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Tackling Food System Challenges through Experiential Education: Criteria for Optimal Course Design

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ABSTRACT

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Educating students to find sustainable solutions to food system challenges is a task that spans disciplines and contexts. Our two-week World Food System Summer School allows participants, specialists and stakeholders to learn from one another. We describe the conceptual framework for the course, elucidate the design criteria used and discuss challenges, aiming to support the development of education offerings in this space.

Keywords

design criteria, education for sustainable development, food systems, higher education, short courses, summer schools

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We are witnessing unprecedented attention to the global challenge of meeting the food and nutrition security needs of a growing and changing population. Achieving this in a way that is sustainable in the short and long term, for both the environment and people, is a formidable task confronting citizens and decision-makers alike. Billions of people currently suffer from one or more forms of malnutrition, be that overweight and obesity, chronic hunger and undernutrition or micronutrient deficiencies (FAO et al. 2017). This global burden has the potential to become even more severe in the face of climate change, decreasing biodiversity, increasing inequality and changing consumption patterns.

We believe that solutions to these challenges demand new ways of thinking, collaborating and learning that reflect the complexity of food systems and consider the interrelated biophysical, social, economic, political and cultural systems.

SUSTAINABLE FOOD SYSTEMS EDUCATION

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Over the past decade, we have seen a proliferation of new academic programs, research agendas and institutes initiated around the theme of food and nutrition security or food systems, as well as renewed interest and reinvestment in established programs and courses.¹ Although these offerings broaden the dialogue on food systems, we have observed that the majority of these activities still maintain an emphasis on agriculture and biophysical systems.

ETH Zurich (the Swiss Federal Institute of Technology Zurich) identified the world food system as a strategic priority for the university in 2010, and out of this initiative, the World Food System Center (WFSC) was established in 2011 (WFSC 2015). The WFSC includes members from 40 research groups across eight ETH Zurich departments and the Eawag (Swiss Federal Institute of Aquatic Science and Technology), and is anchored in the Department of Environmental Systems Science (D-USYS). In addition to supporting inter- and cross-disciplinary research on food system topics, the Center runs unique educational courses, including an intensive, residential two-week short course called the World Food System Summer School.

As an educational model, stand-alone summer school courses are growing in popularity, though they are not necessarily a novel form of education (Torenbeen and van Rest 2014). When designed intentionally, summer schools provide an exceptional format for learning about food systems. As residential, immersion programs, they offer opportunities to use learning methods and pedagogical approaches that may be infeasible in traditional courses. As intensive courses, they provide students with additional knowledge and experience beyond (but complementary to) their disciplinary or core study programs, and the chance to connect to a global network of colleagues. In addition, students can interact directly with a wide range of food systems stakeholders from a variety of sectors, something uncommon in a traditional education setting.

The WFSC developed a course that serves this purpose by building a food systems syllabus that

teaches participants about challenges and solutions from a variety of disciplinary and sectorial perspectives. The course explores the roles of students, researchers and young professionals and how they can engage with the issues in their work, studies and lives. It offers a platform to exchange first-hand with diverse stakeholders from the food system to discuss topics across disciplinary and generational boundaries ([figure 1](#)).



FIGURE 1

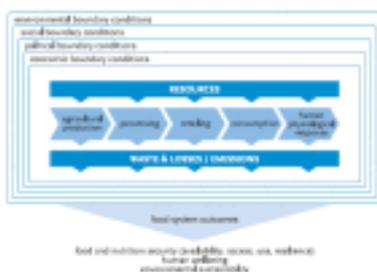
Field work and exchange with stakeholders: participants working with rural smallholder farmers to harvest yams and discuss challenges and solutions to sustainable agriculture in the region. Yamoussoukro, Côte d'Ivoire.

[FIGURE 1](#) Click to view

With the increasing number of food system courses, it is helpful to have a means for evaluating and comparing them to identify their strengths and foci. For instance, what determines the quality of a sustainable food systems course? What criteria should these courses meet, if they should contribute to preparing the next generation to address the complex challenges of the food system?

The course applies a systems thinking approach that invites participants to grapple with systems theory as it is applied to the world food system, while interacting directly with stakeholders.

In this paper, we first introduce our conceptual framework used to analyze food systems and to design the summer school courses ([figure 2](#)). Second, we describe the course that we developed at ETH Zurich in more detail. Third, we present a set of criteria we have developed ([table 1](#), p. 173), which can support others to 1. design new sustainable food systems education courses or 2. reflect on existing courses.



[FIGURE 2](#) Click to view

FIGURE 2

Key elements and desired outcomes of the food system. A food system includes value chain activities that transform inputs and resources into food consumed by humans. The functioning of this value chain is shaped by a complex and interacting set of system boundaries that include environmental, social, political and economic conditions. The whole system operates through a complex network of actors who have varying influence and power. Ideally, all elements and actors of the food system would work together in a way that supports the delivery of the key food system outcomes, namely, food and nutrition security, human wellbeing and environmental sustainability, also in the face of shocks and drivers of change. In this framework, we consider food and nutrition security to include 1. the availability of adequate food in terms of quantity and

quality, 2. access to that food for all individuals, 3. the use of the food in a way that supports health and nutrition outcomes, and 4. the resilience of all of these three elements in the face of increasing number and intensity of shocks to the system in the future.

We mainly drew on our own experiences and on an analysis by [Wiek et al. \(2013\)](#), who proposed a set of criteria for international sustainability education programs. In addition, we used the work by Hilimire and co-researchers, who developed “concepts for effective food systems learning” and “curricula for educational programs on sustainable food systems” ([Hilimire 2016](#), [Hilimire et al. 2014](#)) along with Galt and coauthors’ (2012) discussion about “engaging values in sustainable agriculture and food systems education.” Finally, reflecting on our insights from conducting several summer school courses, we discuss some of the most pressing challenges that we have faced in fulfilling these criteria and that others may encounter as well when designing their own programs and courses. With this paper, we offer a departure point for further discussions around improving, designing and expanding high-quality educational opportunities that support positive change towards sustainable food systems, and sustainability more broadly.

TEACHING SUSTAINABLE FOOD SYSTEMS: A FRAMEWORK FOR ANALYSIS

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The WFSC has offered a two-week, intensive food systems summer school regularly since 2013. To date, we have run the course four times in Switzerland, once in India, once in South Africa, once in Côte d’Ivoire, training 166 participants from 52 countries. The course was designed to foster a cross-disciplinary exchange of knowledge about all aspects of the food system. It applies a systems thinking approach that invites participants to grapple with systems theory as it is applied to the world food system, while interacting directly with stakeholders ([figure 3](#)).



[FIGURE 3](#) [Click to view](#)

FIGURE 3

Participants meet with villagers, farmers, small-scale processors and a women’s seed cooperative in rural India. Such facilitated interactions allow the understanding of the local context from a variety of stakeholder perspectives and through a two-way exchange engage participants as both producers and users of knowledge. In the foreground lies a Puja, a ritual performed by the hosts to welcome and honor guests. Karnataka state, India.

Our overarching approach for the WFSC summer schools was derived from the principles of *Education for Sustainable Development (ESD)* as applied to the academic short-course programs organized under an initiative known as *Youth Encounter on Sustainability (YES)* ([Grant 2009](#), 2013). Like the YES courses, the WFSC summer schools seek to equip young leaders to

address global challenges. This requires a curriculum that combines attention to knowledge, core skills and values (see [Grant 2013](#)).

We developed a conceptual framework ([figure 2](#)) to illustrate our understanding of the food system and guide our curriculum. It includes all food system activities, the boundary conditions that shape and constrain them, and the desired outcomes, namely, food and nutrition security, human wellbeing and environmental sustainability. Though not illustrated in the diagram for simplicity, the framework enables discussion of the complex and interrelated network of actors and institutions that span this system ([figure 4](#), p. 172). As a pedagogical tool, the diagram is useful because it illustrates the material flows and highlights desirable food system outcomes that can be applied to multiple scales. It offers a starting point to add on the complex social and political dynamics of the food system and facilitates discussions about inter actions, feedbacks, emergent behavior and complex systems approaches. In our experience, beginning with this simple conceptual framework to create a common understanding helps students and instructors locate their expertise in a broader landscape and move away from narrow disciplinary foci.



FIGURE 4

Concrete experience and reflective observation: participants explore the local food system and discuss with actors in food retail, distribution and processing, bringing this experience into the following academic discussions with researchers. Yamoussoukro, Côte d'Ivoire.

[FIGURE 4](#) [Click to view](#)

The course introduces new knowledge, builds core skills and encourages participants to connect the outcomes of a food system with the values embedded in it, while orienting them towards exploring their own role in creating appropriate solutions and driving change. Further, participants collaborate in a multi-disciplinary and multi-cultural cohort ([figure 5](#), p. 174) that continues as a professional support network after the course ends. We rely on a variety of participatory and student-centered learning methods to achieve this, including case studies, workshops, panel and facilitated discussions, field trips, role plays, simulation games, creative work and interactive lectures. Participants work in diverse groups throughout the course on activities that encourage peer-to-peer and experiential learning. In particular, the four stages of Kolb's (2015) *Experiential Learning Cycle* (concrete experience, reflective observation, abstract conceptualization and active experimentation) are iterated throughout the course.

FIGURE 5

Participants work in multi-cultural and multi-disciplinary groups to complete a case study that integrates design and system thinking approaches to devise appropriate and sustainable solutions to food system challenges. Stellenbosch, South Africa.



FIGURE 5 [Click to view](#)

The WFSC promotes the courses widely both within Switzerland and internationally through a variety of networks, including our alumni network. Since the course is not a specialist course, we accept applications from a broad range of backgrounds and educational programs. However, the work is designed for those recently graduated from or currently studying in Master’s or PhD programs. With approximately 25 students per course, the selection process is highly competitive, and our acceptance rate is typically less than 25 percent of applications received. In each course, we have students from approximately 20 countries and a wide range of academic backgrounds. There is a purposeful selection of qualified applicants to incorporate cultural and disciplinary diversity in each cohort.

DESIGN CRITERIA FOR SUSTAINABLE FOOD SYSTEMS EDUCATION COURSES

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While an extensive medium-term evaluation of our course is ongoing², we assess - short-term outcomes through evaluations and pre-/post-knowledge tests administered as part of each course. The findings of these short-term evaluations and tests, as well as increasing interest from donors and new course partners, give us grounds to consider the summer school approach a success, while signaling where there is room for improvement and adaptation. Thus, we are confident that the set of twelve criteria we have developed based on our experiences running and evaluating our summer schools ([table 1](#)) can support others establishing new offerings under this theme, or help reflect on existing ones.

TABLE 1 [Click to view](#)

TABLE 1

Design criteria for sustainable food systems courses (including justification and the sources supporting it, with “WFSC” referring to our own experience). The criteria are not listed in any hierarchical order.

FIGURE 6

System mapping: participants work in diverse groups to conduct a system and stakeholder mapping for a real-world case study. Rheinau, Switzerland.



FIGURE 6 [Click to view](#)



FIGURE 7 [Click to view](#)

FIGURE 7

Hands-on learning: participants live and work together on an operational organic farm during the course in Switzerland, getting the chance to blend experience, theory and skill development. Rheinau, Switzerland.

LESSONS LEARNED: CHALLENGES, CONSTRAINTS AND TRADE-OFFS

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Although these design criteria have guided our summer school courses, we have learned many lessons over time, recognized a number of challenges and identified areas for improvement. These largely relate to the many constraints and tradeoffs an organization or institution faces when trying to develop a novel course that falls outside of traditional disciplines and curricula.

The first major constraint we deal with, particularly in meeting criteria 3, 4 and 5, is time. We find two weeks to be optimal for our course due to its intensive nature. But covering a large and complex system in such a timeframe is a major challenge. There is a constant trade-off between depth, breadth and integration, and it is simply not possible to cover all relevant issues. For this reason, we aim to instill a mindset of self-driven and lifelong learning by encouraging participants to identify, enlarge and access their own knowledge networks and resources during and after the course, and to explore further offerings outside of their own curricula.

The time constraints also lead to challenges in terms of allocating adequate interactive and reflective space into the course, linked to criterion 9. The short-course format privileges exchange within the cohort; however, effective learning also requires adequate time and methods for individual reflection as well as free time. Here we have had some success with blocking time for journaling and reflection as well as scheduling social activities and a free day into the course program.

Given the extensive use of participatory teaching methods, our classroom environment may be

more familiar to participants used to student-centered instruction. In many contexts, the classroom is still a place where hierarchy and power relations play a strong role in determining who may speak or contribute and when. To overcome this, we devote ample time at the start of the summer school to set guidelines for how we will work and interact together, and to emphasize that participants are there to learn from one another and share their unique knowledge, skills and experience. This links directly to criterion 9, the appreciation of participants as both producers and users of knowledge. During the course, the core facilitation team observes participation and checks in with students to determine if they need any additional support. In order to manage language asymmetry, we openly discuss potential issues and related measures at the start of the course, offer informal translation when needed, and encourage participants to help one another understand and digest the main topics from each day.

Implementing a course across sectors and scales while using diverse pedagogical approaches requires exceptional faculty and contributors; they must possess the relevant knowledge, be willing to teach in a participatory and experiential manner, and be available to travel to the course site. As this can be challenging, we have worked to build a diverse network of contributors who are aligned with the approach, and who in turn recommend colleagues when we move to other parts of the world to offer the course. Sometimes we will work with a content contributor who has a valuable depth of knowledge but limited experience with innovative teaching methods. In such cases, we offer support by designing or facilitating their session, so they can focus on sharing their knowledge and experience. All of these activities help us to collectively address criteria 2, 4, 9 and 11.

Extensive fundraising efforts allow the course to be offered at a highly subsidized rate. In addition, financial support is available to participants with limited resources to avoid making this a barrier to participation. While this supports participant diversity and the fulfillment of criterion 10, it means there is still a relatively high overall cost per participant. This creates limitations in terms of the feasibility for replication or scaling up. Thus we feel the thoughtful design of the course is all the more important, as we aim to have a high impact on each participant given the investment costs.

Since 2013, we have successfully replicated the original Swiss course in other locations (to date in India, South Africa, Côte d'Ivoire). This has required working with new donors and partners and adapting the course to different cultural and geographical contexts. In doing so, applying our basic design criteria has been invaluable. It ensures that the core of the course and the experiences for the participants remain the same, yet appropriately modified. We always work with local partners based in the host country who support us in developing the necessary network and align the course program and expectations with local cultural norms, including gender dynamics, management styles and approaches to learning.

The design criteria discussed in this paper aim to support the development of food systems education courses and programs in tertiary education. As educators with diverse experiences and backgrounds, we have designed the World Food System Summer School with the aim of serving a highly relevant and complex theme – understanding food system challenges and developing sustainable solutions.

As we continually improve these courses, we share our pedagogical design criteria and our lessons learned, which may provide guidance for other educators developing similar offerings. We fully appreciate that it may be impossible to apply all the twelve design criteria outlined above in all types of food systems education courses. However, we hope that outlining this holistic design for educators who are developing related courses can stimulate a priori reflection about how some of the elements could be integrated, regardless of the course format.

As the challenges facing our food system become increasingly pressing, the need for motivated and capable leadership is critical. Education has a pivotal role to *GAIA* 27/1(2018): 169 –175 play in the drive towards positive change, and as educators we are uniquely placed to innovate our teaching and learning formats towards this goal.

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1. FAO (Food and Agriculture Organization of the United Nations), IFAD (International Fund for Agricultural Development), UNICEF (United Nations International Children's Fund), WFP (World Food Programme), WHO (World Health Organization) The state of food security and nutrition in the world 2017. Building resilience for peace and food security.. Rome: FAO; 2017.
2. Freire P. Pedagogy of the oppressed.. 30. New York: Continuum; 1970.
3. Galt R., Clark S., Parr D. Engaging values in sustainable agriculture and food systems education: toward an explicitly values-based pedagogical approach. *Journal of Agriculture, Food Systems, and Community Development*. 2012;2(1):43–54.
4. Grant M. Internationalising higher education for sustainability: Youth Encounter on Sustainability.. In: Corcoran P., Osano P., editors. *Young people, education and sustainable development: Exploring principles, perspectives and praxis..* Wageningen: Wageningen Academic Publishers; 2009. p. 329-36.
5. Grant M. Youth Encounter on Sustainability: A transdisciplinary, multicultural, and immersive education program. In *Handbook of Sustainable Engineering*. Edited by J. Kauffman, K.-M. Lee. Dordrecht, NL: Springer; 2013. p. 79-89.
6. Hilimire K. Theory and practice of an interdisciplinary food systems curriculum. *North American Colleges and Teachers of Agriculture Journal*. 2016;60(2):227–33.

7. Hilimire K., Gillon S., McLaughlin B. C., Dowd-Urbe B., Monsen K. L. Food for thought: Developing curricula for sustainable food systems education programs. *Agroecology and Sustainable Food Systems*. 2014;38(6):722–43.
8. Kolb D. *Experiential learning: Experience as the source of learning and development*. 2. Upper Saddle River, NJ: Pearson Education; 2015.
9. Torenbeen J., van Rest E. *Summer schools in Europe: The culmination of a trend or the start of another E-book*. Amsterdam: EAIE (European Association for International Education); 2014.
10. WFSC (World Food System Center) *World Food System Center Phase 1 Report 2012–2015*. Zurich: ETH Zurich; 2015.
11. Wiek A., Bernstein M., Laubichler M., Caniglia G., Minter B., Lang D. A global classroom for international sustainability education. *Scientific Research: Creative Education*. 2013;4(4A):19–28.

NOTES

¹The World Food System Center conducted a benchmarking of food system and food and nutrition security initiatives in the academic sector over the period 2011 to 2017.

²We are currently in the process of evaluating the medium-term outcomes of the courses through surveys and focus groups with the alumni cohort.