Bridging the Gap between Academia and Food System Stakeholders

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Abstract: The well-known gap between theory and academic courses at universities and applications of this knowledge in farming and food systems have been identified as barriers to practical development. Production specialists in academia have assumed that focus on increasing crop yields is intrinsically beneficial and will help farmers regardless of scale and need for inputs, including increasingly expensive technologies. Farmers and others in the food system recognize immediate needs and challenges that must be overcome to reach profitable levels of yields and income while not ignoring environmental and social implications of new technologies. There is often lack of communication and shared agenda among the players, including common research priorities, essential questions that address current realities on farms and in communities, and shared long-term visions. A postgraduate educational programme in Norway that explores the ecology of food systems has been designed to lower the barriers to communication by focusing on student learning together with stakeholders and by seeking application of biological and social sciences to improve farming and food systems as well as related activities. Guiding philosophy for the agroecology MSc education program at NMBU – Norway includes whole systems perspectives and phenomenology as guides to learning, which we summarize along with a description of the two-year curriculum in an intensive introductory course. The process includes frequent communication between students embedded in the farm and community with their stakeholders. We combine individual with social learning, integrate biophysical with socioeconomic sciences, and apply a team approach to building human capacity to understand complexity and uncertainty in food systems. One outcome is development by student teams of a series of potential future scenarios that will help stakeholders achieve their own goals. Over the past decade, more than 230 students have participated in this holistic educational activity, and there is growing demand for this type of learning experience in the Nordic region and elsewhere.

Keywords: agroecology, experiential learning, phenomenology, action education

Introduction

There may be a larger gap between knowledge and action than between ignorance and knowledge in agricultural development. This is displayed in the proverbial gap between academia and stakeholders, in our case farmers and food system practitioners. When we recognize that there is currently enough food produced globally to feed everyone, but large inequities exist in access and distribution and there is at least 30% of food loss in the total system, the simplistic goal of producing more food is unlikely to solve the hunger faced each day by more than one billion people [IAASTD, 2009]. It would be equally simplistic to quickly conclude that researchers are working on the wrong problems and teaching in disciplines that are too narrow, and that discipline-specific research and education are no longer needed. Neither conclusion addresses reality. To help develop critical thinking skills for sorting out complexity and orient education toward practical challenges, we employ a phenomenological approach to learning that starts on the farm and in the community that students have found useful to become comfortable working with stakeholders and co-learning about how to improve farming and food systems.

This approach includes putting credibility in practitioner wisdom, whether in farming systems and practices or in the processing, marketing and consumption of food. More importantly, we encourage students to combine the knowledge and skills acquired in university education with the practical wisdom of stakeholders active in the food system. A phenomenological approach to learning used in planning and implementing an agroecology curriculum includes starting on the farm and in the community (Østergaard et al., 2010). This strategy requires an educational reversal where we start with shared experience on the farm and in the food system, rather than with theory and facts about specific disciplines. Often such an approach even requires 're-learning' and critical examination of what has been learned in the past in study of narrow parts of the system. In the world of systems practitioners, students quickly learn that everything is connected, and that simple cause–effect relationships are infrequent. A holistic and systemic strategy for learning is essential (Francis et al., 2011).

Students begin the Agroecology MSc with a range of prior experiences and academic preparations, and we strive to affirm their practical knowledge and disciplinary expertise while at the same time seeking learning methods that will emphasize interactions and connectedness of this information as they apply to whole systems and understanding complexity (Lieblein et al., 2005). We help students integrate biophysical with socioeconomic perspectives and methods, as they become better able to study whole systems and relate more effectively with stakeholders. Most importantly, we provide experience in visioning an improved future situation, develop potential scenarios together with stakeholders, and assess *a priori* the likely impacts of these decisions. In this presentation we describe our educational philosophy that guides design of the learning landscape, and the general format of the two-year program and details of the first autumn semester that contributes to bridging the gap between academia and food systems.

Educational Philosophy in Agroecology

Over more than a decade teaching agroecology, we have developed an educational philosophy that guides the design of the curriculum and specific activities to help reach the overall goal of educating practical agroecologists. We envision their progress in education on a learning ladder that begins with knowledge and skills, progresses to theory about learning and communication, confronts the farming and food system in the field and community, using phenomenology as the guiding principle, explores future informed visions using what has been learned from stakeholders, and designs actions to help clients achieve their goals (Lieblein et al., 2007). They can best achieve constructive change by working closely with key farmers and stakeholders in food systems, thus working toward bridging the gap through better communication between academia and practitioners. Here are dynamic ideas that inform design of our program.

Holistic and systems perspective

Farmers and other food system stakeholders face a reality of multiple elements, processes, values and goals that are intimately interconnected. They deal with complex situations where causation is rarely simple and linear. When educators and students learn to appreciate this complexity, it is apparent that problem identification and solution are seldom as straight forward as narrow challenges such as a plant nutrient deficiency or animal disease. To be sure, these questions are complex in themselves, but need to be approached in a wider systems context. To be relevant to the realities faced by stakeholders, those in academia need to appreciate the wholeness of systems with properties that depend on interconnections among the parts [Ison 2008]. This requires seeing both the whole and the parts, which is a major challenge to human cognition. It is likely that most observers only can see a part of the situation because of their disposition to construct an understanding of reality, and that all of us should become aware of our blind spots in order to reach observations of a higher and broader order. Bland and Bell (2007) introduced an epistemological tool termed 'flickering', which is 'to continually switch back and forth between the perspective of the part and the perspective of the whole'. When dealing with components and their interconnections, it is useful to systematically view a situation through multiple perspectives (Rickerl and Francis, 2004) and to consider each situation as consisting of spatial hierarchical levels where complex interactions result in emergent properties that contribute to the whole system (Ison 2008). It is also necessary to acknowledge the dynamic nature of systems. Soft systems methodology (Checkland and Poulter, 2006) is a strain of holistic systems thinking and action research with a particular emphasis on the dynamics and the reality of change. It consists of a stepwise, participatory approach to map the whole, the relevant parts and the key issues of a situation, and then to improve it by interacting with stakeholders throughout the process. The primary steps are to perceive the current situation('what is') and potential future situations ('what could be') as systems with interconnected parts, and then model the change process itself as a consistent set of nested, purposeful human activity systems aiming at desirable goals. The participation of stakeholders is essential because of the multiple roles of people involved, especially as they contribute knowledge about present and future wanted situations and will be responsible for bringing about the desirable changes.

In our agroecology education program, we have found the approach outlined above fruitful to guide students in understanding farming and food systems and in facilitating informed and responsible action by key stakeholders. Equally important is an approach that motivates students to gain skills and develop attitudes required in their future work as agroecologists (Østergaard et al., 2010). Lastly, feedback from key farmers and food system project leaders strongly suggests that this educational strategy is helping to bridge the gap with academia.

Phenomenology as educational foundation

Phenomenology has been developed and used for a wide range of purposes in teaching and learning science. To differentiate this approach from 'problem-based' and 'inquiry-based' science education, this educational method also has been coined *phenomenon-based science education* (Dahlin et al. 2009). Phenomenological critiques of current science education are important because they insist on lifeworld and natural phenomena transcending scientific knowledge: "scientific knowledge is *one* way to understand the human lifeworld, not *the* way" (Østergaard et al., 2008, p. 115). In his phenomenological approach to science education, the German science educator Martin Wagenschein claimed that the main problem in science teaching is that it is too often planned "from the end", starting with the scientific concepts and the mathematical structures, while phenomena themselves are hardly touched upon as the teacher moves on into the world of abstract concepts, "so that the children no longer can participate with their eyes, ears and hands" (Wagenschein, 1983, pp. 108-109; our translation). In contrast, the phenomenological approach to science education starts with the careful description of lifeworld situations in their multisensual realities. A science teaching planned "from the start" will presumably involve a primary focus on each student's lifeworld experience and a secondary cognitive or reflective activity in which these experiences are understood or explained.

A recent research review on the role of phenomenology in science education concludes that one prevalent concern is how to help students bridge the gap between the lifeworld and the arena of scientific knowledge (Østergaard et al., 2008). This seems to be the core of phenomenological critiques of mainstream science education. This gap is either formulated in terms of science versus society and culture, or in terms of science versus immediate perceptions and experiences of natural phenomena. In both cases the implicit assumption is that the science world and the world of direct experience are too far apart and that this is a prominent reason for the difficulties students have in learning science.

Van Manen (1990) states that phenomenology always begins in the lifeworld, with sensuous experience and perceptive involvement. However, an important point to make in the phenomenological critique of mainstream science education is that sensing is not in opposition to cognition –

it is rather an entrance into a deepened performance of "the task of abstraction" (Wagenschein, 1983, p. 109; our translation). In this sense, phenomenology is primarily a way to connect (abstract) theory and (lived) experience (Lukenchuk, 2006). Phenomenology is an attempt to understand problematic situations as they appear by describing them "in the broadest sense as whatever appears in the manner in which it appears, that is as it manifests itself to consciousness, to the experiencer" (Moran, 2000, p. 4). In the agroecology program this attempt to understand phenomena involves putting credibility in practitioner knowledge and in how practitioners value and judge situations.

Phenomenon-based science education is most fruitful for learning when activities are physically accomplished, when they are turned into actual steps toward understanding and promoting learning. In Michael Faraday's famous lectures from 1861 on the candle (Faraday, 1909), he designs the learning situation with emphasis on *both* natural phenomena *and* students as concrete persons with their own experiences and life histories. Thus, phenomenon-based science education is much about developing and training skills. The phenomenological critique of today's science education points at a profound lack of appreciation of the natural world surrounding us. In a phenomenon-based approach to science education, student's understanding and explanations about nature are based on rich personal lifeworld experiences. Their discussions grow from careful observations and the consciousness that these sensual experiences are integral to their learning about the world of agricultural practitioners. .

Bringing the inside out: learning from the future

During the first scientific revolution, 400 hundred years ago, Galileo and other scientists emphasized the need to use our own senses to experience the world and to make those experiences the basis for knowledge development. In the evolution of natural sciences as a discipline, the early emphasis on observations was transformed into an approach where mathematical representations and scientific concepts took over the role as the starting point of the learning process. Rather than the immediate sense-based experiences, the quantitative and model-based representations of the world were held to be the truth. Harvey calls this an ontological reversal (Harvey1989). One key lesson from the phenomenological approach is recognizing a need for renewed emphasis on our immediate sense experiences as basis for learning. In agroecology we start with experiences on farms and in communities, then build the learning process based on those shared experiences. This approach is rooted in modern approaches to learning, called experiential learning, such as the Kolb-type learning cycle (Kolb 1984). This approach focuses on our reflections around experiences of the past. We can call this approach *bringing the outside in*, where our sense-based experiences are transformed into knowledge through the process of reflection. In agroecology this means that students must observe and participate in farming and food related practices, and use experiences from participation and observation to generate knowledge about farming and food systems. According to Pfeffer and Sutton (2000), knowledge gained from experiences will more likely lead to action than knowledge based on listening to lectures and reading books. As such, experiential learning, in the Kolb-style, is an important approach to learning about farming and food systems, but it has its short-comings. Processes and patterns of the past do not necessary contain what is needed to deal with the challenges of the present and the future. It is therefore not sufficient to learn from the past, we also need to develop a fundamentally different kind of learning, a learning from the future (*bringing the inside out).* It is vital that students are not continually hung up with what happened yesterday or during the last weeks; they also need to focus on tomorrow. In the quest for sustainable development, we see a need for cultivating the ability to learn from the future as a second phase of the scientific revolution (Scharmer and Kaufer 2013).

If experiential learning is about the careful observation of the outside world through our senses, and cultivating those senses, then the new learning cycle needs revised focus and a new source of learning. The Kolb learning cycle has the environment as the source of learning (learning from without), whereas the new learning cycle has our inner reality and creativity as crucial sources of learning (learning from within). Creativity is the ability to transcend existing patterns, those prevailing patterns of yesterday, and the ability to see completely new solutions. Learning from the future (the second learning cycle) has been a part of our agroecology education right from the start, complementing an experiential approach. Learning from the future is trained in a separate seminar on visionary thinking, and is further practised in public seminars with farms and other food system stakeholders as part of the agroecology course (Lieblein et al, 2011; Lieblein et al., 2001). Finally, learning to learn is essential for students to consciously engage new issues and complex questions in an ever unfolding and uncertain future.

Building on disciplinary experiences

The conventional approach to much of our agricultural research for the past century has been to subdivide and specialize, using ever more sophisticated equipment and methods of analysis to better understand the components and mechanisms of systems. We have also divided education into pieces of the whole puzzle, both in the classroom and in cooperative extension and advising, with consultants in the private sector becoming specialized experts. On campus this results in a predominance of courses in soils, entomology, irrigation technology, and agricultural economics with little attention to integrated courses in agricultural production that combine the specialties or agroecology that bridges farming with environmental and social concerns. We have left the integration to students on campus and to practitioners in the field. Although specialization has provided large advances in production, when questions are simple and problems can be solved by clever deployment of technologies, this approach ignores much of the complexity of systems as described in previous sections and does not lead to understanding of critical emergent properties. The strategy is not robust enough to solve what Batie (2008) has called the 'wicked problems' that emerge from complex situations.

Two issues appear important to help bridge the gap between academia and stakeholders in the 'practical world outside' – validation of farmer and food stakeholder experience and how this can be blended with discipline-specific research to better understand systems, and how to build on this consolidation of ideas to better legitimize systems study as a key to improved mainstream agricultural research and education. Farmers have long used university research in designing and choosing farm practices, including non-partial variety test results, research on nitrogen levels for crops, and integrated pest management strategies. They have been the key persons to apply this science-based information in practical farming systems, and in the process have helped build a context for further research and inform investigators about additional questions. Agroecology as a bridge can contribute to enhancing and formalizing this type of mutually valuable interaction. From the side of researchers and instructors in agroecology, their thoughtful integration of relevant discipline-specific results into the research planning agenda as well as classroom education can contribute to legitimizing both the practical value of research results and the importance of integrating these into practical systems language and application. Students in the Norway MSc program have opportunity during second and third semesters to embrace discipline-based courses, and hopefully can bring to them a broader systems perspective. Both discipline-related and systems-oriented learning activities can help bridge the academia—practice gap.

Transdisciplinary perspectives and social learning

Education across disciplines and including their multiple perspectives is essential to achieve a holistic understanding of the complexity of farming and food systems. Our thinking has evolved, starting from the *multidisciplinary* approach of assembling a team of specialists for teaching, where each contributes theories and methods from specific disciplines in an integrated way. This strategy helps identify questions at the boundaries between disciplines, but does not assure integration nor imply an equal sharing of the parts (Schunn et al., 1998). An improvement could be the *interdisciplinary* approach that transcends boundaries and integrates methods leading to emergent properties such as unique combinations of ideas and applications (Mittlestrass, 1998). We have arrived at the *transdisciplinary* approach which "concerns that which is at once between the disciplines, across the disciplines, and beyond all disciplines. Its goal is the understanding of the present world, of which one of the imperatives is the unity of knowledge" (Basarab, 2002). While many educational programmes integrate economics or environmental aspects with agricultural production, ours is perhaps unique in its focus on social learning and combining methods from biophysical and social sciences.

It is this distinction that provides potential for better bridging the gap between our academic program and stakeholders in the food system. There is an old adage in academia that "farmers have problems and universities have departments and disciplines", and only if a farmer's specific narrow problem happens to coincide with corresponding research in a particular department will both investigator and client be pleased with communication of a solution. From the previous sections on holistic thinking and phenomenology, it is obvious that we consider the most prevalent and intractable challenges to be complex, multi-faceted, and resistant to simple description or solution. For this reason we combine the perspectives of agriculturists with those of economists, specialists in the environment, and social scientists as well as the relevant methods they bring to the table to identify issues on the farm and in the food system and then seek potential scenarios or solutions that will help our stakeholders design action plans that will help them meet their goals.

There is a wide range of available methods and tools, and we focus on several that have proven especially valuable to students in agroecology. These include developing rich pictures of a farm or a food system (Checkland, 1975), who describes the importance of a "picture of the problem situation, one as rich as can be assembled in the time available" (p. 281), use of scenario building and SWOT [strengths, weaknesses, opportunities, threats] analysis (Lobo et al., 2005), and mind mapping (Breland et al., 2012) to link concepts with interpretations and otherwise illustrate major connections in the system. One thing that distinguishes the use of these tools from more quantitative measurements common in biological and physical sciences is the potential to include stakeholder goals, world views, ethics, and other dimensions that are not normally a part of ecological or production-focused analysis. They are especially valuable as students identify key issues important to stakeholders and use this holistic perspective to better design potential future scenarios.

Education for responsible action

Finally, our program is guided by the philosophy of learning for a reason, and that is to build capacity for critically assessing situations and working with stakeholders to effect change in farming and food systems. In fact, the final and crucially important step on a learning ladder that students ascend while studying agroecology is responsible action (Lieblein and Francis, 2007). Action research and education have been described by a number of authors, often under the term 'service learning' (eg. Carver, 1997; Jordan et al., 2005) as the process by which students immerse in a practical and real-life situation, collect relevant information and talk with stakeholders, and then design alternative steps toward an improved future. This research strategy is in direct contrast to those methods that see the researcher as impartial observer who can be totally objective because he or she is outside the reality, only looking in, and unaffected by such qualitative dimensions as client's opinions, or their own emotions or personal identity with the situation. By comparison, our students spend two extended periods of time living on a farm or in a community where they interview people and then analyze the situation based on these encounters. They get to know people personally, their goals and aspirations for the future, and together with instructors this project team looks for the most effective ways that can be explored for making responsible change. The process is described in the next section.

An Agroecology MSc Program in Norway

One key goal of the agroecology program at NMBU that leads to a thesis project and MSc degree is building a graduate's capacity to reduce the distance between academia and practical food and farming systems practitioners. To bridge this gap It is important to develop a learning landscape that students can explore through developing and practicing communication skills that will help them apply formal learning and new knowledge to deal with current challenges facing farmers and long-term, sustainable food production. They also need an appreciation of the complexity of multiple players and interactions with institutions and businesses that greatly impact food systems, as well as cultural and political aspects that contribute to successful, equitable food systems. The two-year degree program includes an intensive first semester module in *agroecology: farming and food systems.* The second and third semesters are dedicated to courses chosen by students from several departments with topics such as agronomy and soils, economics, research methods and statistics, ecology and environmental science, rural development, and others as appropriate to a chosen thesis topic or a well-rounded preparation for potential future employment. These two semesters may be taken at NMBU or elsewhere. A one-semester thesis project gives students the opportunity to choose a research question that can be approached in a holistic, systemic, and practical way.

The intensive first semester is a full-time course build on the philosophies and practices of phenomenology, whole systems analysis, working directly with stakeholders, and using integrative biophysical and socioeconomic methods that are appropriate for evaluating farms and community food systems. Theories and tools such as the Kolb learning cycle, interviews, rich pictures, force field analyses, group work, and social learning are employed in two semester-long projects. Both written and oral communication skills are practiced in class during discussions and in several individual and group presentations and papers. We have found that community building is especially important to fostering successful group project work.

Central to the course are two student projects, one on farming systems and one on food systems. The farming system study involves two visits to explore a farm, interview key players, learn about goals and plans, assess the resource base and environment, and record details about current production systems, Students inquire about and observe interactions among components in the larger farm system, markets, and subsidies. Goals are to develop multiple scenarios that would help farmers meet their goals, and the potential outcomes of each strategy. From this they write and present a farming systems client document, and get evaluation from the instructors and other students.

In a community food systems project, students work with a key client to help identify other stakeholders, and conduct multiple interviews to learn about individual and community goals for a future food system and potential national government programs to provide assistance. Examples of goals have been to introduce organic food into schools and government canteens, to recruit young farmers, to develop local food sources and markets, and to reduce the carbon footprint in food systems. From this research in the field and many discussions, students write a food systems client document, make a presentation and conduct a visioning seminar with key people from the community. This one-semester course has proven popular with students, and we have been successful in recruiting 20-25 students each year. The program has received two educational awards from NOVA University and NMBU, and appears to be strongly institutionalized in the department and the university. For more details, we refer the reader to several publications that describe this educational program (Francis et al., 2009, 2011, 2012; Lieblein et al., 2000, 2005, 2007; Østergaard et al., 2010).

To expand the audience for the results of this educational adventure, over the past three years we have been summarizing teaching methods used specifically in our agroecology courses, although we consider these appropriate for courses in other integrative and practical disciplines. Several of these ‘teaching tips’ have been published in the NACTA Journal, one of the leading publications in agricultural education. These tools have been found useful to build a learning community, develop team research capacity, and encourage personal growth [adapted from Eksvard, 2013]. Details on these specific learning tools can be found by searching NACTA Journal for 2011-2014.

Conclusions

In conclusion, we are convinced from the experience of two decades of teaching as well as involvement in systems research that the apparent gap between academia and farming and food systems stakeholders is one that can be bridged by better communication and by involving people in the field with education (Lieblein et al., 2000). In agroecology courses we focus on complexity, uncertainty, and the multi-dimensional nature of many decisions that food systems people face. We have found that the most effective way to learn about this complexity is to start on the farm and in the community, an educational strategy which might be called *phenomenon-based agroecology education*. Students realize that the university is not the only credible source of information, and that we as educators are convinced that people in the field have much to contribute to our education. Thus, it is a small leap to bridge the gap, to see things from the stakeholder perspective, and most importantly to learn from all sources of knowledge.

The use of open-ended case studies brings new opportunities both for students to develop their creative skills at interviewing stakeholders, and for educators to emphasize that there are not simple nor single answers to complex challenges (Francis et al., 2009). Both students and educators gain respect for farmers and food system practitioners in the field, learn a new language appropriate to food systems, and practice communication in ways that build confidence for their thesis work as well as future job opportunities. We have observed that students who complete the program take this set of skills and appreciation of working with a wide range of clients into their employment or further study. The most important result is that they become not only action researchers but effective agents of change who can team with others in academia, non-profit groups, commercial interests, and government to pursue well-informed strategies for development. And for us as educators the most important result is what we observe in students embracing this experiential strategy to learning and taking this forward into their further study and future employment.

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