

CIEA 2006

Educational institutes, which of them support effective learning and sustainable action

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Friday 18 August 2006

**25th International Course on vocational Training
and Education in Agriculture**



Ways of teaching and learning in university education

Case study: project weeks as an introduction into the studies

Introduction

Ecological Agriculture as a special branch of agriculture is a heavily knowledge-based area in which high demands on the understanding of complex interactions in time and space are made. It contrasts with conventional agriculture in the following crucial points:

- Management mistakes, especially concerning pests, usually cannot be rectified in the short term by the use of pesticides or mineral fertilisers. There has to be a long term planning in order to boost and maintain soil fertility and guarantee the productivity of the system.
- Very often, there are no viable marketing structures, i.e. marketing and therefore the customers are much more important than in conventional agriculture.

In order to meet these requirements, connected thinking and interdisciplinary approaches are necessary.

With the establishment of the department for ecological agriculture in Witzenhausen at the beginning of the 90ies, the necessity of the reform of university teaching became more apparent. Instead of mere lectures and a few seminars, the students demanded a stronger participation in the teaching process and the teaching of so-called key competencies. Which means that they wanted to gain competences concerning the organisation of teaching, the management of groups, the drawing up of projects and interdisciplinarity.

In principle, the aims of university education are:

- Learn how to learn
- Work scientifically
- Plan projects
- Interpret findings
- Communicate knowledge, present findings

In the framework of a "model experiment ecological agriculture" project work, student tutorials and interdisciplinarily structured teaching sequences were established at the beginning of the 90ies. In plant production science for example, tillage, crop and plant production, plant nutrition, ecological agricultural systems, grassland, plant protection and cultivation were combined into one unit. Joint field days (cereal day, root crop day, grassland day etc), during which the various aspects are treated in group work on location are added. The tests that are conducted cover several lectures with related content and are combined with questions on connected issues.

In a tutorial, a team of two students is responsible for the organisation and the content of a course unit (15 lessons). Ideally, professors or lecturers take a back seat, perhaps give some input and take part in the discussion. Guidelines for tutorials and project work were established in the framework of the model experiment.

In general, the students have the possibility to sit each exam - as an alternative - in the framework of a project work that has to be overseen by at least two subject areas. Furthermore, several students should – if possible - work together on a project. For many years, however, several flaws in the concept have become apparent:

- The innovative teaching concepts were principally built upon the basic studies that still mainly consisted of lectures. Students that are used to lectures often shy away from the more time-consuming projects and do not see the advantages they have.
- The tests that cover huge subject blocks often overtax the students.
- A well directed instruction of the tutors could no longer be financed after the end of the model experiment and therefore, the tutors and the lecturers very often were overtaxed by the management of group work and projects.

This analysis of flaws then lead to the creation and introduction of the project weeks on ecology at the beginning of the studies - project weeks that we want to present here in greater detail.

Project weeks on ecology

The project weeks on ecology were conceived and realised at the suggestion of advanced students and together with them. The implementation of a new teaching concept can only be successful if the vast majority of the teachers welcomes the innovations and is ready to provide an input. This means that a new concept has to be formulated, presented, defended and adapted until a consensus is reached. To do this, compromises are needed.

Based on the above-mentioned goals of university education and the observation that projects and tutorials are avoided if possible, the question of how to reach these goals had to be asked at the very beginning. These goals included above all:

- Actively involve the students as early as possible
- Promote self-organised learning
- Practise goal-oriented working
- Promote key qualifications
- Make the difference between school and university clear

It is important to make clear that while at school subject-oriented, secure knowledge is taught, explorative learning takes centre stage at university. Then, the following process was carried out:

- a. Concept development
- b. Winning over the teachers
- c. Winning over the tutors
- d. Organisation of a tutor training
- e. Implementation

a. Concept development

Inspired by the project weeks at the department of forestry of the University of Freiburg that have been existing for several years, the bases for the project weeks were determined.

The following cornerstones were set:

- The project weeks have to be integrated into an existing module: Ecology and introduction into agrarian ecosystems.
- The general introduction into the studies (library, internet, presentation techniques, academic writing) has to be integrated into the project.
- A comprehensive topic for all groups is determined and then each group has to decide on a subtopic.
- In groups of about 10 and supervised by a tutor, the students have to deal with a topic in writing and finally make a presentation of 15 minutes.
- Furthermore, each group has to carry out a small experiment in order to gather basic experience with scientific methodology.
- The teachers of the department provide subject-related input in the form of incentive lectures on the comprehensive topic and regularly are at the students' disposal during the project.
- The role of the tutors consists in moderating the group processes and offering organisational help, but no subject-related inputs.

b. Winning over the teachers

In order to convince the teachers to re-organise their way of teaching, an exhaustive plan was submitted in the form of a proposition and presented by the deanery and the students together.

This was a crucial experience. One of the first reactions of the participating teachers was that the idea was good, but impracticable because it was too time-consuming. After an in-depth discussion of an hour, the lecturers, however, were mostly of the opinion that the project weeks had to be carried out and that there was no alternative course of action.

Together with the lecturers, the preliminary concept was discussed and partially modified. Above all, an agreement about the comprehensive topic was reached. Soil fertility was chosen, because it has an impact on all sub-areas of agriculture or is influenced by them: soil, plants, animals, economy, food quality.

c. Winning over the tutors

A well directed campaign was launched among the Ph.D.- and MSc-students. The tutors had to be prepared to attend a two-day training and then be available for their group for about 1 to 2 hours daily during the entire three weeks.

d. Organisation of a tutor training

A one and a half day training was then organised by one of the tutors. This tutor again had gathered ideas among the colleagues from Freiburg and then had - together with a professional presenter - implemented them as regards content as follows:

- Background, aims, perspectives
- Role and function of the tutors (NOT lecturers!)
- Theoretical background (presentation)
- Group work with exercises:
 - Levels of group work,
 - Understanding of one's role,
 - Methodology:
 - Group dynamics,
 - Goal-oriented working,
 - Creativity techniques,
 - Feedback
- Organisation, procedure, determination of the responsibility

The training itself was partially carried out in form of group work. However, as the group only consisted of 14 members, a lot of work was done in the plenary including all the acquired techniques.

It was crucial that the organisation and the procedure of the project weeks were clearly determined, because the insecurity of the tutors was to some extent considerable. A joint dinner and relaxation exercises also played an important role in order to instil as much confidence as possible, and therefore create an atmosphere of mutual support among the participants.

e. Implementation

Finally, the project weeks with the following content were carried out during three weeks at the beginning of the winter semester:

- Group work on the subject
- Carrying out a small experiment on the subject
- Incentive lectures on the subject from various perspectives library course, presentation technique, scientific working
- Presentation of the findings
- Making out of a project report in the form of group work

The timeframe was structured as follows:

Day 1:	Introduction into the study location, get to know the localities
Day 2:	Excursion to the training and experimental farm: Morning: get to know the farm and the aspects of soil fertility Afternoon: division into groups and assignment to the tutors
From the third day on:	
8.15–9.00	incentive lecture. The incentive lectures were divided into subjects according to content and methodology. They also contributed to introduce as many lecturers of the department as possible (table 1) from 9.15 group work and daily meeting with the tutor: specification of the project topic, distribution of the tasks, planning of the procedure with the tutors
Last day:	Presentation of all group projects in the framework of a symposium (table 2).
2 days later:	Handing in the project reports. The deadline prevented that the writing of the reports interfered with other courses.

Table 1 Topics of the incentive lectures

Presentation techniques
Scientific working and writing
Soils and their fertility in agrarian ecosystems
Importance of grassland for soil fertility in ecological agriculture
Importance of humus management in agricultural practice
Is there a connection between soil fertility and animal appropriate husbandry?
Animal nutrition and soil fertility
Soil fertility from the biodynamic point of view
Basis for eco-systems
Materials cycle in waste management
Agropolitical suggestions about soil protection in Germany
Landscape development influenced by humankind
Economic aspects of soil fertility
Bigger, faster, heavier! Bigger, faster, heavier?
The farm manager as energy manager

Table 2: The discussed subjects and the programme of the symposium

Time	Subject
8.15 Soil 1	What is humus? What does the humus management in the case study Fahrenbach manor look like?
8.40 Soil 2	Soil formation and representation of the various soil types
9.05 Plant 1	Sound crop rotation from the point of view of humus
9.30 Animal 1	Influence of free-range systems for various animal species (horse, sheep and cattle) on soil fertility
9.55	Break
10.25 Animal 2	Influence of various animal fertilisers on soil fertility: origin and preparation
10.55 Plant 2	Importance of legumes for soil fertility in ecological agriculture
11.20 ESS 2	Food quality of organically and conventionally produced food, for example the potato
11.45	Break
12.00 ESS 1	Crop rotation subject to economy and soil fertility, the example of Frankenhausen
12.25 Tropics 1	Influence of the vegetation in the humid tropics on soil fertility, the example of agroforestry
12.50 Tropics 2	Desertification in the Sahelian Zone

Additional events

In the middle of the second week, a meeting between the tutors and the responsible lecturer was organised in order to talk about questions and possible problem areas together.

All reports were evaluated by the supervising lecturer and the respective tutor within two weeks. Afterwards, the reports were discussed with the groups.

Evaluation

An important precondition for the long-term success of the event are the follow-up activities and the evaluation made by the students and the tutors in order to find flaws and to plan necessary improvements.

In the framework of a MSc-project, one of the tutors (Ms Birge Ude) developed and carried out an evaluation. This evaluation consisted of a questionnaire for the students, a structured, joint discussion with the tutors and a discussion about and reflection on the event with the participating students that took place about six weeks after the end of the event.

a. Methodology:

In total, 74 students participated in the project weeks and were asked to fill in the prepared questionnaires. The questionnaire return amounted to 65. The questionnaires contained:

- 23 close-ended question, mostly with 5 categories from 1 = "absolutely true" to 5 = "not at all true"
- 12 open-ended questions about experiences and suggestions for improvement

The evaluation together with the tutors took place in the framework of a group discussion with integrated metaplan, in order to look into the following subjects:

- Organisation & procedure
- Problems within the groups: What? Possible solutions?
- Experiences made with the organisation of the project weeks: methodological, social, what have I learnt as a tutor? what was missing?

b. Results from the point of view of the students

The very high questionnaire return was unusual and can certainly be ascribed to the fact that the students were at the beginning of their studies. However, the overall result was very good, and this suggests that the students liked to give feedback. Therefore, one can only speak about the very good and not quite so good results.

The best results all were above grade 2 (table 3), the worst still above grade 3 (table 4).

Table 3. The aspects of the project weeks that got the best results from the point of view of the students (n=67), according to grade; 1 = very good, 5 = insufficient, or according to number of mentions

Subject	Grade average
Final presentation	1,38
Supervision by the tutors	1,58
Comprehensive subject soil fertility	1,62
Script	1,72
Project weeks in general	1,74
Freely formulated	Number of mentions
Intensive getting to know each other	18
Good introduction into the studies	16
Independent dealing with a topic	11
Incentive lectures	11
Working in groups	9

Table 4. The aspects of the project weeks that got the worst results from the point of view of the students (n=67), according to grade; 1 = very good, 5 = insufficient, or according to number of mentions

Subject	Grade
Aims and requirements had been presented clearly enough in advance	2,69
Experiment	2,45
Learning effect on problems in group work	2,45
Team training	2,40
Co-operation within the group	2,23
Freely formulated	Number of mentions
Difficulty to take the elective courses	(7)
More contact between the groups	(5)
Plan of the university with the offices of the lecturers	(4)

As reasons for a basically worse evaluation of the project, the following points can be mentioned in summary:

- Overstraining (not enough information in advance & too high requirements)
- Students are less happy to work in groups
- Students were not very strongly motivated to carry out further projects
- Co-operation was not regarded as successful
- Learning effect from the point of view of content was not very high
- Group size?

In group work, several topics were regarded as positive and negative (table 5).

Table 5. The aspects of group work that were regarded as positive and negative from the point of view of the students (n=67), according to number of mentions

Positive:	Number of mentions
Team experience and success	(11)
Division of labour	(10)
Getting to know each other	(9/18)
Different characters of the participants	(8)
Supervision by the tutors	(8)
Negative:	
Disproportionate participation	(17)
Differences concerning knowledge, motivation etc.	(14)
Communication	(13)
Organisation and reliability	(12)

c. Results from the point of view of the tutors

They evaluated the incentive lectures in a similar way as the students: most were regarded as successful, some as less successful. However, the latter were considered important, because they served as an example.

The formation of the groups and the choice of the subjects within the groups were considered precipitous. This was the result of the insecurity of the students at the beginning of the process.

Similar to the students, they considered the unequal participation within the groups as difficult and they did not have enough know-how to deal with those who remained silent.

Furthermore, it was not always easy to draw a boundary between methodical and content-related support for the groups.

Scientific working in general was considered a complex topic, above all the difficulty of convincing the students that they had to make bibliographical references and how they had to make them.

d. Recommendations for the future

The information of the tutors about aims and requirements of the project weeks has to be improved in order to reduce the insecurities of the tutors.

The experiment was rather considered a disruption and an overcrowding of the programme. The initial worry that the groups would have too little to do did not come true and therefore, the experiment was considered unnecessary. Instead, there should possibly be a joint excursion with two to three groups in order to provide a better opportunity for the participants to get to know each other.

More support of the groups during scientific writing is necessary.

The final presentation should be spread over an entire day.

Conclusions: Impact on the department

In general, the project weeks were considered a great success. In consequence, the students were clearly more active and demanding than the generations before them.

A great number of students is already actively working on projects in the various departments.

The university offers support for the tutor training.

Biographical data under:

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