

Developing Synergistic Knowledge
And its Implications on
Distributed Learning Environments

Chris Bigenho

University of North Texas

INTRODUCTION

Much has been written about how learning is most effective when the learning environment is *learner centered* and *socially situated*. Effective learning requires the learning experience to be *cognitively situated* as well. This places the learning experience in a context that makes it relevant for the learners. We hear how knowledge is constructed through meaningful exchanges with others in a learning community. However, what do we know about the nature of the knowledge that is constructed in socially situated learning communities? What do we know about socially negotiated knowledge? Is it possible that the knowledge constructed in learning communities can be greater than the sum of the information exchanged in the community?

In this paper, I build on existing constructivist theories and propose a theory of *Developing Synergistic Knowledge* as a way to begin addressing these questions. Currently, there is little research surrounding synergistic knowledge related to the development of learning environments and knowledge constructed through communities of learning.

I wish to propose a theory where knowledge constructed in distributed learning environments that function as socially engaged and cognitively diverse learning communities can result in knowledge that is greater than the sum of knowledge exchanged within the community. Synergistic knowledge forms at the interface of cognitively dissonant dialogue in socially situated communities of learners.

LITERATURE REVIEW

Learning environments should be situated in the context of a community of learners (CoL) or practitioners (Lave & Wenger, 2003). Lave and Wenger (2003) tell us that communities of practice are inclusive of individuals with diverse abilities, expertise and experiences where newcomers enter the community and move toward full participation. Newcomers adopt characteristics of the CoL including values, goals, community beliefs and structure of discourse (Jonassen, 1999). “Learning to become a legitimate participant in a community involves learning how to talk (and be silent) in a manner of full participants” (Lave & Wenger, 2003, p. 105). Learning within these communities occurs in teams rather than isolation (Jonassen, 1999). Learning represents a transformation of the individual and “implies becoming a different person with respect to the possibilities” (Lave & Wenger, 2003, p. 53). Polin adds that members will take on new responsibilities and roles within the community as they acquire new capabilities (Polin, 2004). This socialcultural model of knowledge and learning “creates flexible knowledge structures that facilitate the problem solving in new situations” (Grabinger, 2004) (55).

Learning communities work within the epistemic stance of constructivist learning environments where the learner is at the center of the learning experience. (Jonassen, 1999). These community centered environments include learner centered environments, knowledge centered environments and assessment centered environments (Bransford, Vrown, & Cocking, 2003). Learning communities allow for knowledge construction built on a learner’s prior knowledge, ideas and concepts leading them to deeper understanding

that is demonstrated through both formative and summative assessments (Bransford, Vrown, & Cocking, 2003; Bransford, Vye, Bateman, Brophy, & Roselli, 2004).

A major learning tool of constructivist communities of learning is dialogue (Lave & Wenger, 2003). This is facilitated in distributed learning environments through the use of technology (Bransford, Vrown, & Cocking, 2003). A key component for the formation of learning communities engaging in meaningful dialogue leading to deep understanding are the elements of affective trust and cognitive trust (Barker & Camarata, 1998).

Without trust, communities would not effectively engage in “generative dialogue [where] people let go of their positions and views” (Isaacs, 1999) (p. 40). This is similar to Lave and Wenger’s thoughts about learning to talk within the practice (Polin, 2004). Polin uses as an example the OMAET program at Pepperdine University. Here, dialogue is primarily text based in both synchronous and asynchronous modalities. While individual growth is supported through these exchanges, the community goal is to advance the collective wisdom of the group (Bielaczyc & Collins, 1999). This is best facilitate when there is a diversity of opinions and expertise (Lave & Wenger, 2003; Sunstein, 2006; Surowiecki, 2004). “Studies of mock juries [show] that the presence of a minority viewpoint, all by itself, makes a groups decisions more nuanced and its decision-making process more rigorous (Surowiecki, 2004) (p. 183)

Wherever there are diverse opinions, there is the chance for conflict and cognitive dissonance. In studies looking at how diverse groups make decisions, Surowiecki (2004) offers the following:

“Diversity and independence are important because the best collective decisions are the product of disagreement and contest, not consensus or compromise. An

intelligent group, especially when confronted with cognition problems, does not ask its members to modify their positions in order to let the group reach a decision everyone can be happy with. Instead, it figures out how to use mechanisms-like market prices, or intelligent voting systems- to aggregate and produce collective judgments that represent not what any one person in the group thinks but rather, in some sense, what they all think.” (XIX)

How this conflict is resolved is very important to the learning process. It is through resolution of this cognitive dissonance that deeper understanding is developed (Bransford, Vrown, & Cocking, 2003). It is also at this confluence of differing perspectives and worldviews where synergistic knowledge lives

There is little in the literature directly related to the formation of synergistic knowledge. One area of study that draws on the concept of synergistic knowledge is Indigenous knowledge systems. Specifically, comparisons of Indigenous ways of knowing compared to Western ways of knowing (Cochran et al., 2008; Le Grange, 2007; Yunkaporta, 2007). Indigenous knowledge differs from Western knowledge in that Western knowledge is divided into domains or disciplines (Cochran et al., 2008) where Indigenous knowledge is holistic, communal, circular, and synergistic. In this context, synergistic knowledge has its roots in the creation of new knowledge when opposites interact (Yunkaporta, 2007). Yunkaporta (2007) goes on to say that “Aboriginal Synergistic Knowledge can be used to overcome the Western binary oppositional logic that demands adherence to one absolute and rejection of its opposite. Aboriginal rationality instead allows conflicting ideas to coexist simultaneously” (n.p.).

In a study looking at Indigenous learners in a Western science-learning environment, Le Grange (2007) found that the environment was usually hostile to Indigenous knowledge structures. This resulted in collateral learning of which there are four types:

1. Parallel collateral learning-where multiple views can be maintained without experiencing conceptual conflict.
2. Simultaneous collateral learning-where the learner simultaneously learns about a concept from two different worldviews and can assess similarities and differences between the different worldviews.
3. Dependent collateral learning-where one worldview presents challenges for another worldview leading to the current belief being tentatively altered by construction of new knowledge.
4. Secured collateral learning-where the “Indigenous learner has to resolve the mental conflict created by Western science” (583).

The learning process is strengthened through the resolution of cognitive dissonance creating a “convergence toward commonality” (Le Grange, 2007).

Like communities of learners, trust is also fundamental in systems where diverse ways of knowing engage in cognitive interactions (Hassel, 2004). In a study looking at diverse ways of knowing in cross-cultural paradigms, it was reported that trust was an issue. “At the outset, participants within each program reported significant mistrust of large, land-grant research universities in part because prior experiences informed them that their knowledge tended to be discounted or ignored if it did not fit within a scientific

model” (Hassel, 2004). Hassel reported that programmatic success depended on building personal relationships through trust and creating a “spirit of open inquiry”.

The development of epistemic fluency within a practicing learning community can help build trust and understanding. “Epistemic fluency allows one to recognize, appreciate and understand the subtlety and complexity of a belief system that one has not encountered before” (Goodyear, 2007) (p. 358). Epistemic fluency is the ability to represent a variety of epistemic games-“approved methods of constructing new knowledge in a culture” (p. 358). Goodyear (2007) goes on to say that “active engagement in the collaborative construction of knowledge is a core quality and a necessary pre-requirement for the development of epistemic fluency” (p. 363).

In a study looking at interactions and cognition in asynchronous computer conferencing, four classifications of discussions were studied with each leading to “the construction of different kind(s) of knowledge, representing different degrees of openness to the ideas of others” (Schrire, 2004) (p. 480). Interaction patterns for each threaded discussion were analyzed. The patterns included: (1) instructor-centered, (2) synergistic, (3) developing synergism, (4) scattered, and (5) student centered. Distributed interaction similar to synergistic interaction relates to the collaborative learning process and that higher-order thinking was “associated with synergistic interaction more than with other types of interaction....Synergistic threads were found to differ significantly from instructor-centered threads on a classification differencing between exploration on one hand and integration and resolution on the other ($\chi^2 [1, n=48]=5.49, p < 0.05$)” (493). Schrire (2004) concludes that these findings “fit social constructivist theories where thought is considered to be a socially mediated and dialogical process” (493).

THEORITICAL UNDERPINNINGS

Ontology, Epistemology and Methodology

I have grounded the theory of *Developing Synergistic Knowledge* in the ontological perspective that learning is a socially situated endeavor. Learning involves drawing on ones prior knowledge and cognitive dissonance with what is known, what others know and what the learner knows. Learning is transformative and not simply a transmission of knowledge.

Learning is *messy* and requires reflection of personal worldview and open consideration of other worldviews. Understanding adds to learning in that learning becomes transferable to new problems never encountered before. It is through understanding that we can move flexibly through new and similar domains.

The learning community is a community of practice that sits at the heart of how we learn. Distributed learning works best when learners draw on the distributed expertise within the community. Trust, status and social capital develop over time within the community increasing its efficacy.

Courses designed using *Developing Synergistic Knowledge* must follow constructivist pedagogy. Since each individual within the course would have unique understandings and knowledge constructions, traditional summative assessments would not capture synergistic knowledge. Portfolio based assessments, analysis of dialogue threads, open-survey, and authentic assessments would be best suited in evaluating the presence of synergistic knowledge.

THEORY OF DEVELOPING SYNERGISTIC KNOWLEDGE

Statement of Theory

Knowledge is constructed in distributed learning environments that function as socially engaged and cognitively diverse learning communities that can result in knowledge that is greater than the sum of knowledge exchanged within the community. Synergistic knowledge forms at the interface of cognitively dissonant dialogue in socially situated communities of learners.

Classification of Knowledge

There are many ways to classify knowledge. For this discussion, I would like to focus on a two classifications. I will base the first classification group on where the new knowledge resides: individually constructed knowledge and group or community constructed knowledge.

Individually constructed knowledge implies that new knowledge resides within the individual and is the result of interactions within the learning environment, learning community and prior knowledge. The end result of individually constructed knowledge it that the learner develops new knowledge from the learning experience-the learner learns.

Group or community constructed knowledge implies that the groups as a whole has constructed new knowledge and that this new knowledge is part of the collective wisdom known as the learning community. This knowledge is constructed in a similar way as individually constructed knowledge with the addition that it is the result of the aggregated experience and interactions of the group.

The second classification group relates to how we represent knowledge within the mind. Cognitive scientists generally classify knowledge as declarative or tacit. Placed in the context of the constructivist ontology, learners are aware of their declarative knowledge constructions while tacit knowledge constructions remain in the unconscious.

As the theory is developed, both of these classifications will be applied in concert to specify the nature of the synergistic knowledge developed.

Developing the Theory

This theory draws from the literature on synergistic knowledge as presented in studies surrounding Indigenous ways of knowing and Western ways of knowing, as well as studies analyzing knowledge construction through communication in threaded discussions. Learning environments that are learner-centered and encourage dialogue between learners and direction from learners are places where synergistic knowledge can develop. The literature points to a richness of dialogue and ideas when the focus is on the learner's desire to share ideas where they exhibit ownership. At the same time, the community that is engaged in this learning environment must develop a deep sense of trust and respect for members of the community. The learning environment must encourage and facilitate the exchange of dissonant ideas while developing listening skills and deep reflection. The longer these ideas stew within the collective working memory, the greater the contact will be between differing ideas improving the chance for developing synergistic knowledge.

Synergistic knowledge here is referring to the new knowledge that is developed through this cognitive interaction where the resulting knowledge is not simply and

extension of ideas presented in the learning community. Here, the knowledge is truly a composite of ideas that are traced back to sources throughout the community. Yet, the new knowledge is also able to stand on its own as original idea. This can happen with an individual in the group or could result in new knowledge manifesting itself within the entire group. It is important to emphasize here that the new knowledge is not simply an agreement of fact. It is the result of all interactions within the community and respects the rights and views of everyone in the learning community.

This new knowledge may be obvious to the individual as well as the group. In this case, we would classify the synergistic knowledge as declarative. When individuals or groups recognize declarative synergistic knowledge, the knowledge can be directly used to solve problems or represent extensions of understanding for the individual or group.

However, not all synergistic knowledge is declarative. In some cases, the knowledge developed remains tacit with the individual or group remaining unaware of its existence. In this case, individuals or learning communities would be acting on the new knowledge without being cognizant of the synergistic knowledge. While this tacit synergistic knowledge may be invisible to the individuals or learning community, it might be perceived by an outside, passive observer. Much like the study of motion in physics is dependent on the perspective of the observer, tacit synergistic knowledge may be detectable from a remote perspective. If this is true, the observer should be able to evaluate all exchanges of ideas, interactions and reflections and map the formation of the new knowledge. For this new tacit knowledge to be considered synergistic, the map would have to show that no one idea or concept dominated the new knowledge. Yet, there would need to be threads back to virtually every individual within the collective

working memory of the community. The designation of individual tacit synergistic knowledge or community tacit synergistic knowledge is determined by where the observer identified the cognitive placement of this knowledge.

IMPACT ON INSTRUCTIONAL DESIGN

Working with synergistic knowledge as a theory for design, distributed learning environments should seek to maximize the level of open non-destructive dialogue within the community. This dialogue needs to be learner generated and learner centered. Tools such as synchronous chat and asynchronous threaded discussions would be fundamental to the development of synergistic knowledge. While voice chat tools might also be useful, they are not designed to easily maintain searchable records of the conversations that are important for increasing cognitive contact with dissonant ideas.

Course designers and instructors would need to design the course from the constructivist ontological perspective. Early in the course, there would need to be efforts made to establish community norms that govern all exchanges. The goal would be to develop epistemic fluency as a community and as individuals. This development of trust will then foster the freedom to risk and share ideas through engaged dialogue. I wish to differentiate between discussions and dialogue. The purpose of discussions is to reach a decision while dialogue explores the nature of choice (Isaacs, 1999). I extend this distinction further by stating that dialogue explores the nature of choice through deep understanding of dissonant perspectives.

Many courses have discussion boards. These boards need to be changed to *centers of dialogue*. Many times, questions or prompts are posted by instructors or by students at

the request of instructors. The responses to these are often directed back to the instructor with little call for engagement. Students often cite materials assigned in class as part of their posts. This does not work as dialogue is defined above. The dialogue must be more organic rising out of the interests and ideas of the learners as they are introduced to the *big ideas* within the domain of study.

From a pedagogical perspective, the instructor should refrain from offering responses to posts that carry the characteristic of fact or quality. Rather, each instructor response given should be to stimulate increased engagement between the learners within the community rather than between the learners and the instructor. The instructor can help the learners connect with other members of the community by being familiar with the epistemic stances of each of the learners. They can suggest the posts of other learners and encourage them to take on new perspectives.

As trust is important to any community where synergistic knowledge can develop, so to is responsibility. The community should take on a sense of responsibility for the learning of the group. This means that everyone in the community should be aware of projects and ideas held by community members. It is my belief that as trust within the community increases, so will responsibility. This will lead to deeper dialogue and greater reflection that ultimately creates an environment where synergistic knowledge can develop.

CONCLUSION

In this paper, I have laid the groundwork for a theory of *Developing Synergistic Knowledge* within communities of learning based in the ontological stance that knowledge is socially constructed. Synergistic knowledge develops out of communities composed of individuals with diverse and dissonant concepts where the individuals have the opportunity to interact cognitively with each other. Trust and epistemic fluency within the community is a key ingredient for the development of synergistic knowledge. Dialogue is the pedagogical tool employed to increase period of cognition within the community. As learners engage in dialogue around big ideas within the domain and challenge each other's worldviews, new knowledge will emerge that is not representative as dominated by any one idea from the community. This is when and where synergistic knowledge is developed.

RESOURCES

- Barker, R., & Camarata, M. (1998). The role of communication in creating and maintaining a learning organization: Preconditions, indicators, and disciplines. *The Journal of Business Communication, 35*(4), 443-467.
- Bielaczyc, K., & Collins, A. (1999). Learning communities in classrooms: A reconceptualization of educational practice. In C. Reigeluth (Ed.), *Instructional-Design Theories and Models: A New Paradigm of Instructional Theory* (pp. 269-292). Mahway, NJ: Lawrence Erlbaum Associates.
- Bransford, J., Vrown, A. L., & Cocking, R. (Eds.). (2003). *How people learn: brain, mind, experience, and school* (Expanded ed.). Washington D.C.: National Academy Press.
- Bransford, J., Vye, N., Bateman, H., Brophy, S., & Roselli, B. (2004). Vanderbilt's AMIGO3 project: Knowledge of how people learn enters cyberspace. In T. Duffy & J. Kirkley (Eds.), *Learner-Centered Theory and Practice in Distance Education: Cases from Higher Education* (pp. 209-234). Mahwah, NJ: Lawrence Erlbaum Associates.
- Cochran, P., Marshall, C., Garcia-Downing, C., Kendall, E., Cook, D., & Mccubbin, L. (2008). Indigenous ways of knowing: Implications for participatory research and community. *American Journal of Public Health, 98*(1), 22-27.
- Goodyear, P. (2007). Discussion, collaborative knowledge work and epistemic fluency. *British Journal of Educational Studies, 55*(4), 351-368.

- Grabinger, S. (2004). Design lessons for social education. In T. Duffy & J. Kirkley (Eds.), *Learner-Centered Theory and Practice in Distance Education: Cases from Higher Education* (pp. 49-60). Mahwah, NJ: Lawrence Erlbaum Associates.
- Hassel, C. (2004). Can diversity extend to ways of knowing? Engaging cross-cultural paradigms [Electronic Version]. *Journal of Extension*, 42. Retrieved March 31, 2008 from <http://www.joe.org/joe/2004april/a7.shtml>.
- Isaacs, W. (1999). *Dialogue and the Art of Thinking Together*. New York: Currency.
- Jonassen, D. (1999). Designing constructivist learning environments. In C. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory* (Vol. 2, pp. 215-239). Mahwah, NJ: Lawrence Erlbaum Associates.
- Lave, J., & Wenger, E. (2003). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Le Grange, L. (2007). Integrating western and indigenous knowledge systems: The basis for effective science education in South Africa? *International Review of Education*, 53, 577-591.
- Polin, L. (2004). Learning in dialogue with a practicing community. In T. Duffy & J. Kirkley (Eds.), *Learner-Centered Theory and Practice in Distance Education: Cases from Higher Education* (pp. 17-48). Mahwah, NJ: Lawrence Erlbaum Associates.
- Schrire, S. (2004). Interaction and cognition in asynchronous computer conferencing. *Instructional Science*, 32, 475-502.
- Sunstein, C. (2006). *Infotopia: How Many Minds Produce Knowledge*. New York: Oxford University Press.

Surowiecki, J. (2004). *The Wisdom of Crowds*. New York: Doubleday.

Yunkaporta, T. (2007). Indigenous knowledge systems: Comparing Aboriginal and Western ways of knowing [Electronic Version]. *Aboriginal Rights Suite 101*.

Retrieved March 28, 2008 from

http://aboriginalrights.suite101.com/article.cfm/indigenous_knowledge_systems.