School-farm Cooperation in Norway: Background and recent Research

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Abstract: *In this paper three cases of cooperation between agriculture/horticulture and schools are described, evaluated and discussed. The first case, The Agriculture Game, is carried out by farmers who come to the school for one day in the 10th class. In the second case the pupils are integrated in the work of a farm in the vicinity for one week each year (8th to 10th class). In the third and last case the pupils of the 10th class live and work on a farm for 2 weeks. The research question is: How can the different offers in learning about food production give pupils insight in fundamental life processes as well as an understanding of their own potential as participants in these processes?*
The theoretical basis for experiential learning is presented and developed further to accommodate the learning at the farm. Research in phenomenology and neurology are exploited to deepen the understanding of experience as immediate knowledge. Mastery is a key experience for experiential learning where the pre-reflective affects of experience influence both the process of doing a task and the one who does it. Research on the prerequisites for good health shed light on the pre-conditions for mastery which can lead to knowledge.
The empirical basis is carried out with help of qualitative methods. Pupils/former pupils are asked to describe their learning and experience with each of the three learning situations.
After presentation of the three cases, the findings in case 3 are discussed in relationship to our model for relationship-based experiential learning. Education for sustainability is shown to be a result of experiential learning when the work of the pupils is organized to allow for the forming of relationships and for the realization of meaningful goals which have relevance for the pupil and lead to an experience of resonance. This results in a foundation for reflection and re-creation of further relevant actions.

Keywords: *farm-school cooperation, education for sustainability, mastery through practical farm work, relationship-based experiential learning*

Introduction

This paper is written on the background of extensive work in Norway with agriculture/horticulture as an arena for learning. One of the authors began with school-farm cooperation as a teacher in a Norwegian Waldorf school from the beginning of the 1980´s. Parallel to this development, the farmers association (Norges Bondelag) in Norway launched an outreach program to bridge the growing gap between chrildren and knowledge of food production. Their program," The Green School", which distributes free materials to schools at all age levels, was evaluated by the authors of this paper in 2007 (Jolly and Krogh 2007). In addition to these fields of experience, a national project for state schools, "Living School" (1995-2000) was initiated at the Agricultural University of Norway (AUN, now the Norwegian University of Life Sciences, UMB). Pilot schools integrated outdoor cultivation of grounds and gardens in their curriculum as well as farm-school cooperation. On the basis of experience from "Living School", the authors have led accredited courses for teachers and farmers throughout the country: "The Farm as a pedagogical Resource" and "Ecological Gardens and healthy Schools" (Jolly and Krogh et.al. 2004). The work in Norway has inspired initiatives in Finland, "School goes to the Farm" (Risku-Norja and Yli-Viikari 2008) and in the Netherlands (www.boerderijschool.org) as well as an EU project between Finland and Estonia.
Although research on the courses and the farm-school co-operation has been done (Nergård og Verstad 2004), it was first in 2009 that a larger investigation of learning as a result of participation in a project was carried out (Jolly 2009). Since the Norwegian farm-school co-

operation has inspired similar projects in other European countries, one of the main purposes in this paper will be to present findings concerning what type of learning can be made possible through use of the farm as an arena for learning. We will lay special emphasis on the development of competence which is vital for sustainable development. In addition we want to contribute to learning theory. On the basis of the empirical investigations of pupils' learning and the consideration of theoretical models for learning, a new and generally applicable model for relation-based experiential learning has been developed. This theory will be presented in this paper.

In this article we will first present the theory of relationship-based experiential learning developed further from the models of John Dewey (1916, 1938) and David Kolb (1984) and supplemented with perspectives from phenomenology, the theory of salutogenesis and neurological research. Thereafter we will describe the projects which are the basis for the investigation, as well as the methods which were used. The results of the empirical studies and a discussion of the findings in relationship to the model for relationship-based experiential leaning and learning for comprehension will form the conclusion of this paper.

Relationship-based experiential learning

John Dewey outlined a model for experience-based learning early in the 1900's. The model was based on a spiraling cycle where an impulse for action gave opportunity for observation and led to new knowledge which became the basis for judgment (Kolb 1984). This spiral makes learning visible as progression of a continually more refined course of action. The model was a result of Dewey's own personal experience as a teacher and founder of a school for children..

First hand reports from teachers in Dewey's school tell about excursions, the school garden, cooking their own food, sewing clothes and making equipment which was needed at school. Dewey protested against the opinion that theoretical subjects had a worth of their own, whereas practical subjects were only utilitarian. With this point of view, he maintained, the value of practical professions for the (self-) understanding of human development would be overseen. Today we might designate such activities as critical for building a cultural identity.

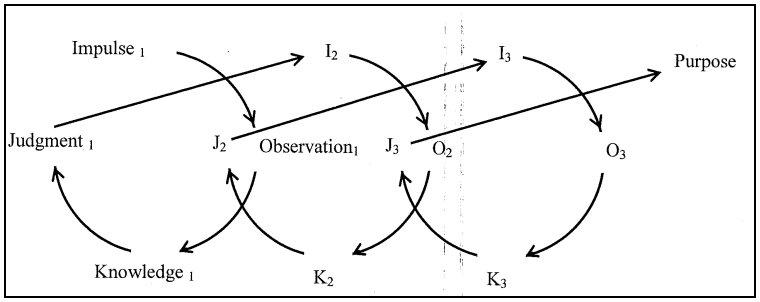

Figure 1. Experiential learning as a cyclical process (Dewey cited in Kolb, 1984).

Such a learning process would, according to Dewey, give rise to a new impulse for an improved action on the basis of a new and improved experiential foundation. Whereas Dewey emphasized the roll of experience in learning both in his own school and in theory, David Kolb (1984) emphasized the forming of concepts with basis in experience which is reflected upon, conceptualized and tested in a new situation.

Kolb presented a model for learning as a cyclical process which bridges dialectical opposites. In Kolb's model, all learning begins with concrete experience. Observation from experience is reflected and formed in abstract, generalized concepts. This is the basis for new concrete experiences or actions which have their point of departure in a new and improved understanding. In this way concrete experience is connected to abstract concepts as reflection is connected to action/experimentation in a cyclical phase (Figure 2). Opposite elements become integrated.

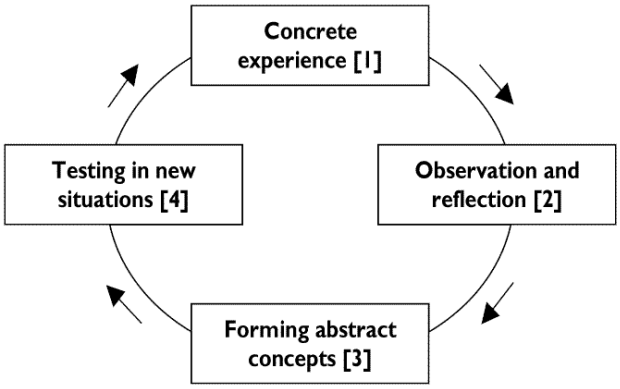

Figure 3: Kolb's model for experiential learning (Kolb 1984).

Kolb's model is primarily concerned with cognitive learning. Illeris (1999) questions how clearly the definition of experiential learning is made in Kolb's model as opposed to other types of learning. Dewey said himself that the learning of abstract concepts in the classroom was also a type of experience, but not in accordance with the needs of the children. He pointed out the need for research concerning the nature of experience as a basis for understanding learning. Kolb's own experience is in the field of organization psychology, not from the classroom and work with children. In our opinion Kolb's model is best suited for this research field in relationship to adults whose work is characterized by goal-oriented tasks. His model, focused primarily on cognitive learning, leads to a reduction in the breadth and character of experiential learning. When we turn our attention to children and pupils, it is necessary to understand and apply the whole spectrum of experience and its nuances in the creation of learning situations. Children learn, in many ways, such as through emotional engagement, through imitation and physical activity.

Phenomenology underlines the roll of the physical body as a vehicle for sense experience in a world of deeds (actions) (Merleau-Ponty 1962). The physical body and senses are often under-stimulated in the classroom. Neurological research shows the importance of experience in formation of the nervous system, for example, in how the skills of the hands modify the structure of the brain (Wilson 1998). The discovery of the mirror neurons and the resonance reactions of the body document learning which occurs before reflection and conceptualization (Iacoboni 2008, Bauer 2005, Rittelmeyer 2002). This provides a physiological basis for the phenomenologist's appeal to re-instate the body and sense perception as our primary gates to the world. Experience occurs through the body as the acting subject (Krogh et.al. 2008). This means that the participation in concrete events is a fundamental prerequisite for experience.

Mastery shows itself to be a fulcrum in the development of learning from experience. With mastery there are two processes occurring simultaneously: the first is that the person who achieves some degree of mastery recognizes this; the other is that mastery shows itself as a result of solving the task. To enable mastery to occur, there must be tasks at hand which can be solved through practical experience. Mastery can be understood as the immediate realization which occurs when a person experiences the solving of a task in a new or better way. When prepared in the proper manner according to the needs of the pupil, mastery can have considerable effects on learning.

The focus on mastery can help us understand the conditions for maximizing learning from experience. Aaron Antonovsky's theory of salutogenesis (Antovnovsky 1987) illuminates the connections between health and fundamental conditions for learning and mastery: comprehensibility, manageability and meaningfulness. When pupils participate in meaningful, manageable and comprehensible processes, their sense of identity can be strengthened further through a concrete relationship to place, to specific tasks and to people they work together with. What is learned is thus a result of both reflected and pre-reflected processing of experience.

With the theory of experiential learning, especially as we have seen in David Kolb's model, most attention has until now been paid to conceptualization and conscious reflection. Our experience has led us to attempt to make a model of experiential learning which includes the immediate effects of experience and how emotions and motivation are activated.

First, the pupil enters into the task which is embedded in the whole enterprise (in our case a farm or production garden), thereby creating relationships underway towards solving and mastering tasks. The result is new knowledge and understanding, which is the basis for new goals and actions. Within the circle, the inner human processes are designated, while the outer task-related stages are designated on the outside of the circle. According to our relational approach, the concrete outer stages of the process will always correspond to inner processes within the person who is participating in solving the task.

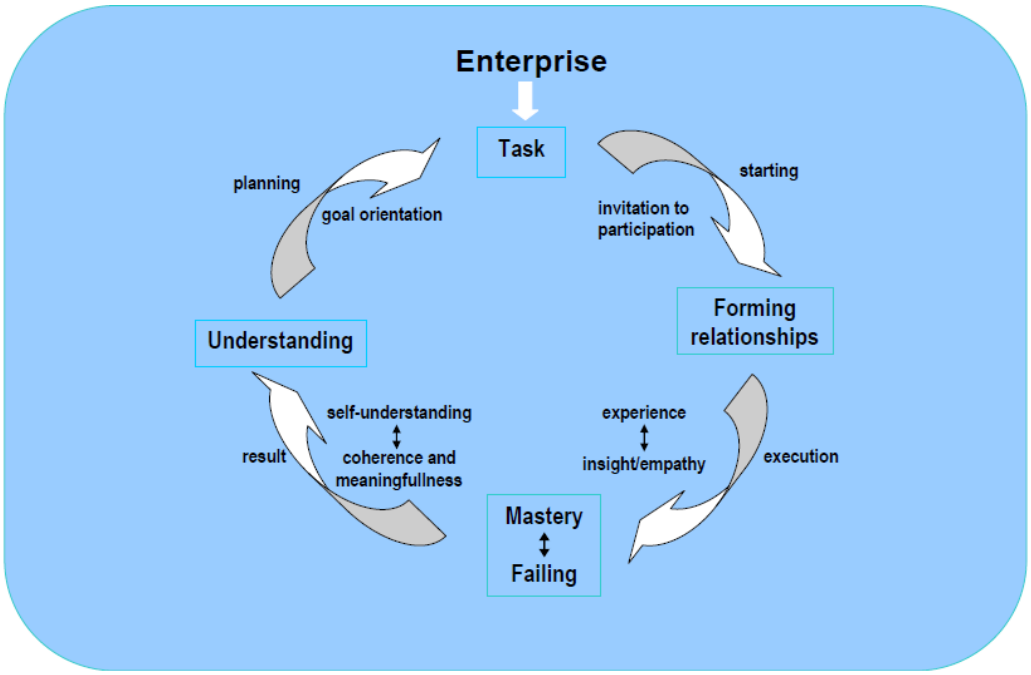

Figure 3: Model for relationship-based experiential learning.

The foundation for relationship-based experiential learning is that the pupil forms relationships connected to the task. To begin with the pupil (learner) stands outside, but is invited in through an introduction to the task which is embedded in the necessary work and production of the farm. Depending on the character of the task and on the calibration or organization of the task to meet the premises of the pupil, he/she will form different types of relationships. The social relationships can include other pupils, teachers and instructors, such as the farmer. Relationships to tools and equipment, and especially to development of physical skills in wielding the tools will occur. In addition there will also be relationships to the phenomena (in nature) at hand - rather be it soil, plants, animals, stone, water or weather.

Together the relationships form the context for the task which is being done. The larger context of the enterprise (the farm and production) is also placed within a still larger societal context which implies meeting an objective need in society, being part of a connection to social interaction and having a place in the overall organization of society, such as through the simple mode of production (Krogh 1999). The learner meets the phenomena with his whole sense-perception, his body and his earlier embodied experiences, and further develops his experience through doing the task. The more the pupil is motivated emotionally, physically and mentally by doing the task and the richer the opportunity for experience, the larger the depth of insight is which can be achieved. But the learner can also choose to distance himself or reject the relationships which the task offers. This will lead to diminished relationships Execution of the task can lead to a degree of mastery, but also to failure. Between these outer poles there is a continuum of possible outcomes. Mastery and

completion of the task can be made possible through competent organization and adaptation to the pupil's proximal development zone (Vygotsky 2001) such that he/she can overcome the resistance which the solving of the task implies.

If mastery and the sought result are achieved, possibilities for both knowledge and self-insight are opened. The learner will experience a greater connection to the task the more comprehensible, manageable and meaningful the task has been. We have also stressed the importance of an anchoring to place, active participation and the presence of role models ("significant others") to achieve an experience of meaningfulness and belonging. Identity and self-insight will be influenced by the experience of connectedness made possible through the task. It must be emphasized that the social relations are extremely important during the whole process.

Comprehension is dependent on the depth and breadth of the relationships which can be developed from the start to the finished task. The broader the foundation for experience, the better the basis for comprehension will be. Comprehension can be said to be a function of the three R's: *Relationships, Realization* and *Relevance*. Comprehension is strengthened through broader relationships, clearer realizations expressed in mastery and results and a strong experience of relevance. The occasions for experiencing mastery will thus affect the basis for comprehension, but the most important basis for comprehension is the quality of meaning and connectedness which the task opens for. The more these qualities are experienced, the broader the basis for comprehension and the more interesting it can be to reflect and learn more about the connections, i.e. increase the motivation for learning.

The less and the narrower the experience of meaningfulness and connectedness, the more meagre will be the basis for comprehension and motivation for learning. Failure in solving the task can also lead to a negative self-image. This requires reflection to work through the failure and analyze the reasons for failure and the conditions needed to succeed next time.

Comprehension forms both the foundation for setting new goals and for concrete planning of further tasks. In this connection reflection will be important both to recall and to be able to improve the procedures in doing the task, and also in communicating the procedure to others such as through instruction or a handbook. In this connection the formulation and use of concepts will be important. Reflection is also important for development of deeper understanding and relevant learning in the subject matter. Teachers can help the pupils use their reflections to implement curriculum goals. All school subjects and exercises can gain from the experience from the tasks at the farm which are vividly recollected by the pupils.

However, it is also important that teachers do not focus solely on conceptual reflection, but also utilize the possibilities for comprehension which lie in practical and artistic activities. In this way the immediate, pre-reflective experiences can be taken into account and deepened. We have attempted to show that the significance of the experiences which the pupils can have at the farm has a potential for their sense of self and for their general understanding that cannot be limited to conceptualized knowledge measured through school subjects.

According to our argumentation comprehensive learning can be understood as a function of 5 R's. In addition to Relationships, Realization and Relevance, Reflection and Resonance are a part of the process. Conscious reflection is in most situations necessary to consolidate and structure knowledge for the learner. But it is also important to recognize the potential for resonance in the pupil. Bråten (2007) uses the term inter-subjective resonance to describe the capacity for immediate and creative interaction with the environment through the mirror neurons. Both the entirety of an experience and the instantaneous pre-reflective comprehension can be enhanced in the learner through tools which supplement cognitive reflection, such as practical and artistic activities. The spontaneous resonance in the pupil will according to Bråten (2007) also be potentially activating for mental representation and expression through language.

Therefore we can also add a sixth R in the functional process of experiential learning on the farm - *Re-creation*. From the experience of comprehensive learning, the learner will in different degrees develop skill, drive and will to act, to re-create anew. The act can exist in

the span between repetition and new creation, dependent on the type and quality of the task and the way in which the other R's vary in the process of comprehensive learning.

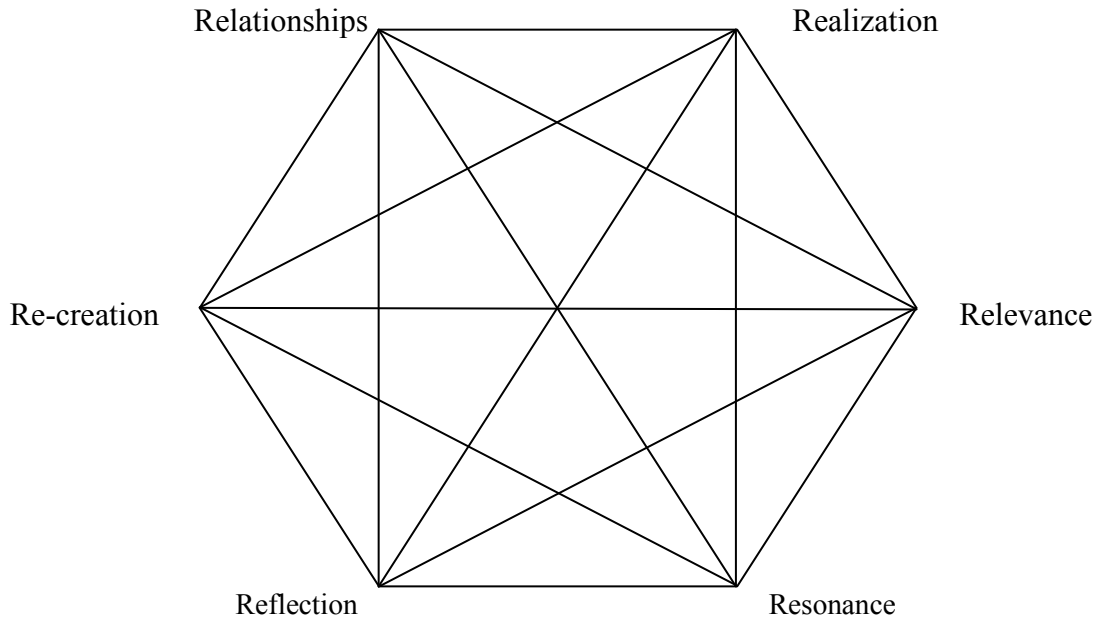

Figure 4: Learning through comprehension.

The model for learning through comprehension can pictorially be compared to a ballgame in a hexagon, where a hit in one corner shoots the ball further to another corner. If relationships are formed in connection with a task which is then realized with a relevant connection, the ball goes from corner to corner. The ball gets a force which propels it inn toward resonance in the learner. Resonance can again trigger reflection and conceptualization. This motivates the pupil to do and re-create in the spirit of the learning process. However, it is not necessary that the R factors are activated in this order, but can be imagined as cross-related. Formation of a relationship can cause an experience of resonance in the learner or immediate reflection. Therefore lines are drawn between all of the factors. The point is that the ball, in form of a preparation of the task suited to the premises of the learner, motivates the learning process. The better the pupil's premises are known and taken into consideration and the more of the R-factors which can be included, the greater the probability will be that the execution of the task will create a self-motivated learning in the pupil.

The cases in this study

Recognition of the fact that children and youth today have little or no contact with agriculture and the practical tasks which bring the food to the table each day has led to different attempts to make learning about and with food production available for schools in Norway. Since the focus in school is mostly on cognitive, representational models and there is little contact with the actual life processes, projects where garden and/or farms are used as learning areas have grown rapidly in the last years. Over 200 school-farm cooperation projects have been established throughout Norway in the last 15 years. In this paper we will describe and compare 3 projects which attempt to bridge the gap between experience and knowledge in food production and school-age pupils. Although the farm-school cooperation in Norway occurs throughout general education from the kindergarten to the 10th grade, this study takes up three cases primarily for pupils in the 10th grade, ages 14-15 years.

The first case is an evaluation of an initiative of the Norwegian Farmers Association (Bondelaget). In their program, The Green School, the local units offer the schools both literature on agriculture and the opportunity of inviting farmers to the school in the 10th grade in what is called "The Agriculture Game". Farmers come to the school with the necessary materials and take over instruction from the teachers on this day. The game consists of a progression of written tasks which lead to the result of an annual account for 3 types of

farms. By holding the books for income and expenses, the intention is that the pupils achieve a better theoretical understanding of the conditions for food production.

The second case started as a pilot project in national program "Living School". From the question posed by teachers and students at the Agriculture University of Norway, “How can we contribute to fostering hope, courage and resolve in children so that they may participate in a productive way in shaping their surroundings?”, examples of gardening and co-operation between schools and farms were developed (Parow 2000, Hugo 2000, Jolly and Leisner 2000). In the school-farm cooperation in this case the pupils have a week of their school hours each year (8th to 10th grades) at a nearby farm doing the everyday tasks of farm work and food preparation. The farmer is also a teacher at the school and incorporates themes from different subject areas into the work at the farm. These themes have to do with the factors of soil formation, recycling through compost, plant growth, animal welfare, transport and distribution of food in global perspective, in short the topics that are vital for understanding the roll of food production in today’s society, but also for a sustainable future.

The third case is taken from the work of one of the authors during her years as teacher at a Waldorf school. These schools have a tradition for school gardens and farm experience for the pupils going back to the first school in Stuttgart in 1919, although these arenas were first developed in the Norwegian Waldorf Schools thirty years ago by the author. In the 10th grade the classes have travelled to a farm in Sweden where they work and live for two weeks. Before hand they have begun working with themes concerning agriculture which will be further developed and presented as oral reports during their stay at the farm. Although in this case, as in case 2, the emphasis is laid on practical first-hand experience in horticultural and agricultural tasks, there are also daily sessions for working towards an understanding of the premises for food production and sustainable alternatives.

Methods

We have chosen to focus mainly on qualitative research methods in this study. Phenomenology informs both the theoretical and the methodical approach in our research (Denzin & Lincoln 1994, Jackson 1989, Østergaard 1998 and 2006). Description of the cases and their context will therefore be important in able to draw a picture of the frame of each case as a basis for understanding. Case study is one of several research strategies (Yin 1989) for qualitative studies. Within the framework for case study, the methods of field work (Wadel 1991, Krogh 1996), semi-open questionnaire and the qualitative research interview (Kvale 1997, Fog 1994) are the basis for the empirical data.

The start for this comparative study was done already in 2006/2007 through the work with an evaluation commissioned by the Norwegian Farmers Association (Bondelaget) (Jolly and Krogh 2007). As one part of this evaluation, the authors participated in execution of The Agriculture Game in 4 schools and 18 classes. A questionnaire was made for the pupils to answer in the first days following the school day where the game had been played. The farmers and the teachers who participated were also given questionnaires. All questionnaires were composed such that there were both questions for quick ratings done by checking off answers and questions for open comments with room for written statements. A log of experience during participative observation, as well as a telephone survey in the local units of the Farmers Association, was a part of the empirical basis in this study which is here designated as case 1.

In case 2, the authors have also participated in workdays at the farm with classes from the school. On the basis of familiarity with the project over several years, as well as interviews with the school leaders and the farmer (Jolly 2007), a questionnaire was prepared which followed the structure of the questionnaire in case 1, but was adapted to relevant questions for the 10th graders immediately after they had participated in their last period at the farm. The questionnaires from the pupils in all the 10th grade classes (classes A to F), together with the background from interviews forms the empirical basis for case 2.

In case 3 where one of the authors was the teacher and prime initiator of work that had occurred over a period of 28 years, the methods described in the first two case studies was not sufficient. While only one class participated each year, there are many older pupils and

former pupils who can give wider perspectives. A questionnaire with the same structure as for the other cases was used, to be distributed over the spectrum of pupils who had participated from the previous year to nearly 30 years ago. In all 83 questionnaires from pupils/former pupils that experienced a similar farm-school learning period from 1980 to 2007 were collected (12 %). In addition 10 interviews were carried out with former pupils between the ages of 19 and 35, as well as with one parent.

Framework for and findings in the three cases

In able to give the reader a clearer picture of the conditions for learning about and working with agriculture in each case, it is necessary to begin each case with a description of the setting and the tasks in which the pupils participate. Following a description of the framework and organization in the three cases, a summary of the results will be given. The concluding discussion compares the results in all three cases on the background of the theory for experiential learning presented in the first part of this paper.

Description: Case 1

In contrast to the other two cases, the "Agriculture Game" takes place in the classroom where the 10th grade is divided into groups of 4-5 pupils for the course of the day. A team of 2-3 farmers introduced the theme of agriculture by telling what they themselves produce and what is being produced in the area where the pupils live. After this general introduction, each group of pupils chose one of three types of farms which they "run" by holding the books and making choices as to purchase of machines, sale of products and similar activities. Each group received a booklet with texts which provided the information for solving the written tasks which are written up specific to the choice of production which the group has made. For example, the pupils calculate the amount of feed which must be purchased and find the prices in a price list. Later in the course of the second and third quarter of the year the pupils are also asked to pull cards which describe advantageous or disadvantageous circumstances which are also written into the accounts. The concept of the game is that the group which makes the best decisions should get the best financial result and win the game. During the day the farmers go from group to group answering questions and assisting.

Findings: Case 1

The observation of the game in different school classes revealed a largely positive attitude towards the event on the part of the pupils at the onset of the game. The teachers were most often absent from the classroom after the introduction, but the dialogue with the farmers functioned well. Some pupils used the opportunity to stretch the rules for school conduct, but generally the presence of the farmers was met with polite response from the pupils. However, the amount of written material to be read and answered took its toll as the day progressed. Few groups came through all the tasks to achieve a result and still fewer had opportunity to discuss the last and most relevant questions. There was a clear "winner" in just one class during the study. Therefore a summary and discussion at the end was inadequate to relate the results to societal and political perspectives.

The questionnaire showed that the pupils valued the game as a break from the usual content of a school day and as an opportunity to do group work. However the question as to if the game had increased their interest for agriculture was predominantly answered negatively. Some felt they understood more of what it means to run a farm, whereas others objected to the impression that holding accounts gives a correct impression of the work in agriculture. When asked to describe what they had learned through the game, most pupils wrote that they learned math and accounting, but that this was what they already had at school. Most were positive to visiting a farm as a basis for getting more out of the game, for as one girl wrote, they could at least see the machines they were asked to buy. Although the teachers and farmers were largely positive to the game, they also expressed doubt as to increased interest in agriculture created by the playing The Agriculture Game.

Case 2: Description

In case 2 the pupils are integrated in the tasks at a farm for one school week each year in the 8th to 10th classes. The farm is within walking distance from the school. Each class walks to

the farm and starts their school day there. The farm is not large even by Norwegian standards (14 hectars of plowed land) and has a herd of around 15-20 milk cows in organic production. In addition there is a large vegetable garden, chickens, geese and pigs for use at the farm. Many of the buildings are of historic value as one of the few original examples of farms from the middle of the 1700s. One of the buildings has been restored to accommodate the pupils with two adjoining rooms for eating and working with log books, simple cooking facilities and a cellar for storage, showers and wardrobe. The stall and milking facilities were built in connection with the start of the pedagogical project in 1999.

The intention with this project has been in part to give the pupils access to an experience of farm life such as it was earlier. All heating is done with wood which the pupils have taken from the woods cut with manual tools. The cooking is for a great part done on the hearth and wood burning oven. The toilet is a pit privy and the garden is cultivated with hand tools. The idea is that the pupils produce and cook their own food, wash the dishes by hand and clean the rooms each day, and in general are exposed for the most basic way to meet the daily needs through the work at the farm. Experiencing the consequences of their own work such as we have shown in the model for experiential learning is the basis for the work at the farm.

When the pupils arrive each day, they take their place around the tables and have, in addition to a cup of tea or hot chocolate, also a program and a theme for the day. Perhaps it is plants, seeds or soil which they observe and get to know before the tasks are presented. On the program there is a short description of the work which each group of three pupils will do before the main meal and another task for each group after the meal. Many of the tasks are routines such as cooking, wood cutting, washing up, but many are connected to the seasonal work at the farm. The 8th grade begins in the spring with sowing and planting in the garden as a main task. They come again after summer holidays to harvest what they have sown, run a vegetable stand, conserve products for winter and partake in slaughtering. The 10th grade has one week in the winter where they prepare and design a banquet for their grandparents. The serving of a meal to their grandparents where they tell about what they have learned during their work at the farm is the last part of their instruction at the farm.

Case 2: The Findings

The pupils in this project were given the questionnaire after they had finished their last week at the farm in the 10th grade. Many of the concrete descriptions of what they had learned came from the previous week at the farm. None the less, the pupils had much to write about when answering the question about what they had learned during their time at the farm.

They described knowledge they had acquired on farming and gardening: insight into the process from the field to the table, the roll of agriculture in society and understanding for sustainability. They also told about acquisition of skills, like taking care of animals, gardening, sowing and harvesting, cooking food from raw ingredients, tending wood ovens, carving up meat, cleaning, serving, holding a banquet, spinning and weaving. The pupils also mentioned experiences such as seeing that milk comes from farms, that all food comes from animals and plants and that practical work must be done to produce food. Attitudes towards farming and a sense of appreciation for the farm work was a part of their comments. Almost all pupils described positive social benefits from the work at the farm. It strengthened the feeling of solidarity, of better contact with their fellow pupils, as well as a positive attitude in the class. The personal benefits of the work at the farm were also important for many pupils. They wrote about mastering tasks, coping with the weather, improved teamwork, learning to take responsibility, getting better to do work and "never to give up".

The many answers as to what they had learned and if they would recommend such experiences for other youth show the influence the school weeks on the farm have had for them, both as individuals and as a class. Their comments also illustrate how their perspectives have been widened, both concerning agriculture and future sustainability in society. We will come back to the issue of sustainability in the last discussion.

Case 3: Description

Case 3 differs from case 1 and 2 in that the pupils travel to a farm and live and work there together over the course of two weeks. Being on a journey heightens the experiences at the farm. They come to a farm with an abundance of different productions. There are cows to milk, sheep, chickens, ducks, geese, bees and work horses to look after. There are fruit trees and berry bushes to be harvested. An herb garden produces large amounts of herbs and teas. On the fields there are all types of grain and vegetables. A little store sells the products and other items like fresh flowers from the nearby flower beds. There are also orders to be filled. The pupils also work with cooking and conserving. In addition there is one hour set aside each day for working with and learning about the history and principles of agriculture, as well as an hour in the evening for writing log books and reflecting together over the events each day.

With this short introduction to the framework for learning, we will now use the model for relationship-based experiential learning to further describe the process and highlight how this process is experienced by the pupils by weaving in their responses to the questions posed both in the written questionnaire as well as in the interviews.

Case 3 - The invitation to participation

In case 3 the invitation to participation in the enterprise which the farm represents is made already before the journey to the farm begins. In the 9th grade the pupils began to work with questions concerning modern agriculture. During a week before summer holidays the pupils chose a theme and worked together in groups with topics such as hunger and food distribution, erosion, use of energy in different systems of production, leakage of nutrients from farming to water systems, irrigation and water resources, genetic engineering and animal welfare. They continued working with their themes at the farm and made an oral presentation for the class at the end of the two weeks at the farm. In this way, the pupils are already prepared for their work with farming and take along questions as a part of their baggage.

When the pupils come to the farm they are welcomed and shown around all the arenas where the tasks are waiting for them. They can see that the farm needs their help and has prepared for their contribution. The invitation to participation is also repeated each day when the tasks are presented for the pupils. As far as possible they are allowed to choose which tasks they take on, but it is also clear that the intention is for them to become acquainted with many different types of work at the farm during these two weeks. Some need more time than others to dare to do certain jobs for example with the animals. The teachers must sometimes ask, encourage, coax and even order them to try as a part of the "invitation" to participation.

Building relationships

When they have begun with a task at the farm, the pupils begin to build relationships. The place is new for them as they are for those they meet. It is a challenge to begin with so much that is new and uncertain, but for many it is a chance to start afresh, unburdened by the reputation they have had at school. One former pupil said:

> "I remember this as a very positive break from our lives in Bergen since we travelled to another country and another climate. I think this was what gave us a new start. Already then the foundation was laid for something very positive."(24 years of age)

At the farm they worked together with their fellow pupils in different constellations. There are also older pupils, or former pupils, who work as group leaders at the farm, in addition to teachers. Working together with others is a strong motivation. Shoulder-to-shoulder pedagogy is what we have called this form of building relationships through doing practical tasks together. The workers who are engaged in the farm motivate the pupils through their connection to the tasks and their insight into how the tasks are a part of the whole farm. One pupil wrote: "I got a lot from meeting those who worked on the farm and learning from the way they worked." The youth who work as assistants during the period on the farm and who have been there as pupils themselves are inspiring both as role models and companions: "They got us to really work hard". Also the relationship to the teachers changes when pupils and teachers are working side by side.

In addition, the pupils built relationships to the animals, the plants, the soil, the tools and, not least, to the weather. Both the importance of the social relationships as well as the significance of relationships to the phenomena which they met at the farm are mentioned often on the questionnaire and in the interviews. Several pupils stated that the class milieu was greatly improved, that they experienced good team work and were welded together, that they learned to respect each other's strengths and weaknesses and take responsibility for each other. One former pupil (22 years of age) wrote:

> "When we worked on the farm we were all teenagers. Everybody wanted to be cool and no one wanted to get their hands dirty. After one day at the farm we were all digging in the compost pile, clipping the hedge or taking up potatoes. And there was NO ONE who complained! In relation to mastering and self-confidence the tasks were something that all could manage. And all worked together. The "cool" ones became best friends with the "dumb" ones. The ones who were struggling at school had a chance to show themselves. This was a lift for many."

There were also many comments to their relationship to nature, to familiarity with animals and to working with the soil. Several pupils mentioned that they had a different relationship to what they ate and to making food from raw ingredients.

Experience and insight (empathy) developed underway with the task

In case 3 there were many who responded to the question of what they had learned by telling of experiences and insights they had had underway during the work with the tasks at the farm. They wrote about life in the compost pile, the wasp nests in the hedge and the temperamental geese that chased them. They wrote also about how hard it was to not give up, to fight on until they had achieved a result. The tasks at the farm are often repetitive and offer a great deal of physical resistance. The first week is especially demanding on their physical and psychological stamina. One of the group leaders invented the competition he called "100 meter hedge" where the pupils were divided into two groups that clipped from each end of the hedge, racing to see who could get to the middle first. In such situations the pupils experience not only flow (Csikszentmihalyi 1998) and that the resistance is conquered, but that they can also achieve impressive results when they work together.

Insights and empathy are also developed during the work with the tasks. Some pupils described their appreciation for the work that must be done to produce the food we take for granted, that the farmers work hard to provide us with products:

> "The experience on the farm awakened in me a good deal of curiosity and astonishment over the relationship between man and nature and opened my eyes for a part of the world which city kids know little about."

These experiences are also strongly related to how the pupils felt that they had mastered the tasks. This is the next station in our model for relationship-based experiential learning.

Between mastery and failure

When working with the tasks at the farm the pupils experienced varying degrees of mastery and failure. With a good organization of the work and an individual consideration of each pupil it is usually possible to create a situation where most will feel that they have reached a positive result. They referred to many small and large victories which strengthened their feeling of mastery. One wrote of driving a tractor, another about learning to milk and taking care of the animals, another on holding a short lecture for his fellow pupils. Some pupils found affirmation in the most exhausting tasks such as digging draining ditches in hard packed clay. One girl (22) wrote:

> "I learned that the work on a farm can call for a lot of perseverance and physical endurance - generally both at the same time. But you can also develop techniques. I thought that I would find the work more and more boring, but it was actually more fun. It was especially good to learn to cast concrete. This is usually real man work, but I felt I did it as well as any of the boys."

It seems for many that the more resistance they met, the more valuable the experience was for them. There were many that told of learning to work effectively and to take responsibility. Generally the respondents gave the impression that they had mastered challenges.

This feeling of mastery was also very important in relationship to the social challenges. When they are dependent on each other for achieving a result, there are often conflicts which must be resolved. "We learned to tackle different social situations and take responsibility for each other" was one such comment (22 years of age). One former pupil said:

> "We worked on different things - it was a trip where we worked together on things with fundamental values - no, not values, but basic needs. When you take up potatoes one day and see that they are used in the kitchen the next day, and there is someone in the kitchen cooking the food, this creates a feeling of connection. You are a part of a team. The connections are easy to understand and this is very positive for the social life of the class. We have had other trips, but it is something different when we worked together for our basic needs. This created another type of unity and connection to each other".

The experience of accomplishing something useful together resulted in a feeling of mastery, but also of connection and coherence. This leads to the next stage of our model.

Results and the experience of meaningfulness and coherence

The experience of mastery with tangible results from the activity at the farm became increasingly meaningful in the course of the two weeks at the farm as the feeling for connection to the place and the people grew. The pupils saw more and more of the interconnection of the tasks and gradually achieved a better understand of the life processes which govern the work. At times the pupils have voluntarily worked overtime and taken initiative to do further tasks, for instance, when they see that rainy weather is on way and there are still onions to be harvested or that there is still more wood waiting to be transported from the forest to the wood pile to provide heating for the greenhouses. They see directly what their contribution means. Some comments from the questionnaires and interviews were:

> "We got a lot of work done for the farm. It was very useful work." (15 years of age)

> "There is a lot of work to do on a farm. One has to make an effort. Things just have to be done. You understand that things have to be done. That is not obvious at school. At the farm you dig until you are finished." (23 years of age)

> "Doing useful things, doing something for others was important. One felt that what we were doing was important for the farm. A good feeling." (27 years of age)

This feeling of coherence and meaning strengthened the self-understanding and self-image of the pupils. They commented on their acquisition of self-confidence through mastering the tasks and how their self-image changed. Many said they knew themselves better and that they had come to realize that they could tackle most situations. Two pupils mentioned their difficulties with dyslexia and how the experience at the farm strengthened their self-confidence:

> "This trip had a great affect on my self-image. I had more self-confidence. Especially the lecture which I held for the class gave me new belief in my abilities to cope at school." (19 years old)

> "I have dyslexia. At the farm I could come into things in a physical way. I could contribute in another manner. I could show myself without being afraid. It was incredibly exciting for me." (27 years old)

From the pupils' comments, there is amble evidence of personal growth and an experience of meaningful tasks in the work at the farm. We now turn our attention to what the pupils reported concerning formal learning, with focus on sustainability in food production and the effects their attitudes and choices.

Knowledge and comprehension

Both on the questionnaires and in the interviews the pupils/former pupils referred to topics which they gained insight into during the time at the farm: "insight into the connections, how a farm functions", "understanding of consumption in the West in relationship to poorer countries", "learned a lot about food and ecological production", "greater insight into how natural resources can be managed in a reasonable way", "the importance of supporting local food production", "understanding of agriculture politics and agriculture's position in a larger societal perspective", "interplay in nature".

Many concrete examples of retained learning were also mentioned in the interviews. When asked what they remembered, one former pupil answered: "the importance of crop rotation and the cultivated landscape". Another said spontaneously: "I learned about the prices for food. Most people complain about the prices. I remember this. Food is not expensive. It is too cheap to be produced in an ethical manner." Topics such as nutrient leakage from agriculture and the affect on the Baltic sea, genetic engineering, use of energy were remembered and of further interest: "I follow much more in the news " and "I have understood the importance of food and knowledge and attitudes to food." One pupil formulated his learning in the following:

> "This is of course also a political choice. We have had school debates, but they are just confusing. Politics is one thing, but a fundamental view, a view of the whole should lay at the basis in politics also. I think we got a good understanding of this at the farm."

And:

> "We heard lectures and about different problems with food production in the world. For me this has made a definite impression and is something that I have taken with me further and that I think about when I buy food. I wasn't one that was the most interested at school because I always wondered why we were learning these things and what use we had for them later. But at the farm I had a feeling that what we were learning had a real meaning." (22 years of age)

When asked to rate the importance of such learning for other youth, the pupils/former pupils who were interviewed gave this high importance. As a reason for their opinion, most of the interviewees commented on the importance of understanding the environmental situation and a having a basic ecological understanding of sustainability. This affected the choices they made in their lives. Almost all told that they were aware of the differences in food quality and made choices accordingly. One former pupil told that she has her own vegetable garden in the city, another that he and his wife (both former pupils) are looking for a house with a garden large enough for vegetables and flowers. Even plans for taking over a family farm or purchasing a farm were related to learning experiences with agriculture during this two week period. One former pupil initiated the first organic bakeries in Norway, another is running a chain of stores for organic foods. Inspite of many factors determining choices and lifestyles, the self-reported affects of the farm experiences shows that this has been a key experiences and the source of knowledge and understanding for those who answered the questionnaire and were interviewed.

Conclusion: Case 3

In the interviews and on the questionnaires the pupils/former pupils maintained that they have greater insight into the connections between food production and environmental issues, food quality and prices. They experienced pleasure and gratification in doing practical work They told of knowledge and interest in agriculture and many things like cooking and sustainable management of resources. Ethical issues became a part of their daily lives and affected their choice of products. Mastery and development of new capacities were important aspects both personally and in relation to appreciating others. The social relations through cooperation in the practical work led to a better social climate, motivation in tasks and even a good relationship to the teachers. Many told about the importance of meaningful tasks which were useful and valuable for others. For some of them the experience has made its mark in their further choices: in what they eat, where they live, use of leisure time and choice of training and profession.

Comparison of the three cases

These three case studies have very different frameworks and conditions, but they are all engaged in building a bridge between agriculture and pupils to give them understanding and affect their attitudes. We will try to describe the span from case 1 to case 3 in relationship to the results which have resulted from this study.

The three cases span over varying spaces of time. Whereas case 1 is confined to one school day for the 10th grade, the 10th grade pupils in case three are on a two week trip to a farm in another country where they live and work integrated in the rhythm of the farm. Between these two extremes, case 2 provides experience and learning at the farm during the school

hours of three weeks, spread over the 8th to 10th grades. This span in time for the different cases is reflected in the answers given by the pupils on the questionnaire, especially where they have answered in open questions. The comments in case 1 are sparse. They experienced a school day which was considered a break and opportunity for group work, but the learning they did was considered as almost the same as what they otherwise had. In case 2 the pupils had much more to tell. They mentioned many aspects of learning. Mastery in practical work as well as knowledge and concrete experience was described by many pupils, whereas almost all commented on the importance of the experience for the social life of the class. In case 3 there is in addition to these aspects a focus on experience at the farm as a key to understanding coherence in nature and society and one's own roll in relationship to the challenges of contemporary food production.

Relationship-based experiential learning in agriculture for pupils

In Dewey and Kolbs models for experiential learning, knowledge or judgement is the point of departure for further actions which again lead to new experiences. We have called the path from knowledge to new actions for "goal orientation" where new actions are motivated on the basis of understanding won from experience. We presented six key concepts to define the conditions for experiential learning more precisely. These concepts can be used to describe what happens in case 2 and 3 when the pupil goes into the enterprise of the farm. When the pupil accepts a task, relationships are created as he/she does the work. Through work with the task, concrete results will be realized. The results have relevance in relation to the needs of the farm, but also relevance through the experience of mastery. Mastering the challenges of the tasks creates a resonance in the pupils because the task are anchored in a coherent and meaningful context which gives the pupils a confirmation of their worth and self-understanding. This forms the basis for reflections where learning can be worked through and made conscious. The resonance seems to be stronger and the reflections richer and deeper according to the breath of relationships which are formed, the amount of concrete realization which has been experienced through carrying out the task and amount of relevance which the pupils meet in the task. Re-creation designates the urge to plan and execute further actions on the basis of this experience. If the other R's open for this, re-creation will be expressed in the form of sustainable values and ability to act in accord with those values.

Our model for relationship-based experiential learning builds upon the recognition that comprehension triggered through mastering tasks in a meaningful context leads to capability of action. Especially in case 3 where the pupils have had the chance to develop broad and deep relationships in mastering meaningful tasks, this study shows how capability for action is acquired. The empirical data verify our model as a relevant tool for understanding experiential learning with the farm as arena and is not yet tried out in other experiential learning situations. However it is interesting to note that what they learned in case 3 was still a vital element in the awareness of former pupils after many years and still plays an important role in their reflections and understandings. According to the results of the inquiry, their learning also exercises a lasting influence in determining their actions. In this case seeds seem to have been sown for development of citizens who think and act according to the viewpoint of sustainability.

Learning for sustainable development is an important issue in our time. Several projects in other countries show that school lessons which take their point of departure in concrete tasks outside of the classroom and in nature improves learning in all subjects (Hoody and Liebermann 1998, Ballentyne and Packer 2009). In the opinion of the authors it is unlikely that the school of the future will continue to lead an isolated life outside of the vital functions of society and the daily work which secures our existence. The school will need to place itself within the real tasks which will motivate pupils in another manner than through examinations. Agriculture and horticulture can be arenas for learning which meet the demands for learning sustainability in an experiential learning process.

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