

ECOLOGIES OF KNOWLEDGE

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INTRODUCTION

Over the course of teaching English in Junior High Schools and living in Japan for two years I often wondered what were some of the factors that made students and myself able to, or unable to come to a mutual understanding about various terms and use language in an active setting. After recalling that when I first arrived in Japan, even though I had studied Japanese in college, I felt I had very little practical ability. It was as though there was some dissonance between what I had learned and my ability to use it that seemed quite disheartening. As time went on I was able to overcome those initial limitations, but that initial disconnect led me to ask some questions about influences of the environment in language learning and also the effectiveness of activities in education. I started to question, what are some of the processes that facilitate people's ability to perceive their environment and act in various ways? When considering such things as daily insights into cultural understandings and language comprehension, recent advancements in various fields (Dynamics, Embodied Theories of Mind, Connectionism, Sociocultural Theory, Activity Theory) have brought about a synthesis of ideas that offer new perspectives about cultural

understanding, learning, cognition, and organism-environment dynamics. By summarizing some of these findings and their possible implications in education, we can glean into a new conceptualization of knowledge and language within cultural spheres of action.

ECOLOGY AND EMERGENCE

Words, signs, and other cultural tools are essentially relational objects, in that they mediate between an active subject and any state of affairs in their environment (perceived in a natural and cultural-historical sense). An Ecological perspective takes the view that any phenomena can be best understood through organism-environment interaction and co-construction. By putting emphasis on the dynamic *relations* between various elements, this perspective has led some to claim that an ecology is "a knowledge [symbiotic] sharing environment" (Siemens, 2006) where information and determination is not one way, but rather bidirectional.

This co-dependence leads to one of the first major propositions of an ecological perspective, that new knowledge, functional structures, and abilities are *emergent* through relations of interaction. Nature is full of such emergent properties. A well-cited example is the shape of a honeycomb. Its shape is not genetically endowed in the bees, nor is it simply some property of the honey, but it emerges through the interaction of multiple bees and

density of honey leading to constraints on the shape of the honeycomb (for further examples see Bates, et al. 2005). When viewed in light of linguistics, recent trends in cognitive grammar and construction grammar take the phenomena of grammatical structures to be an emergent property of the functional needs for people to communicate intentions for activities in a socio-cultural domain and the restraints of general human cognitive abilities (Tomasello, 2005; Bates et al., 2005).

If interactions between organisms and their environment give rise to *emergent* properties of both, how is it that an organism perceives and acts upon the environment and likewise how is it that the environment acts upon an organism?

LIFE-WORLDS

"We perceive the world as it relates to us."

J.J. Gibson

In the early 20th century the German biologist Jacob von Uexküll (1934) proposed an idea to explain how organisms understand and interact with their environment. He was interested in how living beings subjectively perceive their environment(s) and hypothesized that different organisms perceive the world through their own unique embodied experiences within the environment. For example, a mosquito has different physical

characteristics and biological needs, and thus perceives a glass of water, puddle, and blood vastly differently than a human would. He supposed that the relation between an organism and its environment gave rise to worlds of experience known as *Umwelt* (life-world). This life-world is full of sensory experiences that bring about actions based upon the experiences of the organism and its needs within a specified environment.

Organisms living within their individual Life-worlds find that various objects are perceptible, while others are not. For example certain pitches are perceptible to dogs while humans are barely capable of hearing. On the cultural-linguistic front, various phonetic differentiations (so called phonemes) are perceptible to some individuals while others have to re-discriminate between different sounds, because such discriminations are not made within a phonetic system and thus have no direct need to be acted upon (Kuhl, 2000). The same could be said for color terminologies, in that cultures, and individuals with little functional use for discrimination between 'violet' and 'scarlet' would have no need for the term (though if the need arose could redefine such categories within the restraints of human color cognition), while for individuals where detail of color discrimination helps participate in an activity (i.e. painting a picture) such detail may be a daily part of their linguistic repertoire, and thus perceived needs, interpretations, and activities all co-determine one another. This limiting of perception also limits the field of activity (though it should be noted that all

systems of perception and socio-cultural and environmental interaction are open systems and thus the field of perceptible activity can always be expanded, which is one of the main objects of 'education'), but also gives rise to networks of meaningful relations through a perceiving acting subjects.

Some recent research in cognition helps add a physical dimension to this connection between perceiving, understanding, and acting. During experiments with monkeys, and later also found with human subjects (Fadiga et al., 1995), neurons in the brain which have been termed '*mirror neurons*' fired both when the monkey was grasping an object, and when the monkey was watching somebody else do the grasping. Rizzolatti and Gentilucci (Rizzolatti & Gentilucci, 1988) discovered that these neurons, normally thought of as motor neurons for grasping actions, would also trigger when the subject did not grab an object, but only sees a graspable object. Their discovery supports the view that says action and perception are closely related. Other studies have shown how people perceive things not necessarily objects (e.g. stairs, doors, chairs), but the action possibilities (e.g. climbable, passable, sitable) offered by the environment (Kinsella-Shaw et al., 1992. Warren and Whang, 1987). If understanding objects necessarily entails knowledge of how they can be acted upon given various dispositions that emerge in both a physical and socio-cultural setting, then understanding these relationships and what they mean for individuals could be a powerful analytical tool when wishing to understand

ecological interaction.

AFFORDANCES

"Every perception is a stimulus to activity"

L. Vygotsky

The *relations* between Perception and Action have been labeled as *Affordances*. Though the use of this term has often been quite nebulous in the past an understanding of various perspectives with regard to the concept can help elicit the main points shared by these different stances.

The cognitive scientist and philosopher Anthony Chemero once stated that, "affordances are *relations* between an animal and its environment which have consequences for behavior." (Chemero, 2003) The key word in the preceding quotation is that Affordances are *relations*. This in a sense overcomes any sort of Cartesian dualism that would arise if that which is afforded were an entrenched meaning in some object devoid of an acting agent, or a property of a subject, which is bestowed upon an object or environment. It is rather about the connections, the *relations* of meaning production. In a sense his relational sense of affording is how "we" use this object/ concept/ linguistic tool "for": we use cups for drinking, cars for transporting to and from work, money to store value, prepositions to direct attention to relations of action ('at the game' vs. 'in the game'), 'WOW! Did

you see that!' to elicit bewilderment.

Taking the meaning of affordances a step further, a researcher into Second Language Acquisition, Leo van Lier (2000), defines it as a system of relations that, "is relevant to an active, perceiving organism in that environment. An affordance *affords further action*. What becomes an affordance depends on what an organism *does*, what it *wants*, and what is *useful* for it (emphasis added)." What that organism *does*, *wants*, and what is *useful* is a function of self-identity, the structure of the activity, and environment. According to the psychologist J.J. Gibson (1979), "Information about the self accompanies information about the environment, and the two are inseparable. Ego perception accompanies environmental perception, like the other side of a coin." Taken this view on identity in light of van Lier's statement on affordances we can see then that action, movement, seeing, hearing, interpreting and further action are all part of an interpretive process within an socio-environmental context that help give rise to a sense of self and that people afford actions, and objects based upon these understandings (*identity, wants, uses, and habits*).

Taking yet another perspective, Halliday (1978) referred to the notion of 'affordance' as a 'meaning potential'. And that meaning is an *emergent process* through interaction with the world, either social or physical. And since past actions are performed in environments (spatial-temporal and social), the environment itself comes to be afforded meanings and

perspectives that are historically endowed and can influence future actions. Actions are one of the most important aspects that give meaning to place (metaphorically and physically) and that impacts later perception of the environment gradually structuring which actions are possible, and which are constrained. This leads to the environment itself being an emergent process of interaction because, “we engage a meaningful environment of affordances and refashion some aspects of them... These latter constructed embodiments of what is known; which include tools, artifacts, representations, *and social patterns of actions*, and institutions – can be called *ecological knowledge*. [It] becomes an integral social and cultural part of the environment.” (Heft, 2001)

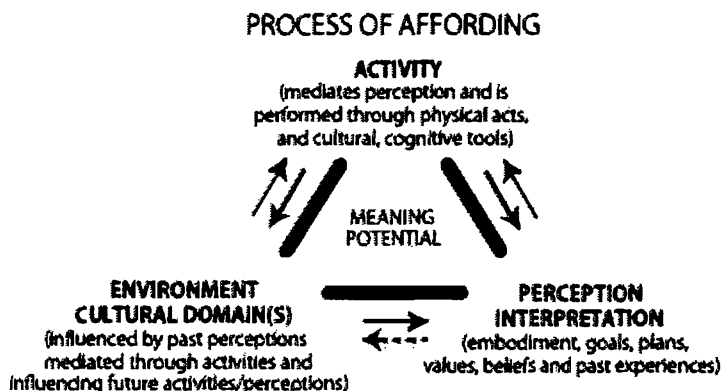
Synthesizing these interpretations a few main features can be drawn:

- ENVIRONMENTAL CONTEXT
- PERCEPTION, INTERPRETATION
- ACTION

In summation, affordances could be said to be relations that emerge through mutual reinforcements of *action* (towards a contextualized objective), *perception and interpretation* (in relation to use, motivation, self-identity, and experiences) in a given *context* (environmental and cultural) that limits and directs action, and is also constructed by historical

actions in a constant *feedback loop*. When a network of *affordance* emerges through historical action, cultural structures, and personal values/beliefs, environments and cultural activities are produced and reproduced.

Thus a basic schema can be depicted as follows:



To understand the implications of this a bit more concretely, take the example of money and economic activity in general. Exchanging paper for goods makes sense in the context of a system of complex cultural relations that practice complex divisions of labor, and commodity production. In cultures that are based upon such concepts of reciprocity, mutual aid, and barter within a small environment, a different sort of network of affordances towards economic activity would emerge. Seeking capital accumulation (**VALUES, PERCEPTION, IDENTITY**) can lead to affording

constant growth and consumption (ACTION) as a means to an end within a defined system of activity (competition, property rights, etc...), while given a different paradigm valuing sustainability would afford different activities as desirable.

Patterned networks of these affordances can be said to make up the life-world or rather cultural domains of knowledge for an individual acting in *a socially defined activity that is intelligible to others*. Meaning, rather than being a static definition as depicted in a Dictionary, is a product of active participation in a language ecology and arises through multiple interactions. While dictionaries are beneficial for their ability to give grounding for how words might be afforded by their interlocutor (i.e. Linguistic communication presupposes a certain degree of shared understanding, and intention reading Tomasello, 2005) it is through active participation in a language ecology that gives rise to contextualized affordances. The establishment, manipulation, and negotiation of joint attention, or rather being able to hypothesize how others afford words and actions, among acting members in a given field of activity is a vital constituent of linguistic communication (Atkinson, 1982). For example if I were to say 'move that there!' just hearing the words would have little relevance to someone if the interlocutor of my communicative act did not know what the 'that' and 'there' were affording. So by setting some groundwork on how affordances, cultural domains, and activities are

intertwined, understanding some of the educational implications of these perceives can help teachers create a language ecology in the classroom that can help students who seek to be active members of language communities.

EDUCATIONAL IMPLICATIONS

With regards to SLA instruction, the foregoing discussion has alluded to some implications for pedagogical activities and ways to create an ecological setting that allows learners of a foreign language to be active members of a communicative ecology. First, given that ecologies are emergent through interaction, we can suppose that fostering interaction and activities in the language classroom which can relate to learners desires (or help to construct those desires) should be able to develop strong affordances for linguistic phrases. Looking back at Leo van Lier's proposition that what becomes an affordance for individuals is based upon what is *useful*, what it *does* (activities, instruction), and what it *wants* a few implications can be drawn for instructional purposes:

- Purposeful implications for the needs of the individual (what *use* is it?)
- Engaging in activities that highlight shared cultural meanings of how will others perceive a linguistic resource (emphasis on what people *do* in *patterns of activity*).
- Directing and responding to the *wants* of students.

Focusing on grammatical structures and lexical development without regard how it may be of practical use for individuals in socially active settings may lead to de-contextualized knowledge, resulting in *inert knowledge* (see also Larsen-Freeman, 2003). Inert knowledge is 'knowing' a grammatical phrase or a word, but not being able to understand, or associate how others afford it in communicative settings. Thus, the traditional structure of looking up words in dictionaries and repeating words, if deprived of strategies to link the affordances of phrases to actions "may foster a de-contextualized practicing of items motivated by a textbook progression rather than by a *learner's practical need*, and so may lead to the sorts of *inert knowledge* that can be displayed on tests, but not used productively in real-life situations."(van Lier, 2005) This is not to say that things rote memorization and other aspects of learning are to be ignored in curriculum, rather each strategy and perspective has its own unique contribution to understanding pedagogy. But by implementing collaborative activities that relate phrases and words to students practical needs (i.e. the functional aspects of grammar and lexical selection) an interplay of multiple aspects of affording (motivation, goal setting, using various communicative strategies to problem solve, etc.) can help increase the likelihood of those associations being reproduced in practical situations.

As seen from an ecological perspective, a lesson provides an environment for learning about the new tools, though these tools are parts

of activities and can be incorporated into a curriculum provide the social support where they have the opportunity to develop competence in using these new tools to express their thinking, thus enabling a student to afford linguistic utterances to situations that are meaningful to others in a social setting. This ties into modern accounts of Activity Theory, in that they both “share the basic idea that perception is connected with action. Only through acting do people perceive their environment.” (Albrechtsen, et al. 2001).

The activity partially determines what is focused on and picked up, not necessarily the environment. Thus just teaching ‘it is ----’, and having them engage in an activity/game where only the lexical items are utilized would help solidify affordances for the lexical items, but failing to creating a linguistic ecology through activities that necessitates both lexical and grammatical constructs, learning to connect syntax, lexicon, and function in active situations would be a precarious methodology. This means that environment is only a potential source of instigative process and it is an activity that to a large degree determines the shape of learning. So, even a simple learning activity is possible in a complex environment.

If we view language as mediational tools that relate people and their environment; both social and physical (Vygotsky, 1986. van Lier, 2005.), and language learning as a way to relate effectively people to the world affordances can be seen as opportunities for or inhibitions of action. Affordances set a relationship between a person and the linguistic

expression and its action potential or a relation of possibility. E. J. Gibson proposes that learning is about “discovering distinctive features and invariant properties of things and events” (Gibson, 2000) or “discovering the information that specifies an affordance” (Gibson, 2003). Simply speaking if an activity or environment affords an action/response and that response is molded by the by the environmental restraints (perceived constraints upon activity) then the subject will learn to associate the environmental cues with the associated actions. Making apparent how utterances afford *opportunities* to act in a linguistic environment and put *constraints* (i.e. phonetic discrimination through exaggerating the differences of various sound combinations) on interaction can help students more effective communicators. This can also imply highlighting affordances for actions/gestures/pronunciations that are initially less perceptible for learners (i.e. metaphorical understandings and relations to bodily movement, phonological differentiation).

Language learning is an *emergent* process accomplished by “active agents who make choices about what and how they learn based on their own personal histories, constrained by, and offered affordances by, their localized environment... [it] is ‘thought in action’ and thought is never a finished product; it is a continual process.” (Swain, 2006) So if we treat an educational setting/classroom as an active environment, one of the main things that can be accomplished is to offer ample opportunities by making

explicit affordances for learners to relate their personal experiences to social actions thought constructing open language ecologies that welcome students to new cultural understandings.

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