Essays on Systems Thinking:

Applications for Art Education

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Keywords: Systems Thinking; Art Education; Museum Education

Abstract

Systems thinking offers a critique of traditional methods of analytic problem solving and presents new possibilities for conceptualizing the interconnected nature of all parts of unified systems. In this article, a collective group of scholars speculates on how systems thinking might be applied to art education, arts administration, and museum education as a way to reconceptualize entrenched problem solving practices in interrelated arts professions. The article begins with a brief literature review before presenting arguments related to (a) the congruency of systems thinking with interdisciplinary and informal learning approaches, (b) a critique of current educational systems built upon rigid uncreative traditions, (c) recent research supporting learner-centered pedagogies as effective approaches for breaking away from linear systems of schooling, and (d) the application of eco-feminist systems thinking to visitor-centered museum education. The article concludes with a discussion of the reoccurring themes and lingering questions that emerged within the respective arguments.

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An often-heard cliché asserts that it is irrational to seek efficient solutions to persistent problems through the repetition of blind and habitual actions, yet expect that different or improved results may occur. One implication of this phrase is that habits of action are hard to break, and that (without significant reflection) many fail to even recognize the need for changing their approaches to given tasks (Dewey, 1922/1983). So if blind habits are difficult to transform into intelligent action, then perhaps a greater challenge is to change *how we think* or, more specifically, to change how we think about problem solving.

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Systems thinking offers a critique of traditional methods of analytic problem solving as well as new possibilities for conceptualizing the interconnectedness and interactive nature of all parts of unified systems that work together for common purposes (Kim, 1999). This holistic approach has been applied to variety of complex systems including, but not limited to, the ecology, cybernetics, politics, health, the management of organizations, and biology (Capra, 1982; Kim, 1999; O'Connor & McDermott, 1997; Senge, 2006). In this article, we—as a collective group of art education scholars—speculate on how a systems thinking approach might also be applied to the various facets of our discipline. The purpose of this article is to share our individual perspectives as art educators, arts administrators, and museum educators who have taken an interest in exploring the potentiality of systems thinking as a new approach for reconceptualizing entrenched problem solving practices in our interrelated arts professions.

The article was inspired and derived from our collective participation in a Higher Education Forum panel on systems thinking at the 2015 National Art Education Association Convention in New Orleans. We begin with a brief review of literature on systems thinking before presenting our points individually and noting our respective authorship under separate headings as a way to retain the organizational format of our original panel discussion. In the first section, Yuha Jung and Victoria Eudy advocate for a turn toward two unique pedagogical frameworks—interdisciplinary and informal learning approaches—that

may be more congruent with ecological systems thinking. Next, Delane Ingalls Vanada discusses how a systems thinking approach can be used proactively, rather than reactively, in identifying the current ails of an educational system that is, itself, built upon rigid, linear, prescriptive, and uncreative traditions. Within her discussion, Ingalls Vanada features a summary of her recent research in middle school art classrooms to bolster her argument that learner-centered, constructivist, and integrated pedagogies may be used as effective approaches to break away from the unhealthy linear models that are prevalent in most U.S. schooling situations. Finally, Ann Rowson Love and Pat Villeneuve offer the application of eco-feminist systems thinking to those involved in museum education, with the overall goal of re-envisioning traditional exhibition curatorial models in favor of ones that are more collaborative, visitor-centered, and appropriate for preparing 21st century museum professionals. As a way to explore the interconnectivity of these various perspectives, Cathy Smilan provides a discussion of the reoccurring themes and lingering questions that emerge within our respective sections.

Background

A system is an organized network of entities in which all parts interact to contribute to a common purpose. Interaction and processes in a system shape its structure (Capra, 1996; Kim, 1999; Laszlo, 1996; Stephens, 2013). These systems rarely operate in isolation, and are usually made up of smaller systems. Consider a human body: it is a system comprised of many systems ranging from individual cells to large organs comprised of cells. Furthermore, the human body is a system that lives within an ecosystem populated by other systems. So systems thinkers do not merely analyze select systems in isolation, but rather recognize that systems also interact with other systems in complex ways with wide ranging effects: political systems and decisions can impact ecological systems, which can impact our own health and biological systems, and so on and so on.

Since the introduction of the term *systems theory* by Bertalanffy (1968) in the 1960s, systems thinking has taken on a number of different approaches. In this article, we adopt a specific type of systems thinking—*ecological systems thinking*[1]—as our model for seeking and making connections to the field of art education. At the heart of ecological systems thinking is a basic critique of traditionally accepted linear or mechanistic views of cause and effect, and problem solving. This linear approach for explaining and examining situations of all types was greatly influenced by the ideas of the 17th century French philosopher, René Descartes, whose understanding of human and animal biology was thoroughly based on a mechanical model where a body's organs (and even human emotions, creative thought, and recollection) worked in a manner similar to gears and cogs in an efficient machine or clock (Capra, 1982; Descartes 1632/2000; Lintschinger, Cohen, & Capra, 1990). Metaphorically, problem solving

[1]For more detailed discussions of other approaches to systems thinking, such as the mechanistic approach, we suggest readers seek out sources and critiques offered by Kettl (2011) and Banathy (1991).

was reduced to the simple formula of replacing specifically identified broken cogwheels, with the expectation that the automated machine could then resume its predetermined task. Ecological systems thinkers, however, posit that this Cartesian worldview is myopically focused on individual parts, and lacks holistic consideration of both positive and negative outcomes beyond the most immediate gears in the succession of linear cogs.

Senge (2006) illustrated the narrow-minded focus of such Cartesian thinking through an analysis of the Cold War era arms race that involved the reactionary production of nuclear warheads by the U.S. government in response to the presence of similar weapons in the Soviet Union. From the Soviet perspective, however, the building of more warheads was in reaction to the presence of nuclear weaponry in the Unites States. The result throughout much of the Cold War was the ever-increasing escalation of arms for both sides, with no real progress toward a larger solution. Lintschinger, Cohen, and Capra, (1990) similarly illustrated how linear solutions to one problem can easily balloon to larger problems for other systems: a poverty-stricken country seeking a solution to its national debt decides to increase cattle and land speculation, yet the resulting deforestation leads to disruptions in ecological systems, and (potentially) more red meat consumption correlated with incidents of heart attacks, which, in turn, impact costs in health care. Systems thinkers prefer not to look at problems in isolation, but endorse a more holistic vision that includes a paradigm shift in how we think about problems. In the individual essays below, we apply a systems thinking approach to a variety of topics in the interrelated fields of art education, before offering a discussion of the common threads emerging from these essays.

Artfully Re-Envisioning Education Through Systems Thinking

Yuha Jung and Victoria Eudy

Ecological systems thinking provides us a different vantage point to approach problem solving by encouraging us to ask better questions. When we can ask better questions about our problems, we are better informed on how to tackle those problems methodically and to arrive at more appropriate and inventive solutions (Capra, 1982; Senge, 2006). Using the current model of education in the United States as an example, we illustrate the possibilities and value of systems thinking as a way to artfully re-envision a system that values reductive, mechanistic, and exclusionary practices. We argue that this method speaks loudest through an arts-based education and has the power to reach in and beyond the classroom into the community, the nation, and the globe.

Our ecological approach to systems thinking promotes inquiry that goes beyond the boundaries set by linear thinking. Senge (2006) argues that organizations, societies, and things are like very *complex open systems* in that everything in the system affects everything else and is part of a larger environment. Therefore, education systems, schools, and education are understood as a whole and in relation to each other.

Ecological systems thinking or theory acknowledges the following principles: (a) human beings have a bounded and subjective rationality, (b) resources are limited, (c) learning processes are organic and based on previous experiences, and (d) consequences are unpredictable and sometimes unknowable (Lindblom, 1959). Therefore, ecological systems thinkers value integration, holistic thinking, mutual causality, and process-focused inquiry (Banathy, 1991). This worldview embraces the idea that solutions are not always cut and dry, obvious, or quick to find. Rather finding systematic solutions to problems may take a long time, and require multiple inputs from all involved parties, where there is equal value in the

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process of problem solving as well as the results. We believe that an educational system informed by the values of an ecological systems approach—including interdisciplinary and informal learning paradigms—is needed to artfully re-envision the current, mechanistic model of education in the United States. We consider these concepts as key components of an artful re-envisioning of our traditional education system.

From Mechanical Educational Structures to Organic, Interdisciplinary Systems

The current educational system in the United States is a product of the Industrial Revolution; it values efficiency, scientific management, formal settings, and compartmentalized subjects (Groff, Smith, & Edmond, 2010; Leland & Kasten, 2002), while devaluing the holistic way of thinking and solving problems inherent in a systems approach. Thus, we need a new way of thinking that breaks, as Senge (2006) puts it "the illusion that the world is created of separate, unrelated forces" (p. 3). When we rethink this illusion, we can create a *learning organization* or system where people work together to achieve results that truly matter to them, nurture new patterns of thinking, and continually learn how to learn together.

We believe that arts education can be specifically structured to provide the necessary environment for fostering the kind of creative, interdisciplinary, and holistic approach to innovative problem solving that underscores systems thinking (Eisner, 2004). Encouraging students to consider issues within a larger system through the arts—be it classroom-wide, nation-wide, or global—encourages them to consider multiple perspectives. By refocusing on the big picture, considering big ideas and the larger systems at play, arts educators overtly encourage citizenship in a pluralistic and diverse society.

By considering problems in terms of networked relationships, instead of reductive parts, students arrive at new ways of understanding that embrace flexible, pluralistic, and divergent thinking. Likewise, by understanding an issue in terms of relationships, students can break out of traditional linear points of view, and instead see issues as interconnected. Interconnected relationships also demand interdisciplinary inquiry. This allows the individual to more successfully anticipate change by rejecting myopic perspectives that can often blind individuals to more effective and pertinent solutions. This in turn sets the stage for the innovative, pluralistic, and interdisciplinary thinking necessary in today's emerging conceptual economy (Pink, 2006) that values creativity, innovation, and experience over the production of goods and information found in industrial and information based economies (Pine & Gilmore, 1999).

Informal Learning

When viewed through an interdisciplinary and ecological systems thinking lens, education is a continuing, informal, and natural process that is not confined by space and time. Formal education only represents a tip of the learning iceberg (Coffield, 2000). Learning happens through many diverse interactions in our social web—between people, with books, browsing the Internet, consuming popular media, interacting with nature and our environment, and more. This perspective is similar to Illich's (2002) notion of the educational web, a network characterized by mutual access that is "designed to spread equal opportunity for learning and teaching" (p. 77) beyond obligatory school education. Thomas and Brown (2011) call this web "a massive information network" (p. 19).

The biggest difference between formal and informal education is that the former is extrinsically motivated and therefore has a clear beginning and end, while the latter is intrinsically motivated and therefore forms a culture of learning that is sustainable and grows organically. Informal learning happens everywhere and is concerned less with formality or administrative structure and more with the mode of motivation and mindset

toward learning. Therefore, informal learning values personal experiences and surrounding environments that have an influence on how people learn (Thomas & Brown, 2011).

This way of understanding learning and education leads us to the discussion of organic, flexible curriculum that is alive—or *currere*. *Currere* is the Latin origin for the word curriculum. *Currere* is a verb and curriculum is a noun, meaning that the former is an action, while the latter is a thing to be acted upon. Therefore, the alive, contextual, and organic concept of *currere* critiques the contemporary meaning of curriculum as being text-based, fixed, and mechanical (Irwin, 2006), and therefore without context. The premise of *currere* is that teachers and schools cannot—and should not—control students' learning and their internalization of knowledge. Rather, educators can design curriculum based on their students' personal cultures, interests, needs, and ways of learning and knowing; teaching and learning becomes a mutual process. As a result, student learning can be more relevant, meaningful, intrinsic, and enjoyable. This organic view of education can be described as ongoing learning and living processes. This approach can humanize schools, allowing playful and effective learning to occur in a way that really matters to individual students rather than imposing a mechanical structure of education that is designed to control their learning.

> *Therefore, ecological systems thinking calls for more holistic, interdisciplinary, intrinsic, and diverse educational opportunities where education becomes a way of living and celebration of different cultural values, ideologies, and epistemologies.*

Conclusion

In order to shift the current mechanical educational paradigm into a more holistic one, we suggested two examples of pedagogies informed by ecological systems thinking: interdisciplinary and informal learning. Ecological systems thinking promotes the values of interdependence and interconnectivity as well as problem-solving and critical thinking skills necessary to consider whole systems rather than its reductive parts. Therefore, ecological systems thinking calls for more holistic, interdisciplinary, intrinsic, and diverse educational opportunities where education becomes a way of living and celebration of different cultural values, ideologies, and epistemologies. We argue that if education is rooted in "The Big Picture" instead of its reductive elements,

it will grant educators a better opportunity to prepare students to consider themselves as inseparable citizens in a diverse and globalizing society.

Under the Water Line: Systems Thinking for Dynamic Learning in Art and Design

Delane Ingalls Vanada

There is a lot of discussion in 21st century education about the need for nurturing resilient students who are independent and self-directed, innovative, and possess a balance of critical, creative, and practical skills (Duckworth, 2006; Vanada, 2011). New and expanded theories of how people learn promote the need for developing flexible, adaptive thinkers (Argyris & Schön, 1996). Yet we know that much of our education system, in which all parts affect the other and are interconnected, is unhealthy and the patient's symptoms are formidable: students are afraid of failure or to express independent thought, lack self-direction, and are more used to being told what to think and do to pass a test or get an "A." Students have become so focused on linear and logical ways of thinking intended to produce one right answer or product, they do not trust their own abilities to make connections and solve complex—let alone, ambiguous—problems. Largely, our educational system has trained students how *not* to be wrong, rather than how to use mistakes and risk-taking as learning opportunities and as essential ingredients in innovation.

Other traditional teaching strategies—including the isolation of subject areas, and the use of teacher centered approaches that devalue independent and creative thinking—will not fix these problems. Art and design education would benefit from adopting what Thomas Fisher, Dean of the College of Design at the University of Minnesota (National Endowment for the Arts, 2013) calls a proactive, public-health model of education rather than a reactive system where you wait until somebody is sick to deal with a problem. The public health model focuses on preventing problems before they occur, rather than curing after the fact (p. 31). What we must prevent is the loss of our students' and teachers' creative, critical, and self-directive capacities and confidence, as well as their abilities to make connections on their own.

Applying Systems Thinking

A systems thinking approach involves looking deeper at interconnected problems that lie beneath the surface level. Rarely in any system do these issues operate in a vacuum, and a holistic view is needed to bring about true transformation. The grove of aspen trees at my home in Colorado serves as an example. Aspens are essentially one massive root system or

network that spread by means of root suckers. New aspen stems can appear up to 130 feet away from the parent tree. From the outside, this grove has looked quite healthy, until signs of stress appeared in the form of oozing sores on the sides of some of the trees. I learned that the trees were being infested by a poplar borer—an insect that can kill out entire groves of aspens by boring into the heartwood of the tree, weakening it, and eventually destroying the entire rhizomatic system. A proactive move was needed: over one-third of the trees were cut down and destroyed. The grove is thinner, but definitely healthier overall.

I believe that similar drastic measures may be needed to make sure that the most entrenched effective practices in our field are allowed to thrive. A socially responsible examination of our educational practices needs to look at the system as a whole and *under the water line* for interconnected factors that may hinder or influence students' opportunities for deep and dynamic learning. Argyris and Schön (1996) call this a double loop theory of educational change (looking at and questioning underlying issues) rather than a single loop (dealing with problems after they surface).

To leverage change, we can ask:

- What kinds of environments and curricula best approach learning as a complex system?
- How might we design curriculum to activate the interconnectedness of learning and thinking?
- How might we better develop students' mindsets toward more connected and deep learning?

Learning as a Complex System

Research in cognitive science, psychology and behavioral science has helped us understand the complex system involved in learning. Aptitude is not equal to a narrow subset of students' cognitive skills—especially not the ones that are often tested. Skills alone are not enough. People's capacity to learn also involves their dispositions, or motivational and affective facets such as persistence, and risk-taking (over and above *ability*) that contribute to deep learning (Claxton, 2007; Dweck, 2006; Perkins, 2001). Dispositions can be defined as the habits, behaviors, or attitudes that show whether one is motivated to use the skills that they have. Simply put, dispositions demonstrate that students are ready, willing, and able to learn. Both skills *and* dispositions support motivation.

Going deeper under the water line, we find other supporting emotional-motivational factors that influence students' *learning power* (Claxton, 2007). Cognitive research tells us that self-beliefs, deeply connected to one's sense of agency, account for a large part of the success or failure of both one's skills and dispositions. How students perceive their competence—their

"theories in action" (Argyris & Schön, 1996)—affects their effort, persistence, resilience and creative confidence (Duckworth, 1996).

Dweck (2006, p. 6) reveals that both children and adults hold one of two self-beliefs: (a) they're born with a fixed amount of intelligence or (b) that with effort, their intelligence can grow. "Fixed mindset" learners, who don't believe that effort will alter their ability, often lack resilience and give up at the first sign of challenge, in comparison to those with "growth mindsets," who apply more effort and increased motivation to achieve. The good news is that art and design students' self beliefs can be positively affected by more learner-centered pedagogies and environments (Ingalls Vanada, 2011).

Learner-Centered Research

I conducted a mixed model research study using both qualitative and quantitative data collection methods in middle school visual art classrooms to explore the effect of learner-centered pedagogies and environments on students' creative, critical, and practical skills and dispositions, as well as their perceptions about themselves as learners. For the purposes of my study, I defined *learner-centered/constructivist classrooms* as those that employed inquiry, connection making, and student self direction to a greater degree.

In my study, I used Sternberg's (1996) successful intelligence theory as a framework and systems thinking model for assessment. In this theory, intelligence is comprised of three necessary and interrelated components involving analytic skills, creative skills, and practical skills. One needs critical thinking skills to analyze existing problems, creative skills for developing new ideas for solving the problems, and finally practical skills for presenting and implementing solutions with the help of others. For my study, I utilized a matrix of sub-tests designed to assess students' balanced thinking skills and dispositions (creative, analytical, and practical).

Results indicated that students in visual arts and design classrooms that were more learner-centered scored higher in a balance of creative, critical and practical thinking (.935 at the .05 level). Classrooms that ranked higher in learner-centeredness also tended to rank higher in balanced thinking scores for students (Ingalls Vanada, 2011, p. 108). I also found a significantly positive relationship between higher ranking learner-centered environments and students' positive self-beliefs as learners (.933 at the .05 level).

The coding of qualitative data for the study led to an emerging theory that I call *quality thinking systems*. At the heart of quality thinking systems is the notion that learner-centered classrooms are more suited to promote exploratory, balanced, and deep learning. While the

overall results of this exploratory study are beyond the scope of this paper and do not claim causation, the study itself may serve as a useful model to others hoping to use a holistic systems thinking view for examining students' belief systems, or other aspects of classroom learning cultures.

Learning Cultures as a Complex System

To proactively address the issues plaguing today's students and teachers, there is perhaps no structural element more central than learning culture (supported by curricular design). I advocate for learning cultures and generative learning environments in which students follow their natural curiosity and engage in the world in empowering ways, rather than passively taking in information dispensed by teachers (Dewey, 1938). Students need opportunities to connect and apply what they learn to other contexts and disciplines (Cullen, Harris & Hill, 20012; Gardner, 2007).

A main goal of such learner-centered approaches to curriculum is integrative learning—that is, learning that is centered around inquiry, critical thinking, problem solving, and direct experience. Learner-centered pedagogies build upon the pillars of connection-making, inquiry, and student self-direction as shown in Figure 1 (Ingalls Vanada, 2011).
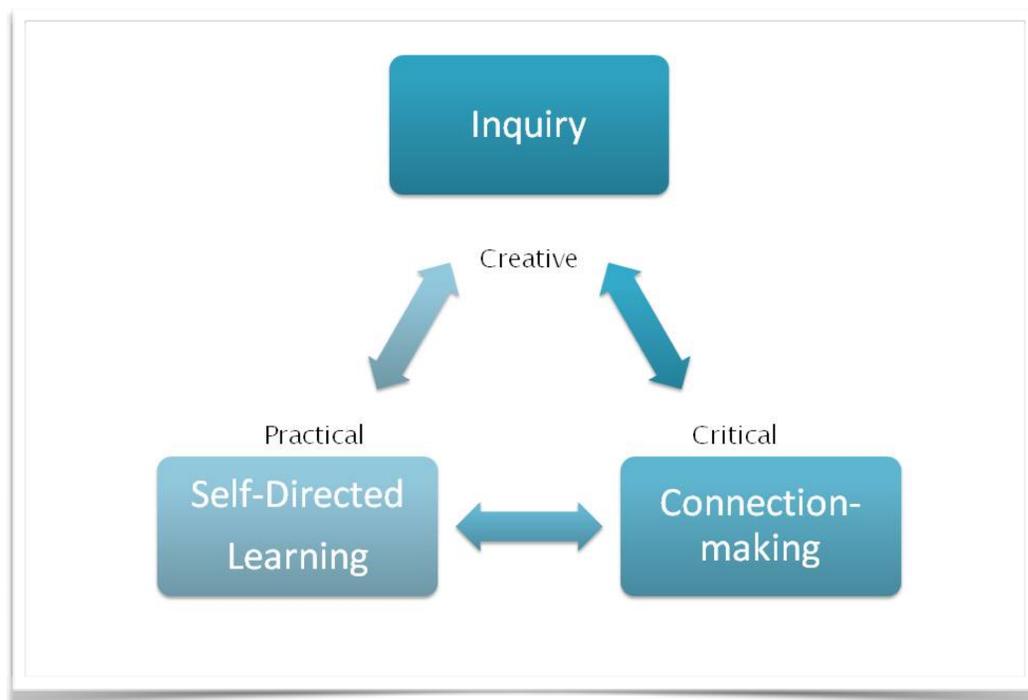
Figure 1. Learner-centered Classrooms

Learner-centered instructional strategies have much in common with postmodern and constructivist pedagogical approaches that focus on deep learning and creating knowledge in social, contextual, and authentic ways. Rather than a traditional focus on content, a postmodern approach toward curriculum is organized around complex big ideas, or philosophical issues of social concern that require multidisciplinary, authentic, real-life solutions (Costantino, 2002). Every discipline provides a unique lens/context through which to view the world, and encouraging art and design students to substantively integrate these contexts promotes creative thinking. Art offers an equally important approach for inquiry-based investigations and can support systemic, integrated learning (Marshall & Donohue, 2014). Connection making can also be supported by research-based strategies, such as problem- or design-based learning, wherein students find a problem, follow a trail of inquiry, make connections across disciplines, and create solutions through iteration and reflection. Such active learning supports a "learning with understanding" approach as well as builds students' self-efficacy, confidence, motivation, and desire to learn (Bransford, Brown, & Cocking, 2000, p. 8). A learner-centered curriculum builds in as much choice, connection making, and self-direction as possible.

Making the Shift

Our classrooms are social systems—living cultures of learning—that greatly affect students' conceptions of their intelligence, capacity to learn, and improvement of skills. To help students develop healthy learning dispositions and self-beliefs that support deep learning, a shift is required—from teaching facts and skills to developing deep understanding, self-directed inquiry, and integrated learning. Covering course content doesn't assure that students *learn*.

In order to build students' agency and sense of self as learners and creators, teachers must be purposeful about the learning and thinking culture they cultivate. Learner-centered/constructivist theory challenges teachers to take risks and give students the power to connect their learning in ways that nurture deeper understanding and meaning. Teachers have a critically important role in creating dynamic learning systems and in "designing thinking" (Ingalls Vanada, 2011, p. 1).

The Problem of the Lone Creative as Curator: A Systems Thinking Approach to Preparing Future Edu-Curators

Ann Rowson Love and Pat Villeneuve

In this portion of the article, we explore the traditional model of exhibition curator as a *lone creative*. Using a systems thinking lens, eco-feminist systems thinking (Stephens, 2013), we re-envision the exhibition curatorial model as one that is deeply collaborative, visitor-centered, and more appropriate for training 21st century museum professionals. In this process we introduce a new type of curator, the *edu-curator*.

For much of the 20th century, the lone creative as curator moved through the exhibition development process as a singular endeavor until design, installation, and programming required working with others. Often, collaboration with a museum educator came at the end of the process in order to program events for audiences—families, teachers, Pre-K-12 school groups, college students, and adults. The steps of the process may look similar to Figure 2.

Concept/Research Question

Research

Object Selection

Interpretive Planning (Gallery text, publication development)

Budget Preparation

Design/Installation

Programming

Figure 2. Traditional Exhibition Development Process with the Lone Creative as Curator

In this traditional model, understanding and preparing for visitor interests, needs, and learning preferences came at the end of the process, rather than integrated throughout, and valued objects and ideas rather than museum visitor preferences (Weil, 1999).

Training paths for curators focused on art historical specialization. Likewise, hiring administrators sought art museum educators who had art historical training and appropriate

specialization (El-Omami, 1989). El-Omami reported on two surveys, one sent to art museum directors and the other to art museum curators, that detailed the skills that they valued in museum educators. In both surveys, findings indicated strong preferences for museum educators with art historical training complemented by additional training in evaluation, audience research, art education, and education pedagogy and theory. Throughout the 1990s, new approaches led to rethinking exhibition development as a lone activity and also a new shift toward ongoing collaboration with museum educators.

Historical Perspectives: 1990s Paradigm Shifters

The 1990s set the stage for an evolving change from the traditional, hierarchical model of exhibition curation to a practice that prioritized education. At the beginning of the decade, Van Mensch (1990) reconceptualized the accepted model of museum functions from the traditional five—collect, conserve, research, exhibit, educate (Alexander, 1987)—to three. His model included the function of *preservation* (which presumed collecting), along with *study*, and *communication*. The communication function conflated the previously separate tasks of exhibition and education, and called for greater collaboration among museum professionals that would favor the interests of museum visitors.

In 1992 the American Association of Museums issued a landmark policy publication, *Excellence and Equity: Education and the Public Dimension of Museums* (Hirzy, 1992). It featured 10 principles advancing education, the first of which stated, "Assert that museums place education—in the broadest sense of the word—at the center of their public service role" (p. 14). Accompanying recommendations moved practice towards a more systems-thinking approach: "Ensure that all staff members and volunteers understand the implications of their decisions and actions for the educational and public service dimension of the museum's work" (p. 15).

The same year Falk and Dierking (1992) introduced their interactive experience model, describing how personal, socio-cultural, and physical contexts impacted the museum visit. The range of factors they offered—from personal agenda, to interaction with others, to the function of gallery spaces—suggested the opportunity for an expanded purview for the museum educator. At the close of the decade, Weil (1999), then the foremost U.S. museum theorist, asserted that museums must go from being *about* something (the object) to being *for* someone (the visitor).

Emerging Models of Inclusive Curation: Visitor-Centered Approaches

Over the past decade, new models of curation have been developed that require collaboration and an increased focus on visitor input during the exhibition development process. Two examples of collaborative, visitor-centered and interactive models for exhibition planning include the *outcomes hierarchy model* (Wells, Butler, & Koke, 2013) and the *Selinda model* (Perry, 2012). Wells, Butler, and Koke (2013) described the goals of the outcomes hierarchy as a means to embed visitor input and evaluation into museum-wide interpretation planning and exhibition development. The model places an emphasis on the importance of outcomes, or what visitors will gain from their interaction in exhibitions and permanent collections. The model also functions as a museum-wide interpretive planning process. Likewise, Perry's Selinda model (2012) relies on outcomes, but also focuses on what motivates visitors to interact in exhibitions as well as varying the types of engagement. In both models, educators play a central role on an exhibition team. Although input from visitors is important in both models, neither requires visitor participation on the exhibition team itself.

Re-envisioning the Theoretical Lens: Applying Feminist Systems Theory to Curation

Stephens and colleagues studied the intersections of *critical systems thinking* and *cultural ecofeminism* in order to articulate principles of a *feminist systems theory* (Stephens, Jacobson, & King, 2010a,b). Feminist systems theory, or eco-feminist systems theory, relies on making social change, empowering the oppressed, and employing research to take action (Stephens, 2012, 2013). We believe that the principles of eco-feminist systems theory can be suitably adapted as a framework for examining the changing role of the art museum educator from one that was previously marginalized during the exhibition development process, to one that is now reconceptualized as an empowered collaborator. Our efforts in adapting the principles of eco-feminist systems theory are illustrated in Table 1, and, we believe are appropriate for considering the art museum as institutional and organizational culture.

Table 1
Adapted Feminist Systems Theory

Feminist Systems Theory (Stephens, Jacobson, & King, 2010a, p. 557)	Love & Villeneuve Adapted Model
Be gender sensitive	Be inclusive and pluralistic
Value voices from the margin	Include voices of the disenfranchised
Center nature	Enhance organizational culture
Select appropriate methodologies	Advance appropriate methodologies
Bring about social change	Bring about social and systemic change

Collaborative Curation and the Edu-Curator

Feminist systems theory aligns with our practices as researchers, as art museum educators, and as teachers in higher education who train emerging museum educators. New models of collaboration in art museum exhibition development require a reexamination of training approaches. We share two of our research efforts related to collaborative exhibition development and a new graduate program designed to give students appropriate methods, training, and leadership skills for collaborative art museum environments.

Love (2013) examined a collaborative exhibition team where the educator, and evaluator, facilitated the collaboration, which included interdepartmental staff members and community members. Aligning with a feminist systems thinking orientation, this study included formerly disenfranchised voices (such as the educator, the community members, and a non-curatorial staff member) in order to influence organizational learning through exhibition development. A collaborative evaluation framework called *evaluative inquiry for learning in organizations* was used to facilitate teamwork (Preskill & Torres, 1999). The exhibition development process was non-hierarchical and moved from phase to phase and back again as team members raised questions, explored curatorial identities, and ultimately made collective decisions. Using grounded theory, Love articulated an inclusive curatorial model.

Villeneuve's Supported Interpretation (SI) is another example of collaborative curation. Supported Interpretation uses a curatorial team comprising representatives from curatorial, education, installation, and other relevant departments along with knowledge-bearing members of the community. SI views the exhibition as an interface, or point of interaction between the museum and the visitor. The curatorial team anticipates viewers' needs to know and imbeds diverse learning resources—mostly non-textual and non-authoritarian—in a free-choice interface that visitors may choose from to support their individualized meaning making. (See (Villeneuve & Viera, 2014 for guidelines.)

SI benefits from the re-envisioned role for the museum educators and also serves as a real-life example of our adapted feminist systems theory put into action (see Table 2). We call the new process *edu-curation.*

Table 2

Feminist Systems Theory Applied to the Edu-Curator

Adapted Feminist Systems	The Edu-Curator
Be inclusive and pluralistic	Envisions exhibitions as a non-hierarchical, collaborative process
Include the voices of the disenfranchised	Includes underrepresented voices in exhibition development
Enhance organizational culture	Facilitates collaborative practices and reflection
Advance appropriate methodologies	Conducts visitor-centered research
Bring about social and systemic change	Seek social justice through museum practices

In response to the re-envisioned roles for museum educators, the Department of Art Education at Florida State University has developed new graduate programs to meet these needs. The new degrees in Museum Education and Exhibitions are available at both the Masters and Doctoral levels and feature a semester at the John and Mable Ringling Museum in Sarasota, Florida. Core coursework includes:

- Museum Education
- Art Museum Education
- Visitor-Centered Exhibitions
- Visitor Studies
- Curriculum and Programs
- Leading the Arts Organization

These courses, along with internship hours, prepare future edu-curators to advance collaborative, pluralistic, visitor-centered education and curatorial practices, using political acumen and research and evaluation to instigate organizational and systemic change.

Discussion

Cathy Smilan

The research and theory presented in this article converge around the ideas that systems thinking, applied to art and museum education, is one of an organic, interactive, non-linear model. Such a model requires complex open-systems thinking (Senge, 2006). The visualization below (see Figure 3) provides key terms associated with the models presented

in this article. The model coalesces around a new *education learning system* that ultimately considers how *students* are thinking about their knowledge systems and worldviews. This thinking involves collaborative processes incorporating experiential problem solving encompassing theoretical framing and collaboration in schools, museums and communities.

Figure 3. Systems thinking visualization.

The research presented in this article offers three views of systemic issues affecting education and ideas, offering varying levels of solutions to these problems. From a theoretical vantage point, Yuha Jung and Victoria Eudy posit a holistic model moving from compartmentalization to collaboration. Artists, teachers, scholars and administrators oftentimes approach problems from isolated perspectives without considering the larger system of an authentic, holistic art education and the students, cultures and economies they serve. The authors aptly point out that the educational system in the United States was designed for a burgeoning industrial society which demanded convergent thinking and training rather than the divergent critical thinking required to create the cultural capital for today's knowledge economies.

Jung and Eudy caution that while formal education provides rewards through external motivators, informal education is intrinsically motivated and all encompassing. They suggest creating educational webs that link arts education in and out of school settings and

involving traditional and virtual opportunities. A major part of this web involves curricular integration of content and concepts. Art lessons that shift global perspectives, as Eisner (2004) suggested, are based on exploration of cultures, concepts and innovative problem solutions that empower student engagement in the "Big Picture" overview and mandate student involvement in personal, community and global issues through art exploration. Integrated curriculum and process oriented inquiry that are provided through applying ecological systems thinking to authentic art education can help learners expand art skills, understandings of self and others, and global awareness and citizenship.

Offering a similar approach, albeit from a roots-up perspective, Delane Ingalls Vanada offers the metaphor of an aspen grove in which every tree sharing the interconnected root system must remain healthy if the grove is to flourish. Interestingly and aptly suggested, in an educational system in which top-down management is believed by many to have led to current ailments, consideration of sustaining equitable access to shared resources must come from the very root of the delivery system. Her concept of systems thinking aims to remedy the concerns posited earlier; in a holistic, student-centered education that develops 21st century skills sets, interconnectivity and pluralistic perspectives are required by all who will participate in and benefit from formal and informal learning. Ingalls Vanada's study involves the interplay of learning environments and curricular modifications that engage learners to activate critical thinking about complex and interwoven problems while empowering them to take responsibility for their learning and contributions to that educational network. Rather than presenting learners with discrete skills and knowledge, Ingalls Vanada's complex edu-network nourishes learners by insisting that they move beyond the treatment of symptoms to understand how their ideas, actions and artistic articulations impact communities and world systems.

Ingalls Vanada found that a learner motivated environment was more effective in developing these social-emotional attributes in students, further supporting research compendia published at the beginning of the 21st century (see Burton, Horowtiz & Abeles, 2000; Deasy, 2002; Fiske, 1999). The author provides an inquiry-based model for art and design education that moves learning beyond teacher directed activities to ones that invite learners to reflect, assess, re-envision and make connections with self, other artists and world. [2] Based on learner-centered, constructivist theory, Ingalls Vanada measures middle school art students' social-emotional skill development to foster both art learning and empower self-resiliency and the confidence that they can be systemic change makers. She asks the questions that are needed in order to shift contemporary art teaching toward addressing the non-traditional needs of the 21st century learner.

[2] For readers interested in exploring other models similar to the inquiry based approach, we suggest that they investigate the art and literacy integrative model discussed in a book chapter by Smilan (2012).

As noted, 21st century learning requires formal and informal environments and curricula. In art museums, curators and museum educators formerly viewed as isolated practitioners are challenged to engage audiences, oftentimes including students and teachers, in art-based learning opportunities. The work presented by Ann Rowson Love and Pat Villeneuve addresses the changing educational needs of museum professionals and provides a systems thinking model that values collaboration. In their edu-curator programmatic model, Love and Villeneuve present an adaptation of Stephens (2013) eco-feminist systems thinking for museum curator/educators. The focus of this adaptation is on collaborative opportunities among museum professionals with the visitor experience at the core.

Visitor-centered museum education adheres to the same principles as student-centered art education, as it places the mission of educating the audience through interactive experiences and learner engagement at the heart of the system. Rather than lecturing to the learner who is expected to passively absorb information, meaning-making is predicated in large part to what the viewer/learner brings to the viewing experience. Love and Villeneuve present a theoretical framework for moving from learning that is about things, to learning that is for people. Constructing these experiences requires multiple or hybrid expertise. In their program model for museum education, the authors advance an ecosystem in which varied experiences of engagement with museum collections are designed for the purpose of advancing an inclusive, equitable reflective practice. This requires the contributive work of all museum professionals; in this non-linear non-hierarchical model, all contributions are equally valued. The *edu-curatorial* model is a promising addition to professional training protocols. Scaling up this program format to include leadership and teacher preparation programs would broaden socially reconstructive opportunities in other realms of education as well.

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A systemic thread seen through the papers is that of expanding the scope of arts education in a non-linear, cooperative, learner centered manner. Many of the arguments presented here echo those of art-integrated curriculum in school and community art engagement. As Marshall (2006) informed us, substantive art integration does not devalue art but helps stakeholders make connections through which "simple ideas are ...extended beyond surface meaning to concepts that underlie them" (p. 19). In this manner, Ingalls Vanada's root system can be traced to see how each individual monolithic structure is inter-dependent on layered understandings. The frameworks and models discussed in this article represent hybrid approaches that require professionals to prepare for interdisciplinary interaction. As one audience member suggested at the National Art Education Association Forum where these ideas were first presented, this interdisciplinary approach also suggests art education for all teachers. Looking at the problem from a more expansive perspective, educating administrators and policy makers as to the value of arts in education will further ensure that arts learning is systemic to the culture of all learning, within and outside of school (Smilan & Miraglia, 2009). Art and design educators must have knowledge of visual arts making, design concepts and client oriented service skills as well as pedagogical knowledge. Museum educators must have solid art historical knowledge as well as curatorial and pedagogical training in order to fulfill their mission. However, these professionals oftentimes function within closed systems of art departments, art rooms and museums. In order for systems thinking to affect change within art education, the systems must be expanded throughout all learning systems and creative economies.

Considerations

The aspen grove serves as a beautiful visual metaphor, but must not obscure consideration of alternative, systemic remedy. Cutting away some for the better good, might be misconstrued by some as justification for the further retrenchment of arts in school for the sake of standardized test preparation. As Graeme Sullivan aptly instructed at the National Art Education Association Forum proceedings, one must take care not to veneer a systems approach that may prove effective for one sector over an educational system that must consider affective and conceptual aspects as well as content skills (G. Sullivan, personal communication, March 27, 2015). In the social ecosystem of the art classroom in which cultures of learning come alive, visual documentation and analysis might go even further than isolated statistical data to advance an agenda for art-based inquiry and self-reflection and toward fostering deep understandings and student agency. A shift in school-wide ecosystems that accommodate and integrate art-based learning requires risking new research methodologies and educating non-arts teachers and administrators about the critical connections made through art processes.

While few would disagree with the value of interdisciplinary, collaborative learning in an interlocking system of subjectivity that is fluid and advances a non- hierarchical perspective, the reality is that the increasingly corporatized education system in the U.S. continues to block the systemic paradigmatic shift necessary to make socially equitable, learner-centered empowerment possible. Researchers, educators, and creative scholars must find methodologies that interrogate pedagogical as well as creative artistic practice in answering these critical questions about formal and informal educational opportunities and outcomes. Through rigorous research of applicable models, higher educators can provide evidence that subjectivity and social justice education through open systems thinking is the path to deeper engagement and learning. As the National Art Education Association recognizes the desperate need to develop arts leaders, higher education is called upon to investigate important questions including: How are we systemically building social justice into art education and museum education curricula? How are we providing equal access and equal opportunity for shared resources and systemically incorporating the arts into every school for every child while honoring the cultural and creative contributions of all learners? How are art teachers and arts policy makers advocating for this type of arts equity in formal and informal settings?

According to O'Malley and Baker (2012), the attributes that make creative, compassionate leaders are those of intention, focus, authenticity, skill, and imagination; these are the qualities of artists and arts educators. As we prepare for the future, we might consider research that supports policy mandating an inclusive arts education for all who teach and lead in order to include arts components to expand critical thinking about culture, access, and creative solutions to local and global problems.

Conclusion

Systems theory has been with us since Bertalanffy introduced it in the 1960's (Bertalanffy, 1968). Since that time, it has shaped the way we think about everything—from living organisms and their habitats, to the universe and its parts and forces, to how humans organize and interact. Systems theory tells us that everything is connected to something else, that when we examine one thing, we must consider all the things it affects and all the things that affect it. That is, we must see every entity in context—*as part of a system*; when we are looking at a complex phenomenon, we must understand it *as a system*.

Beyond its universal applicability, systems theory presents a particularly wise lens with practical applications for educators. The contributors to this article understand this; they articulate how systems theory can be applied to education and to cultural and educational institutions. Furthermore, they address the two reasons why systems theory is so wise and

valuable. Firstly, systems theory helps us to comprehend the nature of our educational institutions, how each one is a living system that has its many interconnected parts and particular dynamics. It also tells us that each living system must adapt and change as its environment changes. Understanding this enables us to work with these organizations in wiser, more effective, systemic and transformative ways. Secondly, systems theory enables us to see how the processes within a system shape the structure of a system. These processes are determined by the purposes of the institution and its understanding of itself. That is to say, the structure of an institution and its methods both reflect and promote the worldview of the institution and determine how it works. With this insight, we grasp how we can transform our museums, schools, school districts and university programs by re-thinking and re-forming their viewpoints and values.

Thinking systemically, they show us how ways of thinking and doing are inextricably linked to the structures that harbor them.

Our contributors not only show us how a change in mindset regarding the nature of an institution (a classroom, a university program, a school system, a museum) transforms *our understanding* of it and, therefore, the way we work with it, but they also show us how a change in perspective toward purpose and values *transforms the institution* itself. Specifically, they call attention to an integrated, holistic systemic approach to both institutions and to the learning that takes place in them. Thinking systemically, they show us how ways of thinking and doing are inextricably linked to the structures that harbor them.

In review of this multi-authored paper and looking back at the Higher Education Forum at the NAEA convention in 2015, we are struck by how important the voices of higher educators are to our system of thinking and learning. Higher education is an essential component of our system. Educators and scholars in universities devise theories from their research, observations and experience. They also make sense of theory and help others to do the same. Higher educators are especially systemic (and contributive) when they make strong links between the two strands that drive our education system: theory and practice. Our contributors to the Systems Thinking Forum and this article are exemplars of this. They present concrete examples from the real world that show us systems theory at work. They also show us why thinking systemically is so important today.

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