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Designing Wise Communities that Engage in Creative Problem Solving: An Analysis of an Online Design Model

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Designing Wise Communities that Engage in Creative Problem Solving: An Analysis of an Online Design Model

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ABSTRACT: Addressing the conference theme of "design thinking," this paper discusses an instructional design model, WisCom (Wisdom Communities) that we developed to build a wise learning community online, to solve open-ended, ill-structured problems such as solving a health crisis or an environmental disaster, which requires the exchange of multiple perspectives, inter-disciplinary thinking, creative problem solving, and social construction of knowledge. Based on socio-constructivist, sociocultural theories of learning and mediated cognition (Vygotsky, 1978), distributed cognition (Hutchins, 1995; Pea, 1993), group cognition (Stahl, 2006), research on how people learn (Bransford, Vye, Bateman, Brophy, & Roselli, 2004), and distance education design principles (Moore & Kearsley, 2011), WisCom specifies three components that must be designed to create a wise community online that engages in creative problem solving and transformational learning: (1) a cohesive learning community involved in negotiation of meaning and collaborative learning; (2) knowledge innovation – moving the learning community from data, information, and knowledge to wisdom, providing opportunities for reflection, sharing of perspectives, knowledge construction and preservation within the community, and (3) learner support and e-mentoring to achieve the communities' learning goals.

KEYWORDS: Wisdom communities, instructional design models, online learning, social constructivism, distributed learning, mentoring, knowledge innovation.

INTRODUCTION

The knowledge-based society in which we now live demands a skillset markedly different from the one required 10 or even five years ago. In a world where data is a commodity, knowing how to filter, prioritize and integrate ideas has surpassed mere knowledge acquisition as a suitable learning outcome. Meanwhile, the ability to negotiate meaning within teams and groups, arriving at new, context-sensitive understandings that produce novel solutions to real-world problems, though critical, is underserved by many existing instructional design models.

We propose a new model calibrated to the demands of knowledge-based societies and focused on socially-constructed meaning. WisCom, the Wisdom Community Instructional Design Model, supports the formation of collaborative online learning cohorts. WisCom provides instructional designers and instructors with a clear-cut but flexible set of considerations to foster wise online learning communities.

Backed by a robust set of learning theories, WisCom is a 21st-century design model concerned with supporting the learning outcomes students need to excel in a knowledge-based society. WisCom emphasizes interdisciplinary thinking, the exchange of multiple perspectives, and creative problem solving. Together, these activities contribute to the social construction of knowledge which, in turn, prepares students to solve open-ended, ill-structured, context-sensitive problems.

Through interactions with content, instructors, and peers, WisCom prompts learners to transform data into information, knowledge and, ultimately, wisdom, creating an environment conducive to the kind of transformational learning that transcends the course and community.

The WisCom model has been implemented in multiple courses, and we review student reactions later in this paper. In general, a course designed with WisCom tends to (1) require ongoing commitment from instructors, students and other participants, (2) focus on collaborative learning experiences, (3) downplay traditional learning and teaching roles, (4), encourage divergent thinking, (5) emphasize problem-based learning activities, (6), place equal weights on process and outcome, and (7) strive to affect students' thinking and behavior beyond the class.

In the following sections, we present the theoretical basis on which WisCom rests. Then, we review the instructional strategies prescribed by the model, highlight ways WisCom can facilitate intercultural communication, and review initial research into the efficacy of the model. We conclude with recommendations for future research.

THEORETICAL BASIS

Social Constructivism, Constructivism & Sociocultural Theory

At its core, the WisCom model incorporates a social-constructivist approach to instructional design. Social constructivism provides a structure for understanding how we learn, both alone and in groups, by combining a constructivist approach to knowledge creation with the communicative focus of sociocultural theory (Hall, 2007).

As an alternative to the traditional behaviorist approaches to instructional design, constructivism emphasizes knowledge discovery over acquisition. Constructivism casts learning as an experimental process, with priority on learner needs and action-based experiences (Glaserfeld, 1992). Active participation is an important indicator of learning outcomes in the constructivist paradigm, and the role of the teacher moves from leader to guide.

The sociocultural paradigm also emphasizes building knowledge through active learning. However, sociocultural theory shifts focus from individual learners to social dynamics (Hall, 2007). This perspective, based largely on Vgotsky's (1978) seminal work, casts learning as a product of socialization. Feedback is central to the sociocultural approach: Learners progress when they interact with teachers and peers. Sometimes, learners become teachers, helping others progress by supplying timely feedback (Pear & Crone-Todd, 2001). Within the sociocultural paradigm, the teacher's role shifts again, this time from guide to moderator.

By combining constructivist and sociocultural theories, social constructivism situates learning as a process that happens both individually, via self-initiated exploration, and collectively, via sharing, questioning, and providing feedback. The teacher or facilitator becomes both guide and moderator and, at times, co-learner.

WisCom extends the principles of social constructivism by synthesizing a range of related theories and frameworks. The WisCom model incorporates perspectives pertaining to (1) distributed intelligence, (2) mentoring and learner support, and (3) knowledge management. Following, these three theoretical areas are reviewed.

Distributed Intelligence

Distributed intelligence, like social constructivism, asserts that learning happens outside the mind of the individual. However, whereas social constructivism emphasizes learning in relationships, distributed intelligence further broadens the scope where learning happens by accounting for environments (physical and virtual), tools, processes and, finally, the minds of individual learners (Pea, 1993). According to distributed intelligence, we adapt physical spaces and cultural tools to facilitate learning and hold knowledge. While distributed intelligence does not apply only to online learning environments, it does take on special meaning in virtual learning spaces that can be fully customized to supplement and enhance the "natural" intelligence within the minds of learners. Slator, et al. (1999) concluded that virtual learning environments can amplify the benefits of distributed intelligence by providing new opportunities for real-world context, for example, via simulation and multimedia, and by allowing faster and more multifaceted learning through sophisticated tools.

The community of inquiry (COI) framework extends the idea of distributed intelligence by defining three kinds of presence in a learning environment: social, cognitive, and teaching (Garrison, Anderson, & Archer, 2000). In COI, *social presence* concerns the ability to project one's self, *teaching presence* concerns how instruction is prepared, delivered and used to facilitate interactions, and *cognitive presence* involves the knowledge, facts and ideas exchanged within the community. The cognitive presence dimension describes a four-step process -- the cycle of inquiry -- in which learners experience a trigger, engage in exploration, integrate their findings, and reach a resolution (Garrison, Anderson, & Archer, 2000). The cycle of inquiry puts critical thinking at the center of the learning process and brings further definition to the philosophical underpinnings of social constructivism. Within the cycle of inquiry, *exploration* is a particularly critical and time-intensive step that involves seeking and sharing discoveries alone and in groups (Richardson & Ice, 2009). Combined, the four phases in the cycle of inquiry play a large role in determining the effectiveness of the learning environment (Makri & Kynigos, 2007), especially in an online context where active participation is particularly critical to successful outcomes (Hrastinski, 2009).

Mentoring & Learning Support

WisCom emphasizes the value of apprenticeship and learner support in online learning environments. To this end, we incorporate ideas from communities of practice and mentoring.

Communities of practice (COPs) are informal groups gathered around practical, imminent problems (Lave, 1991). A COP is a cohort of practitioners focused on working more effectively. By focusing on the tactics and strategies that produce better results around key problems, COPs provide an opportunity for their members to engage in meta work, or work about their work.

Early conceptions of COPs emphasized their organic, self-organizing nature (e.g., Wenger, 1998). However, better understanding of the community of practice phenomenon has lead to efforts to encourage and structure COPs, especially in corporate settings (Zboralski, 2009). COPs reflect different sizes, formalities, and lifespans. How members are indoctrinated varies, as does the extent to which the community is actively managed. (Jeon, Kim & Koh, 2011).

Whether or not they exist in more formal organizational structures, COPs are noteworthy for their ability to self-generate knowledge (Adams & Freeman, 2000). The community may incorporate external resources, but an outside facilitator is not mandatory. The self-sustaining nature of COPs puts them somewhat at odds with formal learning environments, where the role of the instructor, even when conceived of as a guide, is still necessary to propelling a group's work forward.

Within a COP, opportunities to teach arise from the diverse experience levels typical in a group's members. A range of ability in a COP creates an opportunity for apprenticeship learning (Lave & Wenger, 1991). Over time, novices become more skilled working and learning alongside masters. In time, some novices will themselves become masters, positioning them to apprentice new community members.

Successful apprenticeships emerge from several key ingredients: expertise, experience, and, most important, mentoring. *Mentorship* involves coaching, guiding and advising. Mentors provide learning support to more novice community members by helping them perform tasks, acclimate to a group's social dynamics, and interact effectively with members of the community (McLoughlin, 2002). As a source of scaffolding, mentoring can enhance all aspects of a learning environment (Hansman, 2001). The value of mentoring has been documented in research investigating virtual teachers in computer-based learning environments. In one study, students rated virtual teachers designed to both coach and teach more highly than those who did only one or the other (Heidiga & Clarebout, 2011). In a learning community, mentoring relationships can be fulfilled in many ways (Gunawardena et al., 2006), including by instructors, peers, and outside experts.

Knowledge Management

Knowledge management is a well-researched area of adult learning, especially in corporate settings, focused on how the intelligence of an organization can be bolstered by implementing specific systems

and structures. To this end, knowledge management is an endeavor aimed at facilitating the creation, dissemination and preservation of knowledge.

WisCom builds on knowledge management ideas formalized in the cognitive collaboration model (CBM). CBM describes how different levels of cognition -- a "knowledge" dimension -- map against different levels of learning -- a "process" dimension (Salisbury, 2003). The process dimension of CBM reflects a modified version of the taxonomy of behavioral objectives (Bloom, 1956) proposed by Anderson and colleagues (Anderson et al., 1998). This modified taxonomy defines six levels of cognition: remembering, understanding, applying, evaluating, and creating. Meanwhile, the knowledge dimension in CBM defines four levels of information, ranging from the simple -- facts and concepts -- to the complex -- procedures and metacognition. By mapping different levels of the process and knowledge dimensions, CBM provides instructional designers with specific tactics to employ within a knowledge management strategy.

Knowledge management also includes a critical social component. Nonaka and Takeuchi (1995) described a "spiral" in which knowledge flows between members of an organization while shifting between explicit and tacit states. *Explicit knowledge* is concrete, easy to transmit, and easy to record; it confirms to established structures and familiar language. Conversely, *tacit knowledge* is personal, contextualized, and embedded in action (Nonaka, 1994). The two kinds of knowledge represent two ends of a continuum, with specific instances of knowledge reflecting both explicit and tacit traits (Martin-Niemi & Greatbanks, 2010). Through a process of conversion, group members can encode explicit knowledge, rendering it tacit, and decode tacit knowledge, making it explicit.

Related Models and WisCom's Predicted Outcomes

Combined, the theoretical perspectives reviewed above provide a foundation for understanding how online wisdom communities work. They also point to tactics for instructional designers interested in producing high-impact learning outcomes around complex topics.

WisCom builds on well-tested theories and frameworks, and other models have sought to integrate similar concepts. Kimble and Hildreth (2005), for example, examined how knowledge management techniques can enhance communities of practice. Zhan and Chang (2008) proposed a virtual learning environment design based on knowledge management concepts. Gan and Zhu (2007) provided a framework for analyzing how virtual learning communities operate. They outlined a theoretical model based on four interconnected dimensions: systematic wholeness, intelligence, learning models, and knowledge management (Gan & Zhu, 2007). Collective wisdom is situated at the center of this model.

WisCom echos some of the ideas expressed in these frameworks. As an instructional design model focused on the construction of online learning environments, especially those geared toward understanding ill-structured knowledge domains (Jonassen, 1997) and solving complex, multivariate problems, WisCom also offers unique value to educators focused on profound, long-lasting learning outcomes. In particular, WisCom predicts two major outcomes from a successful blending of strategies based on the reviewed theories: The emergence of wisdom (both wise individuals and a wise group) and transformational learning.

Wisdom is typically positioned at the apex of learning (Faucher, Everett, & Lawson, 2008; Gan & Zhu, 2007; Rowley, 2006), above data, information, and knowledge. One meta-analysis concluded that wisdom is the product of knowledge, ethics, and action (Rowley, 2006). That is, wisdom involves the right action guided by the right knowledge and intention. Wisdom also implies self reflection and "meta-thinking," or the ability to find information and reflect on how to learn (Segundo, 2002). In light of these definitions, we see wisdom as a synthesis of perspective, insight, flexibility, and humility (Gunawardena et al., 2004), and we stipulate that wisdom can be observed both in individuals and in group dynamics, thus, the *wisdom community*.

Ultimately, we see wisdom as the pinnacle of knowledge but the forerunner to a second, more profound outcome: transformational learning. A transformational learning outcome is one that creates new frames of reference, often challenging existing assumptions and redefining how we make sense of our experiences and perceive others (Mezirow, 1997). At its best, transformational learning, which can

unfold in both academic and workplace settings (Mathis, 2010), leads to personal growth and permanent change. In the WisCom model, wisdom is the "spark" necessary for transformational learning to manifest.

COMPONENTS OF THE WISCOM MODEL

Social constructivism, a hybrid of constructivist and sociocultural theories, establishes a bedrock for the WisCom model. Three additional perspectives extend and refine this basis: (1) distributed intelligence (informed by the communities of inquiry paradigm), (2) mentoring and learner support (informed by communities of practice and apprenticeship), (3) and knowledge management (informed by Nonaka's tacit/explicit dichotomy and the collaborative cognition model).

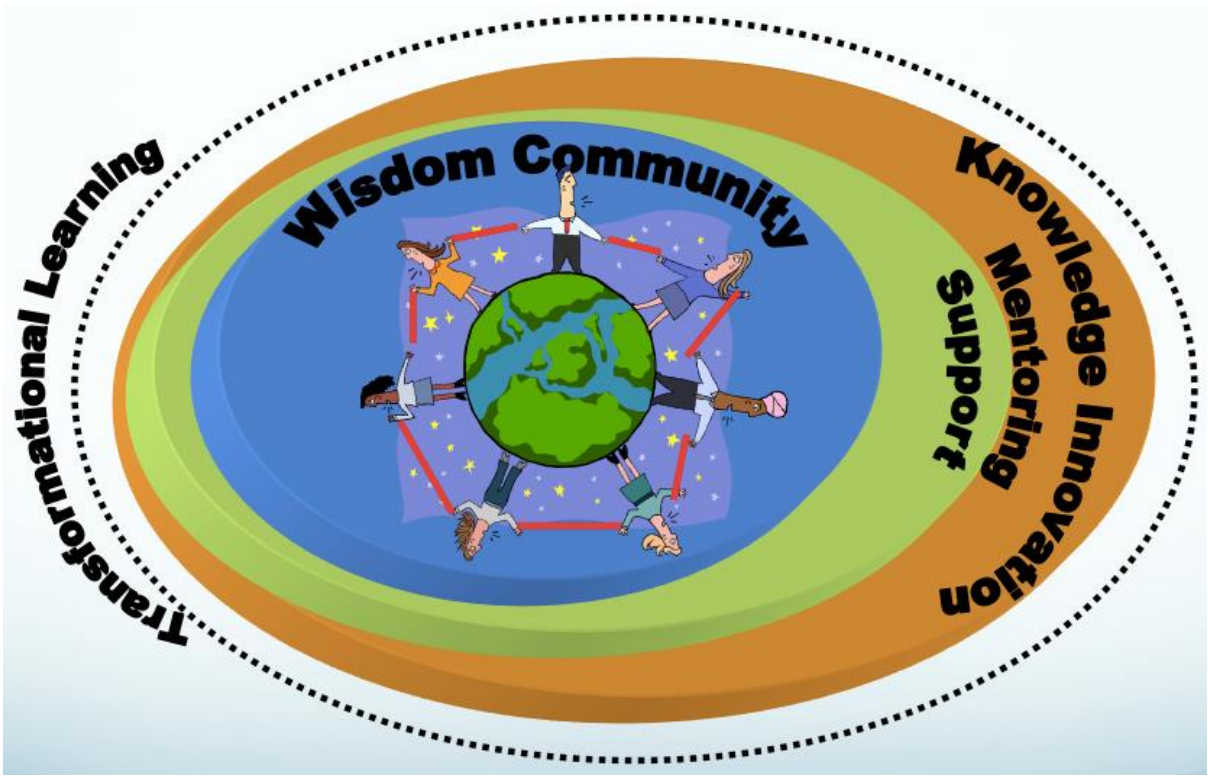

Figure 1. The Wisdom Community Instructional Design Model (Gunawardena et al., 2006).

Combined, these perspectives contribute to WisCom's goal to bring about wisdom and transformational learning. They also inform the design principles embedded in WisCom and lead directly to three components that must be present to create a community that engages in creative problem solving, pursues a cycle of inquiry, and achieves transformational learning.

WisCom Design Component 1: A Distributed Intelligence-based Community

WisCom courses center around virtual communities who negotiate meaning and collaborate on common learning goals. The WisCom model stipulates that the community should be the central learning activity in which students invest. Given the often distributed nature of online learning, WisCom communities tend to coalesce around discussion forums, collaborative wikis, and other asynchronous tools, although real-time communication, such as video conferencing, can play an important role in fostering group dynamics.

While WisCom does not prescribe specific techniques for implementing a virtual cohort, it does outline various essential qualities. These attributes concern both the outcomes produced and process implemented by the group. With regard to outcomes, the WisCom model stipulates that group work should lead to specific, focused conclusions, although multiple outcomes are common. With regard to process, WisCom underscores the importance of reflection and dialogue within an atmosphere of

mutual trust, respect, and commitment. A safe, supportive environment enables learners to engage in a cycle of inquiry, a dynamic learning process grounded in a real-world learning problem, or challenge. Team work, paired with the empowerment of individual members, contributes to this process.

WisCom Design Component 2: Mentoring and Other Forms of Learner Support
Embedded within a WisCom course is ongoing learner support, especially mentoring. Much as the intelligence in a WisCom cohort is distributed, so too are the mentoring responsibilities. Rather than encourage a more traditional mentorship role for the course instructor, WisCom positions each group member as a potential mentor, paving the way for both instructor-student and student-student mentor/mentee pairings. WisCom also accounts for the possibility of expert mentors, guest contributors with subject matter expertise integrated into a course on a short- or long-term basis.

In a WisCom course, instructor mentoring often involves scaffolding techniques. As a form of apprenticeship, scaffolding involves providing learners the most support at the beginning of their studies, while gradually removing efforts to guide learners' efforts as their competency in new ideas and skills grows. Scaffolding is one kind of *instructional support* common in WisCom mentoring. Facilitating conversations and providing feedback on work fall under this same umbrella. Meanwhile, *counseling and advising* is a form of learner support that extends the assistance offered to students beyond their in-course experiences and may include career guidance and diagnostic testing.

WisCom Design Component 3: Knowledge Management & Innovation
Finally, WisCom members constantly engage in the collective discovery and creation of knowledge. We adopt the term *knowledge innovation* for this process and focus on the progression of raw data and information to the knowledge and wisdom that emerge from shared understanding (Applehans, Globe, & Laugero, 1999), reflection, and real-world experience.

All aspects of knowledge innovation, including identification, creation, and preservation, unfold collaboratively in the WisCom model, with knowledge sharing situated as the central activity. Over time, the community enhances the knowledge created, for example, by correcting inaccuracies or incomplete conclusions. Meanwhile, an accumulation of tacit and explicit knowledge becomes a kind of binding force that maintains a wisdom community's cohesion.

WisCom defines four levels of knowledge innovation, beginning with the creation (or discovery) of knowledge, progressing to the permanent storage of knowledge, then the retrieval of archived knowledge, and culminating with the enabling of retrieved knowledge. This final step involves forming connections between retrieved knowledge and both individual and community learning goals. Once tied to a desired learning outcome, retrieved knowledge becomes actionable and can be used to create or discover new knowledge or enhance other aspects of the community's development.

In WisCom, knowledge innovation follows the cycle of inquiry as conceived by Bransford, Vye, Bateman, Brophy, and Roselli (2004). After confronting an initial problem, learners follow the cycle of inquiry to explore possible solutions, develop resources and additional perspectives, reflect on and organize their findings, and negotiate and preserve original knowledge. Along the way, learners deepen their competency in the problem space, increasing the sophistication of the solutions they brainstorm and, ultimately, producing transformational learning outcomes.

How the Components Can Be Integrated
WisCom allows for a range of instructional tactics in support of these components. Discussion forums, collaborative concept maps, one-on-one and group teleconferencing, collaborative document editing, and group presentations are a few tactics common in WisCom courses. The flexibility of the WisCom model also benefits from the option to incorporate cultural values from the student population. The community's communication norms, though influenced by the underlying principles of the WisCom model, are also determined by preferences, including preferred learning styles, of the group members.

RESEARCH INTO THE EFFECTIVENESS OF WISCOM

Since 2005, multiple online, graduate-level courses in the U.S. and Venezuela have been designed with WisCom. Surveys were administered at the conclusion of these courses to identify WisCom's effectiveness in (1) building a sense of community, (2) promoting the social construction of knowledge, and (3) transforming student perspectives. Overall, learners have responded positively to courses designed with WisCom, especially with regard to their sense of participating in a supportive community of learners.

In one case (N=14), 92% of students agreed or strongly agreed their course generated a sense of an online learning community, with an equal number perceiving the community to engage in reflective dialogue and develop a shared identity. Similarly, 46% of students agreed and 46% strongly agreed that group interactions resulted in the construction of new knowledge. All students felt they experienced changes in perspective based on these interactions, with 83% strongly agreeing.

Second and third courses (both N=22) bore similar outcomes. In addition, the survey for the first and second courses found students perceived much of the construction of knowledge occurring primarily through their interactions with the community at large (50-70%), versus 10%-20% apiece for interactions with course content, other students, and the instructor.

Additional research in Sri Lanka has further substantiated the WisCom model. A transcript analysis of a WisCom-based faculty development forum (Gunawardena et al., 2011) revealed the social construction of knowledge, as measured by the Interaction Analysis Model (Gunawardena, Lowe & Anderson 1997). Socially-constructed knowledge occurred online in each of three rounds of training with a case-based reasoning activity designed to solve a complex problem: street children in Sri Lanka.

The process of negotiation and social construction of knowledge led to perspective transformations. Participants gained new insights concerning: (a) the value of well-designed online learning; (b) themselves (self-images) as being able to learn online; and (c) the people directly impacted by the societal problems. Participants' new insights were accompanied by changes in feelings and increased caring toward the problems and people involved. Participants began to see themselves as part of the solution. The group process and product (research papers by the three groups) showed evidence of socially-mediated thinking.

More research is needed to further establish the efficacy of the WisCom model. Analyses of discussion transcripts are ongoing, though results are forthcoming. Efforts are also needed to measure directly the strength of communities and the extent of transformational learning outcomes when a course is designed in line with the principles underlying WisCom. To this end, a study comparing courses designed with WisCom and other instructional models would be beneficial, both in substantiating differences in instructional techniques and course structure and in comparing learners' experiences and outcomes.

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