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more resilient and sustainable food systems**

Journal of Environmental Studies and Sciences 5(4): 671-684

DOI 10.1007/s13412-015-0332-y

The manuscript in this pdf file was published as part of a collection of 27 articles in the *Symposium on American Food Resilience*. See <http://foodresilience.org> for a description of the Symposium and a complete list of abstracts. The published version of this article may be purchased from Springer at <http://link.springer.com/article/10.1007/s13412-015-0332-y>.

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The power of story for adaptive response –marshaling individual and collective initiative to create more resilient and sustainable food systems

Conscious mental life is built entirely from confabulation. It is a constant review of stories experienced in the past and coming stories inventoried for the future.

--E.O. Wilson¹

Our theories determine what we measure.

--Albert Einstein²

Introduction

In 2013, a crowd of about 250 participants at the Wisconsin Local Food Summit in Milwaukee listened to LaDonna Redmond tell her personal narrative around food³. She wove a story giving historical context to her interest in food politics: of her ancestors, people who were enslaved to work in agriculture, of subsequent generations that were left out of homesteading and other land owning opportunities, and of her direct experience as a girl participating in before-school breakfast served by the Black Panthers⁴. She challenged people to look at their own personal narratives around food and farming, to look at how history and our personal experiences around food influence our decisions. Redmond uses personal narrative as a springboard for transforming our food system, one person at a time, as founder of Campaign for Food Justice NOW.

Our nation's food narrative is made up of many such stories: Native Americans suffering food loss as colonists raided and destroyed winter food supplies, Irish immigrants fleeing The Famine, Scandinavian and German immigrants looking for an opportunity to farm the land that they owned rather than farm land owned by the wealthy, the public suffering through the Great Depression and Dustbowl, governments implementing controversial water projects meant to supply water for agriculture, corner grocery stores and rural towns diminishing, and developing food and agriculture policy meant to support farmers and improve food access for the poor. Whether we know it or not, every one of us has a connection to this rich history of food. We also have our individual stories that result from direct experience with food traditions for holidays and daily sustenance. Recipes handed down over generations, "common sense" that this food goes with that food, and national traditions around Thanksgiving holiday are all examples of personal food experiences that hold powerful sway over our habits and inclinations, and shape our sense of community and nationality. Yet we rarely share these personal stories with others, explore the broader social narrative around food, or pause for long to think about what they tell us about food systems.

There are many indications that our national food system has adverse negative consequences to the environment and our communities, and people bear witness to these failures, even while most of us feel secure in accessing food. Systemic failures are apparent in the increasing rates of

¹ From Edward O. Wilson's forthcoming book "The Meaning of Human Existence" published by Liveright and offered as an essay in the September 2014 issues of Harper's Magazine.

² Quoted in Peter Senge's book *The Fifth Discipline*, chapter ten entitled "Mental Models".

³ <https://wilocalfood.wordpress.com/summits/summit-2014/2014-summit-keynote-biographies/>

⁴ See Bloom and Martin 2013 for a historical account of the Black Panther efforts to feed school children a nutritious breakfast, the Free Breakfast for Children program.

obesity and diabetes, antibiotic resistance, food insecurity, food safety scares, difficulty accessing healthy food in rural and inner city communities, excessive food and packaging waste, and in the environmental problems associated with agriculture, such as hypoxia in the Gulf of Mexico and the Great Lakes, and ubiquitous ground water contamination. In addition to these shortcomings, the food system is built on the assumptions of low cost fuel for transportation, predictable growing seasons, and inexpensive labor. Meanwhile, fuel costs, weather and labor markets are more volatile, less predictable than in the past. Our current food system is less resilient, increasingly brittle, and prone to system failure. We are all witness to these failures, but rarely talk about how they impact us or take time to see the relationships between them. So what do we do about it?

It is generally agreed that we need to enhance the resilience of food systems to ensure the sustainability of natural and social systems. Resilience has roots in systems theory and has many different interpretations and applications. The capacity of our food system to adapt to rapid change, to re-organize so that people are well fed without adverse consequences, is the meaning used in this paper. Resilience cannot be accurately measured through generic models since it is complex, dynamic, and perhaps most importantly, context-dependent (Dwiartama 2014). The societal context for food is extremely diverse, making resilience that much harder to track. The important variables of resilience are often what are considered to be the “slow variables,” such as consumer buying habits that take some time to change. When a slow variable shifts, it builds to a tipping point in the system, a threshold opportunity for systems change. Walker and Salt (2006) point to the importance of building social capacity for adaptability and experimentation in enhancing the resilience of social-ecological systems, such as food systems. Changing daily habits is hard, especially if the habits are not fully conscious. Why do we buy that product and not this product? Why do we eat this and not that? Why do we shop there and not here? Do our individual choices matter? How is food consumption linked to food production? How do these actions relate to the hypoxic zone in the Gulf? How do they relate to obesity or food shortages in South Chicago? How do our choices impact policies that seek to change business as usual?

Ultimately, how do we as a people move from a brittle food system to one that is resilient? This paper does not delve into the multiple tools necessary to assess and build resiliency, but rather we discuss one method to build healthy food system resiliency – through story, personal narrative and civic engagement. Bringing people together to make explicit their personal experiences and observations about food and agriculture facilitates the adaptation process to more resilient, sustainable food systems. Our experiences as an environmental educator and a sustainable agriculture researcher are that facilitating individuals and groups to make explicit their mental models around food and agriculture may help people understand their role in our food system, encourage their curiosity about this complex system, and support personal commitment for the change necessary to create a more resilient food system. Narrative based on direct experiences and historic context helps people understand their role as a central actor in the food system and make conscious their responsibility for the health of the system.

In this paper, we provide background on how storytelling links to thinking clearly about systems such as food systems. We then tie these concepts to civic engagement and our need for community around food. Concepts of story, systems, and civic engagement are illustrated in three cases. The first author, as a practicing economic anthropologist, has worked in sustainable agriculture and food systems for thirty years using participatory research methods with farmers

and others who directly act to raise, process and bring food to retail outlets. The first case provides a straightforward example of how teachers can explore story in a classroom setting. This example is with rural children between eight and twelve, as part of a summer camp experience. The second case shows how bringing farmers together to share their field experiences makes it possible for them to better manage complex food production systems both on the farm and in public policy. The third case provides an example where business leaders interested in making regional food systems more resilient can come together to share their experiences with supply chains. These examples illustrate how individuals and groups engage to enhance the resilience of their local food system through an on-going process: individuals develop mental models to understand the food system based on their experiences and observations; they share their mental models with others through storytelling; they adjust mental models based on feedback from group experience; and once their mental models adjust their related actions to influence the food system follow.

This paper proceeds by offering an exploration and literature review of the key concepts of this paper: storytelling, civic engagement and systemic change. Then, three cases are presented that highlight the potential of facilitating storytelling to help people understand and fulfill their roles in the food system.

Storytelling

We use “story” and “storytelling” as general terms. For us, story is “an account of incidents or events” or “a statement regarding the facts pertinent to a situation in question”⁵. These stories are dynamic and loosely structured. Classical elements of “story”, such as setting, character, the problem, change and transformation, may not all be present or well-formed or apparent to the teller of the story. It has been our experience that missing elements emerge over time as people better understand the rich context in which they participate as an actor in the food system. It is the process of telling the story that makes the story explicit and dynamic. In addition to helping us better understand ourselves, stories are a fundamental way that we share information in social settings and build a sense of community, whether with one another as individuals, or in large groups. We tell stories to relate relevant or common incidents or situations in which we find ourselves. For millennia, stories were used to share knowledge, cultural practices, and important places and events. Contemporarily, brain science has shown that we more effectively process information when it is contained in stories and that stories are the foundation of social knowledge (Wyer 2014).

Encouraging people to tell their personal story helps them take their particular experience and connect it to the abstract of history or stories of others. It can lead the storyteller into curiosity about experiences and viewpoints different than their own and a lead them to seek out scientific, specialized observations (such as formal historical research, survey science, ecological studies, health and nutrition studies) in order to better understand the context of their personal experience. We need only to look to the intense interest in genealogical research to see how popular interest in something very personal, may engage people in deep scientific inquiry.

Stories are particularly helpful when we are trying to understand complexity, and complexity is a growing challenge in food systems. For people to take in all the available information and put it

⁵ In Merriam-Webster online. Retrieved from <http://www.merriam-webster.com/dictionary/story>

into practical use, stories may make it easier. People learn and solve problems through a cyclical or spiraling process that involves observation, modeling, application, observation, and cycling back around. Story is one way to model or abstract our observations (Damasio 2010; Kolb and Fry 1975; Maani and Maharaj 2004; Treffinger and Isaksen 2005). Systemic interventions that encourage “big picture” thinking are highly effective at optimizing the emergence of complex systems. Encouraging a cycle of “observation – modeling – application – observation”, “forest thinking”⁶ and other systems thinking strategies may empower people to recognize new approaches as they emerge and incorporate creative strategies into managing the resources under their control. For people to better understand how their food and farming choices lead to resilience or a brittle food system, they need facilitators who can help them think in terms of systems, and then share their understanding with one another through stories.

Part of the way that people deal with a complex world is through the creation of mental models. A mental model is a representation of the world that is developed through experience and observation, one’s association with others, and one’s values (Forrester 1971; Johnson-Laird and Byrne 2002). People develop mental models through their interpretation of real-world experiences, and these mental models become the basis of future decision-making and action.

Mental models are powerful mediators of information so that information contradictory to existing mental models is often ignored. Mental models are so resistant to new information that people will even engage in risky behaviors despite available information (Kempton & Falk, 2000). Story telling is one of the ways in which experiences and observations are translated into mental models and perhaps more importantly, one way for people to alter and adapt their mental models so that they align during periods of rapid change or stress. Storytelling and dialogue are ways that mental models are shared with others (Boal and Schultz 2007) and it is critical that people are exposed to a diversity of perspectives so that they gain a broad understanding of how the system works. Storytelling, therefore, can be a powerful tool in creating change through the development and sharing of mental models that incorporate desired values and actions.

In their chapter on narratives of nature and science in alternative farming networks, Lejano, Ingram and Ingram (2013) discuss how narrative has shaped and been shaped by the experience of many practitioners over generations. Farmers have reshaped the farming narrative away from a technical and simplified understanding of farming systems toward one based in ecological systems. Now we are doing the same with food systems – reshaping the narrative away from one that emphasizes quantity and simplified nutritional quality to food systems in a cultural context, as part of one’s personal narrative and relation to place and ecological and farming systems.

Civic engagement

Civic engagement, that is, organized voluntary activity focused on problem solving and helping others, is a critical next step in making our human activities resilient (Zukin et al. 2006), and necessary for civic engagement is a sense of community. Building a sense of community around food is a traditional activity, as people have shared food and stories around a table or fire for millennium. It is not enough that each individual explicitly understands their part in the food

⁶ Maani and Maharaj define “forest thinking” as seeing the “big picture”. Quoting Richmond (1997), “Forest thinking gives us the ability to rise above functional silos and view the system of relationships that link the component parts”

system: it is necessary to understand one another's needs and find ways to act in concert. This is especially true in the food system where there are layers of complexity, from differences in individual, regional and urban versus rural concerns, to unique perspectives based on the different roles that producers, processors, carriers, wholesale buyers, and consumers hold.

Civic engagement takes many different forms in addressing identified needs or issues. Voluntary professional activities, engaging and educating others, and working to address policy and structural issues of importance to a community are all examples of civic engagement. Civic engagement represents the intersection of individual mental models, a recognized problem (in this case, food system brittleness), and action to address the problem.

Why is it that some people are motivated to take civic action? Like most of human behavior, civic engagement is a multi-faceted combination of behavioral, cognitive, and socio-emotional constructs (Zaff et al. 2010). Motivation for civic engagement is complicated. Civic engagement requires not only resources (time, money, and skills), but also interest and ability to effectively address the problem at hand, which can be gained through education and experience (Gaeke 2009; Youniss et al. 1997). Kempton (1993) identified two common factors in motivating effective responses across a number of environmental issues: the combination of an appropriate mental model for understanding the issue and identifiable actions to address the issue. Family and social connections are also motivators confirmed by a number of studies (Zaff et al. 2010). In the case of food systems, the need for civic engagement is especially urgent so that populations and groups that are experiencing failures of our current food system are able to involve those who are not. For instance, system failures in transportation, food distribution, and farming, exacerbate food insecurity. Actors in all these systems may not realize how their choices are interacting to create these failures, but through sharing stories from their field of experience, may begin to understand how their actions have far reaching, unintentional consequences.

What emerges from the existing research is that social relationships, a sense of community, experiences in place, and the availability of identified pathways to take action are important criteria for people to engage with others to address broader civic concerns, such as those central to failures within the US food system. Storytelling is a strategy that integrates these factors. Communities that share narrative can extend and deepen democratic discourse especially as each actor relates to her/his environment. The process of developing a shared narrative may give room for people to break from convention and to creatively think through ill-defined, complex problems (Lejano et al. 2013, Moreau and Engeset, in press).

Storytelling and systemic change

The food economy is complex, dynamic, and self-organizing. It is a system of systems – natural and human systems intertwined and in tension with one another. Agricultural systems are dependent on natural systems of soil, water, climate, weather, landscape, and the biota. Moving food from the farm to table involves processing, transportation, markets, policies, culture. Living memory of Depression-era food insecurity is waning so that today, most Americans know only that we have an abundant, accessible food supply. We have moved from a nation of farmers to a nation of suburban workers, so how supply chains function to make food accessible is more complex than ever before and largely invisible. In our rural past, most people had some direct

experience growing and processing food but that is no longer the case. Food provisioning has evolved into a function of complex social organization where most citizens have no direct experience with production and supply chain activities.

Changing any system, the food system included, is difficult to plan through a public process because of its complexity. When conditions are favorable, complex systems can emerge through slow variables (Parsons 2007, Choi et al. 2001, Li et al 2006, Kim, et al. 2009). Because the food system is complex, change comes through stimulating an adaptive response from individuals – especially those invested in and dependent upon the current system – so that change occurs at the micro-level. The myriad small changes may then add up to macro-level change.

How can we empower people to address food system failures without undermining the parts of the system that work? To make effective changes from the bottom-up will require a broad range of individuals to consciously, explicitly engage in the systems that feed them and make short and long-range personal, political and economic choices that support and build more resilient food supply chains. Decision-making and action within food systems require strategies to help individuals identify their area of influence, navigate complexity and engage in our food economy in a way that is unique to their societal role, regional location, and community context.

Storytelling is a tool that helps individuals, organizations and other groups define their role in a complex system, create a personal narrative, and engage in ways that are consistent with their values and intentions (Dahlstrom 2014). When the story is about food, it adds an additional motivator to participate by encouraging people to explore their sense of place and belonging. Thinking about food sustainability links people to place as we better understand where our food is grown. When our food system story includes the people who grew the food (ourselves, if we have a garden or farm, or our neighbors or community partners if we buy at a farmers market or through a CSA, or “rock star” farmers known for their commitment to sustainability, or from agricultural workers on a plantation), we start to see the story narrative deepen from one of simply consuming food to a story that includes our relationship to our community and our community’s relationship to the land and other communities, near and far. These stories then help to develop social capacity that is necessary for food system resilience.

Personal storytelling can become a foundation for group story processes like scenario development, governance functions, and strategic planning that are necessary to optimize complex systems resiliency in the public sphere. Mental models that were tacit become explicit and then become intentional (Senge 1990). The storytelling process moves each individual from a greater self-awareness, to understanding and respecting others, to participating in a group that is creating its own story, its shared vision of the future. The individual has transformed from a consumer to a creator. This is effective civic engagement.

Educator and poet Clint Smith talks about the power of story and food narrative to change the way we eat and the way we talk, reminding us “Food and conversation are intrinsically linked”. He advises teachers to jettison one-dimensional narratives and encourage a complex social narrative about food, especially around what we are doing right. This becomes an exercise in self-awareness and self-definition and Smith uses it to empower and train students to become

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4 community organizers⁷. The focus on what we are doing right helps people to move from a
5 control approach to a creative approach guided by intention and vision.
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8 As food system failures increase, uncertainty also increases. Embedded in complexity theory,
9 Complex Adaptive Systems teachings assert that an adaptive response to change requires
10 maintaining a dynamic relationship between certainty and agreement. As uncertainty increases,
11 agreement within the system must also increase to maintain the ability to adapt to change. Rather
12 than pushing change through top-down purposeful design and emphasizing negative feedback as
13 a means to control the system, emergent systems rely on positive feedback and autonomous
14 action (Choi et al. 2001). We can all participate in the emergence of resilient food systems
15 through storytelling and civic engagement. Facilitating change through storytelling increases
16 agreement between actors. It encourages and rewards cooperation and collaboration along food
17 supply chains. Interventions that lower the risks associated with uncertainty (such as federal
18 commodity, conservation and water subsidies programs) are also necessary. To ensure these
19 interventions are system-appropriate, groups of people need to effectively tell their stories about
20 risk and systems volatility. Creating a space where people share their stories and listen to the
21 stories of others supports social cohesion and a sense of community. Creating a space for
22 divergent thinking and novel response enables unforeseeable innovation to occur and invests
23 participants in their own success and that of the larger group. The “adjacent possible” expands as
24 the group becomes larger, more diverse, more inclusive and more cohesive (Johnson 2010).
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30 Stories about effective strategies or behaviors and new visions or directions are effective ways to
31 create community change (Palacios et al. 2014; Solinger, Fox and Irani 2008). Storytelling
32 empowers people to act individually and collectively, and empowers individuals to make our
33 food system more resilient by building trust, leadership and networks of influence. Gathering,
34 documenting and sharing stories offers opportunities for people to identify and create resilient
35 food systems. In addition, personal storytelling (and listening) builds the skills necessary for
36 effective civic engagement on complex issues that scientists, teachers and other professionals
37 address. This method is a low-cost and high-impact approach to interdisciplinary learning for
38 learners of any age.
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41 42 **Creating a stronger food system through story: Examples** 43

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45 The examples below are **not research** on storytelling, but rather illustrate how storytelling
46 methods may be applied in educational and participatory research settings to advance our
47 thinking about and spark adaptation to rapid change in complex systems, and food systems
48 resilience specifically. The first author directly engaged in each of these efforts and is telling her
49 first-hand account, her personal narrative of each example. In the first case educators worked
50 with farm children ages 8-12 to articulate their thoughts about ethics in agriculture. This example
51 shows how mental models are in place at an early age and are made explicit through sharing
52 story. The next two examples are with food system business leaders and show how a small start
53 can expand and develop over time to address an increasingly complex understanding of “the
54 whole under management”. The second example is about a group of farmers who came together
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58 ⁷ Clint Smith teaches English at Parkdale High School, in Prince George County, MD. He was recently profiled as
59 one of the top 50 educators in the nation, and is the founder of Parkdale Students for Social Justice. See his TED talk
60 at <http://youtu.be/QixDnLzXpuU>
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with a common goal – to reduce pesticide risk in apple production -- and then accomplished an even bigger shared goal -- to rejuvenate regional fruit production. In this case, farmers are improving orchard management directly, engaging allied professionals through story and science, and then engaging in civic process to make a more resilient agriculture. The third case is the on-going effort to make our food system more resilient by developing regional food supply chains in the Upper Midwest. Apple growers from the second case sparked this broader regional work, and facilitators soon realized the need for conversation around regional supply chains was something shared by fruit, nut and vegetable farmers throughout the region.

In each situation, participants (including researchers and agency allies) came to the storytelling experience with their own mental models that helped them to understand and explain their connection to the food system. As participants shared their stories and listened to the stories of others, they discovered that they were free to engage in divergent thinking with one another. In the process, they developed a shared mental model that was more complex than their original model and formed the basis for civic engagement. This ultimately changed their personal relationship to the food system and increased resilience as they applied their greater understanding to the activities and resources under their daily control.

We developed this approach as part of a commitment to participatory research in sustainable agriculture and food systems. As researchers we conducted research off-farm and then worked one-on-one with farmers. This process yielded slow change toward more sustainable farming systems. Farmers were ready to move faster and many were moving forward without research support (or in spite of it). Through our participation as researchers and facilitators in farmer networks, we realized that farmers learned and adapted quickly by sharing stories and showing each other their farms and adaptations. As researchers working alongside farmers, we could help diagnose system challenges and opportunities that benefited from more traditional research methods. We are also able to formulate research questions that are of practical significance to farmers and other actors in their effort to create more resilient food supply chains.

A key challenge in this work has been adequate support to provide facilitation. It takes time and attention to build the necessary relationships to organize people and move ideas forward. This work is best done in the community where the change is to take place. In the case of farmers, work needs to happen in their farming communities. In the case of supply chains, this may mean field research must take place in market or production centers, hosted by local actors. For the effort to be successful, community actors must be recognized as industry leaders, so leadership development also plays a central role. While participatory research is widely practiced and better understood in an international agricultural and health context, facilitation work is largely taken for granted in the United States.

Another core activity in our participatory research approach is to identify the “whole under management”. This strategy is central to Holistic Resource Management, a practice that innovative farmers were applying to their farm operations since the late 1980s, and conceptualized by Alan Savory (1988). As our work with apple growers progressed at the farm level, our farmer/researcher team could see value in civic engagement to shape federal conservation programs to serve apple growers – the “whole” under management included government programs. We also extended this concept to food systems, bringing entire supply

chains together to share their experiences, as discussed in the third case study. Although consumer demand for food from resilient food systems is critical in our market economy, it is not enough. It is food system “actors” – people whose livelihoods are tied to raising, processing, transporting, and marketing food – who are in a position to make small, incremental, and in the aggregate, highly significant steps toward food system resiliency. Supporting them in this process is critical. It is from their actions that food system resiliency may emerge.

Educators facilitating student storytelling to develop civic engagement skills: Engaging children in discussions about agricultural ethics

Farm children typically work on the farm all summer, so in 1951, a progressive farm organization decided that they would host a summer camp for their member-families so that their children could learn leadership skills and have a bit of summer fun, like urban children. One such leadership exercise, first attempted in the 1990s, was to engage almost seventy campers, mostly farm children ages 8-12, in discussions around agricultural ethics. Essentially, we were asking them to make explicit the mental models about farming and food that they had learned from their family and community and that they had developed from their own experience. To build community leadership, the lead teacher worked with camp councilors to develop and facilitate the ethics exercise. Once the general structure was developed, the facilitators identified ethical issues for discussion. These included questions such as “What rights do farm animals have?”; “Should corporations own seeds?”; “Should it be legal to breed seeds and animals by swapping genes in a laboratory? What about putting animal genes into plants, or fish genes into chickens?”; “Who should own farmland? How much should farmers and farm workers be paid to raise food?”; and “Should the US provide health care for all citizens, like they do in other countries? What would that mean for your family and community?”.

Councilors divided the children into groups of six or seven, resulting in ten groups, each facilitated by a councilor. A camper from each group drew a slip of paper with questions on it. The councilor started the discussion and kept it on track. In planning the exercise, there was concern that children would drift off or goof off, but the opposite happened. For the most part, they listened to each other. The children could tell that these were serious issues and they engaged each other respectfully as each child gave her or his opinion about the question and why they thought as they did. Councilors prompted participation early on, but soon campers were prompting each other to go deeper into their thinking.

With fifteen minutes left to discuss the question before them, facilitators directed their group to choose a spokesperson to share the high points of their discussion with the other groups, which allowed children to take leadership. The lead teacher then convened a plenary report-back session where groups shared their thinking and synthesized their findings. Sometimes councilors and the lead teacher prompted groups to think even deeper about the ramifications of their experience and opinions. As had happened in the breakout groups, campers modeled the facilitation of the teacher and councilors. Spokespeople were encouraged to share minority opinions, points of contention and agreement. The afternoon passed quickly. Councilors observed that the children left the session feeling heard about their personal experience. In subsequent activities, such as drama skit development, councilors noted that the children continued to discuss ethics and developed story lines for their skits based on areas of agreement.

One courageous conversation was on animal welfare. It was courageous because participants brought to the discussion different experiences and mental models in conflict. They felt strongly about animal welfare, and yet were asked to voice disagreement respectfully. Most of the children were growing up on farms where animals were part of the farming system. They also had farm pets, such as dogs, cats, or maybe a calf that they hand-fed. They participated in their county Extension's 4-H youth program where they learned to raise animals to show at the county fair for judging competitions. Many fished and hunted deer for family consumption and some participated in on-farm slaughter. Children shared stories of tenderness and concern for their animals, and also shared stories about the poignancy of killing animals for food. Some talked about how they made decisions about what they would eat (yes to chicken, no to their pet meat rabbit; yes to animals they raised, no to meat from the supermarket). There were a couple of children who had chosen to eat a vegetarian diet. One child explained that she couldn't kill an animal to eat it, so she didn't feel right eating meat. For her it was a matter of personal integrity. There was a heated discussion about whether it was fair to other people in the world to eat meat, since raising animals meant that food people could consume was eaten by the animals. A couple of the children talked about how their farms weren't good for raising human food but that they could grow pasture for their animals and that grass-fed meat and dairy was good food for colder climates. Children started to understand that farming is a place-based activity and that their farm may not be able to feed people in other countries and that there may be other solutions to hunger in other parts of the world. The discussion turned to an animal's quality of life and how different animals needed different kinds of care to be happy. For instance, beef cattle liked to be outside most of the time, but their observation was that dairy cattle liked more care. Most of the children came from small to mid-size farms, but a few came from large CAFO farms⁸. The children avoided taking on the issue of farm size, perhaps because there wasn't enough time to explore differences of perspective.

Campers brought up the "feed the world" narrative in another conversation about Genetically Modified Organisms (GMOs). For the most part, "GMO" was not part of the campers' lexicon. The discussion started out with the idea of mixing animal genes into plants. The group expressed concern about crossing boundaries between different organisms, and some had religious arguments for their concern, for instance "God didn't set things up like that. Why do we think it is okay?". There was one camper who defended GMOs and needed to bring others up-to-speed by providing a definition of the term. His family planted GMO corn and he articulated some real advantages to it, including that it was a way to feed people in poorer countries. His take was that until disadvantages could be proven to him, this was a new technology that made sense for his farm and the world. A couple of the children in this group were from farms that grazed their animals instead of growing row crops and they asked about other issues in raising corn such as soil erosion and government payments.

This age group was beginning to explore farming in the larger context of environmental and economic systems. It was heartening for those of us leading the session to hear them learn as a group, respect their individual expertise and experience, and also to respectfully challenge each other on dogmatic positions. Councilors reported a positive impact on later activities at camp.

⁸ CAFO stands for Confined Animal Feeding Operation, where large numbers of livestock are crowded into a confined space. This livestock management approach results in the need to manage manure to protect water quality and public health. Most CAFOs are subject to regulation under the federal Clean Water Act.

While there was no follow-up with this group to see how the session impacted their thinking about or action within food systems and agriculture later in life, the organization as a whole continues to engage its members and others on these issues through newsletters, workshops and legislation and offers regular opportunities for civic engagement throughout the state.

Researchers facilitating participatory action research through shared mental models: Upper Mississippi Valley eco-apple production

A chance meeting outside a conference plenary was all it took to spark a group of farmers to build a more resilient food system by reinvigorating commercial apple production in the Upper Mississippi region. But it took more than a brief encounter in 2000 to build and sustain the program over fifteen years and counting. That casual hallway conversation about reducing pesticides through better field management led to a presentation a few months later with the grower organization board of directors, and then numerous one-on-one meetings with researchers, Extension faculty, and farmers to build a participatory research team.

For the most part, the fledgling team knew each other and had already developed working relationships. The idea of working on a project to improve orchard management skills appealed to them. Farmers had heard large commercial growers talk about the benefits of Integrated Pest Management (IPM) – how they could save money and reduce pesticide risk. IPM would make their farms more profitable and reduce the impact of pesticides on the environment. It would also allay consumer concerns about pesticide overuse. Faculty presentations and trade magazines reinforced these grower stories with science and marketing context. It just wasn't clear to many of the growers how to apply IPM in their specific orchards, especially given that larger farmers were working at a scale unsuitable for small to mid-size orchards. There was real interest in moving forward together, so the University of Wisconsin Center for Integrated Agricultural Systems stepped up and convened interested farmers and researchers to articulate shared goals and methods to measure progress. Getting farmers, researchers, and other agricultural professionals acquainted and aligned took two years and volunteer time on the part of many. This was the first step the group took to articulating their intentions and developing a “can-do” shared mental model.

In 2002, the Center secured seed funding from the US Environmental Protection Agency (EPA) to help 13 growers organize into two farmer networks. EPA had a vested interest in pesticide risk reduction, too, and they had resources to support our efforts. The two farmer networks met regularly to share their personal observations with each other, and saw immediate results. The network meetings created space for them to tell their story about what was happening on their farm and share it with their peers. In early meetings, farmers shared stories of their frustration in applying IPM theory to their specific orchard. In the process of group storytelling, a pattern emerged.

Farmers started to learn from one another about managing the complexities of raising apples with fewer pesticides. Each farmer had specific observations about their orchard – how pest populations rise and fall, how different weather conditions affected different varieties and different orchards on different topographies, for example. By putting these stories together we

could start to see patterns that pointed to opportunities and barriers to achieving our shared goals of reducing pesticide risk.

Farmers were interested to know what kind of risk and what intensity of risk specific pesticides posed to their business. Rather than develop an overall risk score, Extension scientists – an entomologist, plant pathologist, horticulturist – and an agricultural economist consulting for NGOs, worked together with the rest of the team to give pesticides separate scores for acute health risk, chronic health risk and environmental risk. Scientists also developed an overall IPM assessment so that farmers could see the full range of pest management options available to them and monitor their improvement over time. Taken together, the risk score and the IPM score provided a way for farmers to measure continual improvement and to fuel change through friendly competition for the best score. Farmers used these self-assessment tools to establish their baseline before the start of the first field season, and from then on to monitor progress.

After the first year of the project, CIAS brought all the participating farmers together for an all day meeting where they shared what worked and what didn't. Farmers shared their struggles in keeping pesticide use records that could be used to make better management decisions. To reduce pesticide risk, they needed real-time advice about whether or not to control common pests, to validate their read of pest pressure data, to mitigate the risk of not controlling pests. They needed advice so they could purchase pesticides in December for use during the pest control season from April to August. In short order, each network independently developed similar narratives about what they needed to reach their business and environmental goals and the groups reported that the general IPM information now had greater relevance to their orchard businesses.

Growers were asked to lead the project: What could CIAS do to support their work toward orchards that were economically vibrant, environmentally sensitive and in touch with consumers? One of the first patterns to emerge was that all the farmers had some needs in common that had to be met if they were to reach their goal of reduced pesticide risk. Each orchard needed insect traps and weather monitors so that farmers could collect better data on orchard conditions. They were hesitant to invest in these tools since they didn't know where to place them, how to organize the information and then use it to make management decisions. To make sense of this data, they also needed site-specific coaching from the state's only private crop consultant for apples. The Center went to EPA for funding to meet these needs, at least for the first year. In return, EPA wanted to see pesticide risk reduction quantified.

By 2004, apple growers could show positive movement toward pesticide risk reduction for most of their orchards. They kept track of their pesticide use and self-assessed their use of IPM strategies. After two years of field data, farmers measured an average 58% risk reduction and 17% increase in IPM use. We saw friendly competition develop between farmers as they compared scores and discussed plans for future reduction. In subsequent yearly meetings, farmers would talk about how little pesticide they used and how much money it saved them. They also told stories about choosing not to control insects and then sweating it out, not sure if they had made the right choice or not. As individual farmers shared their observations, doubts, and outcomes, it was apparent that they shared experiences in adopting these new management approaches, and a way forward emerged.

There were now thirty orchards engaged in the project, divided into five networks around the state. This pushed the limits of the project's resources. At an annual meeting, farmers identified coaching resources as the primary project limitation, so project staff organized a series of trainings to encourage agricultural professionals to fill this role. We built coaching capacity through a series of trainings for farmers and other agricultural professionals in 2005 and again in 2010.

At this point in the project, farmers began to engage in proactive civic change. One of the ideas that emerged from the yearly meeting was to shape federal conservation programs so that they would address orchard-specific concerns. The current programs were targeted at annual crop and livestock farmers involved with federal commodity programs and didn't sync with the challenges and needs of perennial crop farmers, or with farmers growing food for regional markets. Making the proposed changes would provide incentives for apple growers to use IPM and help defray the costs and reduce the risks associated with IPM. CIAS organized a working group comprised of farmer-leaders in the project to tell their IPM adoption and pesticide risk reduction stories to the state USDA-Natural Resource Conservation Service. The result was that the state, and later other states, changed their policy to include fruit, and later vegetable, producers. This dramatically increased the number of apple growers using IPM and created more demand for coaching services.

Another successful innovation was to establish a weekly conference call between the coach and growers during the pest management season so that the coach could minimize time on the road and maximize connection with the growers. These calls are not one-way practical advice from the coach. Instead, they are an opportunity for growers to share their orchard experiences. The coach facilitates the discussion and is available to answer or further investigate technical questions, as needed. Storytelling through this regular conference call continues today as a key resource for farmers engaged in managing their complex orchard systems.

The yearly "All Networks" meeting emerged as a key project function. Farmers from different regions have a place to share observations and experiences and think together. The first section of the meeting agenda is simply a reporting from farmers in each network about the past growing season. Farmers from each region share their individual stories and start to see similarities first within a region and then between regions, as other regions report out. Patterns begin to emerge about what is working, and what is not. CIAS staff facilitated the meetings and encouraged growers to elaborate their experiences and find the emerging patterns. At the end of the meeting CIAS staff would summarize the issues that had emerged and possible actions that staff and faculty could take to support growers. As an example, keeping track of pesticide use helped growers see where they could cut back. It also helped many of them see they needed to pay more attention to how they were applying pesticides so that they could cut back even further. In response, the Center staff sought and acquired funds for field training on pesticide application technology, and to organize a number of workshops on pesticide application. Experts from other states, where the apple industry is stronger and more public money is spent to support the industry, taught hands-on field sessions on pesticide application methods. Growers helped to develop and are now engaged in a record-keeping effort that is linked with a regional label and packinghouses that market local IPM apples grown for wholesale market.

At the yearly meetings, participants begin to articulate a revised set of needs and goals that is especially useful to researchers and other agricultural professionals in developing their work plans. While the early meetings featured IPM stories, subsequent meetings discussed ways for farmers to market their apples with the orchard story attached to the product, soil quality and its impact on tree health, the basics of tree physiology, tree variety options and how different varieties fare in different contexts, adaptation to extreme weather, and labor issues in a fair trade context. This brought home the need for greater public support for local fruit production and the group actively sought out expertise from academics, supply chain partners, and farmers from other regions to further expand their mental models.

A critical conversation around organic apple production was eight years in the making. Early in the program, commercial orchardists held the perspective that organic orchardists were simply not controlling pests. In their view, organic growers were undermining their pest control efforts in commercial orchards, making it harder for them to keep their pests under control. After the first couple of years of intensive data collection and management, conventional growers were more empowered as active orchard managers, and spent less time looking for risk factors out of their control. The group also attracted some organic orchardists to the program who shared their interest in IPM. The organic orchardists shared stories about “the whole under management”; the challenge of managing data to make control decisions, the different approaches they took to managing pests, how they focused on soil health so that their trees would be healthy, and how they developed a marketing plan that didn’t require 90%+ fresh pack out, but rather relied on processing – hard cider, cider for vinegar, baked goods – and agri-tourism for profitability of the entire operation. The conventional growers were respectful of these different opinions and started to show interest in how organic growers produced apples. Then, one of the farmer-leaders in applying IPM announced he was transitioning his entire orchard to organic. The conventional growers took notice. Within a few years, conventional growers told stories of how close to organic production they were and how they wanted coaching to explore what it might mean for them to go organic.

In 2012, disaster hit orchardists east of the Mississippi River. Extreme weather devastated orchards from Wisconsin to New York, altering supply chain relationships between orchards and clients. East of the Mississippi, New York and Michigan are the top apple producers. In 2012, New York growers reported a 41% reduction in the crop, and Michigan had its worst year ever, with a 90% loss. Wisconsin reported its lowest production since 1945, with a 54% crop loss.

At the 2012 All Networks meeting, participants were stunned by the widespread loss. Growers were uncertain what had happened. The first thought from the group was that an unusually warm week in March, followed by a cold snap had damaged the fruit. One of the growers then shared his observation that many of the flowers he saw were sterile. He thought that the extremely cold January temperatures had damaged dormant flowers so that when extremely warm March days brought on an early bloom, the flowers were sterile. Others thought that maybe the early bloom meant that native pollinators had not emerged and they weren’t prepared to bring in honeybees for pollination. This theory meant that they missed the short window when pollination needs to occur. The group realized that if they were going to be able to manage their orchards during times of extreme weather, to bounce back and be more resilient, they needed to have a better idea

of the basic physiology of their trees, and of agroforestry systems in general. Their stories had elicited an adaptive response.

Another set of stories after the 2012 loss revolved around the health of the business relationships between orchardists in the Upper Midwest and between different apple production regions. Not every orchard in the Upper Midwest was hit hard by the volatile weather. Some had good crops, and those that did had a competitive advantage. Orchards that worked together regionally continued to do so through the bad times. In some instances the tables had turned between who had supply and who needed product. Wisconsin orchards that usually purchased apples from Michigan orchards to supplement their supply for on-farm sale found themselves fielding requests from Michigan and New York growers who were short on product. Generally, orchards that had a strong, positive working relationship before the crop failure worked together to support each other. Those that had weak or neutral relationships were on their own. In this example, the community pulled together to adapt to rapid change.

The harvest of 2013 was overwhelming. Some thought that the poor year previously stimulated the tree's natural tendency to bear fruit every other year. Trees were loaded with fruit to be picked. The only problem was who was going to pick it? At the All Networks meeting, farmers shared stories about labor concerns. The orchard packing house has looked at the labor issue for many years, and is developing a fair trade approach so that their seasonal workers are rewarded for their efforts and take a personal stake in the business' success. The growers attempted to organize shared labor crews for the orchards that shared the packing house, but when migrant pickers were offered more money from orchardists in Michigan, they stayed in Michigan. One farmer had made arrangements with a near-by prison for work release inmates to assist. Others were hoping for seasonal labor to come from their communities, but were disappointed. These stories were echoed in grower magazines and are part of the larger national conversations around immigration and prison reform, urbanization, and economic opportunity. The need for fair trade, especially where farm labor is concerned, spans multiple farm types and generations. Researchers at the table could articulate researchable questions and are actively developing a research agenda, based on these conversations, and that of other mid-scale farmers.

In creating multiple opportunities for farmers to tell their personal stories and share on-farm observations, the Center facilitated the development of a shared mental model about regional apple production. Early discussions set the stage for stakeholders to develop a more rigorous way to collect data and analyze it to make decisions and measure improvement. We quickly moved to a deeper understanding of the challenges and opportunities that the industry faces in the Upper Midwest and were able to develop strategic, leveraged responses to support local fruit production. This "story" is continually evolving: orchardists are stepping up efforts to better understand tree physiology, to protect against extreme weather, to broaden their supply chains into webs, to anticipate labor challenges and opportunities.

Researchers facilitating the development of shared mental models: (Re)creating a regional food system

Over the last several decades the structure of our food system has changed dramatically - from one where many people lived and worked on family-owned farms that both fed the family and produced a commodity for sale, to a system where a few large farms organized as corporations

produce most of the food for people living in metro regions. While this approach to food has resulted in abundant and affordable food for many, this system is increasingly unstable. Still, there are some parts of the country that have retained their rural flavor, and one of them is the Driftless Region – an unglaciated, agricultural region along the Mississippi River in parts of four states wedged in-between the Chicago-Milwaukee metro region and Minneapolis-St. Paul.

In our work with the apple growers, we realized that while many of us function within the boundaries of the state, farmers work within production regions. The “marginal farmland” of the Driftless can also be described as a rolling landscape, and is especially well-suited to perennial crops such as apples, wine grapes, nuts, and grazed livestock. It is also home to a large number of organic farmers and their marketing cooperative, Organic Valley. Farmers are growing apples in the four-state region and packing apples in Minnesota under a regional label. These growers talked about transportation challenges for a “cold chain”⁹, especially moving apples the “first mile” to the packinghouse, and then moving product to market, especially Chicago. We heard similar stories of transportation challenges from regional farmers growing other products, too.

Many of the farmers in the Driftless sell product into the Minneapolis metro region, and into Madison, WI. As interest in local, sustainable food has grown, so too have the number of farmers interested in selling their food into the wholesale market. These farmers are looking for food supply chain partners – processors, trucking companies, wholesale buyers - who share their values on sustainability, fair trade, and animal welfare, and who can help them get their food to regional markets. Their stories about how they grow food add value to their products. As the supply chain lengthens and more partners are involved, it becomes harder to keep the product story attached to the product. In their mind, these farmers want supply chain partners who also have a story that values sustainable practices so that the sustainability narrative is amplified in the market place.

In 2013, with support from the United States Department of Agriculture’s Agricultural Marketing Service, businesses interested in developing these value-added supply chains came together in the Driftless to swap stories and strengthen business relationships. The purpose of the meeting was to create a space where supply chain participants could make their stories explicit and reach a higher level of agreement so that regional supply chains would be stronger.

CIAS staff identified leaders in regional food wholesale supply chains and invited them to tell the story of their business – what was working and what challenges they faced. This was similar to what we had done previously with apple growers. The difference here was that the “whole under management” was regional supply chains of independent businesses – the farm, the processor, the transportation company, the wholesale buyer. The supply chains were formed to meet consumer and the broader public interest. Another difference with the eco-apple project was that we didn’t build a peer network in advance of the meeting. Instead, we sought to understand existing business relationships and build on them. This wasn’t a preferred approach, but a practical one given the resources available.

The agenda for the event emphasized storytelling. Three panels – one each for farmers, distributors and wholesale buyers to tell their stories – were followed by lengthy roundtable discussions about personal experiences related to the panel presentations. Each roundtable had a

⁹ “cold chain” refers to a temperature-controlled supply chain from grower to consumer.

facilitator and note taker. Breaks were longer than average to allow for networking. The evening plenary speaker was a representative from the grocer's association who talked about market demand. His talk was preceded by a lively, informal gathering in the lobby, where appetizers and a cash bar brought people together. Groups self-organized to continue discussion over dinner at pre-determined restaurants where we made reservations for ten people each. The second day featured summary discussions, where academics reported the main themes they heard and potential next steps to address challenges in developing a more resilient regional food system. This was followed by a lively plenary discussion.

Participants reported that the meeting was highly successful. It provided an unusual opportunity for food system actors to share their stories and listen to the full range of concerns along the supply chain. Meeting evaluations indicated that it was a valuable business networking opportunity above all else. Participants began to reach agreement around some key conversations about local food.

- What do consumers want? Participants began to agree that “local” means many different things to people, including “sustainability”, “authentic”, “fresh”, “healthy”, “fair trade”, “community”, “organic”, “grass fed”, “stewardship”, among others.
- Why are markets for sustainable, local products different in different cities? Participants began to see that it would help supply chain development to better understand why the Minneapolis metro area is more receptive to regional food than is the Chicago metro region.
- How is the market structured? Understanding the wholesale market from a distributor point of view helped farmers understand how they may want to choose supply chain partners who could help them grow their business.
- What does the regional food supply chain look like? Participants heard stories of successful product aggregation at the farmer-end of the supply chain, and heard a lot of unresolved challenges at the consumer-end of the supply chain.
- How are supply chain relationships developed? Logistics emerged as a key leverage point in making regional supply chains more economical.
- What does a “green transportation system look like?” Discussion included concerns about fuel costs, highway congestion, labor challenges with the current system and some discussion about multi-modal transportation options for food freight.

These conversations have set the stage for subsequent research and helped build new partnerships with businesses and organizations that can contribute to the process of building a resilient regional food system. In 2014, three separate business-oriented events organized independently to develop regional food supply chains for Upper Midwest markets. Each featured discussion around the importance of the product's story, logistics and transportation, and trust and transparency along the supply chain.

In 2015 at least three separate projects on regional food freight are underway in three distinct regions of the country, including one in the Upper Midwest. This CIAS project is looking at transportation opportunities for regional food freight in the Chicago metro region, improved distribution to meet public goals, and “first mile” cooperative logistics for fruits and vegetables. This project has an advisory group of twelve stakeholders and engages eight researchers on the Madison campus. Our preliminary work has been featured on the podcast “How Great Cities Are

Fed”, and is part of a newly awarded multi-county federal designation naming the region a local food manufacturing district. This designation marks the beginning of civic engagement for the project and we hope will propel the process forward into the next stage of development.

Conclusion: Food system storytelling

In the examples provided, CIAS played critical roles in facilitating and contributing to the development of shared stories. These shared stories then elicited an adaptive response from people engaged in food systems work, including the research and policy communities. In the apple case, farmers improved their management systems so that locally-grown apples were more available and were grown in a way that was more environmentally-friendly. They formulated research questions and engaged purposefully with scientists to reach their business goals, measure their progress, and better understand the ecology of fruit production. Apple growers initiated changes in federal conservation programs to serve them better, and in the process helped fruit and vegetable growers in other states to realize the same benefits. The project helped farmers to self-organize and develop adaptive strategies that enhanced the resilience and sustainability of the food system. Farmers continue to meet and work together on building resilience in the face of growing uncertainty from climate change, learning from the stories of others and sharing their experience with beginning farmers.

On-going research and facilitation on regional food supply chains is a direct outgrowth of the work with apple growers and is still in its early stage of development. CIAS again plays the facilitator role, creating space for story telling where people engaged in supply chains are encouraged to share their experience and observations, and researchers participate as translators and articulate the emerging patterns and shared mental models.

Teachers and scientists may function in a number of roles to help people be more conscious of their part in the food system. They can act as conversation facilitators and stimulate engagement in citizen forums. They may provide structure to investigative observation activities, and provide insight into other, more rigorous, modeling approaches that require specific types of observations and data collection to discern patterns, as scientists did in the apple case. They may serve as professional resources to learners at any age, helping people to observe, identify and question assumptions, and engage their curiosity about how human and natural systems interact. Scientists and teachers may mentor others in critical thinking and the scientific process. Scientists may also assist with teaching the basics of systems design as people share their stories about food. Scientists and teachers may show how information flows through systems, share what is known about system archetypes, and leverage points, and articulate how systems adapt to changing circumstances. Storytelling may help scientists to better understand citizen actors and may shape the questions scientists address.

Environmental scientists may play a role in facilitating and stimulating storytelling between different disciplines and professional stakeholders, with benefits for their research programs. The interplay between disciplines and stakeholders is simply another dimension of field research where human systems interface with the natural world. This sort of participatory action research, while less focused than other types of field research, holds promise for more engaged stakeholders who connect directly to the science and can take scientific findings into their work in the world. It shifts the focus from formalized “outreach” to creating learning organizations in communities of geography and practice. It builds stakeholder leadership development into the

project as a deliverable, so that the project continues long after project funding is gone. It also connects the research community to complex, real-world challenges, where research is critical to creating resilient communities.

Everyone has a story to tell, a story about our personal relationship to food. These stories reflect our cultural heritage, personal experiences, observations, preferences, and values passed down from our ancestors and formed casually through social interaction. The stories also reflect the ways individuals and groups are engaging in civic actions to enhance the resilience of food systems in their places of work and community. Bringing people together to tell their stories about food is a low-cost and highly effective way to support people in self-reflection around food and to engage them in civic dialogue around a lynchpin issue in creating more resilient communities. This dialogue leads to deeper understanding of the issues at hand and helps to build social capacity for resilience. And while hard facts may be useful at certain points in the discussion, the stories shared and created as a group form the core motivation for change.

References

- Bloom J, Martin WE Jr (2013) *Black against empire: The history and politics of the Black Panther Party*. University of California Press, Berkeley
- Boal KB, Schultz, PL (2007) Storytelling, time, and evolution: The role of strategic leadership in complex adaptive systems. *The Leadership Quarterly* 18:411–428. doi:10.1016/j.leaqua.2007.04.008
- Choi T, Dooley K, Rungtusanatham M (2001) Supply networks and complex adaptive systems: Control versus emergence. *Journal of Operations Management* 19:351-366
- Dahlstrom MF (2014) Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences* 11(4): 13614-13620. doi: 10.1073/pnas.1320645111
- Damasio A (2010) *Self comes to mind constructing the conscious brain*. Vintage, New York
- Dwiartama A (2014) Investigating resilience of agriculture and food systems: insights from two theories and two case studies. Dissertation, University of Otago. Retrieved from <http://hdl.handle.net/10523/4884>
- Forrester JW (1971) Counterintuitive behavior of social systems. *Technology Review* 73(3):52-68. Retrieved from <http://journals.issn.org/index.php/proceedings56th/article/viewFile/1963/654>
- Gaeke MA (2009) Exploring student motivations toward civic engagement: An application of expectancy-value theory. Dissertation, University of Southern California. Retrieved from ProQuest (3355336)
- Johnson S (2010) *Where good ideas come from*. Riverhead, New York
- Johnson-Laird PN, Byrne RMJ (2002) Conditionals: A theory of meaning, pragmatics, and inference. *Psychological Review* 109(4):646-678. doi:10.1037//0033-295X.109.4.646
- Kempton W (1993) Will public environmental concern lead to action on global warming? *Annual Review of Energy and the Environment* 18:217-245 doi:10.1146/annurev.eg.18.110193.001245
- Kempton W, Falk J (2000) Cultural models of Pfiesteria: Toward cultivating more appropriate risk perceptions. *Coast Management* 28:273-285. doi:10.1080/08920750050133548
- Kim Y, Choi T, Yan T, Dooley K (2009) Structural investigation of supply networks: A social network analysis approach. *Journal of Operations Management* 29:194-211. doi:10.1016/j.jom.2010.11.001
- Kolb DA, Fry R (1975) Toward an applied theory of experiential learning. In: Cooper C (ed) *Theories of group process*. John Wiley, London, pp 33-57
- Lejano R, Ingram M, Ingram, H (2013) *The power of narrative in environmental networks*. MIT Press, Cambridge, MA
- Li G, Yang H, Sun L, Ji P, Feng L (2006) The evolutionary complexity of complex adaptive supply networks: A simulation and case study. *International Journal of Production Economics* 124:310-330. doi:10.1016/j.ijpe.2009.11.027
- Maani K, Maharaj V (2004) Links between systems thinking and complex decision making. *System Dynamics Review* 20(1):21-48. doi:10.1002/sdr.281
- Moreau CP, Engeset MG (in press) The downstream consequences of problem-solving mindsets: How playing with Legos influences creativity. *Journal of Marketing Research*. Doi: <http://dx.doi.org/10.1509/jmr.13.0499>
- Miller M, Anderson M, Francis C, Kruger C, Barford C, Park J, McCown B (2013) Critical research needs for successful food systems adaptation to climate change. *Journal of*

- Agriculture, Food Systems, and Community Development 3(4): 161–175.
<http://dx.doi.org/10.5304/jafscd.2013.034.016>
- Parsons BA (2007) The state of methods and tools for social systems change. *American Journal of Community Psychology* 39:405-409. doi: 10.1007/s10464-007-9118-z
- Palacios JF, Salem B, Hodge FS, Albarrán CR, Anaebere A, Hayes-Bautista TM (2014) Storytelling a qualitative tool to promote health among vulnerable populations. *Journal of Transcultural Nursing* May 2014:1-8 doi:1043659614524253.
- Richmond B (1997) Forest thinking. *The Systems Thinker* 8(10): 6–7
- Savory A (1988) *Holistic resource management*. Island Press, Washington, DC
- Senge P (1990) *The fifth discipline*. Doubleday, New York
- Solinger R, Fox M, Irani K (eds) (2008) *Telling stories to change the world*. Routledge, New York
- Soul ME (1988) Mind in the biosphere; Mind of the biosphere. In: Wilson EO (ed), *Biodiversity*. National Academy Press, Washington, pp 465-469
- Treffinger DJ, Isaksen SG (2005) Creative problem solving: The history, development, and implications for gifted education and talent development. *Gifted Child Quarterly* 49(4):342-353. doi:10.1177/001698620504900407
- Walker B, Salt D (2006) *Resilience thinking: Sustaining ecosystems and people in a changing world*. Island Press, Washington, DC
- Wyer RS Jr (ed) (2014) *Knowledge and memory: The real story: Advances in social cognition (Vol. 8)*. Psychology Press, New York
- Youniss J, McLellan J, Yates M (1997) What we know about engendering civic identity. *American Behavioral Scientist* 40: 620-631. Retrieved from http://crcresearch.org/forum_archive/files-crcresearch/file/youniss_97.pdf
- Zaff J, Boyd M, Li Y, Lerner JV, Lerner RM (2010) Active and engaged citizenship: Multi-group and longitudinal factorial analysis of an integrated construct of civic engagement. *J Youth and Adolescence* 39(7): 736-750
- Zukin C, Keeter S, Andolina M, Jenkins K, Delli Carpini MX (2006) *A new engagement: Political participation, civic life, and the changing American citizen*. Oxford University Press, New York