PERSPECTIVE-TAKING AND OBJECT CONSTRUCTION: TWO KEYS TO LEARNING

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ABSTRACT

Piaget defines intelligence as adaptation, or the ability to maintain a balance between stability and change, or, in his own words, between *assimilation* and *accommodation.* When people *assimilate* the world to their current knowledge, they impose their order upon things. This momentary closure is useful to build "invariants" that lend existence to the world, independent of immediate interaction. In *accommodation*, people become one with the object of attention. This may lead to momentary loss of control, since fusion loosens boundaries, but allows for change. I choose the domain of perspective-taking to illustrate how this alternation between assimilation and accommodation punctuate individuals' interactions with the world. I show that the ability to move away from one's own standpoint, and to take on another person's view, requires the construction of cognitive invariants: a recasting of the world's stabilities that transcends any given viewpoint. I conclude that separation is a necessary step toward the construction of a deeper understanding, and that adopting a "god's eyes view" is by no means contrary to situating one's one stance in the world.

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Knowing as Ways of Relating to the World

In recent years, an increasing number of psychologists and cognitive scientists have adopted the view that knowledge is essentially situated and thus should not be divorced from the contexts in which it is constructed and actualized (e.g. Brown & Collins & Duguid, 1989; Rogoff & Lave, 1984; Lave & Wenger, 1991). This growing interest in knowledge as it lives and grows in context has led many researchers in developmental psychology and other disciplines to focus on people's interactions with, and descriptions of, specific situations. They look at how these interactions and descriptions evolve over time. Such an emphasis on the richness and diversity of individual paths-in-context provides a far less coherent picture of cognitive growth than is suggested by most stage theories. It challenges the prevalent view among developmentalists (such as Piaget and Kohlberg) that removed, analytical modes of thought are necessarily more advanced forms of cognitive functioning. It questions the notion that cognitive growth consists in an uni-directional progression from concrete to abstract, from fusion to separation (Ackermann, 1991; Kegan, 1982; Turkle and Papert, 1991).

Several scholars further elaborate on the idea that divorcing knowledge from experience, by adopting a "god's eye view"—an all encompassing view that transcends any given viewpoint—is by no means a higher form of knowing. It is certainly not, in their views, the most appropriate mode of functioning in all situations (e.g. Fox-Keller, 1985; Gilligan, 1987; Harding, 1991; Haraway, 1991). They argue that *to know is to relate* and that *to know better*, or gain deeper understanding, is to *grow-in-connection* (Jordan, Kaplan, Miller, Stiver, Surrey, 1991). Lave went as far as to suggest that learning should be distinguished from knowledge acquisition. Learning, to Lave, is the ability to function *in situ*, that is, to become an active participant within a multiplicity of communities of practices (Lave, 1992).

What is common to all these approaches is that they bring back *subjectivity, standpoint*, and *context* to the center of discussions about knowledge, science, and learning. They also remind us that, indeed, people can develop different ways of knowing while remaining excellent at what they do.

Piaget and Situated Knowledge

One could argue that situated cognition has been with us for a long time. Piaget has taught us that *knowledge is not a commodity to be transmitted.* Nor is it information to be delivered from one end, encoded, stored and reapplied at the other end. Instead, *knowledge is experience*, in the sense that it is actively constructed and reconstructed through direct interaction with the environment. This idea is similar, in many ways, to the ideas expressed by various "situated cognition" scholars: *To know is to relate*.

However, recent claims emphasize that people's ability to make sense of their world and themselves, and to construct progressively deeper understandings, cannot be portrayed as Piaget has done. A person's development is not a smooth, incremental progression from concrete to abstract, from fusion to separation, from connectedness to autonomy. A closer look into the meanderings of individual minds in context reveals a far more complex picture,

which calls for a redefinition of Piaget's general stages of cognitive development (Ackermann, 1991; Carey, 1987; Karmiloff-Smith, 1992).

Stage theory emphasizes how the average child, or epistemic subject, becomes detached from the world of concrete objects and local contingencies, increasingly able to internalize action and to mentally manipulate symbolic objects within the realm of hypothetical worlds. While this is an important aspect of cognitive development, it does not account for the processes by which knowledge is formed and transformed within specific contexts. Nor does it describe how knowledge is cultivated by individual minds, or shaped by the very media used to make it tangible. In Cellerier's words, Piaget has given less thought to "reflective concretization" than to "reflexive abstraction" (Cellerier, 1992). The situated knowledge approach invites us to pay closer attention to the ways in which individuals *give form to their ideas* , and *how these forms*, once built, *inform back their ideas* (Ackermann, 1994). Both personal expressions and cultural artifacts become objects-to-think-with (Papert, 1980), or mediational means (Wertsch, 1991). People build them to make ideas tangible, and they share them to negotiate meanings, or communicate. Such an emphasis on the processes by which people shape and sharpen their ideas in context provides a rich counterpoint to Piaget's stage theory.

In paying closer attention to the ways in which people rely upon their objects-to-think with, authors in the situated knowledge movement propose a conception of "self" that is distributed and decentralized (Haraway, 1991). If it is true that knowledge cannot be divorced from the contexts in which it is built and from the media that allow its expression, then we cannot think of the knower as an autonomous agent. If our minds, senses, and bodies are expanded through the use of personal tools and cultural artifacts, then these tools and artifacts become *incorporated*, an integral part of our selves. The boundaries of our mental, sensorial and corporal envelopes are thus expanded, in the way that a blind man's cane is an extention of his sensory system. Authors in the situated knowledge movement allow us to rethink the notion of identity as well as the nature of the divide between "self" and "not self."

Cognitive Adaptation: Regulating Exchanges Between Self and World

Although knowledge is necessarily situated, we should not loose sight from the fact that people's ability to be connected, and develop deeper relationships also requires moments of separation, autonomy. This is where Piaget's "other" contribution is very relevant. Piaget has dealt not only with stages. He has also defined intelligence as *adaptation*, or the ability to maintain a balance between stability and change, closure and openness, or, in his own words, between *assimilation* and *accommodation.* Piaget's *functional theory* of intelligence provides a solid ground for understanding how people *regulate their boundaries* with the world.

Assimilation, or Imposing One's Order Upon the World

Piaget's stage theory stresses children's growing ability to extract rules from empirical regularities, and to build cognitive invariants. The functional emphasizes the importance of these constructs—rules and invariants— for interpreting and organizing the world. Once built, they become the lenses, or assimilation frame, through which people attribute meaning to others and things. Piaget's interest, I suggest, was mainly in the assimilatory pole of

adaptation, that is the processes by which the cognitive system as a whole maintains its internal structure and equilibrium. And what Piaget describes particularly well is the nature of this internal structure, or equilibrium, and its "complexification" and reorganizations over time.

Accomodation, or Listening to the World

In accommodation, the subject is connected and sensitive to variations in the environment. Through accommodation, people "dive into" situations. Rather than looking at them from a distance, they "become one" with the phenomenon that captures their attention. The cost of accommodation is momentary loss of control, or disequilibrium. But listening to the world allows for change through adjusting one's current views in the light of perceived mismatches. If Piaget himself has paid less attention to the accommodative pole of adaptation, he has nonetheless laid the grounds for others to further explore its role in achieving a viable adaptive balance.

Cognitive Growth as an Ongoing Dance : Diving-in and Stepping-out

Along with Kegan (1982), I believe that both "diving in" and "stepping out" are equally important in reaching deeper understanding. I argue that separateness resulting from momentary withdrawal does not necessarily entail disengagement. It may well constitute a step toward relating even more closely to people and things. As the Chinese saying goes: "The fish is the only one who does not know that he swims" (anonymous). People cannot learn from their experience as long as they are entirely immersed in it. There comes a time when they need to step back, and reconsider what has happened to them from a distance. They take on the role of an external observer, or critic, and they revisit their experience "as if" it was not theirs. They describe it to themselves and others, and in so doing, they make it tangible and shareable.

Once projected out and objectified, personal experience can be newly re-engaged. People can dive back into the situation of interest to them, get immersed at the cost of losing themselves one more time, until they eventually reemerge and, once more, look at things from a distance. It is this dance between diving-in and stepping-out that keeps us connected while, at the same time, able to grant the world with an existence that goes beyond momentarily relation with it.

Perspective-Taking and the Construction of Invariants

To illustrate my argument, I discuss research on *perspective-taking* and *the construction of cognitive invariants*. By *perspective-taking*, I mean people's ability to experience and describe the presentation of an object or display from different vantage points. This ability involves objectifying one's own view of the object, and anticipating that moving to another station point results in specific changes in its presentation. In other words, perspective-taking involves both differentiation and coordination of viewpoints. By construction *of cognitive invariants,* I mean people's ability to mentally hold onto some features of an object, to

stabilize or "conserve" them, in spite of modifications in other features. The building of invariants or stable referents is a central piece in what Nelson Goodman calls 'worlds making" (Goodman, 1978).

Object permanency and conservation of object-size are examples of invariants constructed in early childhood. At 6 months of age, babies learn to attribute "objectnes" to events that occur in stable, reliable ways. An "object" may well evaporate as soon as they baby turns away—out of sight means out of mind, out of existence—but since it reappears whenever s/he turns back, the baby starts attributing permanence, or "objectness" to it. In conservation of object size, the child grants identity to an object although its projection becomes smaller or larger when displaced from the child. Again, it is the reliability of the object's behavior—the correlation between distance and projective size—that triggers the attribution of invariance or "sameness", despite obvious changes in appearance.

Perspective-taking is similar to the conservation of object-size except that, in this case, it is the child who moves around the object, and not the object away from the child. The invariance of an object's shape is constructed be detection of a stable correlation between movement around the object and changes in its presentation. From any particular vantage point, the object's presentation is always the same. Yet, as one moves around, its presentation changes. As long as the object behaves consistently with relation to the child's movement, the child will eventually ascribe permanence, or 'objectness" to it, in spite of its ever-changing and necessarily partial presentations.

Perspective-taking provides a good example of how people drift in and out of their own viewpoint, and how this drifting leads to the building of a so-called "god's eye view" that transcends any particular vantage point, recreates hidden parts, and schematizes (sometimes adding "ghosts"), in other words, imposes stabilities. To anticipate how another person perceives a phenomenon, we need to reconstruct the phenomenon for ourselves. Only then can we guess what others may perceive from their standpoint. In discussing some classical experiments on perspective-taking, I wish to show that perspective-taking and object construction go hand in hand. The ability to decenter, by taking on another person's view coexists with the construction of a "god's eye view." It is the dance between the two that spurs growth. *Playing other* and *playing god* are equally useful to deepen our own connection with the world.

Perspective-Taking Experiments

The experiment that laid the ground for further studies on perspective-taking involves a situation in which the perspectives of two or more protagonists are at odd with ones another (Piaget, Inhelder, 1967). Subjects have to anticipate how a given object will appear from different viewpoints. In contrasting the classical three-mountain task (Piaget, Inhelder, 1967) with more recent *spatial perceptual* perspective-taking experiments (Flavell, 1990; Huttenlocher & Presson, 1973), I show that young children are not merely egocentric, as suggested by Piaget and Inhelder. Instead, they cannot build a stable enough "god's eye view," which is needed to recreate the hidden faces of an object and to guess how it presents itself to others.

More intricate *psychological* perspective-taking experiments involve situations in which a child knows something—and knows that another does not know. The child's task is to guess what the other may believe. Psychological perspective-taking include so-called "false belief" experiments (Flavell, 1988; Wimmer & Perner, 1983), research on youngsters' ability to adjust speech when talking to younger children, research on their ability to modify instructions to match a recipient's perceived abilities (Astington, Olson, & Harris, 1988). These situations differ from spatial perceptual perspective-taking tasks in that they involve people's beliefs and knowledge about other people's beliefs and knowledge. Research o children's theories of mind shows that 4-years-olds understand very well that someone else can have a viewpoint different from their own. What is more difficult is the realization that viewpoints are lenses, and that different lenses transform "realty" in specific ways. Young children do not understand *how* a given lens informs the mind of those who use it (Perner, 1993). In what follows, I present some of the findings in spatial-perceptual research, leaving it up to the reader to discover the striking convergence with more recent findings on children's theories of mind (Wellman, 1990).

The Tree-Mountain task

Children from 4 to 12 years old are presented with a miniature model of three mountains, different in shape and colors. The model is placed in the middle of a table, and four characters (dolls or people) are seated around the table. The child, who figures among the characters, has to guess how the others will see the miniature landscape from their respective viewpoints. Piaget and Inhelder found that children up to 9 or 10 years produce egocentric descriptions when asked to specify "what another person sees." The authors interpret young children's difficulties by their inability to *de-center*, that is, to put themselves in other people's shoes. Piaget's notion of de-centering, I argue, remains too undifferentiated. It involves all moving away from one's own viewpoint, understanding *that* a person situated elsewhere will see things differently, and figuring out *what* the other will see from his or her vantage point.

More recent studies (Flavell, 1989; Huttenlocher & Presson,1973) show that if young children fall back into "egocentric errors" in the three-mountain task, it is not because of their inability to de-center, as suggested by Piaget and Inhelder. Instead, they are unable to keep a hold of all the relative positions among elements within the 3D scene (right / left, behind / I front, above /below, etc.), and to operate the transformations needed to infer the object's presentation to others (front becomes back / left becomes right, etc.). in other words*, certain displays are harder to reconstruct than others*.

The Cat-Dog Experiment

Instead of a 3D miniature landscape, Flavell and his colleagues presented young children with a 2D cardboard showing the image of a cat on one side, and the image of a dog on the other side. In this situation, children 3 to 4 years old can tell, without any hesitation, that if they see the cat, a person sitting in front of them will see the dog (Flavell, 1989). According to Flavell, the cat-dog experiment is easier precisely because the display is simpler. Children need to keep a hold of a single relation (cat on one side, dog on the other) and operate a single transformation (if I see the cat, the other will see the dog).

This simplified version of the classical experiment makes it clear that young children do not fail because they are egocentric. Children of 3 to 4 years old are able to understand that another person's viewpoint is different from their own, and thus, that an object's presentation is different *from different station points*. What makes the classical experiment so difficult is the requirement to keep in mind all the relative positions among elements within the scene, and to figure out *how* these positions vary when seen from another vantage point. As Flavell puts it, young children know very well *that* someone else will see things differently but they cannot specify *what it is* they will see (Flavell, 1989).

Mental Rotation and Perpective-Taking Experiments

Huttenlocher & Presson (1973) further demonstrate that if children are blindfolded and actually move around a 3-D miniature model, instead of just imagining what another person sees, they can more easily anticipate the other's viewpoint. The authors' interpretation is that the actual displacement around the table facilitates the mental tracking of transformations in the display. As they move along, children progressively change their own relative position to the display. This physical repositioning enables them to locally readjust the changing relations among elements within the scene. Instead of having to compute whole transformations at once (inverting lefts and right, etc.), they can mentally unravel continuous changes, step by step, and in real time.

This experiment is relevant to the discussion on situated cognition in that it stresses the importance of actually being projected into a situation, and acting in it, instead of operating at a distance. "Diving into" a situation enables children to mobilize a wealth of knowledge-in-action from previous navigational experience, and even blindfolded, they can build upon this sensori-motor wealth to mentally track progressive changes in the object's presentation as they move along.

The Shadow-Box.

Reith & Al (1989) have designed yet another variation of the classical perspective-taking experiment that is worth mentioning. In this case, none of the participants involved knows what the object actually looks like. Each has a partial view in the form of a shadow projection, and needs to exchange information with others to figure out the shape of the "hidden object." The setting is a big box containing a 3D object. The vertical sides of the box are opaque windows showing 4 shadow projections of the object. A person is seated in front of each window. No movement is allowed around the display. This experiment provides an excellent metaphor for what actually happens in any other perspective-taking situation. Objects are never visible. They are always "hidden" in the sense that they don't present tall their faces at once. Like in the shadow-box task, people necessarily reconstruct objects, for themselves and with others. They do so by keeping a hold of partial presentations, as seen from specific station points, and by imposing stabilities upon reliable changes in presentations, as noticed through moving around in consistent ways.

Conclusions

The most important contribution of the "situated cognition" approach is that it has brought back *subjectivity, standpoint*, and *context* to the center of discussions about knowledge and learning. In stressing the deeply personal and rooted nature of what we know and how we come to know, authors have challenged the prevalent view among many developmental psychologists that removed-analytical modes of thought are necessarily more advanced. They question the notion that cognitive growth is a smooth linear—or step-like—progression from concrete to abstract, from fusion to separation, from egocentrism to de-centration.

On the other hand, we know from Piaget, Kegan, and othres (Winicot, 1971) that people's abilities to reach deeper understanding also require moments of separation. As Kegan eloquently puts it, cognitive grows emerges as a result of people's repeated attempts to solve the unsolvable tension between getting embedded and emerging from embeddedness (Kegan, 1982). Without connection people cannot grow, yet without separation they cannot relate. People need to get immersed into situations, but there also comes a time when they want to step out. They detach themselves by projecting out their experience. They "objectify" it and they address it "as if" it was not theirs. They recast what happened to them to make it more tangible. They become their own observers, narrators, and critics. And then, again, they newly re-engage their previously "objectified" experience. They dive back into it and they try, once more, to gain intimacy. Both "diving in" and "stepping out" are equally needed to reach deeper understanding.

Research on *perspective-taking* has illustrated how people drift in and out from their viewpoints, and how this drifting leads to the construction of a "god's eye view" which, in turn, is needed to understand another person's view. Such a "god's eye view" is obviously neither static nor permanent. It is bound to be constantly reshaped, but nonetheless plays a critical role in people's ability to adopt another person's viewpoint. Perspective-taking and object construction, indeed, go hand in hand. In adopting too strong a stance against the evil of "god's eye views," many scholars of the situated knowledge tradition lose sight of the fact that building stabilities, or invariants, is the flip side of our capacity to empathize. Playing god and playing other are equally important in keeping us connected while we, at the same time, are able to grant the world with an identity ("otherness") beyond our current interaction. Intelligence requires over-generalizing. People can only understand novel situations in terms of what they already know—imposing their order upon things. It is their ability to navigate between globalizing constructs and local stances that allows for a viable balance between closure and openness, stability and change, or, in Piaget's words, between assimilation and accommodation.

Piaget's functional theory of intelligence provides a solid ground for understanding how people regulate their boundaries with the world. However, Piaget was mainly focused on the assimilative pole of adaptation, and has to a great extent overlooked the self-correcting function of accommodation. I paying closer attention to the ways in which people loosen their boundaries through accommodation, it becomes obvious that projections of self-in-context are a key to learning, and they can take various forms (Hatano & Inagaki, 1987).

In an article entitled "Anthorpomorphic Epistemology," Sayeki developed the idea that people often throw out pieces of themselves, which he calls "Kobitos" (little people), into the contexts that they try to understand (Sayeki, 1989). In doing so, they become able to feel situations "from within." They build an analog the blind person's cane. This kind of "becoming other" is different from simply diving into a situation. It is a bit like remembering a sunny Sunday on the beach, picturing oneself running across the sand. Such a recast is obviously different from the actual being on the beach. We cannot really see ourselves, so the actual experience is more like navigating in space. In contrast, the recast provides an airplane view of the scene that is populated, among other things, with a dispatched miniature "copy of self," A more intricate and humane God's eye view seems to emerge here. People are able to reconstruct entire landscapes in their minds—as seen from nowhere—and they then throw little people ("kobitos") into these landscapes. Yet, as soon as their god-like creation is achieved, and turn around and project themselves into the previously built "kobitos". They dwell in the landscape with them; they accompany them everywhere, they feel things through their kobitos'eyes, in any situation. It is not an overstatement to say that people, young and old, end up inhabiting their own mental constructs.

Yet another form of becoming-other is illustrated by Woody Allen's movie, *Zelig*. The protagonist literally takes on the traits of other people. He becomes a chameleon. In this case, the fusion is total, the self has dissolved into the other.

A close examination of different forms of self-projection and self-diffusion is a necessary "fix" to Piaget's overemphasis on the assimilative pole of cognitive adaptation. It resets the balance by specifying the actual contribution of accommodation. It brings back to the center of discussion the too often minimized role of projective imagination as a lever to cognitive development. It reopens the way to deepening our understanding of the productive tension between fusion and separation, openness and closure, change and stability.

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