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The Working Mind

Meaning and Mental Attention in Human Development

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Glossary

abstraction (reflective): This abstraction extracts and learns invariant patterns (types) and individually variable characteristics (tokens) from actual experience, within and across situations. Reflective abstraction often occurs in levels, the upper levels abstracting from lower ones. This abstraction process is reflective in the sense that upper levels mirror (reflect patterns or characteristics of) the lower levels.

afferent versus efferent processes in the brain: Afferent processes are bio-electric information signals that reach the brain from outside (usually from the sensorial receptors); efferent are processes that leave the brain (usually from motor operative effectors) to go to muscles and other parts of the body.

attention (automatic): Automatic attention, often perceptual or overlearned operative processes, is mobilized spontaneously and without effort.

attention (mental, executive, endogenous): Mental attention (Matt) is the brain capacity to enhance or boost activation of some scheme (information-bearing and/or affect) processes. This *mental or effortful attention* (also called *focal* or *executive attention*) is endogenously driven by brain activation processes. Mental attention is needed to boost task-relevant schemes and interrupt/suppress irrelevant schemes (particularly within misleading situations). It is constituted by a functional system of *four hidden operators* (brain resource processes): E (executive schemes), M (mental-attentional activation booster), I (mental-attentional inhibition or interruption process), F (internal field factor minimizing complexity of the schemes' application and synthesis/integration). That is: Matt$=<E, M, I, F>$.

centration/recentration/decentration: Centration is an act of mental attention. Recentration is a change in centration that changes content but not level of analysis (often called *executive updating*). Decentration is a change of centration that changes both content and level of analysis (often called executive *shifting* or *switching*).

constructivism (empirical rationalism): A form of epistemology (approach to knowledge) that can integrate *empiricism* (the assumption that all knowledge can be acquired via objective observation of outside things out there) *with rationalism* (assuming knowledge is conditioned by innate

structures). Constructivism models processes from within the subject's own mind (called *metasubjective* modeling).

constructivist (or cognitive) learning: The theoretical view that knowledge is not directly innate nor directly acquired from experience, but dynamically constructed via reflective abstraction. This constructivist (dynamic dialectical) learning occurs spontaneously in facilitating situations but needs mental attention in misleading situations.

epistemic/epistemological: Referring to the act of knowing. Epistemology is the discipline investigating basic principles of knowing.

equilibration (regulations, disequilibration): In Piaget's theory *equilibration* is a dynamic-balance system of the psychological organism, which will spontaneously initiate dynamic processes to restore internal equilibrium, when its balance is disturbed by one or another event. *Regulations* are Piaget's name for the sources of equilibration. *Disequilibration* results from (external or internal) disturbances.

field of activation/*F*-factor: The internal *field of activation* is the set of currently activated schemes in the repertoire (long-term memory) of a subject. Coactivated schemes interact to synthesize a minimally complex dynamic resolution. The organismic factor (hidden operator) doing so is the neo-Gestaltist *F*-factor (*F*-operator, which is produced by neuronal lateral-inhibition processes).

figuratives, operatives, and parameters: These are different *sorts of schemes*. *Figuratives* represent objects or entities of any sort. *Operatives* represent transformations, operations that can be applied on figurative schemes. *Parameters* stipulate conditions for successfully applying operatives onto figuratives.

functional structures (e.g., schemes, schemas—affective, cognitive, and personal): Emerging, and later internalized, patterns of structured information or procedures found at a given level of abstraction; they are often reflectively abstracted from the person's own (external or mental) actions. Schemes/schemas are learned (*internalized*) functional structures. As we use the term, schemas are *complex schemes*. Functional structures emerging from performance are not in the repertoire of the person until internalized into schemes/schemas. Schemes/schemas come in four sorts: *cognitive-operative* (procedural), *cognitive-figurative* (which express the *truth/falsity* of experienced reality), *affective* (expressing organismic *vital values—feelings*), and *personal* (expressing both truth/falsity and vital values).

functional totality: The totality of distinct operations (operators) that can bring about change in a given domain of application, while preserving invariant a set of characteristics (the *functional invariant*).

hierarchy, heterarchy: *Functional invariants,* in repeatable situations of variation, *emerge within levels of analysis* (or abstraction) *in which their own structure is clear*. Distinct levels emerge in hierarchies, within the same (or across) content domains. The rank of a level (from low/concrete to high/abstract) is the position it holds in the hierarchy. Heterarchy (or *flexible hierarchy*) is one where ranking of levels can change with the domain of application.

intelligence: The aptitude for solving problems, particularly in novel and misleading situations. Aptitude to anticipate with accurate expectancies (elicited in the situation) that for such purpose or goal a given inference/behavior is good.

internalization/internalized: Term introduced by Vygotsky referring to constructive processes of reflective abstraction (constructivist learning) producing schemes that *epistemically reflect*, often in their own configuration and characteristics, important reality *resistances* and how to control them. Internalization places in the repertoire (long-term memory) new schemes, new *functional invariants* defined at some level of abstraction where their structure is clear.

invariants (functional): Functional invariants are invariants obtained in *repeatable situations* where some aspects are being varied or exchanged. They occur in variations such that at least one set or system of characteristics is preserved, invariantly, across repeatable exchanges. When all possible types of operations that would produce this variation are grouped into a *functional totality*, all these operations constitute a (mathematical) group of variation, whose functional invariant they preserve as a structure.

invariants (types): Invariants are probabilistic patterns of representation, meaning, or action, found to be stable across situations. Peirce and others call them *types* (signs constant across situations that often are symbols). They are complemented by *variants/tokens*—characteristics that change across situations or individuals.

learning (modes): Simple content learning (*C learning*) is substantive-associative and internalizes simple resistances of Reality. Relational-associative learning (*LC*) abstracts simple patterns as well as relational-structural (Logical) learning; with enough repetitions it creates overlearned associative links. Relational-symbolic Logical learning (*LM*) is effortful (uses mental attention, *M-boosting*), producing fast learning and complex schemes. Other sorts of *L learning* use affect (*A*), like *LA* learning. All forms of learning can be automatized: *LC, LCLM, etc*.

levels versus epilevel: A *level of knowing* (*epistemic level*) is a level of analysis that maximizes the clarity of relevant functional invariants or structures. These levels are relative to the knowing process. We call *epilevels* levels that are enforced not just by the act of knowing but also by Reality itself: these are *epistemo-ontological* levels. For instance, *proper developmental levels*, such as sensorimotor versus symbolic (i.e., preoperational, concrete operational, formal operational) *are in fact epilevels*.

logic/psycho-logic: *Logic* is the discipline that studies whether and how knowledge and linguistic statements convey truth, and how to draw true inferences from statements or state descriptions. Truth is the capability of knowledge representations, and of statements, to express information (or fail to express in the case of falsity) that is suitably accurate or appropriate for the object of knowledge. We distinguish two sorts of logic. The first, such as found in *formal logic or mathematical logic*, constitutes a collection of generic systems that represent and analyze thought in a formal (focused on form rather than content or local meaning), categorical, and systematic manner. These generic logical systems serve to formulate possible "objective" relations among meaning-bearing structures of inference in thought and language; to characterize them as true or false.

The second sense of logic is found in *dialectical and other approaches to philosophical/epistemological logic*, *or psycho-logic* (e.g., Piaget's developmental psychology modeling). This alternative intuitive sort of logic may study temporal (diachronic) emergence and evolution of logical systems in the minds of humans who mature and develop—a sort of constructivist process analysis that is qualitative but probabilistic.

meaning (of an object or situation): All anticipations or expectancies, that is, all schemes, that can be estimated to apply to an object or situation, and all those estimated not to apply.

mediation, mediational processes: Mediation is the aptitude of a process (or physical entity) to serve as functional link relating two other terms (processes, objects). It can mean *external mediation*, such as psychosocial relations that a person has with special others. Mediation can also be *internal*—for example, cognitive or perceptual processes that (inside a working mind) link the here-and-now situation (as represented) with thinking processes or actions for coping with the task. For Kant schemas are a mediation between the mind's abstract dimensions or categories (e.g., space, time, quantity, quality, substance, causality) and the concrete raw reality.

metasubjective analysis or perspective: In addition to *objective* (describing from outside) and *subjective* (describing from within the processes), we have the *metasubjective* analysis or perspective, which adopts a *from-within-process perspective* to model (in a rational reconstruction, not just a description) processes that the subject uses vis-à-vis a task.

misleading/facilitating situations: A situation is *facilitating* when its salient aspects (activated cue-schemes, habits, schemas) make it easy to attain intended goals. A situation is *misleading* when salient situational aspects interfere with, or strongly distract from, intended goals.

model (or mental model): A system of signs/symbols that stands for either complex entities of reality, or procedures (blueprints for action), or both. Mental models are functional structures, and often complex schemes (schemas).

motivation: Is the conversion of affective motives into cognitive goals. Motivation functionally intertwines affect/emotion, cognition, and Reality/reality, which leads advanced animals to *internalize* suitable scheme packages and their interdependencies, thus learning the environment's *causal texture*.

objects, proximal and distal: An object is a coordinated functional totality (a "package" or grouping) of characteristics or figurative schemes that together constitute a functional invariant in perception (*proximal object*) or in action and cognition (*distal object*).

operators (brain resources): An operator is a causal agent in the organism that brings about change. We distinguish two distinct sorts: *subjective operators* and *hidden operators*. Subjective operators are schemes, which can be recognized in consciousness because of their effects. Hidden operators are not like schemes; they are regulatory resources, often hidden from consciousness, that can change schemes and their manifestations. Examples of hidden operators are: *A* (affective factors), *B* (psychosocial affective schemas) *M* (mental-attentional capacity), *I* (attentional inhibition), *S* (spatial factor for structuring relations of coexistence), *T* (temporal factor for sequential/episodic structuring), *C, LC, LM*, and so on.

organismic (causal organismic): These are characteristics pertaining to the organism as a *functional totality* within psychology, behavioral neurology, or neuroscience. Organismic processes are causal (*causal-organismic*) if they can predict outcomes produced by the organism (or the brain's functional totality) by using *organismic factors* with their interactions.

overdetermination (*SOP*): A form of causation in which the outcome results from many factors (schemes, etc.) that could concurrently apply to produce it; for example, multiple organismic causes dynamically synthesizing the result. Organismic causation is always overdetermined. One such instance is the *Schemes' Overdetermination of Performance* (*SOP*).

psychological organism (or psychological brain): The functional organismic totality constituted by the brain and bodily processes.

Reality versus reality: The raw Resistances of experience within the Reality out there (or inside us) are presented in our theory with a capital R. We present with lowercase *r* the resistances of reality as already coded and interpreted (*represented*) by the psychological organism.

relations (of coexistence; their complexity): Relations are *functional structural patterns* that coordinate objects or aspects of experience. Their complexity depends on the number of objects that necessarily must be coordinated, via reflective abstraction, to internalize a given activity or state of affairs. *Relations of coexistence* are abstracted relations that express a set of objects or actions (i.e., schemes), which in given situations are often coactivated and work together to produce an intended result.

representation (levels of): This is the classic term referring to reflective abstraction of experientially encountered invariants and stable variable aspects.

Resistances: These are invariant (or variable) characteristic aspects of situations that impose necessary constraints on a person's actions or representations, relative to some goals in a type of situation. Resistances are often relative to each species, within a given type of situation. Written with capital *R*, Resistances are aspects of Reality; if written with lowercase *r*, resistances are schemes' coded characteristics. Facilitating Resistances/resistances are often called *affordances*; interfering or misleading ones are called *encumbrances* or *obstacles*.

schemes (of action, versus executive, versus ephemeral): Schemes are anticipations, that is, action patterns (and/or affective feelings) that can be transferred from one situation or object or action to another—in recognition of similarity relations. *Executive schemes* are those that carry executive functions of control or planning. *Action schemes* (*figurative, operative, affective,* or *personal*) are schemes that represent objects, conditions (parameters), procedures, or affective values. *Ephemeral schemes* are not-yet-learned (schematized) functional structures; that is, figurative, operative, executive, affective/personal schemes currently synthesized by the psychological organism, but not yet internalized into the repertoire of permanent schemes.

sign, signal, symbol: A *signal* is a sign (usually a figurative scheme) that has associative links with another scheme (*the referent*—object or event) so that it can evoke this other scheme before it arrives. A *symbol* is a sign functionally detached from its referent, which allows it to evoke *the possibility* (without the actuality) of its referent.

stages (development): An organismic developmental stage is a stable predictable level of complexity-processing across content domains. It is manifested in critical landmark performances across domains, which are predictable by an organismic-developmental theory or general process model.

structure: A system of relations holding among elements such that if the elements are exchanged with elements of a different suitable kind, the same system of relations is preserved as a functional invariant. A face is therefore a structure, because identification of a face can be done across all animals.

task analysis: A method of formulating the meaning and procedural process-structure for solving tasks by using the subject's own schemes. Metasubjective task analysis (MTA) is one such method for modeling "from within" the subject's task solution.

TCO: The Theory of Constructive Operators, which is the subject of this book. See preface and chapter 1.