Instructional Interactivity Endeavor and Spiral Dynamics

Murat Kahveci

Abstract

It is commonly accepted in most educational research communities that delivery of instruction accompanied by interactivity will increase learning and improve instruction in practice. This article discusses operational definitions and levels of interactivity on the basis of the education literature (particularly in the field of computer-based instruction, cognitive science, and science education). However, in the literature, definitions and forms of interactivity are often confined by instructional media, such as computer programs and telecommunications technologies. The Spiral Dynamics model can be considered in an attempt to base conceptual parameters for the operation of interactivity on terms of human psychology and ability of learning.

Key-words: Interactivity, interaction, knowledge construction, cognition, spiral dynamics, computer-based instruction.

Interactivity and interaction are two terms that have been used very often in the literature of science, science education, computer science, educational technology, distance education, curriculum and instruction, and psychology. This paper aims to focus on the meaning and levels of interactivity and interaction in education in particular. Wagner (1994) has situated both terms (i.e. interactivity and interaction) under the process of instructional delivery in the context of distance education. Wagner defines instructional delivery as dealing with the media and methods of transmitting information and instruction. On the other hand, in the science education literature, there is a relatively new and different epistemology called constructivism, referring to the nature of knowledge as the individual's own construction through the process of negotiation and consensus building (Tobin, 1993). On the basis of constructivist theory, science does not exist as a body of knowledge separate from the knowers. Science knowledge evolves through a set of socially negotiated understandings of events and phenomena. As a result, knowledge is accepted by the scientific community as viable because of its coherence with other understandings and experimental evidences. It appears not to matter what epistemology or instructional medium is in the center of the learning knowledge (i.e. either "instruction" or "the teaching experience"), the interaction of the individual with the subject matter is vital in the process. But firstly, what do interaction and interactivity refer to explicitly in the context of education? Secondly, what are the levels of interactivity?

Unfortunately, in the education literature, there is not much written about a settled view of either interactivity or interaction (Cezikturk, Kahveci, & Cirik, 2000; Kirsh, 1997; Sims, 1997). There are operational definitions of both terms, as well as many attempts to determine levels and characteristics of interactivity and interaction in

Murat Kahveci, Doctoral Candidate in Science Education. Department of Middle and Secondary Education. College of Education, Florida State University, Tallahassee, FL 32306. U.S.A., mkk8653@garnet.acns.fsu.edu.

the context of computer-based instruction and distance education. Indeed, in these attempts, interactivity is essentially medium-specific (e.g. videodisk), somewhat arbitrary', and not very descriptive (Schwier & Misanchuk, 1993). There remain many unresolved questions about the nature of interactivity (Kirsh, 1997). Thus, the operational definitions and given meanings are generally context-dependent, and fluctuate from one meaning to another. For example, Kirsh builds his argument about the concept of interactivity mostly as it applies to the design of multimedia learning environments.

There is no surprise that human cognition has many dimensions (Ashby, 1992) or about the way that the learner interacts with content and instructional medium. As a result, we can conclude that the ultimate desired interactivity' and interaction emerge from the nonlinear, multidimensional, and complex dynamics of human psychology and cognition. From now on, instead of interactivity and interaction, I will use either terms, referring to the same meaning, because the ultimate goal of interactivity or interaction is the learning of the individual regardless of where (i.e. instructional medium) and at what level (i.e. from reactive to mutual or from the beige ^{V}MEME to the turquoise ^{V}MEME in the Spiral Dynamics context) it can happen. By doing this, I will be compressing the conceptualization of both terms (i.e. interactivity and interaction) of Wagner (1989; 1997) into one (i.e. interactivity or interaction). However, in terms of one's learning this compression will make our reconceptualization of interactivity more clear. In the process of the reconceptualization of interactivity, I will not try to come up with a complete definition of interactivity because interactivity is an instructional parameter that provides progression within the instruction and learning process, and due to its multidimensionality (Muirhead, 2002) it will take different forms from one situation (i.e. one person, one group, one instructional medium, one instructional technology, one culture... etc.) to another. Rather, the multidimensionality and the levels of interactivity can be understood by pondering over humans' psycho-social and organizational structures from an interior perspective (i.e. our psycho-social and organizational human systems). Graves sought to get to the mind of the matter and explore why people are different; in the process, he postulated the Spiral Dynamics model (i.e. waves of existence). As Beck and Cowen (1996) quoted from Clare W Graves:

> Briefly, what I am proposing is that the psychology of the mature human being is an unfolding, emergent, oscillating, spiraling process marked by progressive subordination of older, lower order behavior systems to newer, higher-order systems as man's existential problems change.

Because the Spiral Dynamics model is relatively new for the education community, it is worthy to give a brief summary of what the premises of the model are.

Spiral Dynamics

Spiral Dynamics is a model of "self" and the Spiral journeys through "the waves of existence" (the journey refers to the psychological, social, and organizational development of the individual). The Spiral has several quantum (i.e. distinct) levels. However, the levels are mosaics, meshes, and blended structures. The levels do jump from one to another as a result of perturbations, such as a change in life conditions, but this distinct journey does not happen without passing through the interfaces between upper and lower levels. The Spiral is not symmetric either. The levels of self-existence are referred as "ᵛMEMEs". According to Beck and Cowan (1996), a ᵛMEME transposes itself into a world-view, a value system, a level of psychological existence, a belief structure, organizing principle, and a mode of living. A ᵛMEME contains the basic package of thought, motives, and instructions that determine how we make decisions. Beck and Cowan (1996) identify the qualities of ᵛMEMEs as follows (1) ᵛMEMEs manifest the core intelligences that form systems and impact human behavior, (2) ᵛMEMEs impact all of life's choices, (3) ᵛMEMEs express both healthy (for-better) and unhealthy (for-worse) qualities, (4) ᵛMEMEs are structures of thinking, and (5) ᵛMEMEs can brighten and dim as life conditions change. Table 1 summarizes the trajectory of the evolution of the ᵛMEMEs.

Table 1. The evolution (rolling out) of the ᵛMEMEs. Adapted from (Beck & Cowan, 1996)

From less complex	natural, technological, and human **environments**...	**To** more complex
From surviving in the bush	through the awakening of new **minds** and consciousness levels...	**To** surfing the beyond the Internet
From a small piece of land	via migrations across land and information terrain	**To** the global village and cyberspace

The ᵛMEMEs are color coded (as shown in Figure 1) as used by Don Beck and Chris Cowan (1996) and represented in a matrix in the early studies of the Clare W. Graves (Beck & Cowan, 1996, p. 45-47) in pairs of letters, as well. On the matrix, letter pairs (BO, CP, DQ, ER, FS, GT, and HU) identify each of the value systems (i.e. levels in the Spiral). Each level consists of the forces: one force is the Problem of Existence (designated by A, B, C, D, E, F, G, and H) and the other force is the Coping Systems that work in those environments (coded by N, O, P, Q, R, S, T, and U).

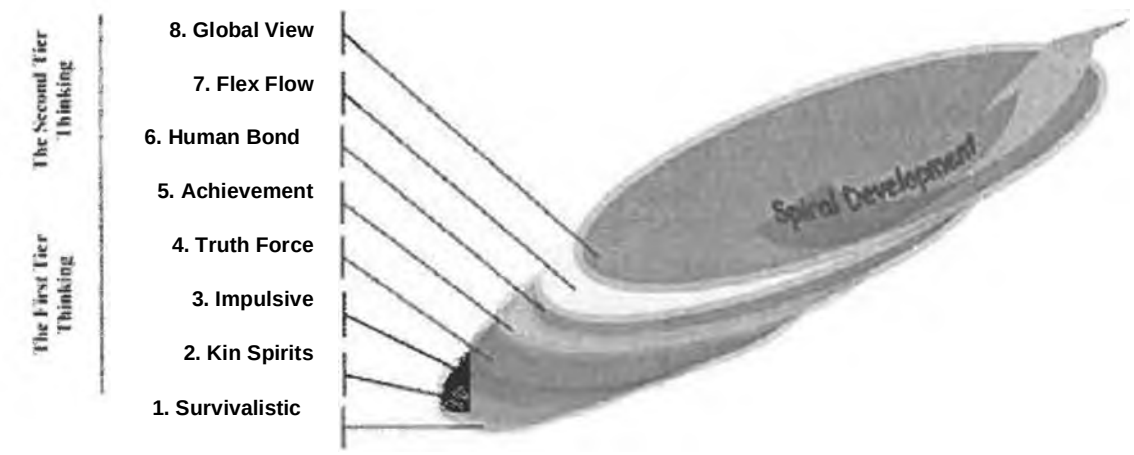

Figure 1. The Spiral Dynamics Model. Adapted from Beck & Cowan (1996). The level of each ^{V}MEME is color coded; transparent borders in each spiral level refer to diffusion of the values of existence from one level to another (i.e. no distinct quantum levels rather continuum change in the Spiral). The complexity of the Spiral gets more sophisticated from the first level (the Beige ^{V}MEME) to the higher ones.

The first six levels of Spiral Dynamics are "subsistence levels" labeled by "first-tier thinking." The second three levels are called "being levels" labeled by "second-tier thinking", which occurs as a result of revolutionary shift from the first-tier thinking. I will mention a brief description of all eight waves (i.e. levels) (Beck & Cowan, 1996).

The First-Tier "Subsistence ^{v}MEMEs"

1. (AN) Survivalistic (Beige ^{V}MEME). The first level of the Spiral. Uses habits and instincts just to survive. Food, water, warmth, and safety have priority. Distinct self is barely awakened or sustained. Forms into survival bands to perpetuate life.

2. (BO) Kin Spirits (Purple ^{V}MEME). The second awakening (i.e. level), in which thinking is animistic, magical spirits, good and bad. Forms into ethnic tribes. This level's basic theme is to keep the spirits happy and the tribe's' nest warm and safe.

Operating system: rely on chief, group, or magic to find security and safety for the people.

3. (CP) Impulsive (Red ^{V}MEME). The third awakening, the first emergence of a self from the tribe; breaks free from any domination or constraint to please self as self desires. Enjoys self to the fullest without guilt or remorse. The basic theme is what you are and do what you want. Operating system: be tough and depend on the self to fend off the aggression of others.

4. (DQ) Truth Force (Blue ^{V}MEME). The fourth awakening, in which one sacrifices self to the transcendent Cause, Truth, or righteous pathway. Life has meaning and direction with outcomes determined by an all-powerful Other or Order. The Order enforces a code of conduct, based on eternal, absolute principles. Laws, regulations, and discipline build character and moral fiber. Operating system: find a truth that offers answers delivered through a chain of command.

5. (ER) Scientific Achievement (Orange ^{V}MEME). The fifth awakening, in w'hich progress is made by learning nature's secrets. Change and advancement are inherent, within the scheme of things. Optimistic, risk-taking and self-reliant people deserve their success. Highly achievement-oriented, especially toward materialistic gains. The basic theme is act in your own self-interest by playing the game to win. Operating system: Entrepreneurism and plans to reach goals to better the self and some others.

6. (FS) Human Bond (Green ^{V}MEME). The sixth awakening, seek peace within the inner self and explore the caring dimensions of community. Spread the Earth's resources and opportunities equally. Reach decisions through the consensus process. Refresh spirituality, bring harmony, and enrich human development. Subjective, nonlinear thinking; shows a great degree of effective warmth, sensitivity, and caring for the Earth and all its inhabitants. Operating system: join others to build consensus and share feelings to make things better now.

The Second-Tier "Being" ^{v}MEMEs

7. (GT) Flex Flow (Yellow ^{V}MEME). The seventh awakening, live fully and responsibly as what you are and learn to become. Life is a kaleidoscope of natural hierarchies, system and forms. Flexibility, spontaneity, and functionality have the highest priority. Differences can be integrated into interdependent, natural flows. Operating system: live according to internal principles in search for most functional way to be.

8. (HU) Global View (Turquoise MEME). The eighth awakening, experience the wholeness of existence through mind and spirit. The world is a single, dynamic organism. Universal order, but in a living, conscious fashion, not based on external rules

(blue) group bonds (green). Turquoise thinking uses the entire spiral; sees multiple level of interaction, and detects harmonics. Operating system: cooperate with world-wide networks to address issues impacting all life forms.

9. Coral ^{v}MEME. This level of the Spiral is still not clear to articulate.

Due to its quantized spiral (i.e. the Spiral expands or collapses around a center, but the levels are distinct) and dynamic structure, the Spiral Dynamics model has very nice properties to project the evolution of human thinking (or existence) as life conditions change. In this process, we should understand that none of the values systems is inherently better or worse than any other. Each system has developed in response to a specific set of problems and calibrated to address those conditions. As educators, the important implication of the dynamics in the Spiral is that social and cognitive (i.e. "within") interactions of the individual shape the quality of learning. The dynamics in the classroom may be harmonized in such a way that the mosaics of the varieties (in ^{v}MEMEs) of learners result in individuals' viable knowledge construction. That is why Spiral Dynamics is a robust model to reconceptualize the characteristics and the levels of interactivity.

The Construct of the Operational Definitions of Interactivity and Interaction

The Collins Cobuild learner's dictionary (Rammell, et. Al ,1996).. definition of the root "interact" are (1) when you interact with another person, you communicate with each other as you work or spend time together, (2) when computers interact with people or other machines, information or instructions are exchanged, and (3) when one thing interacts with another, the two things affect each other's behavior or condition. Although the dictionary definitions cover roughly the most operational definitions given in the education literature, the most difficult discussion relating to the nature of interactivity is still due to the lack of complete understanding of the term (Cezikturk et al., 2000; Kahveci, 2001; Kirsh, 1997; Sims, 1997; Wagner, 1994). When considering different contexts, such as instructional medium, there exists a diversity' in the meaning of the instructional definition of interactivity. 1 will focus on the meaning of interactivity in the education literature as it is the context of (1) computer-based instruction (CBI), (2) cognitive science, and (3) social science.

Interactivity in the Context of Computer-Based Instruction (CBI)

Jonassen (1988) defines interactivity as referring to the activities performed by the learner and the computer. The conception of interactivity traditionally promoted by instructional technologists is based on the programmed learning model, which entails the presentation of instructional stimuli, followed by some form of question by the technology, which presumably elicits a response by the learner, and finally the rejoinder or feedback to the learner by the technology, in which the process is iterative as a

whole. There is a harmony between the learner and the computer by means of questioning and rejoining the responses. The quality of interactivity depends on the following three criteria (1) the type of input required of the learner while responding to the computer, (2) the way in which the computer analyzes the learner's response, and (3) the nature of the action taken by the computer in response to the learner (Bork, 1982). A crucial point about the nature of interactivity suggested is the requirement that each of the involved parties respond to the actions of the other in an intelligent way. There appears to be a very difficult task to be done adequately by the multimedia designers, which is to reach the interactivity level that is desired for effective instruction. To emphasize the difficulty of this feature of interactivity, Kirsh (1997) comments that:

> Computer interfaces are rarely interactive because the programs that drive them are rarely intelligent enough to behave as tacit partners.
> Despite the fashionable talk of dialogue boxes and having a conversation with your computer, there is little cooperation to be found. As a user, I am obliged to adapt to the computer; it does very little in the way of adapting or accommodating to me. Current software agents embodying simple expert systems may change this situation in the future. But so far, intelligence, particularly social intelligence, is largely absent from interfaces.

The taxonomy of interactivity (Jonassen, 1985) suggests that the most fundamental level of interactivity should provide (1) level of intelligence of design, (2) type of interactive program, (3) level of processing, (4) task analysis, and (5) modality of response. Moreover, Schwicr & Misanchuk (1993) suggest a revised taxonomy of interactivity such that (1) an interactive program should have three levels of interactivity (reactive, proactive, and mutual), (2) within each level specific functions are to be present (confirmation, pacing, navigation, inquiry, and elaboration), (3) at each functional level, types of transactions need to be enumerated (space bar/return key, touch screen target, touch screen ray trace, mouse click, mouse drag, barcode, keyboard-key response, keyboard-construction, voice input, and virtual reality interface).

Wagner (1989; 1997) states that, in distance learning, interaction functions as an attribute of effective instruction, while interactivity functions as an attribute of contemporary instructional delivery systems, particularly those that use telecommunications technologies. Interactions are reciprocal events that require at least two objects and two actions, which mutually influence one another. An instructional interaction is an event that takes place between a learner and the learner's environment. The purpose of instructional interaction is (1) to respond to the learner in an intended way, and (2) to change his or her behavior toward an educational goal. Types of instructional interaction are (1) to increase participation, (2) to develop communication, (3) to receive feedback, (4) to enhance elaboration and retention, (5) to support learner control/self regulation, (6) to increase motivation, (7) for team building, (8) for

discovery, (9) for exploration, (10) for clarification of understanding, and (11) for closure. Interactivity, on the other hand, appears to emerge from descriptions of technological capability for establishing connections from point to point (or from point to multiple points) in real time.

Thus, in Wagner's (1989; 1997) proposition, although both interactivity and interaction have the role of instructional delivery, the construct of the terms differs in a manner so that interaction tends to involve in process concerns related to technology integration strategies and application tactics, while interactivity tends to be linked with product concerns related to technology systems, hardware, and software.

Barretto et al. (2003) refer to interactivity' as one of the most widely used new-emerging terms in the process of the Internet development. Interactivity is defined in the context of Internet use as an 'activity and/or action between individuals and/or machines'. On the basis of this definition, interactivity is granted for the main component of the Internet because the network will only grow' and expand if inter-action, an action among participant individuals, the inter-agents, takes place. Notice that interactivity and interaction in meaning are equalized in this approach. In the use of the Internet, Muirhead (2002) emphasizes the human involvement in the nature of interactivity as follows: "interactivity involves participation by the learner in on-line communication between learners and with their class tutors."

Interactivity in the Context of Cognitive Science

Kirsh (1997) comments on how- perception is in itself interactive. In visual perception, the movement of the eyes, head, body, all must act in a coordinated fashion. The coordination can be provided by continuous feedback emerging from the senses. The nature of interactivity' requires cooperation, the involved parties must coordinate their activity or else the process collapses into chaos; all parties exercise power over each other, influencing what the other do, and usually there is some degree of negotiation over who will do what, when, and how. Complex, dynamic coupling between two or more "intelligent" parties as a whole is what is referred to as interactivity'.

Notice that this definition implies that interactivity can occur if intelligent parties are involved in mutual events. Thus, good software can hold interactivity as long as it provides intelligent feedback to the learner (i.e. by means of, so to speak, artificial intelligence). By revamping the linear decision cycle model to a nonlinear process, Kirsh (1997) suggests the following interactivity elements coupled with each stage of decision cycle model: starting with "clear clutter", (1) goal-"exploratory actions", (2) intention-"create reminders", (3) detailed plan-"structure affordances", (4) execute plan, (5) perceive-"complementary actions", (6) interpret perception-"epistemic actions", (7) compare to goal/intention-"perceive reminders", and the cycle ends with "maintenance".

According to cognitive speed theory (Fulford, 1993; Fulford & Zhang, 1993), learners have the cognitive capacity to process speech at twice the rate at which a lecturer speaks. While only half of the cognitive capacity is needed to listen, the other

half can be used to engage in internal conversation. Unless learners are actively mentally engaged during lecturing along with the appropriate interaction, their renegate thought patterns may dominate their cognitive activity. The need for interaction embedded in instruction is vital to maintain a high level of learning.

Interactivity in the Context of Social Science

The process of viable knowledge construction requires social interactions among learners—the teacher is also a learner in this context through interaction (i.e. due to mutual responses between a student and the teacher)-and between learner and teacher. The power of interaction among students and the teacher increases the likelihood of the construction of viable knowledge. Constructivism suggests that learning is an adaptive process in which the learner's extant knowledge is modified in response to perturbations that arise from both personal and social interactions (Ritchie, Tobin, & Hook, 1997; Von Glasersfeld, 1993). Constructivism assumes the relative multiple social realities, recognizes the mutual creation of knowledge by the viewer and the viewed, and promotes interpretations of subject's meanings (Guba & Lincoln, 1994; Schwandt, 1994). Von Glasersfeld (1993) supports the philosophy (i.e. epistemology) that knowledge has to be actively built up by each individual knower. Scientific hypotheses are tested in the experimental world where they either are or are not verified. Experimental worlds belong to the individual. However, during social interaction, they are adapted from one to another. As a result of reciprocal actions, the experimental worlds lead to an equilibrium state where new knowledge is confronted with prior experiences, and thus a consensus can be achieved. This cycle produces what has been referred to as viable knowledge. In the classroom climate, students interact with the teacher and other students as they negotiate the viability of their knowledge constructions (Ritchie et al., 1997). Studying the dynamics of such interactions will increase the students' scientific knowledge and endorses educators in a better position for high-quality instruction.

Simpson and Galbo (1986) propose that interaction is central to the learning process. Interaction creates bodies of knowledge that provide the bases for school subjects, and that this knowledge is sustained and transmitted through ongoing encounters. Although the philosophical point of view differs from former ones.(i.e. the theory of knowledge construction by Von Glasersfeld (1993) and Tobin (1993)), the nature and the function of interactivity refer to the same meaning.

> Interaction is defined as all manner of behavior in which individuals and groups act upon each other. The essential characteristic is reciprocity in actions and responses in an infinite variety of relationships: verbal and nonverbal, conscious and nonconscious, enduring and casual. Interaction is seen as a continually emerging process, as communication in its most inclusive sense (Simpson & Galbo, 1986).

Knowledge is dynamic and always being reformulated in the light of new input experiences (Simpson & Galbo, 1986). This dynamic process can be sustained by means of human interaction. However, we need to understand the nature of interactivity from an internal (i.e. human psychology and cognition) point of view. The ability to interact with others varies from person to person. By superimposing the Spiral Dynamics model (Beck & Cowan, 1996) on interactivity, we can come to a better understanding of how differences in personalities affect the way that humans interact with their surroundings inclusively.

Discussion and Conclusion

Each ᵛMEME is a holon, which transcends and includes its predecessors. What this means is that, for instance, the green 'MEME can grasp the orange 'MEME, if life conditions change or any perturbation occurs. Let us assume one person operating in the green ᵛMEME is looking for a job, which requires a high level of goal and achievement oriented series of competing actions in the current market. The job-seeking process reflects the values of the orange ᵛMEME. The abrupt change in the life conditions of this person awakens the orange ᵛMEME level, whose values are known by the person, in the Spiral as a downward movement (i.e. compression of complexity)- Theoretically, this is not a problem for this person because the orange ᵛMEME is a prior life experience of him/her and can be grasped to operate at that level for a certain time or the rest of his/her life with no problem. Once the life conditions change (let's say, s/he got a new job), then there is a high probability they will jump to the green ᵛMEME, and cater for the values of life at that level back again. In the first-tier thinking level, each ᵛMEME thinks that its worldview is the correct one. The first-tier ᵛMEMEs react negatively with other first-tier ᵛMEMEs unless the person has reached the second-tier. On the other hand, second-tier thinkers are fully aware of the interior stages of development and value all ᵛMEMEs (Wilber, 2000). Although the journey in the Spiral is not dependent on a person's age, it is very- unlikely to see a middle-school child at the level of second-tier thinking.

The levels of interactivity (especially for instructional settings) can be considered as the superposition of each holon (or ᵛMEME). This automatically maps the nature (or characteristics) of interactivity in any situation for any person. As the ᵛMEMEs change depending on life conditions or any perturbations that interfere with an individual's values, the nature of interactivity will shift from one level to another. We do not know how many limes these jumps or the resting times at one level occur from one day (or one course, one class, and one teacher) to another. We construct viable knowledge through social interaction and consensus (Tobin, 1993; Von Glasersfeld, 1993). The quality of interactivity determines the level of learning (i.e. the higher interactivity, the more learning (Simpson & Galbo, 1986)).

However, according to the Spiral Dynamics Model, one person operating at the level of the green ᵛMEME can be accounted for the values of consensus seeking and global thinking, which are the characteristics of interactions described in the studies of Von Glasersfeld (1993) and Tobin (1993). The green ᵛMEME and the above ᵛMEMEs

in the Spiral are only 11 percent of the adult population (Wilber, 2000). In this case, having a highly interactive and consensual classroom culture is likely to be very rare or idealized for the rest of the 89 percent of the world population. It appears that the ultimate goal of education should be leading students to higher ^{v}MEMEs in the Spiral Dynamics so that they (we as a whole) can benefit from the fruits of rich instructional interactivity. Leading student populations to higher levels of ^{v}MEMEs through interactivity is a very systematic process. On the basis of the values as described in the Spiral Dynamics Theory, I propose seven levels of interactivity that have particular values emerging from the levels of human psychology in the process of learning:

BO Level Interactivity

This level operates according to the values of the purple ^{v}MEME (BO). The forms of learning: paternalistic teacher; step by step sequences, rituals and routines; small group nests; use of magic and fantasy.

CP Level Interactivity

This level operates according to the values of the red ^{v}MEME (CP). The forms of learning: immediate rewards for learning tasks; powerful teacher who allows for toughness; rejects rigid structures; depend on the self.

DQ Level Interactivity

This level operates according to the values of the blue ^{v}MEME (DQ). The forms of learning: indoctrination from rightful authority; punishment for errors; moralistic direction; possibility of deferred rewards in future.

ER Level Interactivity

This level operates according to the values of the orange ^{v}MEME (ER). The forms of learning: trial-and-error experiments where success brings anticipated gains; competitive gaming with high tech, high status tools.

FS Level Interactivity'

This level operates according to the values of the green ^{v}MEME (FS). The forms of learning: explore feelings and learn by watching others' actions; share here-and-now experiences to enhance interpersonal skills.

GT ***Level Interactivity***

This level operates according to the values of the yellow vMEME (GT). The forms of learning: self-directed access to knowledge and materials; individual develops without compulsiveness or fear; eclectic and diverse interests.

HU Level Interactivity

This level operates according to the values of the turquoise vMEME (HU). The forms of learning: interaction with whole-Earth networks to expand awareness and explore diverse ways of being and thinking; intuitive learning.

Notice the beige vMEME (AN) is not listed in the levels of interactivity because at that level, intentional learning hardly occurs; survival is the only priori, there is no awareness of the self either. These seven levels of interactivity perpetuate learning as human existence and embrace the nature of interactivity in the way that a knower may exhibit.

Finally, seeking definition of interactivity in one or two sentences would always be "playing with uncertainty". Rather, the levels (from BO to HU) of interactivity seem to be useful quality criteria for instructional interactivity and perhaps, exclusively what one can do with the dissemination of the complexity hidden in human nature. Despite its complexity, interactivity has become a crucial property in education in order to increase viable knowledge construction by individuals.

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2 Sherry A. Southerland is currently a faculty member at the Department of Science Education, Florida State University.

3, 4 Martin Balinsky and Ajda Kahveci are currently doctoral students at the Department of Science Education, Florida State University.

Etkileşimli Öğretim Hedefi ve Sarmal Dinamik

Özet

Pratikle öğretimin uygulanması sürecinde etkileşimin öğrenmeyi arttırdığı ve öğretimin kalitesini yükselttiği eğitim araştırmacılarının büyük bir çoğunluğu tarafından kabul etmektedir. Bu makalede, özellikle bilgisayar destekli eğitim, zihinsel gelişim ve fen bilimleri eğitimi alanlarını içeren günümüz eğitim literatürü göz önünde tutularak, etkileşimin fonksiyonel anlamları ve dereceleri tartışılmıştır. Fakat literatürde etkileşimin anlamları ve formları, çoğunlukla bilgisayar programları ve telekomünikasyon teknolojileri gibi öğretimin sağlandığı ortamlar ile sınırlandırılmaktadır. Sarmal Dinamik modeli temel alınarak, etkileşimin insan psikolojisi ve öğrenebilme kabiliyetine bağlı bir konsept olarak anlaşılması ve *geliştirilmesi düşünülebilir.*

Anahtar sözcükler: Interaktivite, etkileşim, bilgi yapılanması (constructivism), zihin, Sarmal Dinamik, bilgisayar-temelli öğretim.