

**Studying Natural Resource Management in
Interdisciplinary Problem Oriented Project
Groups: Experiences from SLUSE - a
Cooperation between Thai, Malaysian,
Southern African and Danish Universities**

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Abstract

Natural resource management and environmental studies are fields of study that often require a broader approach than what is normally offered within a single discipline. Interdisciplinary approaches may contribute to a more holistic understanding of the complex relationships that characterise this field of study. A Danish university program, SLUSE, brings together students from a wide range of disciplines from within natural and social sciences and humanities. Similar master programs have been or are under establishment in Malaysia, Thailand and in South Africa. Interdisciplinary problem-oriented project studies in groups is the basic pedagogical principle used in a compulsory Joint Basic Course which also comprises a 3-week field course where Danish and students from the partner programs work together in groups. Integration of research into the teaching activities is an important means of ensuring an up-to-date relevance of the topics of the courses. The paper describes the practical application of interdisciplinarity in university studies in the context of an international cooperation focussed on natural resource management and environmental studies

Introduction to SLUSE, TUCED and MUCED

The Danish SLUSE (Sustainable Land Use and Natural Resource Management) program was created in 1997 as a response to a request from the Danish Ministry of Environment (DANCED) to educate candidates within environmental and international development studies with broader interdisciplinary qualifications. Roskilde University, Copenhagen University and the Royal Veterinary and Agricultural University established the DUCED (Danish University Consortium on Environment and Development) consortium with the aim of making a new

interdisciplinary based education for Danish master students and to conduct interdisciplinary research. Malaysia, Thailand, South Africa, Botswana and Swaziland are part of the portfolio of the DANCED grant recipients and were therefore chosen by DUCED as primary countries of cooperation.

An important component of the SLUSE program is close cooperation with universities in the partner countries. University consortia have been established in the partner countries based on complementarities between the participating universities and the common understanding that an interdisciplinary approach demands input from diverse sources and a higher degree of cooperation between them. Hence, a Thai University Consortium on Environment and Development (TUCED)¹ has been established with Kasetsart University, Bangkok, and Chiang Mai University and Maejo University, Chiang Mai. In Malaysia so far only University of Malaysia Sarawak (UNIMAS) constitutes Malaysian University Consortium on Environment and Development (MUCED²). In South Africa a Southern African Consortium of Universities for Environment and Development (SACUDE) has recently been established with university of Pieter Maritzburg-Natal, University of Durban-Westville, University of Swaziland, and University of Botswana as partners.

The goal of SLUSE is to train students from a variety of disciplines in applying an interdisciplinary approach to analyse

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problems in land use and natural resource management. In Denmark a one-year specialisation module that allows master students to gain practical experience and follow specialised courses from a broad spectre of disciplines relevant to natural resource management has been established in the three Danish universities participating in the program.³

In Denmark SLUSE is not a master program in itself, but constitutes an important part of the student's master program. The basic structure is illustrated in the figure below.

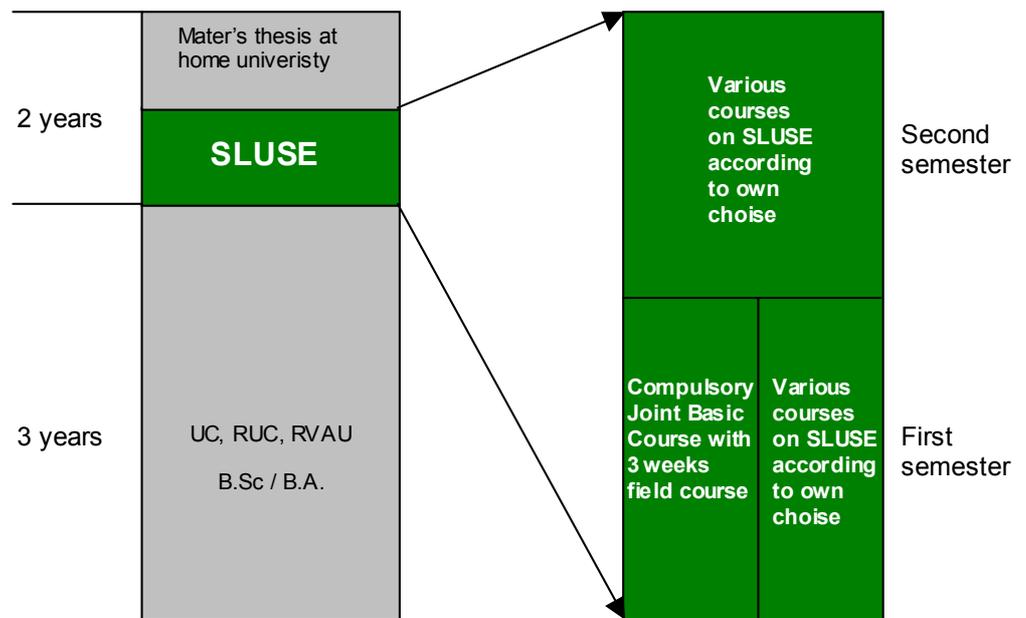


Figure 1 Basic structure of SLUSE in an ordinary Danish M.Sc.

³ For more information on SLUSE and the DUCED consortium see the websites: www.ruc.dk/sluse and www.agsci.kvl.dk/sluse

The Danish M.Sc. has a formal duration of 5 years divided into 3 years B.Sc. and 2 years M.Sc. The B.Sc. is admission requirement for SLUSE students. The one-year SLUSE acts as a “toning” of the students’ original discipline and must as such be incorporated into their regular academic programs. This is done by establishing formal agreements on transfer of credit so that SLUSE students are automatically credited for the courses they take under SLUSE in their home institution.

A Joint Basic Course (JBC) is the only compulsory course under the Danish SLUSE and corresponds to the workload of half a semester or a quarter of the whole Danish SLUSE program. Besides the JBC course, the SLUSE student composes his/her own curriculum by choosing from the more than 40 courses offered under the SLUSE program on the 9 involved university departments. The many courses offered under SLUSE are a mixture of new courses especially designed for SLUSE, but also open for ordinary students at the particular department, and existing courses that was considered relevant. SLUSE has financially supported the establishment of new courses, but the expenses are taken over by the home department hereafter.

Two 16 months master programs building on similar content as the Danish SLUSE program has been established in Malaysia at UNIMAS.⁴ The SLUSE-M master programs “M.Soc.Sc. in Development studies” and “M.Sc. in Land Use and Water Resource Management” started in 2000 with 30 students and is currently running its second cohort. This program is also aimed at mid-career professionals, a group which made up 80% of the students in the second cohort.

⁴ See <http://www.unimas.my/SLUSE-M/> for more information on the SLUSE Malaysia master programs.

A master program building on similar principles is under development at the three participating Thai universities and are scheduled to start in June 2002. A third program is underway in South Africa and Botswana.

Research based teaching

Research based teaching is a trademark of Danish as well as many other universities. Research is also considered an important activity of university staff and is usually the foundation for evaluation of staff qualifications and merits. Typically 40-50% of the working hours are supposed to be spent on research and the rest on teaching and administrative tasks. Thus, although there in reality often is a tendency for the teaching part to be somewhat larger, Danish university staff normally identify themselves as first and foremost researchers, and thereafter as teachers. Research and teaching are therefore closely related and the principle of research based teaching is being applied also at the Thai and Malaysian university consortia.

Teaching and research are combined in several ways:

- Teachers take point of departure in own research
- Teachers use material from their own research directly in teaching e.g. as cases
- Articles etc. from the teachers research field is used directly in the teaching whereby:
- Teachers involve students in the current discussions within the teachers research field
- Students are used directly in research e.g. through the field course
- Students make projects in relation to or as part of ongoing research

In the SLUSE JBC the teacher group apply the above principles to the extent possible. It is common practise that teachers only teach on subjects with which they have personal experience. This is to a very high degree possible as the teacher group is composed of several active researchers from a variety of disciplines, whereby many relevant issues can be covered based on personal experience. Material from the teachers' own fields of research is also most often used directly as compulsory reading, or as material used as point of departure in discussion e.g. through presenting own findings as cases. It can either be material written by the teacher him/herself, or, which is more often, material that the teacher has used in his/her own research, and therefore has an intimate knowledge and opinion of. This often allows for very interesting discussions with the students, from which the teacher also can benefit. In explaining own research and ideas to a live audience, it is not uncommon that new ideas evolve or latent ambiguities become apparent which can be addressed, and which is probably the best way to stimulate interesting and engaged further discussions. Teaching hereby also becomes a source of inspiration for the research.

As well as teaching and research is closely connected, so is research and policy formulation. There is an acknowledged call for policy outcome of the activities in SLUSE. The program adopts a problem-oriented approach, meaning that it is involved in and work with real-life problems within natural resource management and environment. Hereby it is the aim to link academic perspectives with practical interventions and action plans. Research is in SLUSE seen as an innovative learning process with a number of different outcomes corresponding to the different objectives. Different outcomes are necessary as *"...although a single researcher may be perfectly capable of*

satisfying both the world of the academia and of policy, a single product of that researcher can never do so." (McNeill, 1999 p.328). This has much to do with the different levels of detail and the need for more simple practical application-oriented conclusions needed in policy related work.

The diagram below illustrates the principle in the innovative learning process adopted by SLUSE. As can be seen government agencies, NGO's and other stakeholders are involved in the research and also in the teaching. In Thailand the Royal Forest Department and the Land Development Department have been active in both teaching and research as well as a NGO in Nan Province (Hug Muang Nan Foundation) has been involved in some of the teaching activities. Also, the outcome of research feeds back to the teaching activities through dissertations for master and Ph.D. level.

In the TUCED and especially the MUCED program, mid-career professionals are part of the target group. This allows for the knowledge created in research and disseminated in teaching, to become readily available for decision makers in various bodies involved in these issues. Where traditional university programs would have only a long-term effect through better education of fresh graduates, mid-career professionals have the power and expertise to apply the new findings immediately. Hereby an even higher degree of integration of research, teaching and policy formulation is made possible.

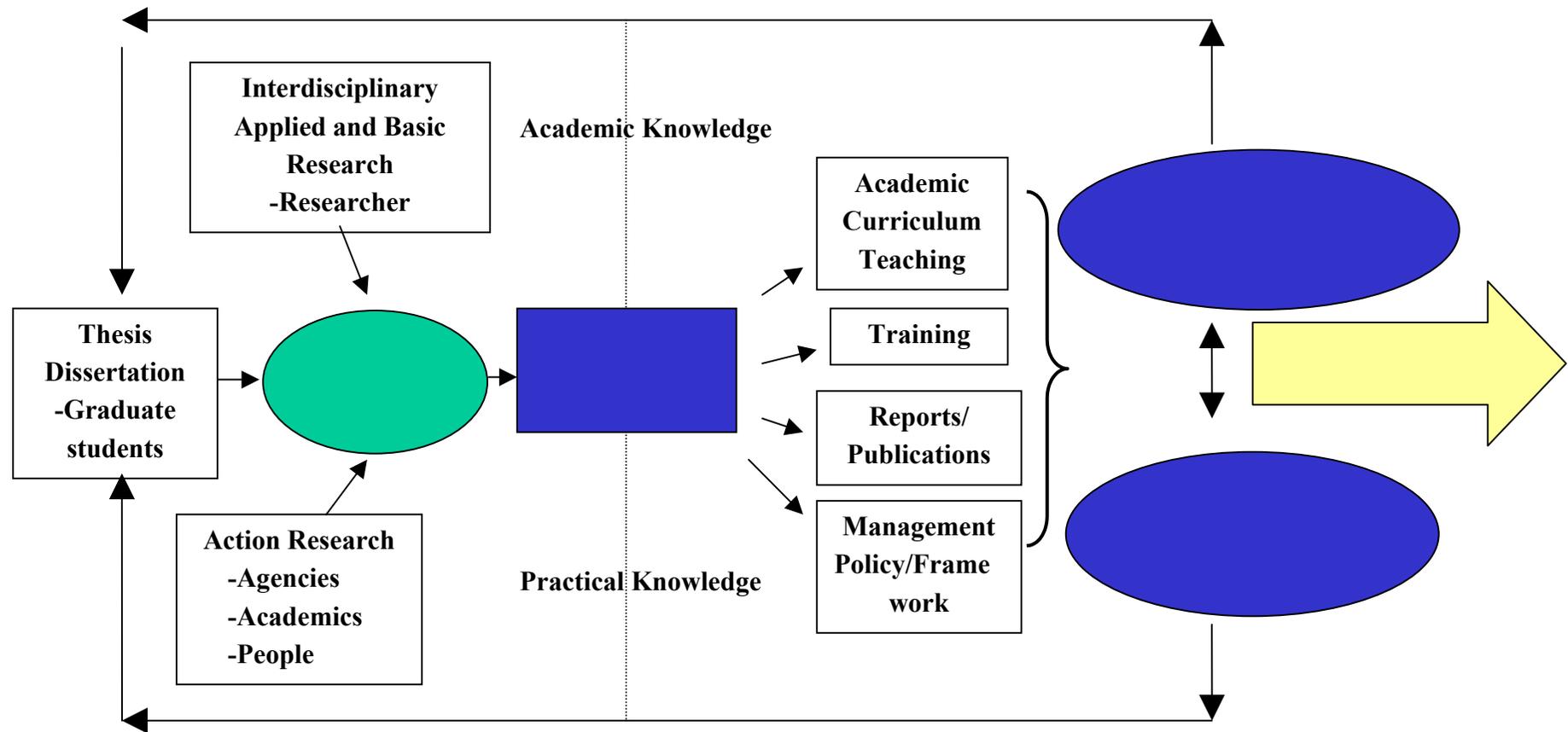


Figure 2 Principles of innovative learning and research in the SLUSE project (Diagram developed by Piya Duangpatra, TUCED, Murtedza Mohamed, MUCED and Peter Oksen. DUCED)

Within the framework of SLUSE, several research initiatives are under development as joint projects between the involved universities. The first joint research was carried out in April 2001 in Phrae province in Northern Thailand in an area where field courses had been conducted in 1999 and 2000. The pilot research project, “Song Watershed Interdisciplinary Research Project” was conducted by 18 Thai, one Malaysian and two Danish scientists from disciplines ranging from anthropology to soil science, and involved also the Royal Forest Department and Department of Land Development.⁵ The research team was primarily composed of scientists who had been actively involved in the SLUSE Joint Field Courses, and it was therefore possible to organise the research according to the principles for interdisciplinary cooperation developed in connection with the student field courses. Plans for a long-term action-oriented research project in Northern Thailand, building on the experience from this pilot research, are under development.

The Interdisciplinary approach in SLUSE

An important component of the SLUSE education programs is the compulsory Joint Basic Course, which is designed according to similar principles in Denmark, Thailand, Malaysia and South Africa. Besides lectures, exercises and report writing, this course includes a three-weeks Joint Field Course where Danish and foreign students work together in groups. This field-course is conducted yearly in Thailand, Malaysia and South Africa, and in Thailand three such field courses have been undertaken since 1999.

The aim of the Joint Field Course is:

⁵ For more information in this research project see <http://www.ruc.dk/sluse>

- To study problems of land use and natural resources management associated with agriculture, forestry, and other land use types.
- To demonstrate the need for and potentials of an interdisciplinary approach in such studies.
- To train SLUSE students in field work methodologies.
- To introduce a wide spectrum of methodologies, both on the bio-physical, socio-economic, political and cultural aspects.
- To further integration of both teachers and students with different academic backgrounds through joint course activities.

The basic motivation behind the SLUSE program is the acknowledgement that natural resource management cannot be adequately studied and understood from a mono-disciplinary point of view. Rather, specialists from several disciplines from both natural and social sciences are needed to contribute with their specific knowledge towards understanding complex problems related to sustainable land use and environmental consequences. Also, in trying to link research with policy, an interdisciplinary approach may be better at providing a comprehensive understanding of a certain issue than an approach based on an arbitrary and traditional division of disciplines.

However, an often heard concern is that interdisciplinary research and teaching is done at the expense of disciplinary specialisation, and that it can be very difficult if not impossible to combine disciplines with divergent approaches, traditions, perceptions and methodologies. Although it by many may be acknowledged that other disciplines are needed, there nevertheless exist a scientific divide as expressed by Gross and

Levitt (1994 p. 243) here cited in McNeill (1999 p. 324): “The humanities, as traditionally understood, are indispensable to our civilisation...The indispensability of professional academic humanists, on the other hand, is a less certain proposition...”

Both problems are significant and present in interdisciplinary work, but may not necessarily degrade the outcome. Interdisciplinarity may be applied in a number of ways which may be more or less well-suited for addressing these problems. In the following will briefly be discussed how we in SLUSE have developed an interdisciplinary mode of operation.

Interdisciplinarity is a term that is often used to characterise a variety of different forms of interaction between traditional disciplines. Basically interdisciplinarity implies linking or mixing different disciplines but the differences between multidisciplinary, transdisciplinary and interdisciplinary can be rather difficult to determine. However, we will here follow the definition used by McNeill (1999 p. 314) who builds on Jantsch (1972). **Multidisciplinary** implies certain autonomy of the individual disciplines and does not lead to changes in the existing disciplinary and theoretical structures. Individual researchers typically work in parallels or in series. **Interdisciplinary** operates within a common framework shared by the disciplines involved and implies formulation of a uniform, discipline-transcending terminology or common methodology. **Transdisciplinary** goes a step further as it is based on a common theoretical understanding and accompanied a mutual interpretation of disciplinary epistemologies.

Interdisciplinarity for us implies more than just having the disciplines work in parallel, as we try to establish a common framework based on a shared terminology. The common

framework is the common overall problem the group of researchers or students is working with, and these problems have been identified based on a common understanding of central terms like sustainability, agricultural intensification etc. However, the methodologies are not shared beyond analytical level, as various disciplines apply each their specialised methodologies in order to contribute to a common broader understanding of complex relationships.

It is, with other words, a matter of degrees of interdisciplinarity rather than just a simple question of inter- contra multi-disciplinarity. The transdisciplinary approach is seen as less relevant here as the specialisation of the involved disciplines is regarded as a prerequisite for attaining an adequate professional level.

The form of interdisciplinarity applied here therefore does not aim to provide students with new tools from alien disciplines that they have little qualifications to use, but rather to allow them to use their specialised skills and knowledge on an adequate level in a highly integrated interdisciplinary group working on a common problem based on a common perception of central terms.

Problem-oriented Project Groups

The methodology-oriented field course is designed to provide Thai and Danish master students from specialised disciplines opportunity to study a real-life problem in multidisciplinary groups and hereby experience the possibilities and limitations of disciplines other than their own.

The basic pedagogical principle is to let the students work in problem-oriented multidisciplinary groups. Problem-oriented project work in groups is the basic principle for teaching at

Roskilde University in Denmark.⁶ More than 50% of the students' activities at the university are normally based on project studies in groups. The students themselves identify a subject for their studies and receive supervision from the teachers. This approach to learning developed in the 1970's partly as a response to some common problems in traditional teaching:

- Learning by heart and forgetting
- Replicating knowledge instead of developing personal perception
- Difficult for students to become personally involved
- Teacher-to-student one-way communication

Instead the problem-oriented project work in groups should overcome some of these problems by the following characteristics:

- Learning by doing
- Using a participatory approach
- Develop criticality with the students
- Develop group dynamics
- Develop negotiation skills
- Develop tolerance and interdisciplinary understanding
- Training in working with complex issues and many sources of data of conflicting nature
- Training in developing own ideas and testing them
- Making students well-articulated and able to argument for their point of view
- Facilitates an active dialogue between students and teachers

⁶ For more information on the development of project studies at Roskilde University see Illeris (1999) and <http://www.ruc.dk>

- Students experience "*Aha erlebniss*" when they learn from own mistakes and overcome problems

Problem-oriented project work in groups turned out to be very popular and the students were in demand among employers, as thorough training in cooperative skills was regarded as a valuable qualification. Today, this approach is being adopted by many educational institutions from primary school to university level.

However, there are also a number of challenges related to the approach of which the major are summarised here:

- Weak students may "hide" in the group – the so-called "free-rider" problem
- The projects have a narrow focus hence students may get narrow qualifications/ knowledge development
- Tendency for the groups to get high grades as external examiners are impressed by level of specific knowledge
- Difficult to control choice of problem/issue
- Choice of problem often influenced by current hot or popular issues
- Danger of becoming superficial if the project is not sufficiently focussed
- High social pressure as it is imperative to be socially accepted in the group
- It may be difficult to evaluate students individually when they work and go to examination in groups
- Teachers have to adjust to a new role as facilitator

It should be stressed that basic skills development through more traditional courses or similar is also necessary. Not everything can be learned through problem-oriented project groups, but once the basic knowledge is present, the student get an

opportunity to explore the specific field of study and penetrate further into this knowledge as deep as ambitions allow.

Problem-oriented group work may facilitate an interdisciplinary based holistic understanding. It is a fundamental principle that all group members work on a common problem; that they have the same goal. However, the problem formulation of the group should be sufficiently broad to allow for more specialised investigations by individual group members or by specialised working teams.

The SLUSE Joint Field Course

In October 2001, 26 Thai and 19 Danish master students participated in a three-week field-course in Nan Province, Northern Thailand. Field courses based on similar principles as described here were conducted concurrently in Sabah, Malaysia and in South Africa. The students represented disciplines ranging from political science, social science, economy and anthropology to forestry, agronomy, biology and geography.

Divided into 6 groups of 7-9 students they worked on a specific local problem that facilitated the involvement of several disciplines. These groups were divided into working-teams of 2-4 students of similar or related disciplines who worked on specific issues in relation to the overall problem as illustrated in the figure below:

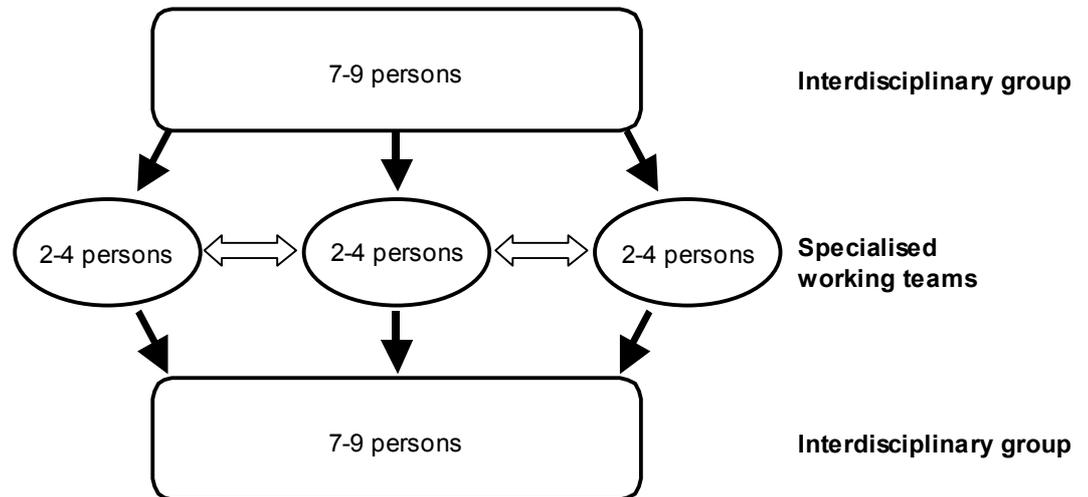


Figure 3 Principle of interdisciplinary group work

This approach is based on the perception of interdisciplinary work as based on in-depth knowledge of specialists, so that an acceptable academic level is maintained. However, in order to avoid a fractioning of the group, the activities of the working teams are closely coordinated and prepared in co-operation with the whole group, so that it is ensured that the information gathered contributes to understanding and analysing the overall problem studied. At the end of the field course, the students prepare and present their preliminary findings as one common debriefing report covering the whole interdisciplinary group. Thus, through close cooperation and communal report writing, it is ensured that a holistic understanding of the complex problems in relation to natural resource management is gained.

Interdisciplinarity holds the inbuilt risk of resulting in studies of relatively low quality. This can be the result when students try to cover a wide range of disciplines for which they do not have qualifications. For example, it would not make much sense to have an economy student doing soil analyses, or a soil science student doing a household economic survey. This would only result in superficial studies and thereby not have yielded an in-depth understanding of the problems. In other words, the work risks being characterised by the lowest common denominator.

Rather, it has in SLUSE been the basic principle, that students should take advantage of their own specialised knowledge, and as such contribute to a holistic approach for the whole group. Students are provided an introduction to the methodologies of various disciplines, but only with the aim of understanding the possibilities of and limitations of these approaches, and not in order for them to be able to apply the methods themselves. With such an improved insight into the possibilities and limitations of the disciplines represented in the group, the students have a better point of departure for combining the represented disciplines into a holistic study on a relatively high level. A high academic level is ensured by having the students gather data and do specific analyses in the specialised working teams where they can concentrate on the field of knowledge for which they are trained and qualified. The results from this specialised work is then, through discussions of the common problem formulation and the common report writing, merged with the results from the other specialised working teams and hence provides for an interdisciplinary approach.

Thus, the teacher group is putting much emphasis on ensuring:

- 1) The interdisciplinary composition in the groups

- 2) That students use and develop their specialised skill in an interdisciplinary environment
- 3) That working teams of students with similar disciplinary background are formed from the groups
- 4) That these working teams collaborate closely before, during, and after the fieldwork

The choice of problems the student work on is important, as it should be designed to provide for an interdisciplinary approach based on specialised in-depth studies. The box below is an example of the problems that the students are working on. It is taken from the basic information provided to the students for the field course in Phrae Province, Northern Thailand, 2000.⁷

⁷ For detailed information on the field-course and the full text of the basic information provided for the 2000 fieldcourse in Phrae see <http://www.ruc.dk/sluse> under “Fieldcourse”.

LOCATION 2: CHANGES OF LIVELIHOOD STRATEGIES AFTER SONG RESERVOIR CONSTRUCTION

Issues of interest:

Investigations that compare livelihood strategies before and after construction of the Song reservoir would be of particular interest at this location. A comparative study should focus on the changing socio-economical status of the villagers and bio-physical conditions that have altered. The three main areas that are recommended for further study are outlined below.

- **Working team 1 Socio-economics: Changing sources of income as a consequence of construction of the Song reservoir.** investigations should focus on:

- Income sources in terms of farming income and off-farm income
- Changing land value and land use types
- Official land policy and actual practices
 - (a) Opportunities for buying, selling, renting and collateral
- Tenure effects on land management
- Collateral and Loans system (public and private)
- Contract farming
- The situation of the landless and those with no land certificates
- Community understanding of land certificate application and allocation procedures
- Community understanding of official land use zoning and policy
 - (a) Reserved forest zones
 - (b) Watershed classification zones

- **Working team 2 Ecology: Environmental consequences of upland farming:** investigations should focus on:

- Soil erosion, reservoir siltation and their impacts
- Pesticide contamination and its impact
- Eutrophication (nutrient enrichment) by external nutrients
- Water pollution
- Forested buffer zone surrounding the reservoir, policy and practice

- **Working team 3 Agriculture: Impact of reservoir construction on the sustainability of agricultural systems in lowland and upland areas:** investigations should focus on:

- *Farming practises and land preparation practises*
- Chemical inputs and nutrient budgets (mineral fertilisation incl. liquid fertiliser)
- Soil fertility and soil degradation (incl. organic matter)
- Crop types and varieties
- Contract farming
- Sustainability under intensive irrigation and intensive agriculture
- Quantification of water use for agriculture
- Soil Doctor Program and activities
- Agricultural Extension activities

For each of the three main issues, students studying the following courses are encouraged:

Socio-economics: Economics, Social science, Political science, Anthropology, Human geography

Ecology: Soil science, Chemistry, Biology, Ecology, Environmental science

Agriculture: Horticulture, Agronomy, Geography, Biology, Forestry

As can be seen, working teams composed of students as indicated at the bottom of the box divide the problem formulations into sub-questions or problems suitable for in-depth studies. The sub-problems are all part of the overall problem formulation of this group as indicated in the top.

It is normal practise that students who work in problem-oriented project groups spent quite some time on identifying their own problem-formulation or research questions. This approach has the advantage that the students are deeply involved in all processes of the work. However, for practical reasons, we have been forced to adopt a compromise in the way the overall problem formulation is defined by the teachers. This is due to a relatively short period of preparation for the field course (1½ months), and the need for ensuring that the Danish and the Thai students work on identical problem-formulations. As the students do not meet before they embark on the field work, the only means of communication during this process is by e-mail, which have proven not to be sufficient. Experiments have been done with videoconferences between Danish and Malaysian students, but so far with limited success. However, as can be seen, several investigations are suggested, and the students are encouraged to chose among these suggestions and make their own adaptations.

The methods applied during the field course reflect the interdisciplinary combination of students and hence includes qualitative interviews, Participatory Rural Appraisal (PRA) methods, questionnaire surveys, soil- and water sampling and analyses, field measurements, forest inventory, satellite image and aerial photo analyses, and GPS mapping. In Thailand GIS was used as part of the spatial analyses and was furthermore used as a tool to combine data acquired through various

methods. GIS is a very convenient tool for providing a common base for exchange, analyses and visualisation of complex spatial data originating from a wide variety of sources and disciplines. Hence GIS can act as an important facilitator for interdisciplinary work.

Methodology training

It is a basic principle in the Joint Basic Course that methodology should be taught with a purpose. It is important that the student not only learns which methods are available and how to apply them, but also why a specific method is used in relation to a specific problem. Therefore the student is encouraged to go through the following three stages (figure below) when planning a research:

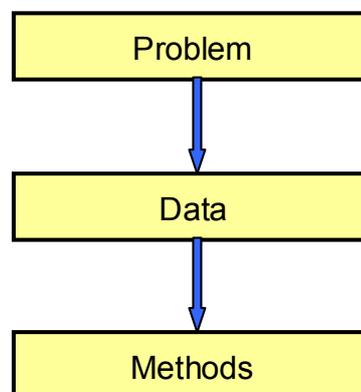


Figure 4 Principle of project planning

The group of students start with a common problem formulation that is to be investigated and split it into sub-issues to be

investigated by the specialised working teams as described above. The students then should consider which data are needed to answer the problem formulation, and finally decide on which methods are suitable for providing this data in the local context. By following this three-step model, it is ensured that the students are conscious of the choice of methods, hence simulating a real research process, and thereby hopefully overcome the common problem of automatic or un-reflected learning.

Level of Knowledge

When doing interdisciplinary teaching one of the major challenges is to arrive at a level where everybody gain from the activities. This is a problem as it is almost unavoidable that some of the students will find the level too low, while others from other disciplines will find it too advanced. The most common solution is to try to find a level in-between minimising the mentioned problem. This we have also tried in the SLUSE teacher group, but it has still been one of the major criticisms from the student evaluations, that the level of the lectures in the Joint Basic Course was not adequate, that is, either too high or too low. Thus, in Denmark we have gradually taken the consequence of this and made the following innovations:

1. Practical methodology demonstration based on parallel sessions where the student chose which demonstration to follow
2. Drastic cut-down of discipline oriented lectures and instead:
3. More focus on cross-cutting issues of relevance
4. More emphasis on group supervision where the level can be individually tailored

Methodology teaching is the area where it has been least of a problem to find an adequate level, as most students have limited prior methodology training of the practical nature we apply in SLUSE. However, in order to allow for higher degree of specialisation, we run parallel sessions during a three-day internship where students can choose freely which session to follow. This allows for students with prior knowledge of the specific method to explore more detailed issues in relation to practical application of the methods under fieldwork conditions.

The number of lectures dealing with more basic issues within the disciplines used in the basic course was cut down. This was a direct consequence of the difficulties of defining an adequate level. As an alternative we focus on a few relevant issues to which all disciplines can contribute. These have been issues like sustainability, degradation, intensification of land use systems, and deforestation. Thus, two or more teachers from different disciplines presenting their specific approach or perception of the issue in question, carried out most lectures and encouraged discussions based hereon with the students. This was then followed up by more emphasis on group supervision, where the specific requirements of each group could be met. A few special sessions with a limited number of students from like disciplines who had requested more in-depth supervision on specific issues or methods, was arranged ad hoc.

Student evaluations

The above experiences have evolved through controlled experimentation. The Danish SLUSE teacher group had only little practical experience in interdisciplinary teaching and research when SLUSE was started, and was therefore forced to

learn from mistakes and continuously make corrections. A process which, as it should, is still ongoing.

Probably the most important tool in relation to this process has been student evaluations of various courses. This evaluation is in Denmark divided into an anonymous written and an oral evaluation. Both are needed, as they are complementary. The anonymous written evaluation concerns all individual lectures, the internship, the literature used and the field course. It is a rather comprehensive evaluation designed as a multiple-choice questionnaire. Besides this, an oral evaluation is conducted in a plenary session. The teachers have prepared a number of issues, but normally the evaluation is more like a discussion. Danish students are accustomed to this form of evaluation, and it is normally not a problem to have them express their genuine and critical opinion. The advantage of this method is that it allows for an impression of unison among the students. When one student raises specific criticism, the rest can be asked for their opinion. If there is a high degree of consensus, some changes probably have to be made.

The written and the oral evaluation are complementary and both necessary. If possible the written evaluation can be used as point of departure for the oral evaluation and as such explore uncertainties in the written evaluation. Furthermore, an oral evaluation will not be able to cover all lectures etc. sufficiently and will probably not allow all students to express their opinion. The more quantitative information from the written evaluation is useful in gaining a comprehensive overview, while the more qualitative oral evaluation will allow for going deeper into specific crucial points of concern.

It is therefore important that the student evaluation is given high priority. It is the foremost important tool for making the

appropriate improvements to the program. However, all evaluations are in vain if they are not discussed openly in a coherent teacher group. It is vital that the teacher group is given the mandate and the freedom to plan and carry out the teaching activities based on their experience and qualifications.

Conclusion

Due to the high complexity of relationships in land use and natural resource management, interdisciplinarity is seen as a necessary approach that can provide a holistic understanding that traditional discipline-oriented studies cannot. However, interdisciplinary studies have an inherent danger of gaining disciplinary expertise at the expense of specialisation, and thereby risk ending up with studies of inferior quality. In the SLUSE program we try to avoid these problems by developing an interdisciplinary approach building on the qualifications and specialisation of the individual students involved. Through organisation of the group work into specialised working teams, a high degree of specialisation can be combined within a common framework and formulation of a discipline-transcending terminology as the basis for the investigations. Problem-oriented project studies in international groups are used as the basic pedagogical principle. This allows students to feel a high degree of ownership for their projects, which is a prerequisite for engaged and thorough studies. The students work with real-life problems in local villages which amplify the hands-on experience and also help the students in identifying topics for their master thesis work. The sites used for the field courses are also identified as potential sites for research projects for the teachers involved. Hereby a close connection between research and teaching is maintained. The research is partly oriented

towards applicable policy recommendations, and as such the villagers involved may benefit from the activities.

The cooperation between the university consortia in Denmark, Thailand, Malaysia, and Southern Africa have shown that there is a common interest in developing interdisciplinary approaches in both teaching activities and in research. In the SLUSE program we have developed a model that has produced promising results within both areas. However, the requirements for the model will be much dependent on the disciplines involved and the expectations to the output. We are constantly adjusting our mode of operation to comply with these changes, and also to solve the difficulties that inevitably arises. It has turned out that probably one of the most important factors for a successful interdisciplinary cooperation is that the involved researchers and teachers are well acquainted, respect the merits of alien disciplines, and have a genuine interest in working together with these.

References

- Gross, P. and N. Levitt, 1994, *Higher Superstition: The Academic Left and Its Quarrels with Science*, Baltimore and London: The John Hopkins University Press
- Illeris, Knud, 1999, "Project Work in University Studies", in Olesen, Henning Salling and Jens Højgaard Jensen (Eds.), *Project Studies - a Late Modern University Reform?*, Roskilde: Roskilde University Press, pp.25-33
- Jantsch, E., 1972, "Towards Interdisciplinarity and Transdisciplinarity in Education and Innovation", in OECD (Ed.) *Interdisciplinarity: Problems of*

Teaching and Research in Universities, Paris:
OECD,

McNeill, Desmond, 1999, "On Interdisciplinary Research: With Particular Reference to the Field of Environment and Development", *Higher Education Quarterly*, 53(4) pp.312-332

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