Big Sandy, Montana: Built on Sand or Food? (Module 2) Teaching Notes

Authors: Roland Ebel, Alexandra Thornton, Montana State University

Abstract

This teaching manual describes the second part of a two-module junior (module one) to senior (module two) standing case study, where each module can be imparted in a different (semester-long) course of interdisciplinary majors such as Food Systems or Agroecology. While the first module is designed for research method courses, module two can be applied in courses with an emphasis on systems-thinking and collective action. The case study deals with Big Sandy, a small rural town in Montana. Although most inhabitants of Big Sandy are dedicated to small grain farming, 40% of them lack access to affordable food. While the first module emphasizes prospects for young people in this community, the second module deals with the food environment in Big Sandy, which widely lacks offers of diverse, fresh and local food. The case aims to increase the students' awareness of the challenges of rural communities in an era of industrialized agriculture and relates the situation in Big Sandy with challenges all over the rural Northern Great Plains. At the end of module two, students should be able to identify the socio-environmental factors that impact a rural food system and how human actors (and their power relationships) interact at different scales with each other and their environment. Thereby, the case study strengthens systems and critical thinking skills within students. It uses pedagogical tools such as concept maps and a role play. Students will produce a problem-solution tree as a final gradable product. Depending on the total number of students, the module can be implemented in three to five 60-minutes classes. Additional field research suited to the case study is recommended.

Author's note

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Contents

1. Topical areas

Food Systems; Food System Resilience; Food Environment; Systems Thinking; Collective Action; Rural Development; Agroecology

2. Applicability

Courses: 4th-year college students of a program with an interdisciplinary focus (e.g., food systems, environmental studies, community health, agroecology, agricultural economics, rural development).

Education level: Senior undergraduate level.

Prerequisites: Introduction to food systems and sustainability concepts, introduction to research methods; moderate background in agroecology and community health/nutrition favorable.

3. Type/method

Analysis case.

4. Background

The present case study was developed for students of the *Sustainable Food and Bioenergy Systems* (SFBS) major at Montana State University (MSU). We selected Big Sandy as an example of challenges (outmigration of the youth, unbalanced food system) of agricultural towns in the Northern Great Plains. We identified the courses SFBS 327, *Measure Innovation in Food Systems* for implementing Module 1, and SFBS 466, *Food System Resilience, Vulnerability and Transformation* (Module 2) as ideal places to carry out the case study.

5. Pedagogical strategy

The present case study is based on the principles of Socio-environmental Synthesis (SES). Pedagogical tools such as Concept maps and a Problem/Solution Tree are used.

6. Duration and context

The case study should be implemented during two semesters in two different courses. It is divided into two modules, one for each course. Module two will be developed in 3-5 classes (depending on the total number of students); it includes concept and power mapping, a role play, and a final problem-solution tree; the latter represents a gradable final product of the case study (Figure 1).

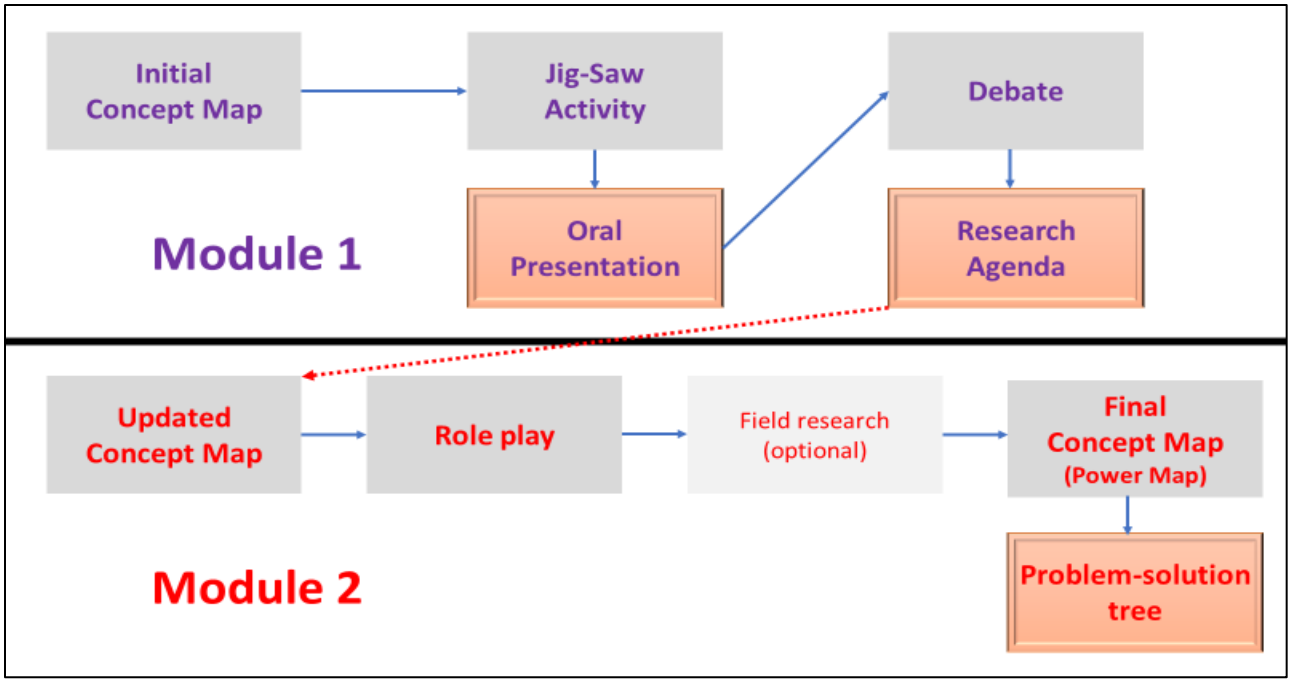

Figure 1: Chronological development of the case study divided into two modules (each module corresponds to a semester-long course); grey components represent learning activities, pink components gradable products.

7. Learning objectives and goals

The present case study module has three learning objectives and is designed to facilitate four potential course learning outcomes, which are aligned to specific (gradable) assignments and the universal learning goals of SES.

Learning Objectives

Students will:

- critically think through challenges of rural communities in the Northern Great Plains;
- systematically analyze the interactions between stakeholders of a socio-environmental system and identify the power relations between them;
- develop an outline for solutions to some of the most challenging problems of this system.

Learning Outcomes

Upon completing Module 2 of the present case study, students will be able to:

I. identify the different stakeholders within a food system of a small town and how they interact with (internal and external) social and environmental factors;
II. analyze a socio-environmental problem considering the importance of scale;
III. co-develop research questions, conceptual models, and an outline for potential solutions to the identified problems in interdisciplinary settings; as well as
IV. find, analyze, and synthesize existing data and ideas using diverse ways of knowing (scientific and non-scientific approaches).

Table 1. Alignment of case study learning outcomes with correspondent activities and products, SESYNC's socio-environmental (S-E) synthesis goals, and generic program learning outcomes for Sustainable Food Systems (SFS) Majors.

Case study learning outcome	**Case study activity/product**	**S-E Synthesis goal**	**SFS program learning outcome**
I. Systems thinking	Concept map	Understand the structure and behavior of socio-environmental systems.	Analyze food systems using a transdisciplinary approach guided by sustainability principles.
II. Critical thinking	Roleplay	Consider the importance of scale and context in addressing socio-environmental problems.	Critically reflect on interactions between worldviews and power relations in food systems, recognizing one's positionality and learning processes.
III. Design of food system solutions	Problem-solution tree	Co-develop research questions and conceptual models in inter-or trans-disciplinary teams.	Design, implement and assess food system solutions across scales.
IV. Participatory research	Field research	Find, analyze, and synthesize existing data, ideas (e.g. frameworks or models), or methods.	Apply appropriate methodologies considering diverse ways of knowing.

8. Classroom Management

The module involves five different classroom activities (Figure 2), which can be implemented in three to five classes of a semester-long course.

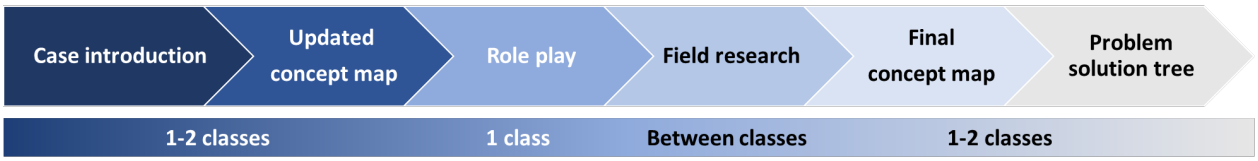

Figure 2: Module 2 classroom activities, components, and duration.

I. Case introduction

Duration: 30-45 minutes, 1 class

Required material: Printed sheets (Intro Story) or laptops

A detailed introduction to the case should occur during the first half of the course. It includes both an overview of all related classroom activities and an introduction to the study itself. As a first activity, the instructor dedicates five minutes to characterize how the case will be approached in class, emphasizing its components, main activities, and goals. Preferably, the instructor recounts using a presentation or an info sheet. The further implementation of the introduction depends on how many students of the group took Module 1 of the case study.

Scenario A (>50% of students are familiar with Module 1)

Students will be given ten minutes to read through the introduction (see: Big Sandy Module 2 Intro Story). Then, students will be organized in pairs, consisting of students who are familiar with Module 1 and students who did not take Module 1. The latter portion of students is requested to develop questions about the case. In a speed-dating arrangement, these students raise a question to their vis-à-vis which can be the starting point for a brief one-on-one discussion. After 1-5 minutes (depending on the available time; intervals should be constant), the questioners move on to another student familiar with the case. This activity may last up to 15 minutes. Each student of one group does not necessarily need to interact with all students of the other group.

Scenario B (<50% of students are familiar with Module 1)

Similarly, students will be given the story's introduction. This is followed by a 10-15 minutes presentation about Module 1 of the case. If available, a student who has taken Module 1 can be previously selected to hold this presentation; otherwise, this is the instructor's duty. The latter can also decide whether to share additional information, for example, student materials of Module 1 and/or photos of the concept maps developed in Module 1. Finally, at least ten minutes should be designated for student questions.

II. Concept map

Duration: 60-75 minutes, 1 class

Required material: Printed sheets (Sample Concept Map, Big Sandy Fact Sheet, Agriculture in the NGP, Food environment in the NGP) or laptops; post-its, flipchart paper, markers

The concept map (CM) is an update of a Module 1 activity. It is used to foster discussion among the students, to stimulate critical self-assessment, but mainly to resume what was learned in Module 1 by visualizing the students' perception of the food system of Big Sandy.

The first part of the class activity serves to familiarize students who are not experienced in CM with the purpose and functioning of CM. Again, the instructor should adapt the emphasis on training students in CM to their level of familiarity with the tool. If the number of students experienced in CM is very low, the introduction may be longer than the suggested 15-20 minutes. If almost all students know how CM works, it may be omitted.

- Students break up into groups, with 3-4 students in each group.
- The students will be presented an example question, such as "How will I decide if I should go camping with my friends this weekend?" (see: Sample Concept Map).
- Then, students individually prepare a similar concept map addressing the question "Which factors determined my (our) decision to study Sustainable Food Systems?". They have 10-15 minutes and cannot use more than ten nodes. They may use an online mapping tool such as Mental Modeler.
- Each team shortly presents their CM and shares challenges they had developing the map (5 minutes).

The second part includes the development of the Big Sandy food system CM. The purpose is to (1) practice CM and to (2) collectively remember findings from Module 1. Its scope strongly depends on the students' experience with CM and the Big Sandy food system. To avoid redundancies, the central question of the CM of Module 2 is not identical to the question used in Module 1.

- All groups receive the following datasets: Big Sandy Factsheet (Module 2), Agriculture in the NGP, and Food environment of the NGP and read through them. Each student should at least read one handout in detail (15 minutes).
- Students continue in the same groups and develop a CM around the question "**Which stakeholders influence Big Sandy's physical food environment?**"
  As a first step, they sum up ideas using post-its for both nodes and action phrases. Then, they group the nodes and add arrows to the action phrases (10-15 minutes).
- Each team has the opportunity to look at the other teams' preliminary maps (5 minutes).
- Finally, they draw the final concept map using a flipchart paper and prepare a 5-minute explanation of their map, which they later share with their peers (15-20 minutes).
- As a homework assignment, students are encouraged to study all four handouts in detail.

III. Roleplay

Duration: 60 minutes, 1 class

Required material: Sets of cards with roleplay characters

Initially, the instructor should make sure that all students thoroughly studied the datasets shared during CM. This may take up to 10 minutes. The role play serves to increase the students' sensibility regarding the diversity of livelihoods even in a small community such as Big Sandy, but also to self-assess their understanding of the reality of living in a rural town.

The roleplay is based on the following scenario, which should be introduced by the instructor:

> *Big Sandy, a small rural town, has one grocery store. The grocery store is small and often carries a very limited supply of fresh fruits and vegetables. It mostly stocks shelf-stable food items. Most residents choose to drive 78 miles to Great Falls, where there are more grocery store and supermarket options. For this reason, the grocery store in Big Sandy is closing next month. Residents are meeting for a town hall meeting to discuss the community-wide impacts of the grocery store closing.*

- Students will be broken up into groups of (preferably) 5 individuals. Each group is asked to consider the impacts on the community as a whole and individual community members if the only grocery store in town were to close in Big Sandy (5 minutes).
- The instructor will pass out a set of random role-play cards to each group. Each card has a role-play character a student will adopt: a wheat farmer, a single parent, a young child, a convenience store owner, and a grocery store employee. The instructor may add additional roles. Characters may appear more than once in a group.
- Each student within the group will write a short bio about their roleplay character and discuss this character's position on the grocery store issue within their group (15 minutes).
- Afterward, the entire class will regather in the front of the classroom for a town hall meeting simulation, with the instructor acting as the moderator and one student representing each roleplay character. The rest of the students will act as the audience, still maintaining their previous roles. In their initial presentation, each roleplay character must detail how they will be impacted by the closing of the grocery store. Then, the audience is invited to ask questions and provide suggestions. The goal of the town hall meeting is to have the characters discuss the future of the local grocery store to meet the community's food environment needs (30 minutes).

IV. Field research (optional)

Duration: 2-5 days field trip + 30-90 minutes class time (1 or 2 classes) or homework

Required material: research agendas produced in Module 1; research instruments adapted to the specifications of the diverse research agendas.

The purpose of the field trip is to (1) generate data that will be used for the problem-solution tree, (2) have the students interact with real persons of the community, and (3) have the students practice their research skills. A participatory field research trip has numerous advantages, including exponentially sharpening the students' systems-thinking and critical reflection experience compared to a classroom simulation. Most importantly, it increasing their dedication to the case and to finding solutions to the real concerns of the people of Big Sandy or other case study areas.

Before the trip, the instructor should thoroughly review the diverse research agendas generated in Module 1 (if applicable) and assess them for temporal and financial feasibility, infrastructure needs, potential redundancies and gaps (especially regarding food environment aspects which were not part of Module 1), and their potential to stimulate interaction with the community. Afterward, the instructor should dedicate additional class time to the discussion of potential modifications of the agendas. If the Module 1 agendas are not available, the instructor should dedicate at least one class to the design of new agendas, which may be uniform for the whole group or have a different emphasis. The students might need additional training in several of the suggested research methods as well as in processing the obtained data.

If a trip to Big Sandy is not viable for logistic reasons, the instructor may select another town that experiences similar challenges regarding food security and access to healthy food. If the trip cannot happen due to a lack of time or financial resources, the instructor may consider the possibility of having the students carrying out their research by phone or computer.

V. Final concept map

Duration: 20-40 minutes, 1 class (alternatively, the final concept map can be programmed as a homework assignment).

Required material: posters, markers, flipchart paper, or post-it notes

The final CM, framed as a power map, serves to highlight the power interactions in Big Sandy's food system and as the starting point for the final product: the problem-solution tree. Power maps are visual representations of all stakeholders that constitute a problem, in this case the food environment of Big Sandy.

- Students will be broken up into groups, with 3- 4 students in each (preferably, different groups than for the roleplay).
- The team list all individual or organizational actors in Big Sandy's food system (5 min).
- The list evolves then into a power matrix, which includes the range of actions of the diverse stakeholders, subjectively quantifies their power-level on a scale from 1-5 and describes whom they are having power on (10 min).
- The teams draw a power map of the food system in Big Sandy, with at least 6 nodes and 2 feedback loops (15 min).
- Once completed, each team presents their power map (physically, not online) in a way that other students in the room can see it. Students will then walk around the classroom, observing other group's map. Each team can then update their map (10 min).
- Optional: The students, guided by the instructor, will eventually create a consensus power map by combining elements from each group's CM. The instructor will start with the initial node 'Big Sandy' and have students fill in all other nodes and feedback loops (20 min).

VI. Problem-solution tree

Duration: 30-90 minutes, 1-2 classes

Required material: Printed sheets (Problem-solution trees) or laptops, post-its, markers, blackboard available

Students will develop a problem-solution tree for the following issue: **In Big Sandy, access to diverse, healthy, and local food is limited**. Especially for the hierarchical structures of the trees' roots and branches, they should base the structures on the power relationships identified in the previous power map.

- Students continue in the same groups as established for the final concept (power) map. They receive the Problem-solution trees handout and study it. Then, they may raise questions to the instructor (10-15 min; to save time, the instructor can share the handouts in a previous class).
- To develop the problem tree, the teams discuss the causes of the problem, group similar causes and include the more specific ones under a major cause. Then, corresponding to the logic of the causes, they discuss and present consequences of the problem for the people living in Big Sandy (one consequence related to each cause). Based on the instructions in the handout, they use post-its to organize the diverse components of the tree. Finally, they draw the problem tree at an assigned space on the classroom's whiteboard (15-30 min).
- The subsequent solution tree is developed by converting the negative statements in the problem tree into positive ones. For each consequence in the problem tree (for example, "People have to drive 70 miles to buy fresh fruits"), a specific goal is developed ("increase the availability of fresh fruits in Big Sandy"). The students then discuss actions to achieve all specific goals. The instructor should stress a preference for short- and mid-term solutions, achievable by the inhabitants of Big Sandy. Again, post-its may be used to prepare the painting of the solution tree (close to the problem tree) on the whiteboard. Finally, the students observe and discuss the problem-solution trees of the other teams (15-30 minutes).

- It depends on the instructor whether a photo of the trees on the whiteboard is taken and used for grading, or whether a more detailed (online or on paper) version of each team's problem-solution tree is required as homework.
- As with the power map, the instructor may then encourage the development of a consensus solution tree based on inputs from all teams.

9. Assessment

The assessment of Module 2 will be based on one student deliverable, the problem-solution tree, which generates grades per teams of 3-4 students (Table 2).

Table 2. Gradable student deliverables, mode of evaluation, and applied assessment criteria.

Student deliverable	Evaluation	Assessment criteria
Problem-solution tree	Per team	Attitude, competency, visual presentation, content (Appendix A, Table 3)

10. Suggested modifications

The case is centered on food systems in small towns in the Northern Great Plains and can be implemented as it is by higher-education institutions all over North America. Modifications of the case, emphasizing rural communities in other parts of the US or Canada, are feasible. In such a case, the student handouts will have to be adapted. Thus, the pedagogical activities and their sequence may remain identical as outlined in the Big Sandy teaching manual.

11. References

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12. Appendices

A) Assessment tasks and criteria

Table 3. Rubric for the assessment of the problem-solution tree.

Parameter	Outstanding	Good	Adequate	Needs Improvement
Attitude	The team demonstrates enthusiasm about the subject.	The team shows certain passion for the topic.	The team shows little enthusiasm about the topic.	The team is uninterested in the subject.
Competency	The team demonstrates full knowledge of the issue, can answer all (teacher and class) questions.	The team is comfortable with the information and competent with expectable questions.	The team is only capable of answering basic questions; is uncomfortable with information.	The team does not show knowledge about the subject; cannot answer questions.
Visual presentation	The design of the tree is easily understandable.	The design is and understandable.	The design is not very clear.	The design is unclear.
	The design has a comprehensible sequence and is clearly structured.	The design has a widely logic sequence and emphasizes key elements of a problem-solution tree.	The design has no clear structure.	The design is confusing, unstructured.
	The tree includes only relevant content.	The tree is not overloaded.	The tree is partially overloaded or appears deficient.	The tree is incomplete or overloaded.
	The design of the tree is original, authentic, and produces interest.	The design of the tree is original but not exciting.	The design of the tree is appropriate but not original.	The design of the tree is inappropriate, or plagiarism is likely.
Content	Lays out problems and solutions well and relates them to the case.	Provides problem and solutions, but the “wider picture” (relation to the case) is lacking.	Attempts to present the problem and solutions; unclear relation to the case.	Does not present the problem and its significance for the case.
	Presents accurate information.	Presents accurate but partially irrelevant information.	Presents insufficient or widely irrelevant information.	Presents no pertinent information.
	Is correctly structured (for example, causes are not confused with consequences).	Is mostly well structured.	Is partially related to the structure of a problem-solution tree.	Does not follow the structure of a problem-solution tree.

	The logical sequence (branching) is comprehensible.	The logical sequence is widely comprehensible.	The logical sequence is deficient.	Problems and subproblems are not presented in a hierarchical order.
	Identifies problems based on the case.	Identifies problems based on the case but some are in-comprehensible or some serious aspects are lacking.	Identifies some problems based on the case but many mentioned problems are in-comprehensible and real problems are lacking.	Identifies problems that are not related to the case.
	Provides plausible and applicable solutions.	Provides widely plausible and applicable solutions.	Provides rather unclear and unrealistic solutions.	Provides unclear, unrealistic, or no solutions.
	The problem and the solution tree are entirely congruent.	The problem and the solution tree are widely related.	The problem and the solution tree are somehow related.	The problem and the solution tree are not related.

B) Additional Resources

Student materials:

1) Introduction (Module 2)
2) Sample Concept Map
3) Big Sandy Factsheet (Module 2)
4) Agriculture in the Northern Great Plains
5) Food Security in the Northern Great Plains
6) Problem Trees

Useful weblinks:

Big Sandy (official website)

Big Sandy MT (Wikipedia)

Montana Agriculture Census per County

The Economy of Rural Montana, Montana Department of Labor Research

Organic farmer Bob Quinn