

Learning Innovation: Teacher Education for a Multidimensional Agriculture

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In this paper we explore the challenges in the education of teachers for an agriculture that undergoes profound changes, in Norway as well as in the rest of Europe. We argue that this new situation requires a new awareness of and emphasise on the skills of change and innovation for both farmers and teachers who are to train pupils in becoming farmers. We discuss some pedagogical perspectives on the education of teachers using phenomenology as a point of departure. Phenomenology in this context is a tool for learning, in regard to both understanding the diversity of current Norwegian agriculture and training the basic skills of teaching. Finally, we argue that emergence of the multidimensional agriculture must be accomplished by a teacher education emphasising the training of multiple skills. In a world of constant change and development, the students learn how to become agents of innovation.

Agriculture's complex and changing situation today, from a narrow-oriented private food production sector to a broader societal activity, poses challenges to the education of teachers in agriculture.¹ One of the main challenges is to focus on the skills of change and innovation as key qualifications, for agricultural workers, as well as for teachers who are educating these persons. The farmer requires a competency of change and innovation in order to cope with processes of change, which characterizes the everyday of a practitioner. In addition, the skill of seeing new possibilities and adapting to new societal trends and demands seems to be of current importance. Similarly, the teacher educating pupils in agricultural schools also requires such a competency. Norwegian teacher education in agriculture has always had a perspective on the *dual teacher competency*; on the one hand the competencies connected to the actual occupation or profession, on the other and the multiple competencies of teaching. In this paper we discuss the dual challenge of educating teachers in agriculture that is changing. Which skills of innovation and change are demanded, both for farmers and teachers?

The Agricultural University of Norway has offered teacher education in agriculture, fishing and forestry (hereafter called agriculture²) since 1965. Since 1999 the teacher education at the Norwegian Agricultural University also include life sciences in addition to agriculture. This teacher-education program can be taken as a one-year full time study, or as a part time education over two years. The latter is more suitable for most of our students because it enables them to combine education and work. Most of the students are already engaged in teaching or other occupations. Those who are teachers mostly work in upper secondary schools, while a lesser number are from lower secondary schools. The education is practice based, emphasising training of basic competencies and skills in the process of

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¹ In this paper we distinguish between teacher *education* and teacher *training*: We use the term teacher training as a subset of education, emphasizing the training of skills. This distinction is in accordance with Codd (1997) who defines training as competency-based, skill and vocationally oriented learning, whereas education more is connected to learning of attitudes and transferable knowledge.

² We use the term *agriculture* as an overall concept which includes all the traditional trades, as horticulture, fishing and forestry, but also the more recent farm professions as “farm teaching” or health care advisory. In Norwegian, the current term for this is “naturbruk”, literally translated “nature use”, which emphasises the use of nature in a broad sense, from management of natural resource to facilitating children’s learning on the farm as a classroom.

becoming a teacher.³ Main aim of the teacher program is to educate teachers and learners for the current and future Norwegian society.

The Current Situation in Norwegian Agriculture

Norwegian agriculture experiences much of the same economic and structural changes observed in other affluent western European countries. The share of population working in agriculture is decreasing at a steady rate. In 1900, some 85% of the people lived in the countryside - closely associated to agriculture. In 1950, around 50% of the population lived in rural areas. Today 25% live in the countryside and only around 10% of rural inhabitants work within agriculture. The number of operating farms is rapidly decreasing and farmers increasingly become part-time operators. Some 60% of the farmers that took over the farm from 1993-1997 take less than 50% of their income from the farm (Tviberg and Haanes 1999). Many farmers now diversify both with respect to on-farm and also to off-farm activities, combined with part-time agriculture. This may involve daily or weekly commuting, often accompanied by "Farm Office Online" activities. Others may take over the farm, but rent out land and other capital assets, such as the barn, storing facilities, machinery etc. Two thirds of the Norwegian farm owners do not send in the Farm Tax Form, implying that they do not have substantial operational income from the farm. This opens up possibilities for entrepreneurial machine farmers. The peak labour and harvest periods in Norwegian agriculture of 2003 are dominated by this group of farmers, with their large machines, travelling between the farms to plough, sow, spray and harvest the areas they own or hire and manage around in the villages. In spite of this process of structural changes and "monoculturing" of Norwegian agriculture, we still find smaller farms with production diversity. This is most likely due to governmental subsidies to smaller animal production farms which the farmers still received up to the middle of the 1990`s. In recent years, such farmers have had possibilities for new sources of income.

Parallel to these immense changes in the conditions in Norwegian agriculture, we also see an outspoken development regarding the attitude of the consumers and citizens. The urban public is no longer content in viewing agriculture as a privately owned source of food production (Lieblein et al. 2000). Especially the last decade, society has shown a growing demand for the ecological, ethical and social dimensions of the agricultural production and use of rural resources (Wilson and Morran 1990). Individual farmers are now beginning to relate to this challenge. We see the development of activities and productions that can cater for emerging focus on identity needs in the "Dream Society" (Jensen 1999), linked to experience of nature, therapy, education, organic agriculture, food culture and the conservation of natural and cultural landscapes. In the region of Nord Trondelag in Norway cooperation between local schools and farms is developed in all of the municipalities (Jolly et al. 2003).

This change does, however, presuppose a reconditioning of the farmers' competence and identity from being oriented towards traditional agricultural products, to a stronger focus on "identity products", on the landscaping of farming and on documenting and selling the production processes – both in private and public markets. These changes challenge the traditional production-oriented paradigm in Norwegian agriculture, because they generate a need for a broader competency among farmers and extension workers (Lieblein et al. 2000), as well as for teachers in the agricultural upper schools. Earlier, the farmer could simply deliver his/her products to wholesale companies. Today, the new situation often forces the farmer himself/herself to become a sales person when a higher price for the "identity products" is demanded. Further, the farmer often has to relate to the public, whether it is kindergarten

³ The education is named "Praktisk-pedagogisk utdanning" ("Practical-pedagogical education") and presupposes a Bachelor or Master degree in agriculture (animal husbandry, plant production, management of natural resources etc.).

children, school children, pupils with learning or social disabilities, persons suffering for substance abuse or psychiatric patients.

The Question of Farmer's Competencies

For the problem formulation in this article, two aspects of farmer's new competencies is important: firstly the need for developing the skill of acting according to a situation characterised by change and uncertainty, and secondly the need for the farmer to extend his/her competency to include the professional interacting with groups or individuals who participate on the farm, with the farmer.

Farm management is a matter of making the totality on the farm run in a satisfactory manner. This requires a manifold of knowledge and competencies, from knowledge about the various activities and productions, short term and long term economic planning, to knowledge about the surrounding world, marked possibilities etc (Østergaard 1997). As farming is an activity in constant change due to climatic conditions, marked situation, unforeseen events etc, a key competency is the skill of adapting to the current situation (Nitsch 1990 and 1994). This is a lasting process of decision-making that is integrated in the farmer's daily work activities (Nitsch 1990). In order to cope with the changing situations on the farm, the farmer is in a continual dialogue with the surroundings. This dialogue is characterized by the need for new knowledge *and* the skill of interpreting and adapting this knowledge to the farm situation. This *adaptive rationality* is an act of interpretation that is guided by the farmer's experience and competence on the one hand and his/her goals and visions on the other (Nitsch 1994).

The conversion from conventional to organic farm management can form a fruitful case for discussing farmers' skill of adaptation and change. Farmers' motivations for converting to organic agriculture is both influenced by societal movements and environmental initiatives and driven by the need for realizing personal ideas and visions (Østergaard 1998). For the farmer, converting the farm is a profound process involving many dimensions. One might even say that the farmer converting to organic farming undergoes a personal "shift of paradigm" (Østergaard 1997). Conversion itself implies an application of new knowledge and new ideas to the farm's site-specific conditions. In order to become indigenous to the farm, the farmer is in a process of change and is practising and developing the capability of adaptation. Further, this skill is of vital importance in a situation with rapid economic, political and social changes in agriculture. Today's agriculture is put under pressure by consumers who demand cheap food and by policy makers who are aiming at cutting the subsidies. In this situation competent organic farmers have an advantage because they have trained the skill of adaptation (Morgan and Murdoch 2000); they have practiced being in conversion and they have acquired the capability of adapting to new conditions.

Therefore, for the farmer this skill of adaptation implies much more than coping with changes due to natural variations or agronomical, political and food marked dimensions. In a situation where farmers are combining traditional production of goods with social welfare or pedagogical activities on the farm, the skill of adaptation also can be regarded having social and pedagogical aspects. By meeting and receiving school classes on the farm, by using the farm as a classroom, the farmer's adaptive skill is needed in order to facilitate the situation as a learning process. The skill of adaptation is needed for relating to different school classes according to age, gender, individual differentiations or special needs. In this manner, two kinds of adaptive skills are intertwined: the practical adaptive skills and the pedagogical adaptive skills.

These changes in farmer's competencies will necessarily lead to changes in curriculum in regard to the education of farmers. How can teachers in agriculture facilitate for pupils' learning of this skill of adaptation? And, on the next level, how can an educational program for teachers in agriculture incorporate the training of adaptation and innovation? Before discussing these questions, let us first examine the teacher's competencies.

The Question of Teacher's Competencies

The competencies of a teacher are manifold. Five different kinds of competencies are defined in the Norwegian guidelines for teacher education (National Curriculum Guidelines 2003):

- *Subject-oriented competence*. This competence is based on the content of the profession for which the pupils are educated. A teacher in plant production has to have basic knowledge about this profession and its different sub areas, for example applied biology.
- *Didactical competence* implies the skill of facilitating pupils learning processes – planning, accomplishment and assessment of teaching. This is a core competence for the teacher, used every day.
- *Social competence* implies the skill of co-acting, cooperating and communicating with as well pupils – individually or as a group – as parents and colleagues.
- *Ethical competence* implies the capability of reflecting on moral and ethical aspects of the profession and how these issues pervade the daily decisions a teacher has to make.
- *Innovation and development competence* implies the skill of renewing and developing ones own knowledge and pedagogical activity as a teacher by taking part in innovative school initiatives.

For our teacher students, the first of these competencies relates to the actual teaching in agriculture, whereas the other four competencies may be regarded as equally important for all kinds of teaching activities. The subject-oriented competence is related to different professions within agriculture, not only encompassing the *knowledge* aspect of agriculture (knowledge about grain production, animal husbandry, forestry, fishing, etc.) and applied life sciences (knowledge about biology, chemistry etc.). It also includes the *skills* involved in agricultural professions and the *attitudes* connected to and underlying the teaching of these subjects and their purposes in society. Teachers' competencies are generally expressed through the four last competency categories. However, the specific subjects in the curriculum also influence these competencies. For example, the social competency is based on knowledge about common social values. Teachers in agriculture need profound knowledge about the importance of social values for good agronomy. Farmers use some basic values – as independence, proficiency and management responsibility –when deciding what is right or wrong, agronomical sound or not (Vedeld and Krogh 2003). It is obvious that the competent teacher in agronomy treats and teaches the agronomical knowledge as “embedded” in these values. Similarly, the ethical competency of the teacher in agriculture is influenced by society's demand for animal well fare and ethical sound production practices in agriculture. For the experienced teacher in agriculture, these two aspects of ethical competence are intertwined.

The skill of innovation and development is already stated as one of five major competencies a teacher should have and which the teacher education should educate for. This means that teacher students must receive practice in learning innovation and how to participate in developmental processes related to actual school situations. As we have argued, training of this skill is of special importance in today's agriculture. The next question is therefore: How do we actually facilitate for the training of the skill of innovation and adaptation in the teacher education program?

A Phenomenological Perspective on Teacher Education

A phenomenological perspective on educating teachers in agriculture is relevant for two reasons: Firstly it opens up for a broad, perceptible access to the social and natural world, thus being a complement to the more cognitive based science education, and secondly, it very explicitly emphasises the training of skills. One of the objectives of our teacher education is to develop basic skills of learning facilitation through a deeper understanding of the interaction between man, nature and society. In a phenomenological perspective, a person's connectedness to nature is much more than a subject's relation to objects (stones, plants, animals) and processes (physical, chemical, biological) in nature. Rather, this relation can be described as a complex web of a person's acting and interacting in nature and in social and cultural contexts (Krogh 1995, Strangstadstuen and Østergaard 2001).

With a starting point in phenomenology as a branch of philosophy, we have over the last years developed phenomenology as a theoretical foundation for our teacher education by transforming the mere philosophical dimensions into practical-pedagogical guidelines for teaching. In this approach, we stress the perspective and participating dimensions of teacher education as much as the cognitive training: Phenomenology provides a shift of focus from *understanding* the world to *perceiving and acting* in relation to the world (Østergaard 2003). According to the French phenomenologist Maurice Merleau-Ponty, our relation to nature is primary a doing, not a knowing relation. Merleau-Ponty argues that our consciousness and our ability to think is based on our already being and acting in the world:

“... consciousness is in the first place not a matter of ‘I think’ but of ‘I can’” (Merleau-Ponty 1945/1962: 137).

In the academic world, we are often confronted with the attitude that the theoretical knowledge we gain automatically can be transformed into action whenever we wish. According to Merleau-Ponty's interpretation of phenomenology, it is just the other way around: Our already being in the world and our developed acting skills form the basis for developing thinking skills. This focus in phenomenology emphasises our experience and our experiential acting in the world. Lived experience “overflows the boundaries of any one concept, any one person, or any one society. As such, it brings us to a dialectical view of life which emphasizes the interplay rather than the identity of things” (Jackson 1989: 2). In this sense, phenomenology is a tool for understanding and reflecting upon experience. It is an attempt to describe human consciousness in its lived immediacy, before it is subject to theoretical elaboration or conceptual systematizing. Phenomenology is not aiming at explaining phenomena by reducing them to facts, determinants, hidden principles or cognitive patterns (Jackson 1996). Phenomenology is a methodology for illuminating life as people themselves see it.

This phenomenological perspective is in accordance with the theories of John Dewey on learning and experience. According to Dewey, the task of the teacher is to provide for the pupil a vital and personal experience by focusing on...

“... what there is in the child's present that is usable with reference to it. (...) He is concerned, not with the subject-matter as such, but with the subject-matter as a related factor in a total and growing experience” (Dewey 1961: 105).

Experience is a core concept bridging the gap between phenomenology and learning. The pupils bring their individual experiences into the classroom; the teacher on the other hand must take this experience in account in order to reach and understand the pupils' life worlds. Dewey argued that knowledge is derived from *embodied* intelligence, and not from an abstract reason having an existence independent of the senses and affections of the lived body (Dahlin 2001). For the teacher, understanding this embodied intelligence implies taking lived experience as a point of departure in teaching.

Dahlin (2001) criticises a particular trend in educational research and practice that focus on the mere cognitive dimensions of learning. The basic feature of this trend is a one-sided focus on conceptual cognition and concept formation. He argues that mainstream theories of science education should be complemented with phenomenological perspectives. This trend can also be found within the teacher education programs, even though agricultural education always have had a strong basis in applied natural and social sciences. A goal of the education at the Agricultural University of Norway has traditionally been to apply theoretical knowledge in extension, locally based research and rural development. In this sense, phenomenology forms an opposite pole to the cognitive academic trend, and at the same time a further development of a teacher education based on practical application of theoretical knowledge.

In Norway, active use of nature is not only connected to agricultural production, but also through for example shorter or longer hiking in the mountains or forests. This specific way of using nature can be regarded as a common cultural trait and the cultural meaning is acquired through walking (Teigland 2000). In addition, creating and rebuilding their own identity is a main attention of youths in the “Dream Society”.

The last decade, “horse girls” have secured the number of pupils in many Scandinavian agricultural schools and thus have saved these schools from being shut down. Tiller and Tiller (2002) have done a qualitative study of letters where the girls in a Swedish agricultural school describe their learning situation. Many of the girls experience that the practical horse lessons inspire their theoretical learning. Two of them are cited below:

“Monday morning. The clock alarm wakes me up. “Oh, no, do I have to rise? Then I experience that it isn’t so hard. First lesson: Horse and stable. It is good to be in the stable and talk off the weekend. Just being in the stable and talking with the horses is a pleasure... You can clean your head to manage to concentrate on the rest of the day.”

“Of course there are subjects that are quite dull and hard to learn, but I feel that learning has become more “cool”. Even the English lessons have become more interesting. I feel more responsibility for my own learning; that I learn for my own sake and not only for getting good grades. The combination of theory and practise is excellent. Some times we even have theoretical lessons down in the stable. Then learning becomes living and interesting” (our translation) (Tiller and Tiller 2002: 113-124).

Tiller emphasises that none of the letters express negative critique of the school or any of the teachers, even though the letters were guaranteed to be exclusively for the researchers. Interviews and end additional evaluation gave the same impression. The pupils show gratitude for having the possibility to attend to the school. Both explicitly and implicitly the pupils express the importance of the combination of practical and theoretical learning.

The girls` interest in and care for the horses is consciously taken as a point of departure for teaching agriculture and life sciences in many of the Scandinavian agricultural schools. In connection with our Teacher Education Programme at Agriculture University of Norway, we have visited several “horse classes” in different parts of Norway. Our experience is that a teaching focus on girl/horse relation and horse interest seems to motivate learning about “dull” themes as anatomy, fodder production, biological processes etc. Skilled care taking for the girls` beloved horses presupposes competence in illness diagnosis and how ways and kinds of foddering influence the well being of horses in different situations.

Learning Innovation and Development

A good learning situation is a setting where the student can practice several of skills simultaneously. Before going into these skills more in detail, let us start with an example: Every autumn, a student teaching period is arranged in a cabin up in the mountains, above the tree line. Our students are encouraged to go into the natural surroundings and develop “learning biotopes” connected to subjects in life sciences or agriculture.⁴ The aim of this exercise is threefold: Firstly; to find and define a teaching-sequence on basis of a chosen “learning biotope” in the vicinity of the cabin. Secondly; to teach the other students and teachers from this “learning biotope” for 5 to 10 minutes. And thirdly; to reflect on the relation between the use of the chosen biotope and the goals of the teaching sequence by asking. One of the student-groups chose an old stone cottage as a “learning biotope”:

Such stone cottages were a traditional way of building houses in this area due to the lack of trees, but with sufficient stone material. First, we were taught about the walls and their function, both concerning insulation and as a foundation for the roof, which had to hold the additional weight of one and a half meter of snow in winter. Then we were told to study carefully the thick logs which supported the roof: Where did we think these logs come from, considering that we were situated far above the tree line? Eventually, one of our students, who himself teaches forestry, told us about the characteristics and origin of “malmfuru” logs (logs of pine heartwood) which had to be brought up from the nearest valley. The building of stone cottages was in this way put into a historical, local and cultural context. Both the physical and biological resources, as well as the human resources were involved in this “learning biotope”, thus giving it a dimension bridging several subjects in life science and professional activities. (Strangstadstuen and Østergaard 2001).

This kind of exercise encourages the students to use the whole range of skills which they have been trained in: the skills of observation, reflection, communication and participation (figure 1). Being innovative is in this context connected to being a teacher and creating an environment for learning. Thus, the four skills that are to be described further, we relate to the *act of teaching*:

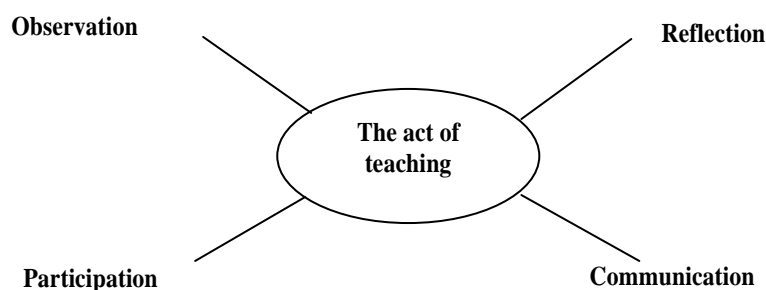


Figure 1: Basic skills related to the teacher’s act of teaching: the skills of observation, reflection, communication and participation

The skill of observation is profound because it provides the basis for learning and reflection. Traditionally the virtue of observation has been emphasised in life sciences: By the careful observation of phenomena in nature, the very secrets of nature were revealed. Similarly, the careful observation of the skilled agricultural practitioner has been an important pedagogical foundation in agricultural training and education. For the teacher we here again find the dual perspective: It is necessary that the skill of

⁴ In biology, a *biotope* is a place defined by a characteristic composition of plants and animals. Translated from Latin, a biotope is a place (*topos*) for living organisms (*bio*). A *learning biotope* can thereafter be defined as a place where the characteristic ecosystem composition is used for teaching and learning (Strangstadstuen and Østergaard 2001).

observation is trained also in relation to the pupil. Observing phenomena in nature and agriculture is in our training program complemented with exercises involving pupils. Through interviews and conversations with pupils, students are practicing the skill of observation. Such conversations form the basis for understanding the pupils' life world, but also improving one's own teaching.

The skill of reflection is closely related to the observation capabilities. One might even say that reflection starts with thoroughly observing *one's own prerequisites for learning*. The individual and group based reflection is a driving force for renewal and change – on the personal as well as on the organisational level. In our education, several exercises aim at connecting theory with experience. The task of pedagogical literature the students have to read during education is to reflect their own experiences as a teacher and learner. By reading theory, concepts and words are put on emotions and attitudes that maybe have been hidden from childhood. By putting words to own experiences, and by communicating feelings and emotions from teacher practice periods in relation to pedagogical theory, the experiences can be shared in the larger group.

The many skills of communication is therefore of great importance in the teacher education. Many of our new students share the opinion that this is the main skill to be trained during the education. Through exercises in writing, verbal communication, story telling and ICT, this skill is being practiced. We especially emphasise communication between the students themselves through daily written and oral communication. Due to a shift of focus from teaching to learning, the teacher needs to emphasise methods for mutual communication with the pupils more than one-way dissemination of knowledge. In this perspective, reflection is a mode of communication, just as communication is a mode of observing and reflecting upon the “inner” personal landscape.

The skill of participation is trained through the students' guided practical teaching periods in the schools. During the education, they receive between 12 and 14 weeks of guided practice in teaching situations. From a phenomenological point of view the skill of participation is perhaps the most important one. The participatory teacher is a person who is deeply involved in the learning situation and who is committed to the school and the pupils. The teacher is not only facilitating for the pupils' learning; the teacher is herself/himself a part of an ongoing learning process. Further, the participatory teacher is also relating his/her teaching to current issues in society and the rural community. In a situation with rapid societal and rural changes, the training for participation is of vital importance for education of teachers in agriculture.

These four skills are of course not trained separately; they are all intertwined, they are all found in the actual act of teaching. By using real situations, as shown in the example above, we are aiming at a case-based mode of teaching (Strangstadstuen and Østergaard 2001). Practicing these skills enables the student consciously to meet the world as a teacher. In a world of change and uncertainty, the students learn how to become agents of innovation.

Conclusions

Our teacher education program started in 1999, which means that we now have more than four years of experience with using this phenomenological approach to learning and teacher. Our experiences, which also are indicated through the students evaluations, can be summarized in the following manner: The students experience a phenomenological perspective on learning as very relevant and practical, due to the fact that it starts with the reality itself and not with theories, models or abstract ideas on how to teach. And because of the explicit emphasis on the training of skills, the students feel that they are met

individually, with their own personal qualifications: During the education, they have developed useful tools in their profession as teachers. However, many of the students, especially those with an academic background, are sometimes provoked by the emphasis on the senses and the training of observation skills. This non-cognitive approach to learning and teaching is unaccustomed to students who are used to reading and thinking in order to learn something. During the education many students experience a shift of focus in their view on learning, from a main emphasis on *imparting* the knowledge, to an emphasis on *cognitive and perceptive skills* as incorporated in their teaching skills. This feedback from the students is interesting because it shows how a certain attitude towards learning is implicit in their previous scientific and academic education. Our challenge is to facilitate for the students to reflect upon their own view on learning and teaching.

Evidently, modern teacher education in agriculture is faced with new challenges due to the growing awareness of and focus on natural environment, agriculture and use of nature. New challenges are met with new ideas about how to teach, which role of the teacher should have and how the pupils' learning can be improved. The emergence of the multidimensional agriculture in Norway and Europe is a fact due to immense political and environmental processes of conversion. This process must be accomplished by a teacher education emphasising the training and education of multiple skills. Traditionally, agricultural schools have contributed to development and innovation in rural districts in Norway. This role is of vital importance in today's situation in agriculture. As the case is also for the education at the university level (Lieblein et al. 2000), the agricultural schools need to provide dynamic learning environments for the pupils that provide not only knowledge, but also skills of communication, creative problem solving and innovative thinking. This is why teacher education in agriculture itself has to be innovative and this is why the educators themselves have to practice the skills of innovation.

The situation in Norwegian and European agriculture and society will most likely be radically changed within the next decade. In order to prepare for this transition, the students themselves must continue the lifelong learning process that started during the education in order to become agents of innovation.

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