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Abstract

This theoretical paper utilizes cybernetic-based approaches (Bopry, 1999; Wiener, 1954) and communications theory (Habermas, 1984,1990; Krippendorff, 1994) to advance knowledge of constructivist learning. I argue that past educational research literature on constructivist learning is partly responsible for limiting how educational designers conceptualize individual and collaborative learning environments. A cyber-constructivist perspective (CCP) is explored as a tool for increasing awareness of factors that may contribute to effective constructivist educational design (ED) within learning communities. I discuss advantages and disadvantages of adopting a CCP in the design of constructivist learning environments.

Résumé

Cet article théorique recourt à plusieurs approches cybernétiques (Bopry, 1999 ; Wiener, 1954) et à la théorie des communications (Habermas, 1984,1990 ; Krippendorff, 1994) pour faire avancer notre connaissance de l'apprentissage constructiviste. Je défends que les comptes-rendus de la recherche pédagogique antérieure à propos de l'apprentissage constructiviste sont en partie responsables d'avoir restreint la façon dont les concepteurs de cours conceptualisent les milieux d'apprentissage tant individuels que collaboratifs. Une optique cyber-constructiviste (OCC) y est développée, en tant qu'outil accroissant la visibilité de certains facteurs qui peuvent contribuer à une élaboration des cours (EC) constructiviste efficace au sein des communautés d'apprentissage. J'y discute des avantages et des inconvénients de l'adoption d'une OCC dans la conception de milieux d'apprentissage constructiviste.

Introduction

Constructivist epistemology originates with the basic assumption that the experience of reality includes participants in its observation. Constructivist learning theories in educational research address issues concerning what one knows and how it is that one comes to know. The arrival of constructivist learning theories reconceptualized the role of the learner from being a passive recipient of knowledge to actively constructing knowledge from experiences within different learning environments. It is for this reason that some constructivist researchers prefer the term "constructivist learning theory" to "constructivist instructional theory" when describing the design of educational applications. In this paper, I adopt the term educational design (ED) instead of instructional design (ID) to describe constructivist learning theories applied to the design of educational applications.

Many competing constructivist theories now in existence depict the construction of learning from different philosophical paradigms (Phillips, 1995). In contemporary constructivist theory, the strongest individualistic theory of constructivism comes from von Glaserfeld (1990). Von Glaserfeld's *Radical Constructivism* rejects the objectivist notion that knowledge can be treated as an accurate representation of external things. In contrast, the author emphasizes that knowledge be treated as an individual's mapping of actions and conceptual operations that prove viable in experience. Under this view, no two people produce the same constructs and mutual meaning is construed as a gradual process of accommodation that achieves a relative fit of meaning constructions. Spiro, Feltovitch, Jacobson, and Coulson (1991) offer a very selective version of individual constructivist learning theory drawing from their *Cognitive Flexibility Theory*, an integrated theory of learning, mental representation, and instruction that focuses on the acquisition of knowledge in ill-structured domains. This approach is characterized as critical (addressing deficiencies in learning) and involving multiple perspectives or representations of knowledge (multiple juxtapositions of instructional content).

Social constructivist theories concentrate on the socially and culturally situated nature of learning activity, drawing much of their theoretical inspiration from Vygotsky's work and the belief that individual's self-realization is derived from actions in the social world. This view of constructivism is largely embedded in a social context characterized by argument, discussion and debate. Cunningham (1991) describes individual theoretical views as personal creations embedded in a social context within a social reality. Harré (1983) and Cobb (1994) argue that social reality that should dictate the theoretical perspective. Harré (1983) advocates that individual processes are a reflection of persons and their conversation encountered in society.

What is striking in the educational research literature reviewed is how explanations of constructivist learning vary as a function of the constructivist position held. This is important to consider because knowledge of constructivist learning informs ED. Constructivist learning theories within the educational research literature do not provide a complete description of the variety of constructivist learning taking place. Constructivist learning theories are psychological or social constructivist theories upholding dichotomies

between individual knowing and knowledge negotiated. Learning, however, is complex and difficult to classify because it can be more individually oriented or more socially oriented depending on the context. Not surprisingly, different scholars criticize constructivist theories for upholding dichotomies between individual and social learning (Bopry, 1999; Krippendorff, 1994).

A major problem within the constructivist research literature resolves around ED issues regarding individual and collaborative learning. When is collaborative learning effective and when is it not? When is individualist learning effective? How can educational designers determine where to apply collaborative and individual ED? What factors influence the success of ED implementation?

I argue that limitations in the educational research literature on constructivist learning are partly responsible for conflicts in how instructional designers conceptualize group and individual oriented instruction. I posit that knowledge of constructivist learning outside educational research literature can compensate for limits of constructivist learning theory framed within current educational research literature.

This paper explores a cybernetic constructivist perspective (CCP) that integrates innovations in cybernetics, second-order cybernetics, and communications theory to offer potential leverage for extending knowledge of constructivist learning and advancing ED.

Cyber–Constructivist Perspective (C C P)

CCP is a cyber-constructivist approach to fostering mutually satisfying learning within a community of learners. It requires that one recognizes that what constitutes individual learners extends beyond psycho-social processes and a dichotomous approach to the study of self and others. Criteria are directed at communication-based aspects learning to emphasize individuality and collaboration within communities of learner. Utilizing CCP for the purpose of ED could result in adopting the following orientation. See Table 1.

Table 1: *Key Postulates of the Cybernetic Constructivist Perspective (CCP)*

CCP Postulates	Sources	Description
Critical Orientation	Habermas (1984, 1990)	Not all subjectively constructed meaning is equally accurate and it is sometimes necessary to critically evaluate constructions within a community of learners.
Identity Orientation	Krippendorff (1994), Bunge (1979)	Personal and social identity are continually constructed because subjective experience is socially embedded and lifelong.
Multiple-Perspectives	Boyd & Zeman (1995), Cobb (1994)	Many perspectives contribute to richer understanding (i.e., students, parents, teachers, and other perspectives).
Communication System Orientations	Bopry (1999) Krippendorff (1994), Wiener (1954)	

The first criterion, *critical orientation*, defines constructivist learning in terms of participating in critical discourse and addresses a need for rational communication of individual perspectives and responsible decision making within communities of learners. This aspect of constructivist learning requires that individuals partake in ongoing communication and decision making together. The second criterion, *identity orientation*, describes continuous recreating of personal and social identity within communities of learners. Engagement in both individual and collaborative learning is required for recreating personal and social identity. The third criterion, *multiple perspectives,* is intended to expose individuals to a diverse range of interpretations. This aspect of constructivist learning requires different points of view to be integrated into learning activities carried out within a community of learners. The fourth criterion, *communication system orientation* , addresses a condition of awareness required to accommodate outside influences that impact learning outcomes. This aspect of constructivist learning requires that structuring and content address the interconnected of various stakeholders and institutional influences. CCP criteria are derived from knowledge of constructivist learning outside educational research literature.

Contributions To Knowledge of Constructivist Learning Outside Educational Research

Knowledge of constructivist learning through the study of types of communication structures provides additional grounding for constructivist ED. The types of structures discussed here include critical discourse, recursive communication of identity, multiple

perspectives, and cybernetic-based approaches to communication systems.

Critical Discourse

Rationalist philosophy has provided initial support for viewing human beings as possessing universal knowledge. Spinoza (1677) posits that human reason begins with its native powers and creates its own intellectual tools. Similarly, Piaget's (1952) cognitive development approach posited universal structures of knowledge (e.g., pre-logical, concrete, abstract) or general categories that evolved with the organism (genetic epistemology).

Habermas examines structures of social interaction where individual goal-directed actions are coordinated within a dynamic social environment (lifeworld). Communication is at the base of Habermas' (1984) *Theory of Communicative Action: Volume One.* Communicative action is intended to achieve mutual understanding, coordinate actions, and socialize individuals through a system of ethical discourse (universal). Habermas' (1990) communicative approach to universal knowledge maintains its individual appeal to rationality while being at the same time deeply related to communicative exchange. It has the potential to offer much to educational researchers interested in the theoretical bases of the relation between individual and social learning.

Habermas (1990) situates individual rationality within a dialectical framework. He accomplishes this by treating human consciousness as that which is structured by language exchange within a normative structure of social interactions characterized by the following features:

1. Validity and truth claims are decided by resolving normative rightness, which can be determined through discursive argumentation.
2. An imperative of critical discourse is that all individuals affected can accept the consequences over known alternative possibilities.

Habermas (1984) considers discourse practices to be social matters decided by the interactions of individually deliberating subjects. Validity claims are rationally formed norms of action contributed by all individuals involved and decided through consensus. Claims to validity apply to instances where an interest *common to all* those affected *deserve* s general recognition. Validating claims through motivated approval of everyone affected under the conditions is intended to neutralize all motives except that of cooperatively seeking truthfulness, rightness, and sincerity. The resulting knowledge is a product of the constructivist learning guided by active participation within a learning community.

Recursive Communication of Identity

Krippendorff (1994) advances a recursive theory of communication based on assumptions of the self-referential quality of human communication. This approach to human communication focuses on the process of communicating as well as what is communicated. It is based on communication assumption summarized as follows:

1. Communication theory is about itself.

2. Everything said is communicated to someone understanding it as such.
3. Human communication constitutes itself in the recursive unfolding of communication constructions, held by participants (including of each other), into intertwining practices that participants can recognize and explain.

This approach to human communication contains defining features that are crucial to constructivist ED. First, it acknowledges self-referential quality of experience. Asserting that communication theory is about itself is to recognize that individuals' experiences (even acts of theorizing about communication) are not products of the outside world but, rather, are constructed from within the realm of one's own experiences. Krippendorff (1994) states, "Whatever gives rise to the awareness of something being said and communicated, the causes of ones experiences, must be located within one's horizon of understanding" (p.83). As such, individuals are responsible for constructing their own communication and the communication of others. Second, it recognizes the recursiveness of individual and social identity recreation. Individuals monitor their communications, transforming the consequences of actions into information that revises knowledge used to direct future actions. It maintains the necessary positioning of oneself within communications, which includes other human beings, and to attempt to understand others' perspectives. The learner is always the central point within an ongoing recursive communication of identity.

Multiple Perspectives

Particular approaches to multiple perspectives (Boyd & Zeman, 1995), emergent perspectives (Bopry, 1999; Bunge, 1979), and second-order cybernetics (Krippendorff, 1994) do not uphold dichotomies that separate individuals from world or society. Such non-dichotomous theories are amenable to situated cognition within communities of learners and align more easily with views of individuals as constituted through active participation in the world. One main distinguishing feature of non-dichotomous theories is their ability to accommodate different theoretical perspectives. For instance, Cobb (1994) makes the case that differences between constructivist and sociocultural research approaches should be viewed as differences in perspective, which are complementary to research. He states, "From one perspective, the focus is on the social and cultural basis of personal experience. From the other perspective, it is on the constitution of social and cultural processes by activating interpreting individuals" (p. 15). Complementarity is possible in situations where multiple perspectives provide more useful information than one perspective alone. Cobb suggests that maintaining complementarity depends on retaining distinctions in language use. Multiple perspectives are useful for providing rich explanations. Boyd & Zeman (1995) advocate the complementarity of multiple perspectives. In the context of constructivist learning, multiple perspectives allow individual-based and social-based perspectives to be considered together. This is an alternative to the view that constructivist learning is socially constructed (social constructivism) or the view that constructivist learning is individually constructed (individual constructivism).

Cybernetic-Based Communication System Orientation

Cybernetics combines communications and systems theory within a single framework. Early developments in cybernetics as the study of communication and control had a dual focus on natural and artificial organizing systems. Wiener's (1954) hallmark text. *The Human Use of Human Beings: Cybernetics and Society,* applies key techniques of cybernetics to demonstrate that understanding the concepts and processes of communication and control is fundamental to society. Wiener argues that reciprocal communication is necessary in social environments for effective information transmission. He posits that communication organizes information into messages that take on patterns. Communication feedback that happens at multiple levels (i.e., simple feedback on for reflex conditioning and higher order feedback for learning) enables individuals to adjust their future decisions based on past performance. Wiener illustrates how cybernetic concepts of communication promote order and reduces chaos in social systems.

Later developments in cybernetics concern "observing systems" with interacting structures of language, culture and communication that influence. Cybernetics is applied within natural and social sciences, and humanities to explore the meaning of cognition and communication. Basic cybernetic systems are autonomous organizing systems, operating by feedback mechanisms mediating from system outputs to subsequent system inputs. Attention to the role of structure and organization in structural change are valuable assets for constructivist ED.

Second-order cybernetic-based approaches like Krippendorff's (1994) are especially useful within learning communities where negotiation, conflict, and institutional influences affect learning objectives and performance outcomes. Integral to second-order cybernetic epistemology is the importance of self-reflexivity and participation of stakeholders in cyclical processes of knowledge creation. Iterative processes of planning, action, and evaluation are essential features to the operation of learning organizations in the real world. Cyclic processes allow for changes to be introduced and observed within contexts studied. Feedback of findings to participants is essential for introducing changes into social contexts and making adjustments to satisfy those affected. Negotiation and conflict resolution are essential components in real life where individuals have different goals within social contexts. It is essential to consider power and status issues in the study of social contexts where participants occupy various roles and interact differently with individuals occupying specific roles (Senge 1990).

Educational Contribution of C C P

Critical discourse, multiple perspectives, communication recursivity of identity, and cybernetic-based communication systems, provide potential tools for building on constructivist learning theory addressed within educational research literature. The CCP view of constructivist learning informed by cybernetic constructs and communicative theory offers multiple possibilities for ED. First, assumptions of perspective complementarity allow constructivist learning to be considered from multiple perspectives (psychological, social, institutional). This is an emergent-level perspective in that there are simultaneous levels of learning emerging at the same time with their own respective

properties (Bunge, 1979). Second, CCP is a systemic perspective addressing contextual influences that can greatly affect the success of ED implementation by insuring that the interests of all relevant stakeholders are satisfied.

CCP suggests a change in learner conception whereby learners engage in identity creation, critical discourse, multiple perspective taking, and systemic thinking, within a community of learners. Competing stakeholder goals, different degrees of stakeholder involvement, and scarcity of time for necessary deliberation restrict the application of CCP and similar perspectives.

Conclusion

CCP contributes knowledge of individual and collaborative constructivist learning neglected in contemporary educational research literature. Insights from cybernetic and communications theory provide grounding for CCP as a potential tool to advance effective constructivist (ED) within learning communities.

Future work will be directed at developing educational interventions that raise the general awareness of the complex set of learning processes and knowledge that arise from individual and collaborate constructivist learning.

Acknowledgements

References

Bopry, J. (1999). The warrant for constructivist practice within educational technology.*Educational Technology Research & Development, 47* (4), 5-26.

Boyd, G. & Zeman V. (1995). Multiple perspective co-channel communications as a knowledge and attitude reform tool for a sustainable civilization. In H. Burkhardt (Ed.),*Proceedings of the Ryerson Conference on Knowledge Tools for a Sustainable Civilization*.

Bunge, M. (1979). A systems concept of society: Beyond individualism and holism. *Theory and Decision, 10,* 13-22.

Cobb, P. (1994). Where is the mind? Constructivist and sociocultural perspectives on mathematical development. *Educational Researcher, 23* (2), 13-20.

Cobb, P. & Yackel, E. (1996). Constructivist, emergent, and sociocultural perspectives in the context of developmental research. *Educational Psychologist, 31* (3), 175-190.

Cunningham, D. (1991). Assessing constructions and constructing assessments. *Educational Technology, 31* (4), 13-17.

Descartes, R. (1641). *Meditations on first philosophy.* Paris: Michel Soly.

Habermas, J. (1990). *Moral consciousness and communicative action.* Cambridge: MIT Press.

Habermas, J. (1984). *The theory of communicative action, volume one: Reason and the rationalization of society*. Tr. Thomas McCarthy. Boston: Beacon Press.

Harré, R. (1983). *Personal being*. Oxford: Oxford University Press.

Krippendorff, K. (1994). A recursive theory of communications. In D. Crowley and D. Mitchell (Eds.), *Communication theory today* (pp. 78-104). Stanford: Stanford University Press.

Phillips, D. (1995). The good, the bad, and the ugly: The many faces of constructivism.*Educational Researcher, 24* (7), 5-12.

Piaget, J. (1952). *Essai sur les transformations des opérations logiques*. Paris: Presses Universitaires de France.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organisation.* New York: Doubleday.

Spinoza (1677). *Essay on the improvement of the understanding* (J. Katz, translator). Oxford: Oxford University Press.

Spiro, R., Feltovitch, P., Jacobson, M., & Coulson, R. (1991). Knowledge representation, content specification, and the development of skill in situation-specific knowledge assembly: Some constructivist issues as they relate to cognitivist issues as they relate to cognitive flexibility theory and hypertext. *Educational Technology*, *31*, (4), 22-25.

Von Glaserfeld, E. (1990). *Radical Constructivism: A way of knowing and learning*. London: Falmer Press.

Varela, F. (1981). Autonomy and autopoiesis. In G. Roth and H. Schwegler (Eds.) *Self-organizing systems* (pp. 14-23). Frankfurt: Campus Verlag.

Wiener, N. (1954). *The Human use of human beings: Cybernetics and society* , New York: Da Capo Press.