science, to evaluate their patient's diagnoses and treatments?

J Intern Med. 1999 Jan;245(1):57-61. **Decreased heart rate variability in patients with type 1 diabetes mellitus is related to arterial wall stiffness.** Jensen-Urstad K, Reichard P, Jensen-Urstad M.

Eur J Appl Physiol. 2010 Apr 23. **Heart period sensitivity to forced oscillations in ventilatory pressure.** Quint SR, Vaughn BV.