

The effectiveness and coherence between different course modules

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Introduction

The M.Sc. programme Nature Management is offered at the Faculty of Science, University of Copenhagen from autumn 2012. The first course of the programme “Ecology and management of nature and semi-nature areas” is divided into five sub-themes that are all organized according to the tradition in many biology courses with a mixture of lectures, exercises, field and laboratory work. This structure is generally regarded as effective and stimulating for student learning. As an extreme case, the department of Biology offers summer courses as residential courses with focus on field and laboratory exercises, which always receives good evaluations from the students. A previous pedagogic project on the summer courses also reflected the high educational outcome for the students (Hansen 2006). However, previous findings have also shown that especially laboratory exercises with too much ‘cook-book’ approach are not very effective (Tamir 1989, Dewey 1910). In addition, some students do not see the connection between different course modules (based on input from fellow pedagogic students and colleagues). This potential mismatch between the resource-intensive teaching (i.e. anything but lectures) and the learning outcomes of the students in ordinary semester or block courses is a major problem and should be taken seriously in planning and designing new courses.

Problem definition

The aim of this project was to investigate the student's interpretation of the effectiveness and coherence between course modules in the new course in Nature Management. The focus was put on the part of the course that I was responsible for called 'Theme III: Holocene development of climate, vegetation and human impact on lakes and catchments' containing both lectures, discussion exercises, field and laboratory work over a period of 1½ weeks. Especially, the coherence of the individual modules was in focus during the planning of Theme III and questions on coherence between all the individual modules were addressed. Student activation during lectures was a secondary focus point for increased learning outcomes of the students inspired by the university pedagogic program (KNUD), Biggs & Tang (2007), and Mazur (1997). However, as several teachers contributed to the lectures this particular aspect of the course was not separately investigated due to different teaching styles. Instead, a general investigation of the students self evaluation on specific topics within Theme III was performed.

Based on prior knowledge of possible problems with coherence between course modules, the hope was that a stronger focus on creating a good link between field and laboratory exercises and theory (lectures and discussion exercises) would have a positive effect on the student's interpretation of the course and consequently increase their learning outcomes. However, it was also recognized that the schedule and amount of theory included in the course set relatively narrow boundaries for time and material that could be included in each sub theme.

Planning of Theme III

In the introduction lecture, the students were introduced to the different course modules and the reasoning for including them, together with presentation of the condensed version of the intended learning outcomes (ILOs). Each lecture had focus on links to other modules of the course, the discussion exercise and the field and laboratory work, e.g. by indicating what parts of the theory they would be discussing, work with, or calculate. Based on reflections of previous teaching and supervision, I have found that increased student activation during lectures works well both for the students and for me as a teacher and several student activities were included throughout all

lectures conducted by me. These activities included the use of small cases during the lecture as well as for summarizing the lectures.

Active use of the web-based student-teacher forum at University of Copenhagen, Absalon, making the students choose one of two themes for both the discussion exercise and field was applied to make the students take active part in the content of the theme. The discussion exercise was introduced a day in advance and guiding questions to the reading material was put on Absalon together with the time schedule. The discussions consisted of group discussions of the individual papers followed by presentations for the entire class where the fellow students were expected to act as opponents. A full lecture was devoted to introducing the field and laboratory work including the specific proxies which were going to be measured and a discussion among the students as to the value of these proxies. The introduction was conducted a day in advance of the field trip and the field and laboratory protocols were put on Absalon. During the laboratory day, a peer instruction exercise was introduced where the two groups had to explain to the others what they were doing and why.

The theme was concluded with a discussion and a report of the obtained data from the field and laboratory work in groups consisting of students working with both themes (historic and current status of a lake). The objective of the formation of groups was to take advantage of information sharing as a good way of learning. However, the time provided for this part of the theme was more restricted than originally planned, which to some extent limited the outcome of the sharing exercise. Theme III was concluded by a lecture putting the theme in perspective on the global scale.

Student evaluations

Questionnaires were handed out at the end of Theme III. The questionnaire was organized in three parts: a general part on student background and overall level of the theme, a part on the coherence of the different activities in the theme, and a last part concerning the outcome of Theme III. Evaluation of the coherence between the course modules included coherence of lectures and discussion exercise, lectures and field/laboratory work, and general theme and report focus as these could be evaluated differently by the students. Effectiveness was evaluated based on questions to their self-evaluation of their skills on topics from various parts of the course e.g., 'ability to understand mechanisms of natural succession', 'ability to

interpret a stratigraphic diagram in relation to catchment development', and 'ability to plan and conduct fieldwork on a lake'. In addition, the students were given the opportunity to come up with suggestions for further development of the course based on their prior experience, as these students were all master students and thus experienced students. The questionnaire on the specific theme was supplemented by phone interviews of three students as well as answers to the general questionnaire on the entire course.

Results

Questionnaire

There were fifteen students in total attending the Theme III of the course and fourteen who filled out the questionnaire. Overall, the results from the questionnaire were very positive and particularly, it was noticed that the students found good coherence between the modules, which was a major focus point in the development of the theme.

The students were evenly distributed between Biology at University of Copenhagen (4), former Life at University of Copenhagen (4) and international (5) students (one indicated as 'other'), most of them with a biology background. Most were female (11). The majority found the scientific level adequate while the workload was rated as adequate or high. Time allocation between the different modules was also rated as adequate.

There was a general satisfaction with the execution of especially lectures and field, while there was more variability in the evaluation of execution of the laboratory and discussion exercises as well as the report requirements. The most common concern among the students was too little time for the individual tasks.

The great majority of students found that there was very good coherence between the individual course modules (Fig. 18.1). In addition, they found the teachers engaged, while they were not as satisfied with the communication of what was expected of them as well as the general outcome of Theme III (Fig. 18.2). However, the majority of the students found that they had achieved the intended outcome 'to some extent' or 'to a great extent' (Fig. 18.3).

A qualitative evaluation of the differences in answers between the groups (Danish/International) was undertaken due to the low amount of students. There was a tendency towards the International students evaluating

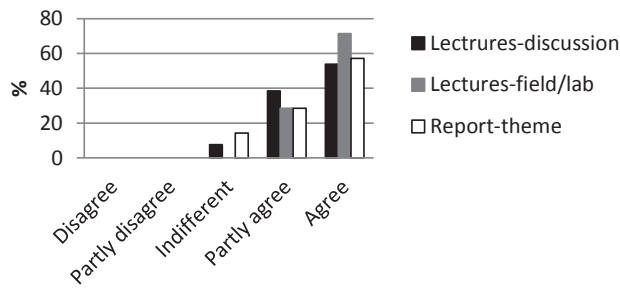


Fig. 18.1. Coherence between the individual modules of Theme III.

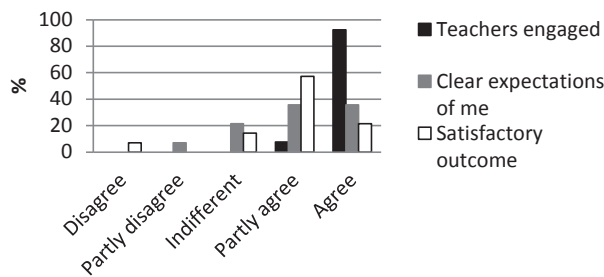


Fig. 18.2. Expectations of the teachers, students and general outcome of Theme III.

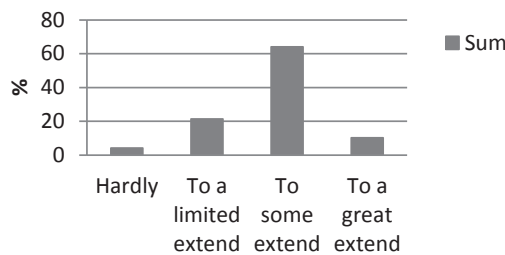


Fig. 18.3. Effectiveness of Theme III based on student self-evaluation of their ability to understand or perform different topics of the theme..

their achievements a bit lower (65% ‘to some’ or ‘to a great’ extent) than the Danish students (80%). There was no clear trend in what topics that were rated as best achieved based on how the material had been covered, e.g. primarily in lectures, lectures and discussion, lectures and field/lab or report. However, the ability to plan and conduct field and laboratory work was rated low, and could be a focus point for future teaching of this subject. It should be noted that this was originally the plan, but it was not con-

sidered possible under the current time constraints of the course and the variable background of the students.

The most common 'best things' indicated by the students were the field trip, the good structure and coherence of Theme III, and the topic including the methods in general. The 'worst things' were found to be lack of time and laboratory/report work. The suggested changes to the report requirements and Theme III in general were mostly concerning how to lessen the time constraints experienced by the students.

Interviews and general evaluation

As a supplement to the written evaluation, three students (two female and one male) were interviewed over the phone after conclusion of the entire course and exam. They had all agreed to participate in writing before the interview and were asked for additional comments to the teaching style, the discussion exercise, the field and laboratory work, the conclusion of Theme III with a report, and links between the modules in general.

Both female students liked the activating teaching style, while the male pointed out that discussions and summarizing among the students are only efficient if they are all well prepared. He pointed out that more discussion time between teachers and students and use of summarizing discussions every day could be an option. Two of them were present at the discussion exercise and were very happy about discussing primary papers enhancing their understanding of the topic. There was general agreement that the time allocated for direct introduction of the field and laboratory work was important for them to prepare themselves and get more out of the practical exercises. They also stated that the practical work was good and interesting and helped them get a better understanding of the theory. However, they all pointed out that time constraints was a problem as not all students had a chance to try all methods, and they also felt that they did not have time to engage in all aspects of the theory for the concluding report. More time for discussion of the results among students and with the teacher would have increased the outcome of the practical exercise and report. They all found a good coherence of Theme III in general.

Nine students answered the general questionnaire on the entire course. Coherence between the different modules in Theme III was evaluated higher (96% agreed or partly agreed that there was a good coherence between lectures-discussion and lectures-field/laboratory) than in the course as a whole (44% agreed or was neutral). This indicates that the focus on

coherence have been successful in Theme III. However, the evaluation of the course as a whole will also have been affected by the fact that it consists of five sub-themes with very different focus.

Reflections on execution of Theme III

The execution of Theme III including lectures, discussions, field and laboratory work went mostly as planned. Particularly, the lectures including teaching learning activities (TLAs) and focusing on creating links to the other modules went as planned and had a good response from the students. Several students pointed out the planning and coherence as one of the best things about Theme III. This is in line with the ideas of Biggs & Tang (2007) that constructive alignment of courses on all levels and designing of appropriate TLAs, both in lectures and as separate modules, is important for achieving the best learning outcome.

It was noted by one of the female students in the phone interview that even more discussion of the individual proxies measured or looked at in the field and laboratory could have been included during the lectures. The original idea of letting the students be part of designing the field and laboratory exercises did not seem feasible due to the very variable previous knowledge and experience of the students and the condensed time of Theme III in general. However, in the future, more focus on posing open questions where possible and maybe introducing selectivity in methods as suggested by Tamir (1989) could be an asset to the field and laboratory part of the theme. The problems of lack of previous knowledge and time constraints could be addressed by relatively short discussions among the students and more thorough discussion in cooperation with the teacher, i.e. an extended version of the dedicated lecture for discussion of proxies.

More time constraints than expected was experienced by the students during the discussion exercise of primary papers, and this was the likely cause that the execution of the discussion exercise was rated relatively low compared to other parts of Theme III. However, in the phone interviews the two students present both expressed that it was a very good thing to discuss primary literature and that it helped enhancing their understanding of the topic. Reduced time constraints during discussions could be implemented in future teaching by decreasing the amount of guiding questions and keeping focus on the more general aspects. Also, less focus on presentation of the discussion points to the rest of the class (creation of PowerPoint) and more

focus on the discussion itself could be promoted by pre-prepared presentations with the main figures for use in the common concluding discussion. Even though I believe it is important that these discussions are not controlled by the teacher, it is also important to use these discussion sessions to facilitate discussion with the teacher if needed. This could overcome the lowered outcome that can be experienced if the students are badly prepared as pointed out in the phone interview with a male student.

The execution of the field work went very well, while the laboratory work and concluding discussions for the report suffered from time constraints particularly during the concluding discussions. This was foreseen, and was tried compensated for by insisting on full calculations and some discussion during the laboratory day. However, part of the laboratory work took more time than anticipated and the groups therefore finished at different times, which hampered a more formal and effective conclusion and check up of the calculations on the laboratory day. This should be restructured for the next teaching so that the laboratory day is concluded with solid data ready for discussion, both by the students alone and in the common discussion with the teacher. Preferably, there should be at least a day between the laboratory day and the discussion to give the groups some time to look into their data before presenting them. In addition, there should be allocated some formal time for report discussions, particularly when part of the aim of the report is information sharing between students that have performed different parts of the laboratory and field tasks. This information sharing or teaching among peers is important as this has been pointed out as a very effective way of learning (Biggs & Tang 2007).

Conclusion

The conclusion of this pedagogic project, based on a specific part of a newly developed course in Nature Management, confirmed my expectation that focus on coherence between course modules as well as teaching learning activities during lectures are important in structuring an efficient and well perceived course with multiple and diverging intended learning outcomes. The students expressed that they were very satisfied with the coherence of the module both between lectures and discussion exercises and between lectures and field/laboratory work. They also expressed understanding for the choice of the topics chosen, but felt that too many things were covered in the limited time available. Time constraints are a major issue in all courses

and maybe particularly in the new block structure, and make it even more important to create a strong link between the modules of a course to make sure that the students get the most out of all the different parts. The current data did not provide direct evidence of whether the outcome of the theme was enhanced by the focus on coherence and student activation, however, based on the students own evaluations, the outcome of Theme III was relatively good and no one failed the final exam.

Given that this is the first time the course was offered and the considerations stated above for the execution of the various modules of Theme III, some adjustments of the course in general and Theme III are going to be made for future teaching. In particular, a major adjustment considered is the removal of one of the five sub-themes of the course in order to provide more time for the remainder sub-themes. Restructuring the hours scheduled for the individual modules in Theme III, taking more advantage of the learning potential of the report discussions and keeping focus on teaching learning activities during lectures, will also be conducted to facilitate more time for deep learning of the main subjects. Possibilities of including increased participation in designing the field and laboratory work will be explored further. It is my strong belief that continued focus on coherence between teaching modules and student activity will enhance the outcome of any course and how it is perceived by the students.

All contributions to this volume can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/2013-6/

The bibliography can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/kapitler/2013_vol6_bibliography.pdf/