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Teaching Systems Thinking Through Food

Brooke Chornyak

Virginia Commonwealth University;
bchornyak@vcu.edu

Abstract: *This paper presents a case study of a junior level design studio where food is an entry into systems thinking. In the design classroom, food systems are a familiar and inclusive concept that provides a set of conditions that require students to integrate social, economic and environmental phenomena into comprehensive solutions. Consequently, the study of food as a design problem can extend beyond a basic identification of nutrition and personal preferences of taste and flavor into inquiries on accessibility, environmental sustainability, and political power. Graphic design has traditionally defined and understood the term “systems” as visual communication structures. However, today’s complex problems need designers to employ a more comprehensive and shared understanding of systems thinking for multidisciplinary work environments. At the semester’s end, students gained an understanding of the local, national and global food system they are a part of through research methods such as concept mapping, field research, ethnographic studies, and written critical evaluations to name a few. Working with complex problems for the students reinforces the necessity for design practitioners to be skilled in systems thinking, and further substantiates the need for a multi-disciplinary collaborative approach that is research oriented.*

Keywords: *systems thinking, food, graphic design, education*

Learning Within Complex Systems

This paper presents a case study on a Graphic Design studio class, which learns to comprehend and design within complex systems through the topic of food. For students to understand a complex system they study and learn how relationships between parts give rise to the collective behaviors of a system, and how the system interacts and forms relationships with its environment (Bar-Yam, 2002, p.2). Design educators are in powerful positions to provide learning environments that privilege problem solving that involves complex systems over simplistic ones. Modern problems, for example, a healthy and sustainable food system, involve economic, political and environmental factors that are more complex rather than complicated (Brown, Harris, & Russell, 2010). The complexities are a result of each problem's unique circumstances, the innumerable possible solutions, changing individual values, and mindsets. In the classroom these conditions that require systems thinking can help prepare students to address our current and emerging global challenges.

Sustenance is not only a common need for survival but also a complex issue for many individuals (Maslow, 1943). When considering the human food system one has to acknowledge social equity, human and environmental health, economic disparity and cultural sustainability. These interconnected systems have numerous successes as well as current and advancing failures. For instance, between now and 2050, the earth's population will have increased to the point that more food will need to be produced in the next 40 years than in the previous 10,000 years combined (World Economic and Social Survey 2011). This increased demand must be met in the face of increasingly unstable energy supplies and climate patterns. Nevertheless, only increasing the planet's food production won't solve other issues such as our current diet and health problems. The Center for Disease Control and Prevention reported more than one-third of adults and almost 17% of youth were obese in 2009–2010. Results of obesity lead to increased medical care and costs, obesity-related conditions include heart disease, stroke, type 2 diabetes and certain types of cancer (Ogden, Carroll, Kit, & Flegal, 2012). Other puzzling and contradictory concerns involve food waste and food security. Surprisingly, in the United States today 40% of the food produced goes uneaten (Gunders, 2012). However, an estimated 50 million Americans do not have access to enough food (Coleman-Jensen, Christian, & Singh, 2014). These problems are a few of the many unique and interconnected complications the design students in this food systems class are challenged to consider.

Historically, the Graphic Design discipline has traditionally defined and understood the term "systems" as visual communication structures for example, brand identities with a range of visually consistent components (Davis, 2012, pg.216). Emphasis is placed on creating objects, and systems thinking is used only as formal vocabulary establishing a recognizable visual identity across a range of platforms, websites, printed matter, and signage. However, the design discipline is evolving with the introduction of new technology, social and business needs affecting the desired outcomes of products and services. Considering how recently 'new technologies shift our attention from the arrangement of content to the facilitation of behaviors and mediation of experiences in the

environment itself' (Davis, 2012, p.217). This occurrence is a radical shift, one that alters how the discipline approaches how and what we do. The development of useful and desirable design work, which facilitates behaviors and the mediation of experiences in the environment, involves designers investigating and acknowledging the social, economic and environmental phenomena their work might impact. What is beneficial and evident about food as a topic is that numerous other systems effect or are in symbiotic relationships with it.

The projects given in this class exposed the students to systems thinking and a scaffolded learning experience (Hogan & Pressley, 1997). This means that each project or problem given re-organized similar content dealing with our food system according to different points of entry. The students were immersed in complex problem solving from the beginning of the class and encouraged to discern the nature of things through comparisons under varied conditions or parameters. For example, students entered the food system through having to create concept maps. Then again they looked at the food system as it interacts with small and large-scale points of distribution, such as the grocery store, corner store and the community farmers' market. Finally, they designed for their areas local food system working with a farm and such issues as environmental and human health systems, community building and cooking. What this approach encourages is an understanding of the scales at which design functions, as well as the use of appropriate methods for each problem.

Teaching systems thinking takes a comprehensible method to prepare design students for emerging avenues of interdisciplinary practice and research that we as educators have yet to imagine. This method trains and sharpens the designer's system mind, a capacity to see things in terms of how they relate to each other. A key aspect of design thinking, studied by researchers such as Nigel Cross, Donald Schon and Bryan Lawson, appears to be common across practitioners in their ability to take a broad 'systems approach' to the problem, rather than accepting narrow problem criteria. An industrial designer, for example, thinks about a car in terms of all it's parts working together to make it go. In contrast, most Engineers do not think in systems terms, they are concerned about designing a good piece-part, like a clutch. A systems minds thinks not only about the vehicle and its components, but also the roadways, fuel stations, environmental impacts, and the travel experience (Cross, 2011).

Phase One: Visualizing Our Food System With Concept Mapping

Students began the study by conducting significant research to define 'a food system', from origin to the dinner table. This constrained task was designed to introduce the group to an abstract problem, however one that had concrete outcomes. Groups of five individuals were created to divide and focus their research. Class time was spent sharing knowledge they gathered individually with the group and the rest of the class as a means to create a democratic classroom. Democratic classrooms establish heuristic skills and

acknowledge the collective wisdom of the classroom. The professor takes on the role of facilitator or guide during the process.

The class was given a short lecture and reading on concept mapping according to Novak and Gowin's work on the subject (1984). Then their research investigations were synthesized and made into group concept maps over a two-week period. These maps were periodically refined throughout the semester as their knowledge grew and became



Figure 1 Students making preliminary maps

reference points for future projects. For collaborative research, visualizations are powerful tools that capture and illuminate the intricacies of the creative process. Creating visual representations or mapping research also makes this work tangible, and accessible as a sharable tool for working together. Maps can be studied and interpreted, to locate points of intervention for their work: where they could alter or improve the system as they envisioned it. Students can also use these tools to recognize gaps in their individual or group knowledge and begin to form critical opinions about the topic (Novak, Gowin, & Kahle, 1984).

FOOD SYSTEMS In a Community can be

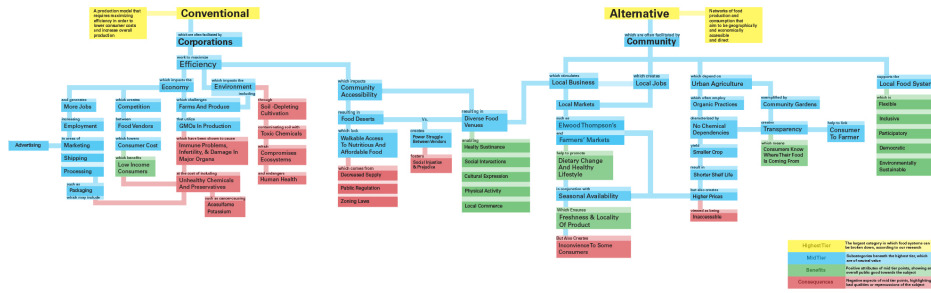


Figure 2 An example of a first digital iteration of the students' food system map

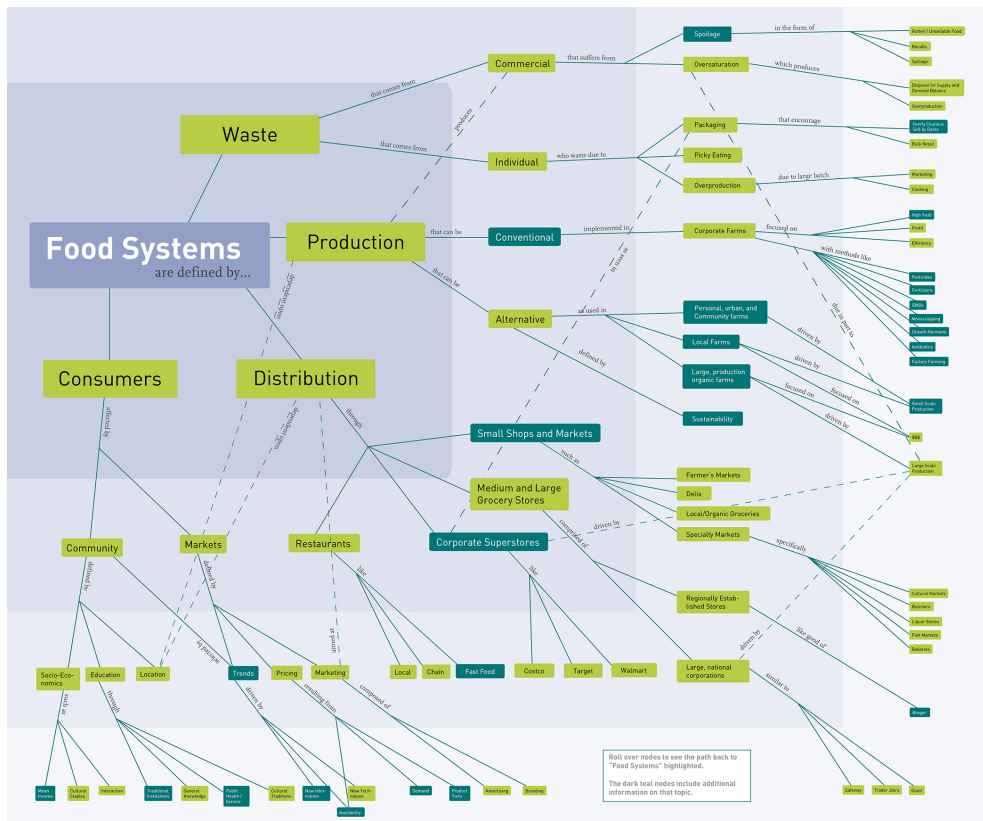


Figure 3 An example of a refined iteration of the students' food system map

Phase Two: Using Human Centered Design Methods to Empathize with Others

The second project required the students to craft solutions supporting the sale and consumption of local foods to consumers they identified through initial inquiries. The project parameters constrained the design problem by selecting the location, a list of possible audiences and a one-day workshop on design methods for understanding their chosen group. The group was first required to start with the following questions; what are the successes and challenges of the farmers' market and how might design enhance or solve these issues? How might the farmers' markets be turned into a hub for learning and connecting with your community? Next students were tasked with identifying an audience from the following list, children, adults with young children, young adults, low-income individuals, athletes, young professionals, seniors and new immigrants. Once an audience was identified, ethnographic research was carried out that included crafting surveys, behavioral mapping, thick descriptions, and video recordings and diaries (Geertz, 1973). The students were taught the ethnographic research methods commonly used in design in a one-day workshop prior to starting the project. This type of information gathering helped generate solutions for outcomes that did not necessarily involve formal design objects, but rather flexible tool kits, educational events, and space planning. Requiring the class to take on an audience outside their own age group also helps teach the importance of research. It was through this work that the students were able to see the specific issues their audience was facing rather than making assumptions as to the needs and desires of these individuals. For the final product the research informed the design of a system of two objects.

Solutions generated ranged in outcomes, from teaching games for children to multi lingual wayfinding and signs for new Korean immigrants. The student who chose to engage children in the farmers' market experience observed the lack of interaction between the vendors and children. She crafted a smartphone educational app designed to teach children about where food comes from and how to locate the certified child fun zones at sponsored booths. Promotion for the app came from vendors who wished to be involved. These vendors had the option of utilizing different forms of signage like banners, tablecloths, and signs to advertise their own booth as a kid approved zone and simultaneously showcase the app. In creating this app the student had to consider the child, his or her parents as well as the vendors. She capitalized on using the smart phone, a technology already prevalent in the lives of young children and parents.

Another student identified the need for more promotion and democratization of the Supplemental Nutrition Assistance Program at the market. She chose to redesign the Richmond area farmers' markets wooden currency, Farm Cash. This currency is exchanged by charging individuals debit, credit and SNAP EBT cards. To distinguish the SNAP program Farm Cash from the debit card version the student devised wooden tokens with small ridges carved in the ends. The ridges are subtle so that SNAP users will not be uncomfortable or embarrassed using government assistance. Distinguishing The SNAP

participants was necessary because they get twice the buying power per dollar and only food and seeds can be purchased. A different student also chose to work with SNAP participants, and the “Farm to Family” Bus, a mobile Richmond, VA area farmer’s market. She found that finding a way to communicate and educate SNAP participants was a difficult endeavor because of time constraints. Many of the individuals the student interviewed had two jobs and little time to shop for food at a farmers’ market as well as the assumption that farmers’ markets were more expensive than the local grocery store. To reach lower-income families she proposed to create digital flyers to be mailed via the SNAP organization. This was designed to first educate and initiate an interest in the “Farm to Family” bus. The flyers contained information on using SNAP cards on the bus, healthy quick recipes and seasonal offerings. Also within her system she included a website and application to track the Farm to Family bus for quick and easy access. This allowed families to easily track the mobile market and food drop-off times. The primary focus of her work was conveying the message that the bus offered more flexibility than imagined and all families had entry into this market, even SNAP members.



Figure 4 Wooden tokens titled Farm Cash for the farmers’ market currency. For the SNAP program participants the wooden tokens had small ridges carved in the ends.

Learning objectives for the farmers' market project were what Wiggins and McTighe cite as six facets of understanding, arranged hierarchically in terms of student accomplishment (1998). First students identify what they don't know, this is accomplished through defining a researchable question. Secondly they develop empathy about the problem and this is realized through ethnographic research and dialogue with others. Thirdly, the student's form a perspective on the issue, asking what information did I find and how does that shape my work? Then they apply their research and perspective into tangible outcomes, interpreting what was made and the desired outcomes to explain it to others. The students made presentations of their research and it's outcomes to the chair of the graphic design department.

Phase Three: Self-Directed Design Research for a Small-Scale Farm

For the semester's final assignment students were asked to demonstrate the ability to frame and design for a self-selected food problem within yet another context. In that process, they had to independently acknowledge diverse stakeholders as well as defend the inclusion and exclusion of various factors from the problems' parameters without the pre-selected constraints from the professor. Victory, a local community sponsored agriculture farm was in transition with new owners who sought to enrich their involvement in the community. Alistair Harris, the owner, renamed the business Origins Farm and was the primary contact for the class project. The farm is small, family-run and located in Hanover, Virginia. Artisanal produce is grown on their six acres of land, hand-harvested, tended to daily by Alistair and a small team. The produce is sold at several of the Richmond area farmers' markets, restaurants and small organic grocery stores. Each season, more than 50 different vegetables are grown. Alistair asked the class to generate work around the following problems. In what ways can design translate the importance of small farms and their connections to communities? How can design educate individuals about the "system of health" involved in supporting a small farm? How can design assist in creating a community focused on growing and sharing foods?

Students formed groups of three and were asked to use the tools and methods learned from previous projects to conduct research, synthesize their findings into actionable tasks and finally make a proposal to Origins Farm. Two 3-hour tours and volunteer sessions were arranged with Alistair and the students. In the first session the students were able to gain a sense for the work involved in farming and the produced grown. In the second session the students had time for one-on-one questioning and discussions with Alistair before finalizing their proposals.

When the students reframed the given question, they often chose to examine issues they as young adults could identify with. One group chose to develop a greater presence of Origins Farm on the VCU campus, thus connecting the farm to the VCU community of students. They conducted surveys and in-person interviews with a wide population of the VCU faculty, staff and students. They found convenience, accessibility and price to be

limiting concern for students not on the school meal plans. Through this research tool they were able to identify key conditions of the student body, such as convenience, cost and customization of the farms potential products they wanted to sell on the VCU campus. Their solution proposed was a once-weekly salad cart made with Origins Farm's produce. However, Origins Farm didn't have the equipment or means to start a food service business. The students outlined a budget for setting up a commercial kitchen and permits necessary for producing salads but found it placed their budget above the intended amount. A proposal was put forward to find a potential collaborative partnership with a local catering company, to produce the weekly salads. This partnership would allow both companies to profit and provided them with a convenient and quick, local food product. In addition the other work proposed by the group included marketing and relationship building events to target students with an initiative to eat healthy, quickly and budget friendly. During the first month of opening the salad cart, young basil plants grown by the farmers would be given along with instructions for growth and use. This act might encourage individuals to consider their own food production system. Within this project the group indicated their ability to frame their issue within two different yet connected systems and arrive at a collaborative proposal.



Figure 5 The class learning about farming and food growth at Origins Farm, Hanover, VA.



Figure 6 The once-weekly salad cart made with Origins Farm’s produce and promotional materials.

This next group constructed work around the following inquiry, how can design educate individuals about the “system of health” involved in supporting a small farm? They began their work interviewing other students and found that many of this population had a strong desire to have an interactive learning experience growing their own food. They capitalized on that wish and proposed a hypothetical cross-disciplinary class called *Learn to Grow*. This class would teach sustainable organic farming and problem solving to students. In the inaugural semester students would have to organize a mini-farm on campus, and work along side Origins Farm to learn, cultivate and distribute the outcomes of the farm. Throughout the creation of the class, the group repeatedly had to manage many systems including town and campus policy on land use when they wanted to reserve a plot of green space owned by the city. Other systems involved were, production needs involving soil, water, sunlight to name a few. They also were required to write proposals for the class to

be included in the VCU School of the Arts interdisciplinary curriculum, and schedule faculty from the Biology, Arts and Design colleges' involvement. In the planning stage of the project, care and maintenance during the summer session were also considered.

Not all students chose to address their peer group. The students were given Origin Farm's mission statement as well as business goals. The farm expressed a desire to reach a broader income base in their CSA program. These student groups created a proposal to subvert the current economic system built on exchanging goods for cash and create a bartering system. Their idea extended the CSA membership where people could earn credits for produce through work. They organized an online volunteer sign up that allowed workers to earn their credits. They proposed designing a smart phone application that kept track of points earned and spend. Attracting this new audience for the CSA was done through both online and print materials such as large posters, stickers, stencil graphics, bumper stickers, and magnets.



Figure 7 A promotional poster advertising the call for volunteers at Origins Farm.

Though most proposals were not implemented some of the more simple interventions were. A group of students created a project that helped college students to consider how their food choices were impacting not only their healthy but also the local food system. Most college students don't have much money, time and are relatively new to shopping for

food and cooking. The class created a quick solution, which involved a once-a-week farmers' market in Richmond that takes place adjacent to the VCU campus and in a neighborhood where many students live. They proposed to Origins to offer a \$10 box complete with a simple recipe and all the ingredients necessary. The veggie box was advertised school wide via social media and the campus paper. Origin's farm implemented this box to not only students but also staff and faculty at VCU and has had much success with sales.

Conclusion

For students, food systems are a familiar and inclusive concept. Food provides a set of conditions that requires students to consider far beyond the basic identification of nutrition and personal preferences on taste and flavor. The content forces them to examine and acknowledge phenomena such as accessibility, environmental sustainability, and political power. All individuals have a unique relationship with food and no matter what your relationship is the act of buying, cooking, eating and enjoying food is universal. Each student came to the class with their own customs and knowledge to share with the group, thus engendering familiarity and trust (Tye, 2010). What this research has demonstrated is that food is a facilitator of conversation. As a topic food naturally invites us to join in on the conversation because we all have individual experiences, knowledge, likes and dislikes. Students found that much of this class involved collaboration or conducting research with strangers, yet many were willing to share their own food experiences, knowledge and preferences.

To help successfully stage these inquiries in the classroom the students were given a scaffolded learning experience, where each project re-organized similar content according to different points of entry. Consequently, they were able to build their knowledge of food, design research methods and systems thinking with each project. These junior level students had little to no exposure to the design research process. Nevertheless, the course was approached through a carefully scaffolded structure that builds to independence in process and method selection. At the semester's end, students gained an understanding of both the local, national and global food system, many other systems, as well as basic design research methods. Working with complex problems reinforces the necessity for design practitioners skilled in a systems thinking method, and further substantiates the need for a multi-disciplinary collaborative approach.

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