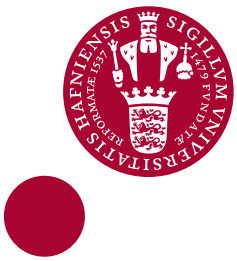

Teaching plant-animal interactions with active student participation and deep learning

Altenburger, Andreas

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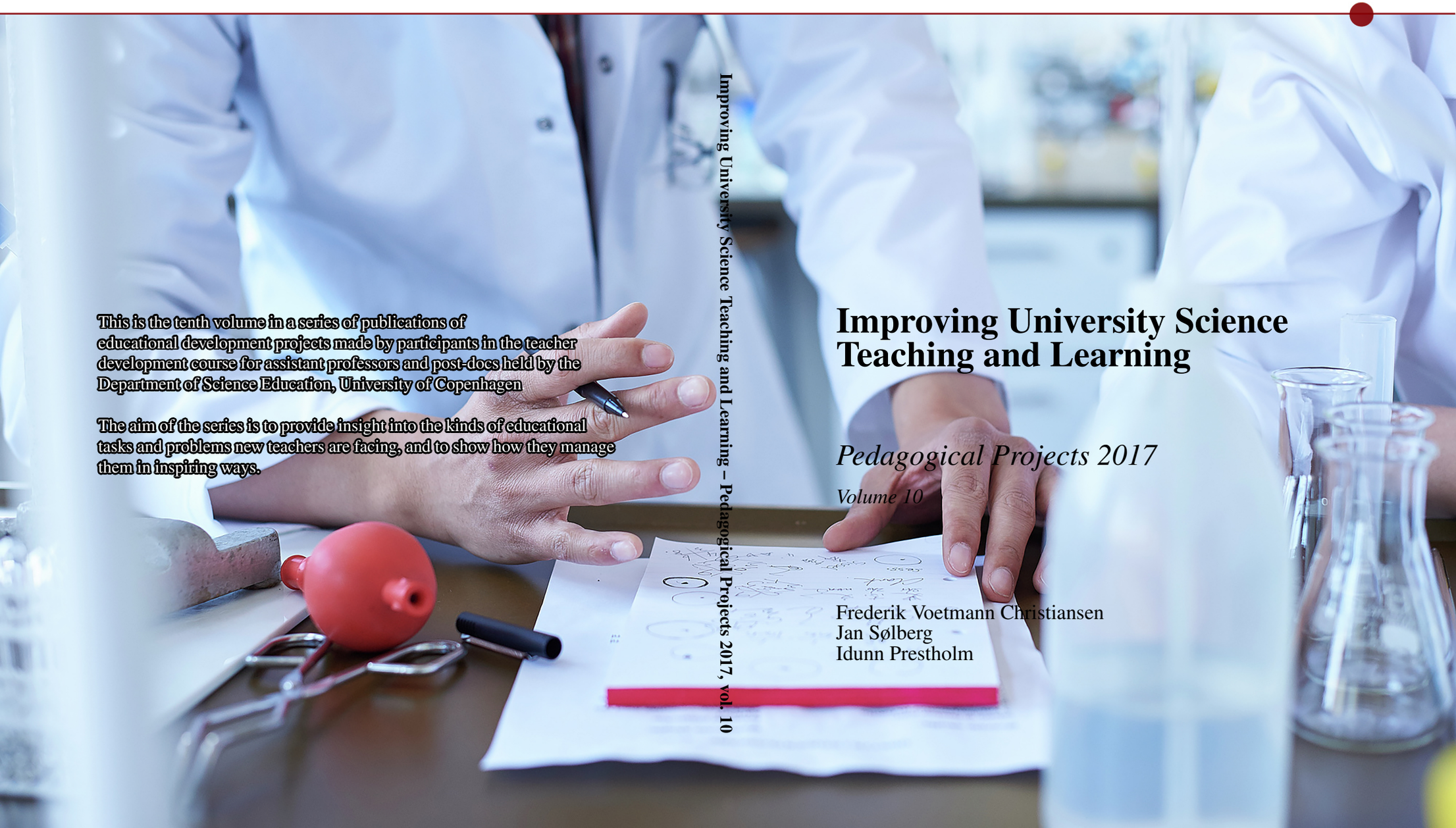

Improving University Science Teaching and Learning

Pedagogical Projects 2017

Volume 10

Frederik Voetmann Christiansen
Jan Sølberg
Idunn Prestholm

This is the tenth volume in a series of publications of educational development projects made by participants in the teacher development course for assistant professors and post-docs held by the Department of Science Education, University of Copenhagen

The aim of the series is to provide insight into the kinds of educational tasks and problems new teachers are facing, and to show how they manage them in inspiring ways.

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University of Copenhagen

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Preface

Jan Sølberg

Department of Science Education
University of Copenhagen

This is the tenth volume of the Department of Science Education's series of anthologies based on participant's development projects made in relation to the Teaching and Learning in Higher Education programme ("Univeristetspædgogikum" or UP) at the University of Copenhagen. The series is published in both hard copy, print-on-demand at lulu.com as well as digital versions, which can be downloaded from the webpage of the Department of Science Education under publications. It is possible to search through previous projects by using the local search engine found here: http://www.ind.ku.dk/publikationer/up_projekter/.

This volume consists mainly of project reports written by participants from the January 2016 course. Each participant is required to conduct a small-scale development project as part of UP. The projects show how individual teachers have identified specific problems relating directly to their teaching practices and includes their reflections on how to develop their practice and the quality of teaching more generally. Topics covered in the projects include course design and redesign, constructive alignment, research based teaching, feedback to name a few. This anthology is organized into parts based on some of the recurring overarching topics to give the reader a structured overview.

We would like to thank all the authors for their valuable contributions to the promotion of Scholarship of Teaching and Learning at the University of Copenhagen.

Thematic overview

In the following, I have attempted to give the reader a brief overview of the papers found in this anthology. The chosen categories represent themes commonly found in the work the participants do during the course. Each paper is not limited to the described themes and some of the papers include more than one of the themes. Never-the-less the reader will hopefully find the following short descriptions of each of the papers included to be helpful in guiding them through the anthology.

Course design and redesign

Thorsten Hansen analyses possible improvements to the introductory course in mathematics for chemistry and biochemistry students. Following years of failing rates of 30%, the course was due for improvements to increase student success rates. Thorsten points to possible points for improvement based on an analysis of the constructive alignment of the course that could increase the improvements to the course already documented following changes in the teachers assigned to the course and the use of course assignments.

Eline Lorenzen describes the redesign of the course "Danmarks Fauna" by introducing flipped learning to the course. She describes in detail the basis for flipped learning and the potential benefits and challenges. With the support of the IT-learning centre at Science, she has detailed plans for introducing substantial changes to the teaching formats, student feedback schemes as well as assessment without overwhelming the teachers involved.

Irini Pateraki writes about the redesign of a Masters course in synthetic biology, which is a new field drawing students from many backgrounds. To accommodate the large variety in student background, Irini tried to create better coherency in the course by actively helping the students understand the course learning objectives and the connection between the many different expert lectures in the course. Irini describes the relative simple steps taken to achieve this as well both the potential gains and concerns involved.

Christian Fertner writes about the major course revision for the Landscape Architect bachelor program, which had been criticized by students who required more coherency in the program. The result was combining five former mandatory courses into one 30 ECTS course. Using a theoretical framework to design the new course to be a more productive learn-

ing context for the students, the course become more project-oriented and student-centered.

Research based teaching and teaching based research

Lulu Jacobsen's project is focused bringing in the students in the course "Climate change adaption and planning" as "partners" in the course. The motivation behind this approach was her years as a project leader and advisor to companies and organisations. Building on her experiences, she invited the students to become active learners and to motivate them to take part in activities close to practice. She describes her "Partnership model" in detail including both the possibilities and pitfalls that she has found.

Charlotte Amdi Williams is concerned with the decrease in practical elements in veterinarian education. In the paper, she explores the students' perspective on the role of visiting pig farms, peer supervision and lectures. She conducted a small survey and found that the students learned from all three types of teaching, but that having to interact with real pig farmers provided a deeper understanding of the theory in the course.

Improving feedback to students

Sofie Kobayashi explores the use of peer feedback as part of her course "Introduction course for new PhD students at Science". Her motivation stems from a need to save teacher time spent on providing feedback to the students' Personal Development Plan and to enhance the courses learning environment. While the first attempt to use peer feedback did not provide clear cut positive results, Sofie provides many insights into feedback and how the course might yet be improved.

Marie Pedersen writes about how lecturers may increase their impact on student learning. She describes many of the factors that affect student learning and explains how she asked students to write notes on 1-2 things that they learned from her lectures. She then collected the notes and reviewed them by the following lecture, where she gave a summary of the students' responses. She found that this simple exercise allowed her to see that there was less overlap in the students' responses than she expected. Finally, she reflects on possible ways to improve on the exercise.

Student motivation and learning

Ramona Teuber describes how she introduced economic classroom experiments to increase student learning by letting the students become active participants in classroom experiments and the subsequent analysis of the results of the experiments. Ramona designed two different experiments aimed at elucidating selected theoretical concepts of the course. The students responded well to this and the experiments and the experiments gave the students opportunities to develop skills not otherwise included in the courses design despite being part of the intended learning outcomes.

Andreas Altenburger describes how he tried to increase active student participation and deep learning through the addition of five different learning activities to a master's course on plant-animal interactions. Based on student evaluations, he finds that the eight students involved in the course found the lectures more valuable than practical activities. He reflects that the intended learning outcomes of the course focus on acquisition of knowledge, which he uses to explain this deviation from previous research findings. He also finds that the students' responses reflect a diverse group of learners and that variation in teaching methods therefore could be beneficial for student learning as long as teaching activities match the intended learning outcomes.

Karin Beukel explores student diversity in terms of a broad range of skills related to innovation and entrepreneurship through a series of tests and questionnaires. The results reveal a large variety among the students that puncture common assumptions about students that gravitate towards courses on innovation and entrepreneurship. She argues that this has implications for the way teaching and group formation should be planned. Students should be made aware of their differences, so they learn to use them productively. She also reflects on how the course assessment scheme should be redesigned to avoid favoring particular traits such as creativity but rather reflect the students understanding of the curriculum instead.

Assessment

Melissa Catherine R Lutterodt demonstrates how using "one-minute papers" to evaluate each individual teaching session can provide excellent and detailed feedback for the teacher while creating an atmosphere where the students feel that they can contribute to the quality of teaching through feedback. At the same time the "one-minute papers" helped make course

objectives more explicit to the medical Master students and thereby enabled them to pursue the course objectives more autonomously.

Supervision

Emily Pope investigates supervisors' expectations of bachelor projects. She interviewed supervisors with different levels of experience supervising bachelor projects and found that KU has no set standards or references to guide supervisors. Never-the-less, the interviewed supervisors were consistent in describing the expected outcomes of a bachelor project. In addition, she found that the supervisors identified two critical factors that helped students achieve the intended learning outcomes: student ownership with their project and significant time to reflect on their analysis and synthesis of results in their project.

Part I

Course design and redesign

1

What to do about MatIntroKem?

Thorsten Hansen

Department of Chemistry
University of Copenhagen

Introduction

The introductory mathematics course offered to freshman students in chemistry and biochemistry has posed an insurmountable obstacle for too many students for more than a decade. The percentage of students failing the course has been on the order of 30% for more than ten years. This, of course, is a problem for each individual student, who wastes time that was better spent learning chemistry, and also for department finances. The number of students failing will never become zero, but ideally it could be cut in half.

The objectives of this paper are to provide an analysis of the course, and to suggest some ideas for change or improvements. It will serve as a white paper for my work with Professor Tinne Kjeldsen to develop the course.

Course curriculum and structure

The course *Introduction to the Mathematics for the Chemical Sciences (MatIntroKem) NMAB13022U* is mandatory for first year students in chemistry, biochemistry, and nanoscience. Chemistry students and nanoscience students will subsequently take additional mathematics courses.

The course curriculum comprises a range of topics from differential and integral calculus. An estimated 20-25% of the curriculum is a review of high school A-levels.

Intended learning outcomes (ILOs)

The course description (kurser.ku.dk) breaks up the ILOs of the course into knowledge, competences, and skills. The paragraphs on knowledge and competences are hard to read. The writing is convoluted and does not seem specific. Only the skills paragraph gets to the point. 11 skills are listed. 9 of these are specific mathematical capabilities, such as *make Taylor approximations for functions of one variable*. Also, the students must be able to *argument correctly for application of theory and methods in solution of exercises*. Proficiency with Maple (a mathematical software) is listed as one among 11 skills to acquire.

Learning activities involving teachers

During a regular week, a student meets four teachers. **A:** The lectures are given by a mathematics professor (4 x 0.75h= 3h). **B:** The classroom teacher is a chemistry or physics graduate student or faculty member (2 x 1.5h). Here connections to chemistry can also be made. This person also grades the homework assignments and multiple choice tests. **C:** A mathematics student is available for questions during an exercise session (1.5 h). **D:** A mathematics student helps with Maple questions (1.25 h).

The weekly bulletin announces what will be the topic of the lectures, and which exercises will be covered as part of activities B and C.

Assessment

Homework assignments and two multiple choice tests count towards the final grade. The 4 best (out of possibly 6) homework assignments count 50% of the grade. In previous years, each of these has comprised three in-depth exercises, one of which was corrected by the classroom teacher. This year an assignment contains one in-depth exercise and 12 short specific exercises.

Two multiple choice tests each count 25% of the final grade. Each multiple-choice test comprises 12 exercises, which must be done in 75 minutes. These are short specific exercises.

Two conditions must be fulfilled to pass the course. First, the average grade must be 5 (out of 10). Secondly, in the multiple-choice tests, one must score a total of 6 points out of 20 (10+10) possible points. Virtually everyone who fails, fails because of this last condition.

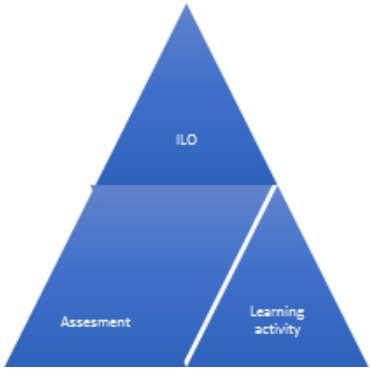

Fig. 1.1: Bigg's constructive alignment model. (Rienecker, Jørgensen, Dolin, and Ingerslev, 2015, Section 2.2)

Constructive alignment

The constructive alignment model put forward by Bigg's (Rienecker, Jørgensen, Dolin, and Ingerslev, 2015) advocate that optimal student learning requires an alignment of the ILOs, the learning activities, and the assessment.

The ILOs (which we identify with the 11 skills) is largely a listing of the curriculum. The 9 topical skills are covered progressively by learning activities A, B, and C. A general discussion of the application of mathematics in the sciences, *the modeling aspect*, which to some extend is introduced in the lectures, the in-depth homework assignments and some (terrible)textbook exercises are not stated as an ILO.

The intention that the students must be able to *argument correctly for application of theory and methods* ... is not given separate attention.

The use of Maple is taught separately, and used in the in-depth homework problems. In the 2016-2017 edition of the course, Maple is predominantly used for plotting functions in various ways. The use of Maple's algebraic features has been toned down.

The bottom of the triangle connects learning activities with the assessment. The assessment corner is dominated by the multiple-choice tests. They only count 50% of the grade, but this is where people fail the course. Only short specific exercises appear on the tests. Notably, the multiple-

choice tests involve no use of Maple and do not test the quality of the mathematical arguments of the students.

The points for the homework assignments are given out more leniently. This is where the in-depth, and modeling aspects appear. The argumentation and Maple aspects are worth some points, but are not in focus.

The left side of the triangle represents excellent alignment between the ILOs and the assessment. The list of specific skills is well tested by the multiple-choice questions. Maple skills are not tested, but the basics is required to score high on the homework assignments. The modeling aspect is not mentioned and leniently tested.

Discussion

As should be evident from the above analysis the course has some issues with the constructive alignment. Beginning at the top of the triangle, a clear strategy for development of the course should manifest itself in clearly written ILOs. The listing of the curriculum is good, but outcomes a bit higher on the taxonomy scales are needed.

The phrase on *correct argument for application of theory* seems to be a relic from the time when all science students took the same mathematics course. The intent is to infuse the students with *mathematical maturity*, which is a strong prerequisite to absorb more abstract mathematics. This is hardly necessary for chemistry students. They need a much stronger focus on specific computational skills. Thus, this ILO should be eliminated.

The role of Maple or other software is due for reconsideration. Is it worth 9x8x1.25h (= 90h) of mathematics student time to teach the students to plot a graph? What is the level of ambition? Clearly, there is simpler software for producing nice figures. An algebraic software like Maple can do a lot more, but it requires investment of time and effort. It seems a bit odd that the teaching of Maple is handled by a fourth teacher without interaction with the other three.

We have come to a fork in the road, and we must take it. Either Maple is integrated stronger in the course, or it is abandoned. Commitment is time consuming, and the course is relatively packed already. An increased focus on Maple would force us away from the successful multiple-choice tests in their current form.

Part of the curriculum comes as worksheets written in Maple. The students have very mixed feelings about these. I don't see them as the future of mathematics teaching.

The modeling aspect, how to apply mathematics in the sciences, deserves a stronger spot. This should be clearly defined in the ILOs. The current textbook was chosen for this purpose. It has a huge number of examples of science applications. Not all of these are convincing. Especially, a number of the exercises are problematic. Modeling shouldn't interfere with the training of solving the short specific exercises.

Moving to the left tip of the triangle, can we improve the learning activities? My personal experience with the course is as a classroom teacher. The classroom teachers take different approaches to the teaching. No class has performed significantly better than others, and the handling of the classroom seems more of a personal choice.

At the moment, the classroom teaching, B, and the exercise sessions, C, are not correlated in any way. Would it be beneficial with a stronger communication here? Could the class room teacher focus on topics, which have proved difficult during the exercise sessions, C?

Daniel Kahneman (Daniel, 2011) describe the two systems of our brains. System 1 is the quick, automatic system that we rely on make split second decisions. System 2 is the slower system, responsible for conscious analysis and reasoning. Conventional lectures and classroom teaching is easily handled by system 1. No need to disturb system 2. Deep learning, on the other hand, which the students can apply two years from now, require activation of system 2. Teaching system 1 new tricks, which can be applied in a flash, is a task for system 2. In *make it stick* (Brown, Roediger, and McDaniel, 2014) a number of learning techniques that have been demonstrated to work are presented.

One technique for learning a topic is the practice of *recalling* it. It is more efficient to extract the method for solving some integral from memory, and do it, that to be force fed ten integrals in the classroom. The students like copying the answer from the blackboard, but that induced no learning. Can the quiz function of Absalon be used to set up multiple choice questions that can trigger *recalling* in the student brain? This would also constitute some feedback, which is scarce in this course.

Another useful notion is that the recalling a specific technique should not be done many times in a row. It must be mixed up, or *interleaved* with other tasks. A sizable portion of the curriculum review high school mathematics. Basic differentiation reappears when calculating partial derivatives

of functions of multiple variables. Simple integrals pop up when solving differential equations by separation of the variables. Can we invoke these recurrences of basic calculus in a more systematic way? As interleaved practice of basic techniques. If this is an option, we can cut part of the early curriculum and expand on the later parts. If the students have bought the premise that they need to solve a given differential equation, they have a stronger impetus to solve the integrals.

The final tip of the triangle is the assessment. The multiple-choice test function well in their current form. Now changes are required. Stronger components of modeling or Maple use will challenge this.

I have stayed away from specific discussions of the curriculum. This may develop over time, but not independently of other courses.

The Christmas miracle of 2016

December 21st 2016 the students had their first multiple choice test. The exercise set was comparable to previous years. Yet, the students scored 2-3 points (out of 10) higher on average than usual. This improvement is much too large and the number of students too large for this to be a coincidence.

Many students already have the required 6 points (out of 20) and no longer worry about failing the course. The mood in the classroom is different and the percentage of students failing the course will drop significantly.

How did this happen? Two changes have been made to the course this year. A new professor is lecturing and the six homework assignments have been changed. Professor Tinne Kjeldsen has extensive experience from RUC, teaching mathematics to students from other programs. A change of the focus and style of the lectures, may have contributed to a stronger alignment of learning activities and assessment.

The change made to the homework assignments, with a stronger focus on the short specific exercises, has also improved the alignment between of learning activities and assessment tremendously. That the changes made this year, have already impacted the failure rate significantly is very promising for the future development of the course.

Conclusions

The course has some specific constructive alignment issues. The garage sale of course components have not found their final form. The poorly defined

ILOs are symptomatic of the issues. A way forward is a clear reformulation of the ILOs. Decisions must be made on the modeling aspect and on the fate of Maple.

The Christmas miracle suggests that a tipping point has been reached, where most students will absorb most of the curriculum, and only a small minority will fail. This opens the possibility of adding new contents to the course.

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2

From a traditional to flipped classroom
– a course redesign to foster learning and engagement

Eline Lorenzen

Natural History Museum of Denmark
University of Copenhagen

Background and motivation

The BSc course *Danmarks Fauna* is popular among biology students at the University of Copenhagen, drawing 50–80 students every year. The course introduces students to Denmark's faunal diversity through a mix of auditorium lectures and subsequent hands-on time in a smaller classroom, where specimens from the vertebrate collections from the Natural History Museum of Denmark are studied in detail.

The course has been running for 10 years, and receives positive reviews. However, when auditing the mammal lectures in spring 2016, some of which I will be teaching from 2017, it struck me that the student learning and engagement might be improved by changing the format of the lecture from a (mostly) one-way projection of information, to something more dynamic.

While taking Universitetspedagogikum at KU-SCIENCE in 2016, I was introduced to the concept of blended learning, and met colleagues from other institutes who have successfully flipped their classrooms. Although I have followed several Coursera courses over the past few years, I had not considered that university courses could be flipped, having never experienced this format myself as a student or otherwise. The introduction of the flipped format made me realize that the course *Danmarks Fauna* would be an ideal course to flip.

Here, I will introduce the concept of a flipped classroom, discuss why I believe students and teachers alike may enjoy and benefit from flipping *Danmarks Fauna*, and showcase what we are doing towards flipping the

course, which will hopefully be fully flipped by 2019. It is my hope that other colleagues at the Museum (and elsewhere) will be able to use this paper as a vantage point to consider a flipped format for their own courses.

For this task, I have had many hours of fruitful discussions with my fellow teachers from *Danmarks Fauna*, Kasper Thorup and Peter Rask Møller, who have taught the course since it started. We have also has discussions with Jeppe Sand Christensen and Henrik Kaas from the Science IT Learning Centre, University of Copenhagen. Finally, I have read relevant primary literature, blogs, and educational online material from various universities that are experienced in flipping classrooms.

The flipped classroom

The flipped classroom is a relatively new pedagogical model in which the typical elements of a course – a lecture followed by homework – are reversed (Initiative, 2012). In a flipped setting, students prepare prior to attending class by viewing short online video-lectures produced by the instructor/teacher(s). The face-to-face (F2F) time between instructor and students is spent in an active learning setting, with discussion, projects and hands-on activities, rather than in classic lectures.

The benefits of flipping

There are many benefits to flipping a classroom, for both students and teachers (Table 2.1).

In a classic lecture setting, the instructor prepares material to be delivered in class (Figure 2.1). Students listen to the lectures and take notes, and homework is assigned to demonstrate understanding. There is little – if any – time for reflection during class.

In the flipped classroom, students come prepared. The instructor records and shares lectures online prior to class, and students prepare by watching these before coming. Often, online preparation will include quizzes or assignments, which enable the instructor to ascertain the level of student understanding prior to class, and pinpoint the parts of the curriculum that may need more focus. Class time is devoted to applied learning and higher-order thinking tasks (Figure 2.2), and students receive support from the instructor and fellow students when needed.

Table 2.1: Some advantages of a flipped classroom. Synthesized from Herreid and Schiller, 2013 and Gilboy, Heinerichs, and Pazzaglia, 2015.

Teachers can more easily customize and update the curriculum and provide it to students 24/7
Doing activities in class gives teachers better insight into student difficulties and learning styles
Classroom time can be used more creatively and effectively
Learning theory supports the new approaches and the use of technology is flexible and appropriate for 21st century learning
Students move at their own pace
Students are given ownership and responsibility for their own learning
Students are actively working with their peers
Materials are available online and can be viewed at leisure by those who miss class, and can be viewed as many times as necessary
Students get more time working with scientific equipment that is only available in the classroom
Students are more actively involved in the learning process
Students really like it

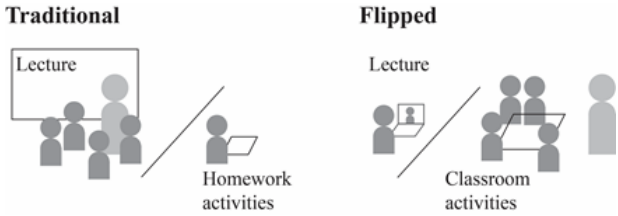

Fig. 2.1: Traditional vs flipped classroom. Graphics from Flipping the Classroom, Center for Teaching and Learning, University of Washington. Available at http://www.washington.edu/teaching/teaching-resources/engaging-students-in-learning/flipping-the-classroom/.

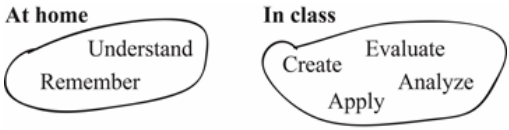

Fig. 2.2: In a flipped classroom, students come prepared to class and engage in active learning. Figure adapted from http://www.michaelserra.net/.

In a flipped F2F class, teachers function as facilitators and advisors rather than as one-way projectors of encyclopedic knowledge. They focus on being a 'guide on the side' and not a 'sage on the stage', and encourage individual inquiry and peer learning. Whereas in the traditional setting, the students are merely passive receivers of information, the flipped approach is student-centered; the focus is shifted from the teacher's needs to the student's.

When students come prepared to class, there is little to no need for teachers to address content related questions. That content has already been presented in the online material, which students can view at their own leisure, pausing and rewinding as needed. In the flipped F2F, teachers can support students in better understanding the concepts through practical application. Students apply their new knowledge and build their skills while gaining immediate feedback from their teachers and peers (Figure 2.2).

F2F classes become interactive workshops; students interact directly with the course teacher and other course participants, testing their skills and directly applying their knowledge in case-based problem solving. Through collaborative projects, social interactions among students are encouraged, improving the class atmosphere. In fact, communication and peer learning among students can become the determining dynamic of a session devoted to learning though hands-on work (Danker, 2015). Such an approach allows the teacher to quickly ascertain the level of student understanding; errors in thinking can be detected, and misconceptions can be immediately corrected. Importantly, the flipped format gives students ownership and responsibility for their own learning.

The challenges of flipping

There are two major issues when flipping a course, which each require time and effort. The lectures need to be transitioned to online material, perhaps videos, and methods of online assessment tool(s) have to be developed. Also, the corresponding F2F classes will need to be restructured and redesigned accordingly, to include activities for active learning.

Limited time, expertise, and resources for conducting such a course redesign often result in either a decision not to redesign the course or, worse yet, courses that are even less effective than the original (Brown, Edwards, Alshiraihi, and Bowser, 2017). Flipping successfully requires dedication and careful preparation. It is, after all, much faster and easier to give a series of lectures, without having to think about student learning and engagement, not to mention the production of the online material.

Pre-recording lectures and making them available online prior to class requires resources in addition to time, both of which may be in short supply. If the ambition is videos rather than lecture podcasts, camera and editing equipment are needed. As is the good will of one or more colleagues who will be required to film the videos. Editing is also an acquired skill, and teachers will need to be involved in the editing process, even if it is outsourced, to ensure the intended learning outcomes are met.

However, once a video is done, it can be reused until the content becomes outdated. In this regard, *Danmarks Fauna* is an ideal course; mammals, birds and fish will always have their distinguishing characteristics, and the faunal diversity of Denmark is unlikely to drastically change anytime soon. However, once produced, the University owns the course material, and it is therefore worth reflecting over what this means for the role of the individual instructor, should s/he leave the course.

Student learning during the online part of the a flipped can be assessed with carious methods including quizzes, to ascertain what components of the curriculum students may not have grasped prior to their arriving in class. The development of good assessment tools requires time and careful preparation. Any questions and assignments must be carefully designed so as to adequately inform the instructor of student learning. Getting such tools right is no easy task. However, when the assessments work, insights into student understanding prior to F2F class allows teachers to identify problems, and F2F classes can be focused accordingly.

The bulk of work required to flip a course may be mitigated by a slow transition, which reduces the effort required by each instructor by spread-

ing out the time needed to produce the required online material before the start of the course. By changing only a few components at a time and slowly transferring lectures online, instructors have the freedom to try out different formats and figure out what works best. There is time to reflect, and adjustments can be made. This will save a lot of time and effort in the long run. For courses with collaborative teaching such as *Danmarks Fauna*, a slow transition furthermore enables time for peer discussion, and instructors can learn from each other. Indeed, the development and implementation of a flipped course comprises as much active learning for the instructors as for the students participating in the F2F classes of a flipped course.

Students may initially be resistant to the idea of a flipped classroom, even if they are millennia kids and used to watching youtube videos. They may not have tried the format before, or a flipped classroom may go against their expectations of what university teaching ought to be. To get students used to the idea of a flipped setting, where they have to come prepared and actively participate during F2F class, a course can be transitioned slowly, over several years, and introduce only a small component of online material at a time.

There are ways to ensure students come prepared and do work with the online material prior to class. An option is to design quizzes that students must pass them in order to continue watching the next online video. Alternatively, it could be a requirement that the student pass all online quizzes/assignments to be eligible for the course exam. However, it should be made clear at the start of the course that the online assessments are included so the instructor can assess student learning, and use the F2F time best. The online assessments are not a part of the final grade, and this must be made clear to the students at the get go. Key to the teaching methodology is deep learning; if students think the online material is part of the exam, they may shift their focus from the process and the learning may become superficial.

Our hope is to provide engaging videos and develop classroom activities that focus on student-centered learning and active engagement. But ultimately, we want students to have an incentive to come prepared. Therefore, the F2F lab practicals should be meaningful, and the format should necessitate that students come prepared if they want to get the most out of class. This can be achieved if students experience that it pays off to come prepared. For example, if a critical mass of students does come prepared, social regulation can develop and students that have not prepared will stop showing up for class.

The case course: *Danmarks Fauna*

The course *Danmarks Fauna* is a flagship BSc course at the Natural History Museum of Denmark, and draws 50-80 biology students each spring. The objective of the course is to introduce students to Danish faunal vertebrate diversity, and the course currently comprises a mix of traditional lectures and lab practicals.

The course runs over 7 weeks in block 4. Each week comprises three 4-hour sessions. Six instructors teach it collaboratively, and collection staff help running the practicals. A few field excursions are included in the course, such as a day spent fishing and describing the diversity of a local lake, an early-morning birding trip, a late-night field excursion in search of bats, and a walk around Dyrehaven in search of hooved mammals and reptiles, however most of the classes are taught in-house.

At present, each 4-hour session comprises a 45-minute introductory lecture, usually covering an animal group (e.g. carnivores or rodents for the mammals). This is followed by a short break, while students make their way to the lab practical, where students study specimens including skulls, skins and animal in alcohol from the bird, fish, mammal and herpetology collections. Due of space limitations and the limited number of specimens, students are split into two groups that each have 90 minutes for the practicals.

Importantly, the flipping will not reduce the number of student confrontation hours, or the course workload. By changing the way the course is taught, we will redistribute the hours. Lectures will be moved online, freeing up one hour per 4-hour session. This hour will be split among the lab practicals, which will each be extended from 90 minutes two full hours. The half hour less that every student will have in class in total, will be spent on preparing for class using the online material.

Danmarks Fauna was developed 10 years ago, to provide a course for biology students that introduce them to the natural history and vertebrate faunal diversity of Denmark. The format of the course has remained unchanged, and the instructors agree that the time is ripe to evaluate and perhaps redesign components of the course – one change already in place is the switch from a 20-minute oral exam to a multiple choice exam, which will run for the first time in 2017.

The incentive for flipping

I audited the mammal part of the course in spring 2016, as I will be teaching parts of this component from 2017. At the same time as I was auditing the lectures, I was introduced to the concept of a flipped classroom during Universitetspedagogikum. In addition to believing that flipping *Danmarks Fauna* could benefit the course, students and teachers alike, my incentive for proposing a flip is driven by a desire to broaden my own teaching platform to accommodate a wider range of learning styles (Figure 2.3).

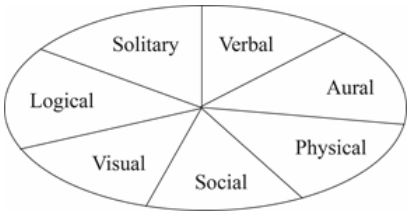

Fig. 2.3: Spectrum of learning styles. Like a fingerprint, each student handles new information according to their own unique response to factors within the learning spectrum so that no two students learn exactly alike. Adapted from Brown, Edwards, Alshiraihi, and Bowser, 2017.

Furthermore, I believe flipping will:

1. Engage students and foster learning. In their current format, the 45-minute lectures introducing each session do not work well. The one-way projection of information by the instructor does not engage students or foster learning as well as other methods might. Our lectures directly precede the lab practicals, and students therefore have little time to reflect on what they have just heard, or indeed to realize whether there is anything they did not fully grasp. The lectures have become a necessary evil for introducing each animal group prior to the practical, a way of getting everyone together in the same room and on the same page. Parts of this material could easily be transferred to online videos/quizzes to be worked with prior to class, and the rest could be facilitated and worked with during the F2F practicals. As the primary lectures introduce the biology, ecology and diversity of Danish fauna, and this information is unlikely to become outdated soon, parts of the curriculum is well suited to being presented via online video lectures.

2. Free up more time for F2F lab practicals. We are already tight on time during the lab practicals, especially for those sessions covering an animal group with a large number of species, where each species needs to be identified. By moving the intro lectures online, a full hour will be freed up per 4-hour session. This time hour can be split among the two lab practicals, which will each gain 30 minutes, increasing the current 90 minutes F2F time to 120 minutes. The excess 30 minutes that each student saves by not having lectures can be spent on online preparation prior to class (Fig. 2.1). Hence the total workload of the course should remain the same after flipping, with an increase in the time spent on preparation and F2F, at the cost of the lectures (Fig. 2.2). The lab practicals are the defining part of the course, and students benefit immensely from studying the museum specimens directly, and really enjoy it – short of spotting the critters in the field, this is certainly the next best thing.

3. Improve the delivery and format of information. The lectures are very heavy on knowledge that the students must learn off-by-heart; the main objective of the course is species identification. By splitting 45-minute lectures into short 5-8 minute videos with one or a few learning objectives each, students can easily switch between videos and pursuing information by other means, fx by reading their text book, or using online resources. Furthermore, instructors can utilize the 33% increase in F2F time during lab practicals on additional activities that foster student engagement and learning.

The process of flipping

The other instructors involved in the course agree that flipping *Danmarks Fauna* is a good idea – none of us are enthused by the classic lecture setting - and we are therefore in the process of redesigning the course (Fig. 4).

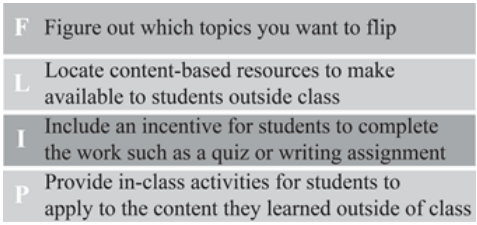

Fig. 2.4: Four easy steps to flipping the classroom. Adapted from the University of Tennessee Chattanooga Think Achieve website, available at http://www.utc.edu/think-achieve/flipped-classroom.php.

In the following, I will use the redesign of my own teaching component of *Danmarks Fauna* (mammals) to describe how the transition can be facilitated, and discuss the resources that are available for the implementation of a blended learning course at KU-SCIENCE.

We plan to make a slow transition, fully flipping our lectures by 2019. For this year, we will produce only a handful of short online videos, and each of the course instructors will produce a video. There are several reasons for this, and we will: (i) try out if the format even works for us and the course, (ii) get a realistic idea of the level of resources, time and effort needed to fully flip our course, (iii) test various ways of producing the online material to see what works best, (iv) conduct student assessments over the next two years to assess their response to a flipped format – we are doing this to foster student learning and engagement, and it is therefore important that this goal is reached.

Students will be introduced to the format during the course introduction on the first day of class. As it will be only a handful of videos in 2017, these will be presented by email on Canvas prior to class. Also during 2017, we will plan in detail which component of the lectures are flipped in 2018 and 2019, so students are well-informed of what is to come, and accept the didactical contract that lectures will gradually be reduced, and that online material will be available and is to be worked through prior to class. We will avoid flipping some lectures entirely and others not – there obviously must be a level of consistency among sessions. We are very aware that this is a potential problem. We are six instructors, and the transition to a flipped classroom must therefore be carefully coordinated among all, so the course runs in the same manner throughout. Finding the time for us all

to get together to plan the course and coordinate the redesign of our various sessions is a major hurdle – we all need to agree and align our expectations on what is to happen.

In addition to figuring out how best to make the online videos, we will spend 2017 and 2018 trying out various forms of online assessment tools - what works well, what works less well. By taking it in small steps, we will be actively learning by doing, and will have time to evaluate and tweak the process as we go. An important part of the course development will be peer learning; we will likely be filming each other's videos. Finally, by spreading the workload of flipping a course out over several semesters, we will not have to allot an unmanageable amount of time and effort in any year.

So what are we doing?

We have reached out to the Science-IT Learning Centre (http://itlc.science.ku.dk/), which is housed at the Frederiksberg campus. We invited consultants Jeppe Sand Christensen and Henrik Kaas for a meeting at the Natural History Museum of Denmark to discuss how to go about flipping our classroom, what resources are available, and what insights and experience they could share with us. They are now providing us with training and resources to develop and implement this teaching platform.

The fact that we are six instructors on the course has made the upstart more challenging, as we need to agree on how to do this. Although we all have different teaching styles, which we feel is a strength of the course, there needs to be a consensus of and similar style in our online material. And this is the process, which will take the most time. We had originally envisioned that each instructor would produce a small number of short online videos of 5-10 minutes duration for 2017. However, due to the logistical challenges involved in getting all six course instructors together in the same room at the same time to align expectations, discuss video content and agree on presentation form, we have realized that it is realistic to only produce one film each this first year. Hence, the auditorium lectures will still very much be a part of the course in 2017, and perhaps also 2018.

However, to engage students during the lectures, we all came to a workshop 'Asking good questions, and how to do it in a lecture setting with ~ 60 students', run by Jeppe and Henrik. We were trained in making live quizzes, using the program Socrative (https://www.socrative.com/), which none

of us had tried before. We agreed that we will all spice up their lectures with a couple of think-pair-share questions or similar, to increase student engagement. We have also produced the first two videos ('Advanced bony fishes' by Peter Rask and 'Swing feathers' by Kasper Thorup). Based on the footage, we are currently discussing the best video format, and plan to film the other four videos prior to course start in six weeks.

The Science-IT Learning Center has several cameras on loan, and freeware editing software is available for most operating systems. We will be learning by doing, but it will be with the support and supervision of experienced people doing. Our videos will be filmed on location in our respective collections. Not only will this set the scene of the curriculum, it will also allow us to present specimens, pointing directly at what is of interest rather than showing pictures on powerpoint slides, as we have done during lectures.

As we design the F2F component of our classes, we will choose only a few active learning strategies to use throughout the course, rather than a different one for each class. This will allow students to become familiar with the active learning strategy and avoid the risk of students focusing on the process of the strategy rather than the learning related to content. This will require collaboration and communication across the instructors involved in teaching the course.

When we run this year's course, we will keep the design principles of flipping a classroom in mind (Figure 5). Although the course has been running for a decade, it is important that there are clear links and intentions with the in-class and out-class activities, so this needs to be a focal point.

Student-centered learning

Teaching presence	Provide incentive for students to prepare for class Provide mechanism to assess student understanding Provide prompt/adaptive feedback on individual or group works
Learner presence	Provide enough time for students to carry out the assignments
Social presence	Provide facilitation for building a learning community Provide technologies familiar and easy to access
Cognitive presence	Provide opportunity for students to gain first exposure prior to class Provide clear connection between in-class and out-of-class activities Provide clearly defined and well-structured guidance

Fig. 2.5: Nine design principles of the flipped classroom. Adapted from Kim, Kim, Khera, and Getman, 2014.

Assessing the impact of flipping *Danmarks Fauna*

Enhanced student engagement and learning has been reported across the STEM fields, with the majority of students preferring the flipped method compared with traditional pedagogical strategies (Gilboy, Heinerichs, and Pazzaglia, 2015). However, recent research has found that higher learning gains from a flipped classroom may actually be due to the use of an active-learning style of instruction rather than the order in which instruction is provided (Jensen, Kummer, and Godoy, 2015). Our key motivation for flipping the course is to improve the time available to the course: move the lecture material to a more appropriate format online, thereby increasing the time available for F2F lab practicals (Figure 2.1). Importantly, the time spent in class will be the same in the flipped format; we are not moving lectures online to decrease our time in class with the students. Ultimately, we want to develop teaching that engages students regardless of their preferred learning style (Figure 2.3), and fosters their learning to the best of our abilities.

We plan to assess the development of the course, focusing on enhanced student learning and engagement, using in-depth interviews with a handful of students. As we learned during our first UP2016 assignment, one-on-one interviews with students are an insightful way to assess a course and enable a high level of detail, which is impossible to obtain through e.g. questionnaires handed out to all students at the end of a course. This will help us

evaluate student learning as we gradually flip the course, and the student feedback will allow us to redesign the course in the best way possible, for our mutual benefit. We will synthesize these interviews in a paper assessing the impact of the flipped classroom, and hope this will be a useful resource for colleagues who are contemplating a similar course redesign.

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3

Urban planning for Landscape Architects
– ambitions for a good learning context of a new course

Christian Fertner

Department of Geosciences and Natural Resource Management
University of Copenhagen

Introduction

In 2014, a major change in the bachelor programme in Landscape Architecture at the University of Copenhagen was implemented, effecting courses of the second and third year. The main rational for the changes was two-fold: (1) the integration of different methods for mapping and designing and (2) a more equal structure between the two specialisations in the programme, Landscape Design and Urban Design. The prior was tackled by introducing a new course in Geodesign, which integrates the use of more analytical GIS tools (Geographic Information Systems) and more design oriented CAD tools (Computer Aided Design). The latter was tackled by significantly restructuring the Urban Design specialisation established back in 2008. This was also motivated from feedback by students who asked for a more coherent project course, similar to what was offered in the Landscape Design line. The five former mandatory 7.5 ECTS points courses of the Urban Design line were taken out of the programme and a new, project-based, 30 ECTS points course called 'Urban Planning Studio – Strategy and Design' (da: Byplan Studio – Strategi og Design) was introduced (see Figure 3.1).

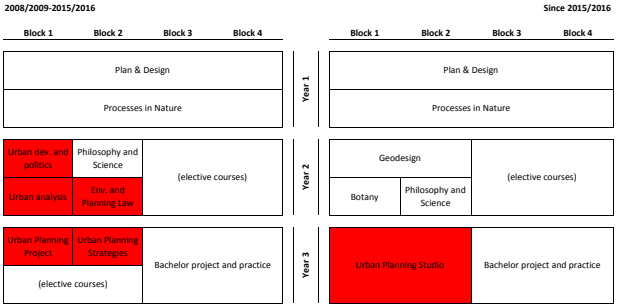

Fig. 3.1: Old (left) and new (right) structure of Bachelor programme in Landscape Architecture at University of Copenhagen. Courses of the Urban Design specialisation are highlighted.

I myself was responsible for one course and engaged in two others in the old specialisation. Together with several colleagues, I am now responsible for the new joint course, which has been held recently (Blok 1 & 2, 2016/17) for the first time. In this paper I elaborate on our main pedagogical ideas for the new course by reflecting on Biggs & Tang's seven general characteristics of a good learning context (2011, chapter 4). I draw on experiences from the new and former courses. Before that, I review some literature discussing the core elements in urban planning education describing the general context of the new course.

Core elements in urban planning education

Urban planning in education and science has a rather ambiguous profile. This is caused by its double character as being a practice or profession (i.e. doing urban planning) and at the same time being a field of research. Research is further split into (1) research in practices of urban planning and therewith planning theories and (2) research into the phenomena related to the city and urban development, i.e. the actual subject of plans. Last but not least, urban planning builds on various other sciences and disciplines such as sociology, economics, geography, law, political science, environmental science, architecture and design.

The plethora of perspectives on urban planning is also mirrored in the great variety of educational programmes. There are some core elements, but a major part will be different from university to university. Edwards & Bates (Edwards and Bates, 2011) examined the core curricula of thirty planning schools in North America and not one of the nine categories of core requirements was present in all 30 programmes. However, 'Planning History, Theory & Practice', 'Legal Aspects of Planning' and general statistics are core requirements in almost all schools. In Denmark, there exists only one full degree in urban planning called "Urban, Energy and Environmental Planning" offered by Aalborg University. Otherwise planning education is typically part of other educations such as at the University of Copenhagen, where Landscape Architects in bachelor and master programmes can specialize in Urban Design and Planning, or also at the Aarhus School of Architecture.

Back in 1995, the Association of European Schools of Planning (AESOP), where Aalborg University, Aarhus School of Architecture as well as University of Copenhagen are full members, has defined a threefold core of the planning education (Dühr, Colomb, and Nadin, 2010, p. 24):

- Theoretical and practical knowledge on the **desirability of legitimacy of and conditions for purposeful planning** intervention
- Theoretical and practical knowledge on the **preparation and advancement** of such interventions and on judging the effects thus generated
- Technological knowledge and **skills to actually engage** in planning activities in real life situations

Davoudi (Davoudi, 2015) pointed out that good planning is a combination of different kinds of knowledge and skills and called it as being "a practice of knowing", i.e. it ranges from knowing on theories or concepts, to knowing on the ideology behind (moral choices), knowing how to do things (crafts, skills) and doing them (action). Not least, a key element in planning practice is the application of practical judgement (e.g. what works what not) which builds on wisdom and experience. Planning has thereby a lot in common with other disciplines as law, politics or design, as pointed out by Alexander (Alexander, 2016).

Although AESOP's threefold core and Davoudi's five kinds of knowledge and skills are referring to a whole programme in urban planning, both are a great inspiration for the newly established course. While we certainly have managed to include knowledge on theories and concepts, on moral choices as well as on how to do things in the courses of the old special-

isation, actual application and 'building up wisdom' from that had minor focus, at least not as a direct activity. This might be grounded in the structure of the courses, where it is difficult to come the 'whole way round' in a relatively short period of time. A basic premise for the new course was therefore to be project-based (or problem-based), where academic knowledge comes in at times when needed for application in or reflection of the project work. This is especially important since urban planning has transformed in the past decades from a more technical practice to an activity strongly interlinked with and dependent on social and political dynamics in the city (Jørgensen and Ærø, 2008). In teaching practice, this is not always possible and challenged when student projects develop in different directions. Still, for this very first round of teaching the course, it was important for us to agree on this general course ambition.

Ambitions for a good learning context

Biggs & Tang (Biggs, 2011) identified seven characteristics for a good learning context. In a previous edition of their book (Biggs and Tang, 2007), they had identified only five characteristics which shows that a good learning context is difficult to base on checklists only. Still, the characteristics provide a great framework to discuss the wider course setup. The characteristics are:

1. Metacognitive control, reflective learning
2. Relevant learner activity
3. Formative feedback
4. Appropriate motivation
5. A base of interconnected knowledge
6. Social learning
7. Teaching quality

Metacognitive control, reflective learning

The first characteristic for a good learning context (Biggs & Tang, 2011) is giving the students control over their own learning and being reflective about it. The main characteristic of the new course is that it is project-based,

i.e. that within the frame of the specific sub-assignments, the students control themselves how and when the work has to be done. Some of the assignments are more specified beforehand, others are more open which has mainly to do with a certain progress in the course. E.g. in the beginning the assignments are more specific so that we can relatively fast come to some first results which we can discuss in the course, while later on students can decide the content to a large extent themselves and only the overall format and deadlines are given. Another key point for reflective learning is to make clear from the beginning, where the activity is supposed to end so the students can argue for their decisions and deal with various challenges along the way.

Relevant learner activity

The activities in the new course vary from lectures (held by teachers or students) to exercises and individual and group project work. Lectures by teachers are kept to minimum, mainly supporting the work on assignments and introducing topics. To discuss course literature, reading seminars are held were students present a text followed by group discussions around given questions. The core of the course, the project work, is structured into several assignments as shown in Figure 3.2. All assignments are done in groups, though with shifting team members. In the first block (week 1-9) the assignments are collected in individual portfolios, while in the second block one joint group project is handed in followed by an oral defence.

Week	Assignments	Other activities
1	A1: Urban structure	
2		3 day field trip to Danish case city
3		
4	A2: District analysis	1 day field trip to Danish case city
5		
6	A3: Scenario, vision and strategy / Portfolio	Vision workshop in Danish case city
7		
8		
9	*Examination week block 1 (evaluation of written portfolio A1-A3)*	
10		3 day international study trip
11	A4: Plan and Design	
12		Critique with guest (practitioner)
13		
14		Critique with guest (stakeholder)
15	A5: Implementation and evaluation	
16		
17	Finish Project	
18	*Examination week block 1 (evaluation of project report and oral exam)*	

Fig. 3.2: Assignment structure

Formative feedback

The third characteristic is to provide formative feedback, which means feedback during learning - opposite to summative assessment at the end of the course. In our course, there are several occasions where students present their work in written or oral form during the course and get feedback from teachers or fellow students. Furthermore, there are several supervision meetings in each group work. However, a challenge for that issue is the limit resources (time) of teachers to give formative feedback, which is rather time consuming. A strategy would be to include more peer feedback from fellow students (The University of Edinburgh, 2010) which we did not use in this first round – not least because the very clear assessment criteria which are necessary for peer feedback where partially still in development during the course.

An important role for this plays also the physical setting. As this is a ‘Studio’ course in the Landscape Architecture programme, we are lucky to

have one room which is only used by us for the whole course period. That means that we can have posters and other course results displayed in the classroom for longer periods that makes it makes it easy for teacher and students to refer back to previous work done.

Besides the course internal feedback, there are also several occasions where the students present some of their work on site. In 2016/17 the municipality of Hillerød, 50 km north of Copenhagen, was chosen as study case. A first field trip to the town was concluded with a short exercise on potentials and challenges of the city, which was presented to planning practitioners from the municipality the same day. Later we returned to Hillerød with scenario posters and invited to a small exhibition in the town's library where many students for the first time got the chance to talk to ordinary citizens from their professional viewpoint.

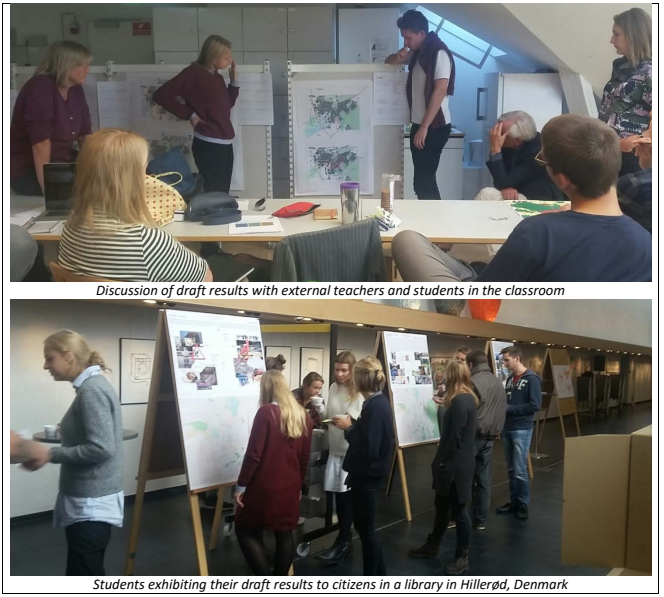

Fig. 3.3: Internal and external feedback session (Photos: Christian Fertner)

Appropriate motivation

The Intended-learning outcomes (ILO) of the course (block 1 and 2) are thought to be the primary element to align expectations and motivate. They are

- To understand complex problems in urban and landscape planning and development in a Danish town,
- To be able to communicate those to others in text, diagrams, maps, drawings, photos as well as orally and
- To develop visions and strategies which tackle the identified problems.
- To understand how visions and strategies can be implemented and
- To design concrete interventions

The ILO's mirror the main idea of the course, namely that the students get in touch with all relevant phases of an urban planning process, including (1) scoping the problem, (2) conducting analyses, (3) forming scenarios, visions and strategies, (4) planning and designing proposals and (5) working with implementation and evaluation. This was also the reasons why part of the programme was changed and the current course was established. In the smaller courses a comprehensive approach was not possible, making it difficult for the students to see how the different phases are related.

Another motivational element is that we try to come close to actual planning practice. That means that, although we incorporate theoretical readings and discussions, all is centred around the students' project work embedded in a real life case. We were in close contact with planners from the municipality and besides a first study tour to the city in the beginning of the course where we met various stakeholders, from the mayor and various civil servants to representatives for local associations, we returned to Hillerød several times during the course for fieldwork and exhibitions.

A final core motivational element is that we try to prepare the students for the bachelor project. The form and structure of the project they have to deliver at the end of block 2 is similar to what is expected in a bachelor project, besides that they typically do not work on that in groups but individually.

A base of interconnected knowledge

With 'creating a base of interconnected knowledge' Biggs & Tang (2011) refer to build on the existing knowledge of the students and furthermore organize the teaching in a way so that students can actually refer and connect

to other knowledge and thereby structure the new knowledge themselves. To get an overview of pervious learned skills we asked the students to take a little survey regarding the courses they took the previous year. Besides landscape architects, also four geography students took the course, making it even more important to highlight different competences, not least for later group work. Connecting to existing knowledge is also a big part of single Teaching-Learning-Activities. Looking at the whole course, e.g. the exam of block 1, a portfolio of several assignments that build on each other followed by an individual reflection, should give the students the possibility to structure the gained knowledge in their own way. Still, this has to be done more systematic e.g. by relating to specific elements of previous courses and developing them further or taking a different perspective on them.

Social learning

Social learning refers to learning from each other in various kinds, with the possibility for the students to learn to see things differently and reflect on own interpretations. Almost all student work is done in groups of 2 to 4 persons. In block 1 these groups also changed regularly, increasing the possibility to add different perspectives on the same issues. This was also evident in the late group assignments where students referred back to pervious results of different groups. However, group work needs to be facilitated (by the teacher or the students) which can take quite some resources. In an oral evaluation with the students after block 1, some mentioned that the shifting group work was rather exhausting. However looking at the outcomes it is clear that this mixing of groups really enabled them to draw on a great variety of different group work results for their final project. Another social learning activity were reading seminars where students presented an article from the course literature, a form of peer tutoring. Also here evaluations were mixed, e.g. mentioning that other students not always are as clear presenting specific content as in a lecture. Still, when presenting themselves, students highlighted that they learned a lot, refereeing back to the idea that the learning effect is highest when you have to explain something to another person (Biggs, 2011). Another social learning form would be peer supervision – the idea that critique from fellow students is taken more serious and can be better understood than from teachers (Race, 2001). We did not apply this systematically this time. Clarifying how the different forms of social learning should contribute to a positive learning effect is crucial.

Teaching quality

Being reflective on one's teaching practice is the last characteristic for a good learning context mentioned by Biggs & Tang (2011). Especially for a new course as ours this is essentially to maintain during the full course as we do not have any experiences of how things work out. Certainly, we can use experiences from previous courses – and did that while planning for the course by e.g. inviting other teachers for talks on their practices in project work, course work, exam etc. As the course is split over two blocks, the results of the obligatory written evaluation of block 1 where already available when starting block 2 and were used to adapt the second part of the course. As written before we also applied a longer oral evaluation at the end of block 1 as well as smaller discussion during the course. One element we are changing because of these discussions are the reading seminars and how they can be attached closer to the project work. Also various practical issues can be improved right away. Other issues regarding assignment structure and exam mode are to be developed after course end by joining up the teachers in the two blocks in an evaluation seminar.

Conclusions

In a big course as ours, filling a semester full time studying and trying to train the core skills and practices of spatial planning (Dühr et al., 2010; Davoudi, 2015), it can be sometimes difficult to keep the focus and provide a clear learning structure. The seven characteristics of a good learning context listed by Biggs & Tang (2011) are thereby a helpful tool to plan for and reflect on teaching. Certainly, there is much to improve around this course whereas the most important will be, based on the experiences of this first round, to clarify the learning goals. Beyond that, it is important to focus on the alignment of elements within the course as well as within the programme. A regular review of the curriculum is therefore at least as essential as the review of the single courses. E.g. Edwards and Bates (2011) suggest a review of the curriculum, also by practitioners, even every other year. The current restructuring was mainly driven by student's wishes, which is not a problem – the contrary –, but we could have tackled that wish earlier when reviewing the programme regularly.

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Part II

Research based teaching and teaching based research

4

Partnerskabsmodellen

- Undersøgt i kurset Klimatilpasning og Planlægning

Lulu Jacobsen

Skovskolen
Københavns Universitet

Resumé *The current trend* in university policy seems to be positioning the university as an environment for learning distinct from its traditional role of knowledge transmission.

This assignment poses the question: How can the partnership-model - that can be connected to this trend - be described and used in the specific course ´Climate Change Adaption and Planning´ – and which advantages and challenges does it imply?

To answer this question *I have* adjusted my course to a more learning-centeret action plan and included more student activities. I have also sharpened my own attitude towards the students and spent time explaining my teaching intensions, having a lot of dialogue about their and mine expectations and facilitating their learning in a process stream approach.

The conclusion is that the partnership-model has worked very well in this course, the students were very satisfied with the course and expressed to have gained many of the intended competencies. They performed very well at the summative assessment, which is not a goal in its self, but still an indication. I have become more aware of how to create a holistic approach towards the course alignment by using activities that support each other and the partnership-idea. I have also experienced how a learning-centered action plan is able to lead to educational output. This experiment has given me a greater awareness of how to create an atmosphere, that makes the students see university as providing a partnership to develop a culture of curious deep learners rather than a ´school with teachers´ who are supposed to guide, direct and evaluate them.

Baggrund

Da jeg blev landskabsarkitekt fra KU (det daværende KVL) midt i halvfemserne, brugte jeg de næste 20 år som rådgiver og projektleder i firmaer og organisationer.

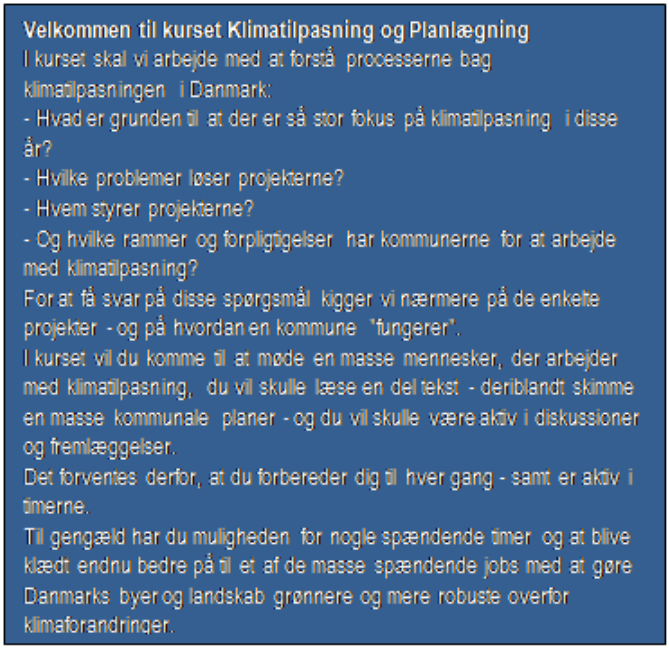
I september 2014 stod jeg for første gang som underviser over for et hold ingeniørstuderende på Skovskolen i Nødebo. Jeg havde fået til opgave at formidle den viden, jeg gennem de senere år havde oparbejdet om klimatilpasning. Klimatilpasning er en relativt ny disciplin, der handler om hvordan vi skal tilpasse vores byer og landskaber til det ændrede klima, således at vi minimerer skaderne ved fx oversvømmelse. De studerende på kurset skulle jeg også ´lige´ sikre, at de forstod plangrundlaget, den offentlige forvaltningsstruktur og lovgivningen, der ligger til grund for at vi kan udarbejde projekterne i virkeligheden. Det var en stor muldfuld og selvom jeg kendte mit stof, anede jeg ikke ´hvordan jeg skulle gøre det til de studerendes´.

På det tidspunkt havde jeg stort set ikke sat mine ben på en videregående uddannelsesinstitut siden jeg selv blev færdig med et speciale om klassiske japanske haver, som jeg havde skrevet på en smart maskine, som jeg havde lånt af en på kollegiet – nemlig en computer. De andre opgaver undervejs i studiet var enten tegnet eller skrevet i hånden - eller hvis det skulle være meget fint; på skrivemaskine.

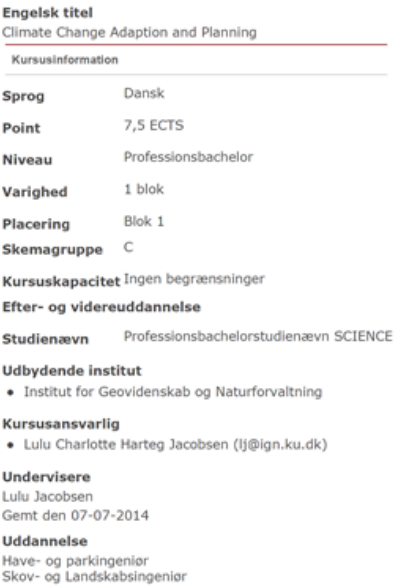
Nu stod jeg her igen, som i en tidsboble, i et undervisningslokale efter 20 år. Jeg havde ingen anelse om, hvad der var sket i mellemtiden. Jeg så ud på en flok unge mennesker, som alle sad med en bærbar computer foran sig. Jeg vidste ikke, hvad de tænkte eller hvordan de arbejdede – og allermindst; hvordan jeg skulle bære mig ad med at give dem, den viden, der var listet op i læringsmålene. Dette fag havde tilmed kun kørt et enkelt år før jeg kom til, så der var ingen lære bøger eller måder ´man normalt underviser i dette fag´. Så hvad skulle jeg gøre?

Min umiddelbare løsning blev: At gøre som ´jeg plejede´. Jeg havde tidligere arbejdet med både mundtlig og skriftlig faglig formidling, så jeg kunne da skrue en forelæsning sammen. Men jeg havde også fungeret som projekt- og mødeleder, og derigennem faciliteret samarbejdsprocesser. Så uden at skænke det en tanke, at jeg var på vej med at indføre en form for partnerskabs-model, gik jeg i gang med det, som jeg nu kan se, var et ´passende valg´ i netop dette kursus: Fra dag ét gjorde jeg klar for de studerende, at vi sammen skulle undersøge diverse cases og jeg meget gerne ville høre deres mening om tingene og at jeg naturligvis forventede at

de bidrog fagligt, fulgte med i medier, gik til konferencer sideløbende og brugte deres fritid se at dygtiggøre dem inden for området.



Figur 4.1: Min præsentation af kurset i blok 1, 2016, opslået på Absalon.



Engelsk titel
Climate Change Adaption and Planning

Kursusinformation

Sprog	Dansk
Point	7,5 ECTS
Niveau	Professionsbachelor
Varighed	1 blok
Placering	Blok 1
Skemagruppe	C
Kursuskapacitet	Ingen begrænsninger

Efter- og videreuddannelse

Studienævn Professionsbachelorstudienævn SCIENCE

Udbydende institut
- Institut for Geovidenskab og Naturforvaltning

Kursusansvarlig
- Lulu Charlotte Harteg Jacobsen (lj@ign.ku.dk)

Undervisere
Lulu Jacobsen
Gemt den 07-07-2014

Uddannelse
Have- og parkingeniør
Skov- og Landskabsingeniør

Figur 4.2: Facts om kurset.

Den ´selvstændige´ form viste umiddelbart sig at passe fint ind i lige netop dette kursus, som blev det første, jeg fik ansvar for. At jeg således kom helskinnet igennem det første kursus, endog med meget tilfredse studerende, som senere har udtrykt at dette kursus har været med det at give dem drømmejobbet, tror jeg primært kan tilskrives en række omstændigheder, som jeg på daværende tidspunkt ikke var så bevidst om:

- Holdet er et lille hold med ca. 10 studerende hvert år.
- De studerende har selv valgt kurset og derfor er mange på forhånd motiverede.
- Kurset er tilrettelagt som et overbygningsfag på Have- og parkingeniørlinjen på deres 4. og sidste år.

Jeg oplevede altså primært at have med erhvervs-parate studerende at gøre, som var modne nok til at tage et ansvar og kunne reflektere over hvilke kompetencer, der var vigtige for dem for at være godt rustet til fremtidige jobs.

Udfordringer i undervisningen

Jeg havde som ny underviser naturligvis udfordringer i form af at prioritere indhold, mængde og i forhold til at forstå hvorfor min undervisning ´virkede´ – eller ´ikke virkede´. Jeg havde fx en fornemmelse af at mine forelæsninger måtte være temmelig kedelige, selvom ingen sagde det til mig. Jeg kunne jo se at de studerende så trætte ud efter en hel formiddags forelæsninger.

En ting, der også bekymrede mig var, at der et par enkelte på hvert hold, som jeg ikke ´kunne nå´: De stille og introverte studerende, som jeg havde svært ved at få til at deltage i dialoger og (brilliere) fremlæggelser, hvor var de henne? Dem kunne jeg slet ikke fornemme, om var med.

Set i bakspejlet har min største udfordring været, at min undervisning og tilgang har været ubevidst og uden egentlig samlet retning. Jeg har således ikke haft redskaber til at arbejde med alignment i kurset – sammenhæng mellem ILOs og TLA, så aktiviteter er blevet meget tilfældige. Jeg har fx både forventet at de studerende har læst meget store mængder litteratur, som ikke blev brugt aktivt i kurset - og samtidig ubevidst forventet deep learning.

Min manglende kendskab læringsmetoder og didaktik har også betydet, at jeg har haft svært ved at forklare de studerende hvad præmisserne for undervisningen var, hvilket er væsentligt for at få sat rammerne. Indimellem er jeg sandsynligvis også selv hoppet over i en anden rolle end partnerskabsrollen, da jeg ´jo var læreren´, der skal sikre at man har læst sine lektier el. lign., hvilket kan have skabt en form for dobbelt kommunikation og dermed forvirring.

Af disse grunde har jeg i dette projekt valgt at arbejde med en mere gennemgribende tilpasning af kurset til partnerskabs-modellen.

Formål

Formålet er at undersøge hvordan kurset Klimatilpasning og Planlægning kan tilpasses partnerskabsmodellen. Hvilke fordele og faldgrubber er der?

Min forventning er, at kurset bliver mere helstøbt ved at have en alignment, hvor de enkelte aktiviteter er udvalgt mere bevidst i forhold til at styrke den indbyrdes partnerskabs-relation mellem underviser og studerende.

Dette gøres ud fra en forventning om at partnerskabsmodellen vil understøtte studenter-aktiviteter, som i højere grad end passiv lytning, er med til at øge indlæringen. Udgangspunktet er at det at arbejde bevidst med relationen til den studerende og understøtte større ansvar for egen læring giver mere motivation og i sidste ende mulighed for dybere læring og bedre kompetencer i forhold til læringsmålene.

Da jeg i kraft af min erhvervsmæssige baggrund allerede benytter en del af metoderne, vil et af delmålene være at sætte ord på noget, som jeg gør i forvejen.

Jeg ønsker således bl.a. at undersøge om partnerskab-modellen kan bidrage til:

- At de studerende i højere grad oplever at tilegne sig relevant viden og kompetencer
- At de studerende føler et ansvar for egen læring
- At de studerende undervejs i kurset føler sig motiverede
- At jeg opnår større bevidsthed om metoder, der understøtter den procesorienterede tilgang
- At jeg opnår en bedre føling med om alle studerende er med
- At kurset får en logisk sammenhæng i forhold til sammenhæng mellem ILOs og TLAs

Herudover forventer jeg, at det at arbejde mere didaktisk med kursusindhold i sig selv vil være med til at højne kvaliteten af undervisningen på kurset.

Metode

Jeg har i denne opgave valgt at fokusere på afprøvning af en undervisningsmodel, som jeg har tiltro til vil kunne forbedre min undervisning i kurset Klimatilpasning og Planlægning, hvilket jeg vil argumentere for ud fra eksisterende litteratur og teori. Undervisningsmodellen er dog ikke helt ´ny´ for mig, men jeg har forsøgt at gøre den mere gennemgribende i kurset end tidligere og arbejde mere bevidst med metoderne.

Re-design, metoder og fokus

Som en del af projektet har jeg re-designet, udført og evalueret et kursusforløb. Dette har jeg bl.a. gjort ved at sammenligne læringsmål for kurset

med de indlagte aktiviteter. Med udgangspunkt i læringsteorier og aktivitetsbeskrivelser har jeg således både afprøvet nye undervisningsmetoder og undervejs haft stort fokus på min relation til- og kommunikation med de studerende.

Feed back og evaluering

Evalueringen og mine registreringer undervejs forventes at give svar på om forbedringerne er lykkedes, samt om implementeringen har særlige fordele og ulemper i netop dette kursus. Som opsamling vil jeg gennemgå svarene fra et spørgeskema, som jeg har udarbejdet til de studerende på holdet, som specifikt tager udgangspunkt i spørgsmål vedr. tiltag, som underbygger partnerskabs-modellen. Den summative feed back vil jeg således bruge formativt gennem fremtidig undervisningsplanlægning og -udførsel.

Vurdering af output

Selvom jeg i dette projekt ser på et specifikt kursus, vil jeg gøre mig overvejelser om, hvilke parametre, der vil kunne bruges i andre kurser og i hvor høj grad nytænkning af undervisningsmodeller, der arbejder med studenterprofiler skabelse af særlige læringsmiljøer og i hvor høj grad det fordrer samarbejde med kollegaer. Igennem udarbejdelse af dette eksamensprojekt forventer jeg endvidere en større forståelse for sammenhænge i didaktik og undervisning og dermed at styrke mine egne undervisningskompetencer.

Kollegial sparing

Jeg har undervejs haft dialog med min kollega Kirsten Carlsen om indholdet i dette afsluttende projekt og vi har især udvekslet erfaringer med konkrete tiltag. Ligeledes har vi det sidste års tid haft et par "pædagogiske dage" på Skovskolen, hvor vi i underviserteamet bl.a. har diskuteret muligheder for at indføre partnerskabs- og kollegamodel i undervisningen, især for de ældre årgange på studierne.

Partnerskabsmodel – hvorfor?

I litteraturen peger flere på at universiteterne i disse år er ved at omdefinere deres rolle som ´læringsmiljøer´ i modsætning til tidligere tiders fokus på ´overførsel af viden´. I undervisningen ses at universiteterne går fra at være disciplin-orienterede til at være mere emne-orienterede, hvilket netop har til

formål at forberede de studerende til arbejdsmarkedet (Løfvall og Nygaard, 2013).

Udfordringen for universiteterne, der i fremtiden i højere grad forventes at ´levere et produkt´ vil ifølge Löfwall og Nygaard være at få forventningerne fra studerende, undervisere og aftagere til at gå op. De peger på at udvikling af partnerskabsmodellen på uddannelsesstederne og en gradvis ændring af læringskultur kan danne basis for design af en helt ´ny universitetsmodel´.

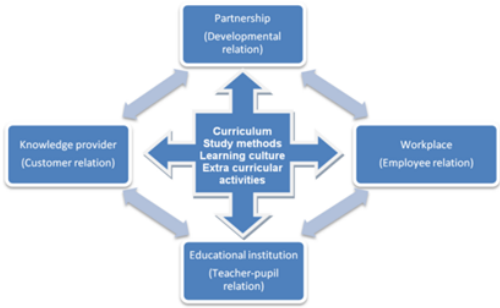
Christiansen, F. et al skriver ligeledes i Universitetspædagogikum s. 24 at [...universiteterne....i højere og højere grad er blevet koblet til den samfundspolitiske diskussion om, hvad Danmark skal leve af i fremtiden. (De)...skal levere den bedst mulige arbejdsstyrke med højtuddannede, innovative og kompetente medarbejdere.]

At anskue universitet som ´producent´ for erhvervslivet har også en slagside, da universitetets historiske identitet som videns-institution, uafhængig af politiske strømme kan være i fare (jf. Rienecker, Jørgensen, Dolin og Ingerslev, 2015, s. 18). Den markedstænkning, der følger med, kan desuden med rette diskuteres. Det kan dog anføres, at idéen om at ´udvikle viden sammen´ i virkeligheden går tilbage til den Humbolske tradition og det, som det danske uddannelsessystem egentlig hviler på. Denne diskussion ligger dog uden for denne opgaves rammer og jeg vil holde mig til at antage, at der i partnerskabstanken ligger nogle muligheder for at selvstændiggøre den studerende og i sidste ende opnå en mere dybdegående læring end i den traditionelle elev-lære-rolle, hvor ´eleven´ i højere grad blot forsøger at aflæse og imødekomme det ´læreren´ efterspørger og som hun tror at hun bliver målt på.

At arbejde med at tilrettelægge undervisningen mere bevidst efter partnerskabsmodellen og skabe overensstemmelse mellem læringsmål og metoder giver god mening i dette valgfag, Klimatilpasning og Planlægning – som er et fag, som hovedparten af de studerende har deres 4. og sidste år - lige inden de skal ud i arbejdslivet. Det er et fag, der omhandler en aktuel problemstilling, og hvor det samfundsmæssige og erhvervets arbejde er en stor del af forståelsesrammen. De studerende, som kan vælge Klimatilpasning og Planlægning er Have- og parkingeniørstuderende på 4. år, skov- og landskabsingeniør-studerende på 3. år, andre studerende på Institut for Geovidenskab og Naturforvaltning samt færdiguddannede planlæggere, som fx arkitekter.

Skovskolens professions-bachelorer har som en del af den fire-årige uddannelse et praktikforløb i fx en kommunal forvaltning eller en virksomhed.

Skovskolen har en målsætning om at være praksisorienterede og da kun ganske få af de studerende fortsætter med at tage en kandidat og Ph.D-grad er forskningsmæssig tilgang ikke vægtet så højt. Også af denne grund, mener jeg at det giver god mening at arbejde med partnerskabsmodellen som forberedelse til livet udenfor universitetet.



Figur 4.3: Students´perception of universities. Source: Løfvall og Nygaard, 2013.

Studenterprofiler

Partnerskabsmodellen kan forklares ud fra idéen om at inddele studerende i forskellige ´profiler´, hvor man ser på hvordan de opfatter deres uddannelsessted. Dette er blevet gjort op gennem tiderne i mange forskellige modeller, men fælles for dem er at de er blevet til gennem interviews med studerende, hvor de er blevet bedt om at beskrive deres forhold til uddannelsesstedet. En af de ´mere nutidige´ er Steffen Löfwall fra CBS, som vi har vi haft fornøjelsen af at have haft med i vores fælles pædagogiske arbejde på Skovskolen.

Steffen Löfwall beskriver fire studenter-profiler, som kunne være studerende på Skovskolen, KU (Løfvall, 2015):
Type 1 Elever

- ”Underviserne har styr på teorier, metoder og eksamenskrav så undervisningen og læringen bør styres af underviserne”
- Skovskolen/KU er et uddannelsessted - en skole

- Lærere har ansvaret for at planlægge curriculum og undervise i relevante faglige temaer
- Elever forventes at blive guidede og styret af lærere, der ved hvad der er rigtigt og forkert

Type 2 Kunder

- ”Vi har købt et ”produkt” – og derfor kan toptunet vidensleverance fra undervisernes side”
- Skovskolen/KU er en vidensleverandør, der forbedre den aktive studerendes (kundes) fremtidige jobmuligheder
- Undervisere er eksperter inden for deres fagfelt
- Studerende kan forvente at få “value for money” – forstået som indbydende undervisningsmaterialer, motiverede undervisere, gode fysiske og tekniske faciliteter og administrativ support

Type 3 Partnere

- Undervisning er et fælles anliggende – og derfor vi bør vi opbygge et læringsfællesskab
- Skovskolen/KU er center for skabelse af læringsrelationer mellem praktikere, medstuderende,
- undervisere og forskere
- Undervisere faciliterer læringsprocesser
- Studerende må afsætte tid til sine læreprocesser og bidrage til et konstruktivt studiemiljø ved at interessere sig for fagene og ekstra curriculære aktiviteter (fx litteratur udover pensum og faglige foredrag)

Type 4 Kolleger

- ”Undervisere og studerende har hver sine styrker - vi er ligeværdige og vores relation bør være
- kollegial”
- Skovskolen/KU er en arbejdsplads og et vigtigt sted for at udvikle studerendes professionelle og personlige identitet
- Undervisere faciliterer professionel identitetsskabelse
- Studerende skal opfatte studiet som et fuldtidsarbejde og bør bidrage til et konstruktivt studiemiljø ved at engagere sig aktivt i mere organisatoriske aktiviteter (fx studenterpolitik, forskningsprojekter og tutoring)

Der er flere ligheder mellem de enkelte ´modeller´. Især de to sidste tilgange kan have mange lighedspunkter og i mange tilfælde giver det god mening ikke at se så stramt på opdelingen, men mere være bevidst om,

hvornår man understøtter de enkelte tilgange. I mit kursus mener jeg at især nr. 3 og 4 – partnerskabet og kollega-relationen – er relevante for at opnå mit mål om større fokus på dybdelæring frem for overfladisk kendskab til pensum.

Det er vigtigt at have i mente, at man som enkeltunderviser har svært ved at gennemføre en kultur-ændring alene, men at dette helst skal ske i samarbejde med undervisergruppen.

Partnerskabsmodel – hvordan?

Nygaard og Bramming peger på at at fokus på læring frem for pensum er vigtigt, at de studerende skal være aktive, også i en vis grad i planlægningen, det er vigtigt at den viden, den studerende tilegner sig sættes ind i en sammenhæng (contextual).

Endvidere er underviserens fokus på læring fremfor pensum-gennemgang essensiel, ligesom procesfacilitering og supervision understøtter den partnerskabslignende relation mellem underviser og studerende. I undervisningen er det også vigtigt, at man som underviser lægger op til at de studerende bruger hinanden og får dem til at refekterende over egen læring.

Derudover er løbende feed back i form af formative fremfor summativ feed back vigtig (jf. nedenstående skema).

	Content stream	Process stream
Curriculum	Syllabus / guide for teaching	Learning-centred action plan
Agency	Teacher driven activities	Student driven activities
Learning	De-contextual learning	Contextual learning
Orientation	Input orientation	Output orientation
Evaluation method	Summative	Formative / developmental
Main focus points	Curriculum design, syllabus planning, teaching, exams and evaluation	Learning design, process facilitation, supervision and self-/peer assessment

Figure 2: Two broad streams within the curriculum theories. (Elaboration on Nygaard & Bramming, 2008).

Tilpasning af kursusindhold til partnerskabs-model

Jeg har tilpasset kurset Klimatilpasning og Planlægning ud fra ovenstående principper samt aktiviteter, der understøtter den procesorienterede tilgang og ligeværdige relation mellem underviser og studerende.

1. **Progression i ILO (Intented Learning Output)**
   For at få et logisk forløb i kursets udvikling har jeg taget udgangspunkt i Biggs SOLO-taksonomi (Biggs, 2003) (jf. Rienecker m.fl., 2015, s. 101). Som det ses ud fra Bilag A har jeg tilrettelagt kurset, således at den faktuelle viden, som fordrer ´kendskab til´ ligger tidligt i kurset. De mere komplekse problemstillinger, hvor den studerende skal bruge sin tilegnede viden til at ´Kunne reflektere over løsningsmodeller for planlægningen af klimatilpasning i de grønne områder´ ligger sidst i kurset. Det er især i den sidste del af kurset, at partnerskabs-modellen især kan ses i undervisningen. Her skal de studerende for alvor bliver bragt i situationer, hvor de skal kunne reflektere, argumentere og spille rollespil. Men alt dette ´bygges op undervejs´ bl.a. ved at italesætte undervisningen og gøre opmærksom på deres læringsmål (se Bilag A).
2. **Sammenhæng mellem ILOs og TLAs (Intented Learning Output og Teaching Learning Activities)**
   Biggs constructive alignment-model (Rienecker m.fl., 2015, s. 100) er ´trekanten´, der beskriver forholdet mellem læring, mål og eksamen. Selve eksamensformen har jeg også arbejdet med konkret i kurset og har lavet nogle tilrettelser, så formen på eksamen i højere grad afspejler fagets indhold og form, men dette vil jeg dog ikke komme videre ind på her, blot nævne at jeg i høj grad har arbejdet med at flytte fokus væk fra eksamen, bl.a. ved at påpege at alt hvad de hører og ser i lektionerne i princippet er pensum samt ved at give dem eksamens-opgaven relativt sent i forløbet. Dette kan jeg mærke har skærpet fokus på processen og tilstedeværelsen i lektionerne (Se Bilag A).
   Jeg har valgt at lægge vægt på aktiviteter, der understøtter læringsmålene i de enkelte lektioner. For hver lektion har jeg taget udgangspunkt i læringsmålene og derefter sammensat et aktivitetsprogram, der understøtter disse. Jeg har vægtet at formen afspejlede indholdet (implicit læring), således, at når vi snakkede om borgerinddragelses-processer, har der været lagt et rollespil ind, så de studerende kunne erfare processen selv. For at få den formative feed back med undervejs, har jeg lagt ´spil´ ind, der samler op på det, som de har skulle kunne indtil da.

Ser er et eksempel fra Bilag A på sammenhængen mellem ILO og TLA i en af lektionerne:

ILO - Intended Learning Output	TLAs - Teaching Learning Activities
Forståelse for de mange aktører, der skal inddrages i planlægningen af klimatilpasningen af de grønne områder, herunder en forståelse for de tilhørende politiske processer	Ekskursion til både kommunale forvaltninger og til problemområder (oversvømmelse). Både oplæg og diskussion med projektledere og selvsyn af områder. Desuden møde med berørt borger, der mistede sit hus og arbejde pgra oversvømmelse.

Tabel 4.1

Afprøvning af aktiviteter som underbygger partnerskabsmodellen

Udover at arbejde på at skabe sammenhæng mellem læringsmål og aktiviteter, har jeg arbejdet med at varierede min undervisning med en række aktiviteter, der i henhold til litteraturen og egne erfaringer, understøtter partnerskabsmodellen. Disse aktiviteter er listet op i Bilag B (1. skema)

Jeg har desuden gerne ville arbejde mere bevidst med min egen rolle som underviser i forhold til partnerskabsmodellen. Det gælder således relationen til de studerende, min måde at kommunikere på og hvordan jeg italesætter læringsmål og gensidige forventninger. Derfor har jeg oplistet nogle af de praksiskonsekvenser, som jeg har udviklet med tanken om partnerskabs-modellen i baghovedet (Se Bilag B, 2. skema).

Som nærmere uddybning af aktiviteter henvises til Bilag C.

Evaluering af kurset i forhold til partnerskabsmodellen

Skriftlig evaluering – summativ evaluering

For at vurdere om jeg med min ´tilgang´ og mine ´konkrete aktiviteter´ har øget den studerendes oplevelse af at have været en del af et ´partnerskab´, udformede jeg et særligt skema som supplement til den skriftlige standardevalueringen på KU. De studerende fik spørgsmål, som var formet med udgangspunkt i aktiviteter, der understøtter partnerskabsmodellen ifølge Rienecker m.fl., 2015, s. 337 (Se Bilag C).

I indledningen til evalueringen skriver jeg bl.a. at "det er vigtigt, at du giver en feed back her på om jeg har opnået noget af det, som jeg ville med kurset. Jeg har arbejdet efter ´Partnerskabsmodellen´, hvor hensigten kort fortalt er, at fremme dit aktive bidrag i undervisningen igennem en ligeværdig relation, hvor du, som studerende og jeg, som underviser, i fællesskab ´undersøger og diskuterer´ emnerne, vi arbejder med. Formålet er større aktivitet, motivation, ansvar for egen læring og i sidste ende forhåbentlig en bedre læring".

Ud af skemaet ses, at de studerende især vurderer kurset i stand til at understøtte ´At blive betragtet som en partner´, ´Selvstændighed´ ´Kritisk tænkning´ samt ´Ansvar for egen læring´ (spg. 2, 3, og 7). På disse parametre svarer omkring 3/4 af de studerende ´i høj grad´ eller ´i nogen grad´.

Halvdelen af de studerende synes, at de ´i høj grad´ er blevet bevidste om deres egen læring ved at blive opfordret til selvrefleksion (spg 6). Til gengæld er der et par stykker der er meget i tvivl om, om hvorvidt de har opnået dette: Dette tror jeg man skal se i relation til at dette er et 9 ugers kursus og at det er en kompetence, som man nok skal arbejde på at underbygge et længere forhold, evt. under hele studiet.

Selv om det stadig er langt over flertallet, der mener, at de har været motiverede og aktive i timerne, scorer disse parametre lidt lavere end førnævnte (spg. 1 og 4). Mht til manglende motivation kan dette skyldes at en del ikke helt har haft de rette forudsætninger eller har valgt faget for at blive fri for de andre valgfag, som én nævnte i starten. Jeg undrer mig dog lidt over at 25 % svarer ´både og´ til spørgsmålet om de synes at de aktive i timerne, da jeg netop har gjort meget for dette. Men omvendt har der også været lagt en del forelæsninger ind, hvilket også har sin berettigelse.

Samlet set mener de studerende at undervisningsformen har understøttet deres læring (spg. 8). Dette kan kun tages som et fingerpeg, da undersøgelser viser, at det at sætte særligt fokus på en undervisningssituation i sig selv kan virke opmuntrende og motiverende på de studerende. Dog mener jeg at kunne konkludere, at det ville kunne ses i evalueringen hvis kurset helt havde fejlet.

Generelt scorer kurset højt i de studerendes vurdering – også i den generelle del af evalueringen, som er udeladt her af pladsmæssige grunde. Et enkelt skema (vurderingen af mig som underviser) er dog medtaget fra standard-evalueringen. Her skriver en studerende en sætning, som glædeligt nok er kendetegnet for mange af udtalelserne: ´Virkelig godt kursus! Højaktuelt, veltilrettelagt, inddragende og motiverende undervisning. TAK!´

Mundtlig evaluering - summativ

Udover den skriftlige evaluering, har jeg gennemført en opsamlende mundtlig evaluering på den sidste kursusdag.

Her bad jeg de studerende uddybe nogle af svarede i den skriftlige evaluering. Derudover præsenterede jeg dem for deres egne forventninger til kurset, som vi havde lavet som ´post-it planche´ den første kursusdag og bad dem vurdere om de havde fået indfriet deres forventninger.

De studerende syntes selv, at de havde fået indfriet deres forventninger i forhold til læringsmålene og deres personlige forventninger. Dette bl.a. fordi jeg til at starte med havde understreget, at vi ikke kom til at arbejde med dimensionering og at udforme et projekt selv, hvad nogle af dem havde troet, hvilket understreger vigtigheden af at lave en forventningsafstemning i starten.

Generelt var der rigtig meget positiv tilbagemelding og flere gav udtryk for at det havde været et særdeles godt kursus. Blandt kommentarerne var:

- ´Det var godt at have en ´brush up´ hver dag og at man kunne forberede sig. Også det at skulle være særlig observatør en hel dag og tage notater var godt.´
- ´Det var godt, at vi var et lille hold og der var plads til diskussioner ind imellem.´
- ´Tavleundervisningen er god, jeg forstår det bedre når jeg ser en figur eller tegning´
- ´Rollespil var svært, men sjovt og viste hvordan folk argumenterer´
- ´Jeg er ked af at jeg ikke nåede at evaluere kurset, men du må ikke være i tvivl om at jeg synes, at det var et rigtig godt kursus´

Mundtlig evaluering - formativ

For at kunne tilrette kurset undervejs, har jeg været særlig opmærksom på at få formativ feed back i form af samtaler med de studerende og ved at starte hver lektion med en ´brush up´-øvelse (Denne øvelse er også beskrevet i Bilag C).

Jeg stillede følgende spørgsmål:

1) Hvad var de tre vigtigste punkter fra sidste lektion?

2) Hvad overraskede dig mest?

3) Hvad tror du, at du vil kunne bruge i dit fremtidige job?

I forhold til de studerendes selv-reflektion var spørgsmål 2 og 3 vigtigst og oftest de svar, som jeg skulle trække lidt ud af dem, mens de kunne

bruge meget lang til på at svare på det første, som i virkeligheden var ren repetition fra forrige lektion.

På spg 2 og 3, fik jeg bl.a. følgende svar:

- ´Jeg har fundet ud af at det er vigtigt at samarbejde over kommunegrænser´
- ´Det er vigtigt, hvis man samarbejder med en kunstner at kunne tale hans sprog, det må godt være noget vildt med bæverdæmninger og sådan noget´.
- ´Da vi selv skulle lave spil, fandt jeg ud af at hvor svært det er at stille gode spørgsmål, som kan besvares´
- ´På ekskursionen var programmet for presset, gerne mere tid hvert sted, hellere få steder og god tid end mange steder´
- ´Jeg kunne godt tænke mig at vi tog på en ekskursion mere´ (dette gjorde vi så)
- ´Det overrasker mig, at kommunerne gør det så besværligt for borgere at ansøge om afkobling af regnvand til kloakken. Hvis jeg selv skal arbejde i en kommune, vil jeg tænke på at gøre procedurerne lettere for borgerne.´

Overstående udsagn viser, at de studerende har været i stand til at reflektere over deres egen læring. Selve processen med at skulle forholde sig til læringsmålene for hver lektion ligger i tråd med tanken om partnerskabsmodellen. En vurdering af de aktiviteter, der udspringer af partnerskabsmodellen, kan desuden ses i udtalelse fra pædagogisk vejleder, som deltog en dag i kurset (Bilag D).

Eksamen

Til den mundtlige eksamen (tirsdag d. 8.nov 16) skulle de studerende præsentere et power point oplæg udfra en afleveret skriftlig opgave. Herudover skulle de besvare et vilkårligt spørgsmål, som kunne være alt inden for pensum. Her opnåede fire ud af de ni, der var til eksamen, karaktéren 12. Mindste karaktér ved eksamen var 7 og én enkelt deltog ikke pgra sygdom. Samlet set var det et pænt snit på knap 10.

De studerende, som havde haft faget ´Klimatilpasning og byens vand´ klarede sig - ikke overraskende - bedre end de, der ikke havde haft det (tre studerende opnåede 12 og en fik 10). Det, at de havde en viden at bygge ovenpå, kunne også mærkes på deres motivation.

Det var desuden mærkbart om de studerende læste på 3. eller 4. og sidste studieår eller var helt færdige med studiet, idet de studerende, som næsten var færdige eller i arbejde, var meget mere optaget af at skulle ud og arbejde (gerne med klimatilpasning) og fik højere karaktérer end de øvrige.

Eksamen er en svær størrelse og jeg mener, det er et postulat, hvis man tror, at det er en reel måling af den viden og de kompetencer, som den studerende har tilegnet sig. Denne diskussion vil jeg dog ikke komme nærmere ind på her, blot konstatere at det var både min egen og censors oplevelse, at de studerende både var godt hjemme i stoffet og var i stand til at sætte deres viden i relation til aktuelle problemstillinger og egen faglighed.

Uden at konkludere at andre undervisningsmodeller er uegnede, viser dette, at brug af partnerskabsmodellen i dette kursus har været godt for de studerendes læring.

Konklusion

Formålet med dette projekt har været at undersøge hvordan kurset Klimatilpasning og Planlægning kan tilpasses partnerskabsmodellen med det underlæggende mål at øge læringen hos den studerende. Herunder har jeg set på fordele og faldgrupper ved partnerskabsmodellen.

Partnerskabsmodellen - en god ramme for kurset

Udfra egne observationer og ovenstående evalueringer, kan jeg konkludere, at partnerskabsmodellen har fungeret særdeles godt i kurset Klimatilpasning og Planlægning.

Denne afprøvning viser, at skabe en atmosfære, der underbygger de studerendes opleve relationen til universitetet og underviseren som et ´partnerskab´. Jeg har i denne proces oplevet, hvordan man ved at arbejde bevidst med relationen til den studerende og med udvalgte aktiviteter, kan understøtte større ansvar for egen læring og øge motivationen. Størstedelen af de studerende opnåede en dyb form for læring og særdeles gode kompetencer i forhold til læringsmålene. Jeg oplevede samtidig at det store fokus, der ligger på dialog i partnerskabsmodellen, var et godt redskab til at få alle på holdet med.

Måden at opnå dette på, er at arbejde målrettet med at ´aligne´ kurset i forhold til partnerskabsmodellen ved at inkludere aktiviteter, der understøtter både læringsmålene samt de studerendes selvstændighed og selvre-

flektion. Dertil er ligeværdig kommunikation og en værdsættende relation mellem underviser og studerende også afgørende.

Faldgrupper

Det er dog vigtig, at være opmærksom på de studerendes forudsætninger, både faglige, men også på identitetsmarkører som baggrund og interesser, for at kunne tilpasse undervisningen efter dette. Nogle studerende vil have svært ved at udføre meget selvstændige opgaver, ligesom visse aktiviteter kan være ´grænseoverskridende´ som interview og rollespil. Der er det vigtigt at arbejde på at etablere en tillidsrelation og viden om den enkeltes forudsætninger.

Holdstørrelsen har også en afgørende betydning for om partnerskabsmodellen kan fungere, idet mange af forudsætningerne for at få den mere personlige relation til de studerende umuliggøres på store hold.

Partnerskabsmodellen synes især at fungere godt i dette specifikke kursus og her på Skovskolen, hvor vi i forvejen har stor fokus på det erhvervsrettede. Som tidligere diskuteret er der tendenser, der peger på, at partnerskabsmodellen vinder indpas i univeritetsverdenen, men om det alle steder, hvor den vil passe ind, kan denne ´afprøvning´ ikke sige noget om. Jeg er dog ikke selv i tvivl om, at jeg som underviser har fundet nogle gode arbejdsmetoder at støtte mig op ad og at jeg fremover kan bruge denne model til at skabe gode rammer om min undervisning.

Perspektivering

Kurset Klimatilpasning og Planlægning har i 2016 været afholdt for sidste gang. I 2017 vil en ny uddannelsesstruktur være delvist indført på Skovskolen og jeg vil i stedet blive ansvarlig for kurset Landskabsarkitektur og Planlægning, som jeg skal i gang med at definere læringsmål for. Jeg forestiller mig, at jeg kan bruge meget af min viden om partnerskabsmodellen – og i øvrigt generel didaktisk erfaring - i udvikling af det nye kursus. Umiddelbart tænker jeg at vil tage det med, som egner sig til sidsteårs-studerende, men må tilpasse en del af det, som forudsætter mindre hold, da dette hold vil være noget større end det forgående.

Mange af mine kollegaer har efterhånden deltaget i pædagogisk efteruddannelse og workshops, og det virker som om at der er en øget bevidsthed om de forskellige underviser-studenter-relationer på Skovskolen. Det er mit

håb, at vi med tiden sammen kan finde en fælles platform for at videreudvikle partnerskabs- og kollegamodellen, især i forhold til de ældre årgange af studerende. Selv vil jeg, efter at have læst, skrevet om og arbejdet med partnerskabsmodellen, meget gerne bidrage til at skabe en større bevidsthed om hvilke læringsmiljøer, vi arbejder i og med, så vi kan skabe de bedste rammer for undervisningen.

Afslutningsvist bør det nævnes, at jeg gennem dette projekt været vidt omkring i den ´didaktiske litteratur´, afprøvet aktiviteter og ikke mindst været gennem processen med at sætte ord og begreber på mine handlinger, deriblandt aktiviteter, som jeg arbejdede med i forvejen. Dette arbejde har uundgåeligt givet mig en værdifuld forståelse for min egen rolle som underviser.

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A Skema over kursus-alignment

Klimatilpasning og Planlægning	ILO - Intended Learning Output	TLAs - Teaching Learning Activities
Hele kurset	**Formålet med kurset** er, at den studerende *får en forståelse* for, hvilke rammer de grønne arealer og rum planlægges indenfor og hvordan klimatilpasningen påvirker de traditionelle måder at planlægge de grønne områder på	HVER dag starter jeg med en ´brush up´, hvor to studerende på skift skulle reflektere over den forgående lektion og egen læring. **Igennem kurset** bruges en bred vifte af aktiviteter (listet nedenfor:)
Mandag d. 5. sep, kl. 8.30-12.00 Lektion 1 Introduktion til kurset og til begreber	***Kendskab*** til forskellige planlægningsinstrumenter, herunder kommune- og lokalplaner, klimastrategier ***Kendskab*** til de overordnede klimaforandringer, der påvirker planlægningen af de grønne områder	Forelæsning om klimatilpasning og planlægning m. summeøvelser, præsentationsrunde, forventningsafstemning med flipover, øvelser
Onsdag d. 7. sep, kl. 8.30-16.30 Lektion 2 Planlægningsinstrumenter	***Kendskab*** til forskellige klimastrategier og øvrige resultater af den seneste planlægningsstrategi for kommunerne ***Kunne*** anvende forskellige planlægningsinstrumenter	Forelæsning om plansystemet m. summeøvelser, øvelser, spillede jeopardy for at finde ud af deres viden pt, desuden tilbud om ´ekstra ekskursion´ ud over pensum.
Mandag d. 12. sep, kl. 8.30-12.00 Lektion 3 Forberedelse til Roskilde-ekskursion	***Kendskab*** til grønne områder og bydele, hvor klimatilpasning har haft stor betydning på udformningen	Forberedelse til ekskursion, forelæsning om Jyllinge Nordmark, litteraturlæsning og øvelser.
Onsdag d. 14. sep, kl. 8.30-16.30 Lektion 4 Ekskursion til Roskilde og Egedal, Hjælp vandet stiger…	***Forståelse*** for de mange aktører, der skal inddrages i planlægningen af klimatilpasningen af de grønne områder, herunder en forståelse for de tilhørende politiske processer	Ekskursion til både kommunale forvaltninger og til problemområder (oversvømmelse). Både oplæg og diskussion med projektledere og selvsyn af områder. Desuden møde med berørt borger, der mistede sit hus og arbejde pgra oversvømmelse.
Mandag d. 19. sep, kl. 8.30-12.00 Lektion 5 Forberedelse til Vidensfestival, Kunst & Klima	***Kunne sætte*** sin "grønne" faglighed i relation til klimatilpasning og planlægning	Forelæsning og film om Lokal Afledning af Regnvand, og om samarbejde med bl.a. kunstnere. Øvelser med kortmateriale. Gæsteforelæser: en færdiguddannet 23 årig Have- og parkingeniør, der sidder med projektansvar for klimatilpasnings-projekter på 130 mil.
Onsdag d. 21. sep, kl. 8.30-16.30 Lektion 6, Vidensfestival, Kunst & Klima	***Kunne indgå i faglige*** teams og formidle faglige budskaber i relation til planlægning og klimatilpasning ***Kunne håndtere*** de mange fagligheder/ aktører i projektudviklingen	Samarbejdsproces, forelæsning og workshop med kunstneren Alfio Bonnano om landart- og LAR projekt på Skovskolen. Besigtigelse på stedet, skitsering og idéudvikling.
Mandag d. 26. sep, kl. 8.30-12.00 Lektion 7, Klimalokalplaner	***Kunne anvende*** og understøtte forskellige klimastrategier i sit faglige arbejde	Diskussion og opsamling af samrbejdsprocesser (når ingenniører arbejder sammen med kunstnere) Forelæsning om klima-lokalplaner, øvelser.
Onsdag d. 28. sep, kl. 8.30-16.30 Lektion 8, Aktører i klimatilpasningen	***Kunne reflektere*** over løsningsmodeller for planlægningen af klimatilpasning i de grønne områder	Gæsteforelæser Landskabsarkitekt fra Odense Forsyning, der holdt oplæg + øvelser om projekter i Odense. Spørgsmål og diskussion.

Mandag d. 3. okt, **kl. 8.30-12.00** Lektion 9 Trekroner samt Midtvejs-jeopardy	***Kunne danne sig overblik*** over foreløbigt pensum samt over egen opnåede læring	Forelæsning m. øvelser. Udarbejdelse af spørgsmål til Jeopardy – og derefter at spille hinandens spil. (Formativ feed back) Se også udtalelse fra pædagogisk vejleder, Bilag D
Mandag d. 10. okt, **kl. 8.30-12.00** Lektion 10 Merværdi i klimatilpasningen, Trekroner, Ekskursion	***Kendskab*** til grønne områder og bydele, hvor klimatilpasning har haft stor betydning på udformningen	Alle: Mundtlige fremlæggelse af opgaver om Trekroner. Samme struktur som den eksamensopgave de skal skrive.
Onsdag d. 12. okt, **kl. 8.30-16.30** Lektion 11 Aktører i Klimatilpasningen, Odense & GIS,...,	***Kunne reflektere*** over løsningsmodeller for planlægningen af klimatilpasning i de grønne områder	To gæste-undervisere og undertegnede stod for: Øvelser i Jura på tavlen (tegninger og paragraffer). GIS-øvelser på computer
Mandag d. 24. okt, **kl. 12.00 – 16.00** Lektion 12 Klimatilpasningsprojekter	***Kunne relatere*** forskellige problemstillinger indenfor klimatilpasning til planlægningen	Ekskursion til Trekroner, Roskilde. Ekstra tur arrangeret på efterspørgsel fra studerende. To projektledere fra kommunen viste rundt og satte problemstillingerne i spil i forhold til den virkelige verden.
Onsdag d. 26. okt, **kl. 8.30-16.30** Lektion 13 Klimatilpasning og Jura (studiepraktikanter),	***Kunne reflektere*** over forskellige aktører og interessenters syn på klimatilpasning af grønne områder ***Kunne indgå i faglige teams*** og ***formidle faglige*** budskaber i relation til planlægning og klimatilpasning	Fælles jura-opgave ved tavlen, hvor forberedelse har været krævet. Jeg havde tegnet by-landskab. Rollespil med definerede roller, som alle skulle spille. Vi havde et ´publikum´i form af 20 studiepraktikanter
Mandag d. 31. okt, **kl. 8.30-12.00** Lektion 14 Selvstændigt arbejde	***Kunne deltage*** **i udviklingen** af en strategi for en overordnet planlægning af de grønne områder	Opgave. Analyse af et udvalgt projekt på egen hånd, hvor der blev lagt op til litteraturstudie, besigtigelse på stedet samt interviews med medarbejdere. Afleveres som eksamensopgave (Kun den mundtlige fremlæggelse af projektet tæller – på lige fod med trukket spørgsmål i øvrigt pensum).
Onsdag d. 2. nov, **kl. 8.30-16.30** Lektion 15 Opsamling og evaluering	***Kunne danne sig overblik*** over pensum samt over egen opnåede læring	Formativ feed back, opsamling. Evaluering af deres og mine forventninger.

B Skemaer over TLAs, som understøtter partnerskabsmodellen

Her er nogle af de aktiviteter, som jeg har arbejdet med undervejs i kurset:

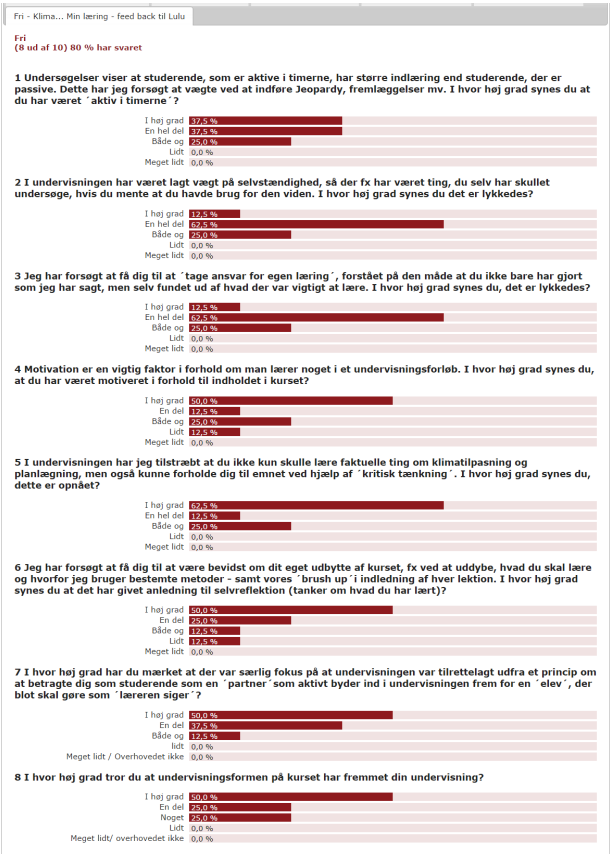
TLA	Resultat	Faldgruppe
Brush up øvelse hver morgen, hvor to studerende ved tavlen skulle reflektere over sidste lektion og deres egen læring	De var meget glade for både at skulle være observatører på skift og fortælle, men også at de lige af hinanden blev mindet om hvad vi lavede sidste gang. Desuden var der mange der i evaluereingen sagde, at det havde været en god øvelse i at stille sig op overfor de andre.	De studerende vil gerne fortælle ´objektivt´om at så lærte vi dét og dét. Så det er vigtigt hele tiden at holde dem op på at kunne reflektere over deres egen læring og hvad, de kan bruge det til i deres uddannelse/fremtidige job.
Spillede spil, som jeg havde fremstillet (Jeopardy om Klimatilpasning og Planlægning)	Den studerende fandt selv ud af, hvad hun/han vidste om emnet. Jeg fik en fornemmelse for, hvor jeg skulle samle op – og hvor jeg havde mulighed for at ´bygge videre´på eksisterende viden	Der må gerne være en vis grad af konkurrence, dog er det vigtigt at fokus bevares på fagligt indhold fremfor spillets strategi.
De studerende skulle selv **fremstille spil** – og siden spille dem (Jeopardy om Klimatilpasning og Planlægning)	De studerende talte i lang tid efter om hvor svært det havde været at lave spørgsmål, som kunne forstås – og kunne besvares med, det svar de havde tænkt. God erkendelse for læringssituation.	Det tager meget lang tid for nogle studerende at søge viden og omforme til (relevante) spørgsmål.
Ekskursioner Både til klimatilpasningsprojekter, som er vigtige at se i virkeligheden. Men også til folk, der arbejder med projekterne.	Det er essentielt at se de fysiske projekter for at have en fornemmelse af hvad vi snakker om. Dialogerne med involverede parter, der arbejder med projekterne har de studerende nævnt som relevante og det er tydeligt at de får en helt særligt indblik i hvordan sammenhængen og fx proces-serne i en kommunal forvaltning er.	Hvis man tager afsted uden at kende stedet eller baggrunden ordentligt kan det være spild af tid. Det er vigtigt at vide hvad, der skal ses og hvorfor. Også at kunne fortælle - eller fx lade de studerende - den relevante historie, om hvad vi ser.
Skåret ned på et meget omfattende litteraturpensum og lade de studerende fordybe sig i enkelte tekster og sørget for at bruge baggrundsmateriale aktivt i timerne	Mindre frustration over stor læsemængde Større tilegnelse af stof	Man skal passe på med ikke at skære alt for meget væk, de studerende skal stadig stilles rimelige krav til at kunne læse længere tekster
Implicit læring - workshop Vi arbejdede sammen med en kunstner m.fl i en workshop på Skovskolen, hvor vi bl.a. måtte give køb på mange af vores egne idéer.	God erkendelse – da vi endelig var kommet gennem forløbet - for samarbejdsprocesser. Større forståelse for kommunikation mellem faggrupper.	Mange studerende fokuserer på målet og ikke processen. Det er vigtigt at kunne forklare hvorfor vi har fokus på selve processen og støtte dem til at se denne som et ´arbejdsredskab´.
Film og andre medier, at udfordre med kreative fremstillingsformer	Jeg bruger ofte videoer i mine kurser og havde planlagt at de studerende også selv skulle lave film med interviews af folk udefra i dette kursus. Men da den sammensætningen på holdet var med stor vægt på lidt yngre og tilbageholdende studerende, skruede jeg ned for de meget kreative forventninger og skar filmproduktions-delen væk	Hvis de studerende føler sig presset ud i noget, de ikke behersker, kan der opstå modvilje. Jeg kunne mærke at det var en stor overskridelse hos mange blot at lave et telefoninterview med en fremmed person. Ved film og andre fremstillingsformer er faren også at det tager alt for lang tid og dermedtager fokus fra indholdet.
Eksterne undervisere	De allerfleste gange en god oplevelse, hvor de studerende får mulighed for at efterprøve deres viden og høre hvordan teori fungerer i praksis.	Det er vigtigt at styre de eksterne, så de fortæller relevante ting i forhold til kurset og at det ikke er for langt.
Gruppearbejde, hvor alle var aktive lyttere/deltagere	Alle var på og aktive i diskussionerne, selvom der i starten var lidt skepsis med	Nogle studerende har svært ved blot at skulle samles rundt om et bord, da det

Dette er en liste over nogle af de praksiskonsekvenser, som jeg har indført i kurset for at skærpe min egen rolle i forhold til partnerskabsmodellen:

Aktivitet	Resultat	Faldgruppe
´Finde knager at hænge viden på´ Jeg startede kurset med at høre alle om deres kendskab til emnet, fx om de har været i praktik et sted, hvor man arbejdede med klimatilpasning	De studerende føler sig inddraget og jeg har kunnet bruge denne viden i undervisningen, idet jeg har kunnet referer til steder og projekter, som de studerende havde et forhold til.	Kan være svært ved store hold
Jeg har efterstæbt en troværdig og venskabelig stemning, som lægger op til at man vil dele sine erfaringer. Dette i selve undervisningen, men også ved fx at holde kaffepauser sammen med de studerende	En meget behagelig tone og stort sammenhold på kurset til trods for at de få studerende kom fra fire forskellige studieretninger/fag og ikke kendte hinanden.	Jeg tænker, at det er vigtigt ikke at blive alt for meget ´venner med de studerende´, men stadig beholde sin profesionelle tilgang
Brugt den socialkonstruktive tankegang i at sproget former vores virkelighed. Jeg har været meget bevidst om det sprog, som jeg har brugt. Fx skriver jeg på min introside til kurset samt i mail til dem at ´Jeg glæder mig til at arbejde sammen med dig´.	De studerende betragter mig som faglig partner, de kan komme til. De skriver til mig og kommer med egne eksempler, nyheder, brochurer, som vi evt. diskuterer eller bruger i undervisningen. Mange af mine tidligere studerende har jeg stadig kontakt med.	Det skal naturligvis gøres med måde, da vi er ikke reelle partnere i et fagfællesskab. Jeg skal fx stadig bedømme dem til eksamen.
Sørge for klar kommunikation under hele kurset, både før, undervejs og efter.	De studerende var forberedt på hvad hovedoverskrifterne var – havde haft mulighed for at teste sig selv inden – samt var forberedt på at der blev stillet krav til deres aktive deltagelse i kurset.	God kommunikation kræver tid. Faren er at bruge alt for meget tid. Men også at ´overloade´de studerende med for mange irrelevante oplysninger.
Lave klare læseplaner med links og forklaring til alt litteratur, film og opgaver på Absalon. Bla. Angav jeg om tekster skulle skimmes elelr nærlæses.	Dette har stort set alle nævnt eksplicit som en stor fordel. Jeg tror at min uddybende kommunikation til dem, har medført at de omvendt også har orienteret mig om deres eventuelle fravær el. lign.	Faren er naturligvis at man ryger over i ´tankpasser´-modellen, hvor den studerende forventer alt ligger klart foran ham/hende.
Give de studerende mulighed for at komme med til ekstra-konferencer og ekskursioner via mit netværk. De får mulighed for selv at få et netværk.	De studerende, der tager imod disse tilbud bliver positivt overraskede over at blive betragtet som ´fag´-person når de kommer ud. De oplever også at det er ok at bruge sin fritid på faglige aktiviteter, fordi det gør noget godt for dem.	De studerende kan føle at der er et pres på at skulle deltage i alt det underviseren finder på.
Tilpasse kurset til de studerende på holdet ved at være lydhøre overfor deres forventninger og forslag	Jeg har i høj grad taget hensyn til at dette hold var et hold, der var mere sammensat end de tidligere, bl.a. med flere der ikke havde forudsætningsfag. Dette gjorde fx at jeg (på de studerendes foranledning) lagde en ekstra ekskursion ind.	Ved større hold kan dette være umuligt. Det er vigtigt at holde fast i at der ikke sker alt for store ændringer fra år til år, da ´niveauet´ bør være det ssamme.
Summeøvelser efter hver forelæsning	Etablering af relationer mellem tidligere viden og ny viden, der skal læres	Det skal ikke gøres for en hver pris, men give mening, hvor der er noget at snakke om
Indførsel af mange flere små pauser, bl. Når de studerende sige til	Dette har i høj grad løst min udfordring med de mange (lange forelæsninger).	Det er stadig vigtigt at variere undervisningen, bl.a. med øvelser, tavleundervisningen mm.
At italesætte min undervisning og hele tiden give de studerende mulighed for meta-refleksion	Giver tryghed for at der er en ´mening med galskaben´, når den studerende bliver udsat for nye anderledes former. Giver mange aha-oplevelser for den studerende, fordi han/hun bliver	Det er vigtigt ikke at blive for ´overpædagogisk´, da det kan virke lidt latterligt.

C Evalueringsskemaer

Dette skema, særligt udarbejdet efter partnerskabsmodellen, blev brugt som en del af evalueringen af kurset:



Fri - Klima... Min læring - feed back til Lulu

Fri
(8 ud af 10) 80 % har svaret

1 Undersøgelser viser at studerende, som er aktive i timerne, har større indlæring end studerende, der er passive. Dette har jeg forsøgt at vægte ved at indføre Jeopardy, fremlæggelser mv. I hvor høj grad synes du at du har været ´aktiv i timerne´?

I høj grad	37,5 %
En hel del	37,5 %
Både og	25,0 %
Lidt	0,0 %
Meget lidt	0,0 %

2 I undervisningen har været lagt vægt på selvstændighed, så der fx har været ting, du selv har skullet undersøge, hvis du mente at du havde brug for den viden. I hvor høj grad synes du det er lykkedes?

I høj grad	12,5 %
En hel del	62,5 %
Både og	25,0 %
Lidt	0,0 %
Meget lidt	0,0 %

3 Jeg har forsøgt at få dig til at ´tage ansvar for egen læring´, forstået på den måde at du ikke bare har gjort som jeg har sagt, men selv fundet ud af hvad der var vigtigt at lære. I hvor høj grad synes du, det er lykkedes?

I høj grad	12,5 %
En hel del	62,5 %
Både og	25,0 %
Lidt	0,0 %
Meget lidt	0,0 %

4 Motivation er en vigtig faktor i forhold om man lærer noget i et undervisningsforløb. I hvor høj grad synes du, at du har været motiveret i forhold til indholdet i kurset?

I høj grad	50,0 %
En del	12,5 %
Både og	25,0 %
Lidt	12,5 %
Meget lidt	0,0 %

5 I undervisningen har jeg tilstræbt at du ikke kun skulle lære faktuelle ting om klimatilpasning og planlægning, men også kunne forholde dig til emnet ved hjælp af ´kritisk tænkning´. I hvor høj grad synes du, dette er opnået?

I høj grad	62,5 %
En hel del	12,5 %
Både og	25,0 %
Lidt	0,0 %
Meget lidt	0,0 %

6 Jeg har forsøgt at få dig til at være bevidst om dit eget udbytte af kurset, fx ved at uddybe, hvad du skal lære og hvorfor jeg bruger bestemte metoder - samt vores ´brush up´i indledning af hver lektion. I hvor høj grad synes du at det har givet anledning til selvreflektion (tanker om hvad du har lært)?

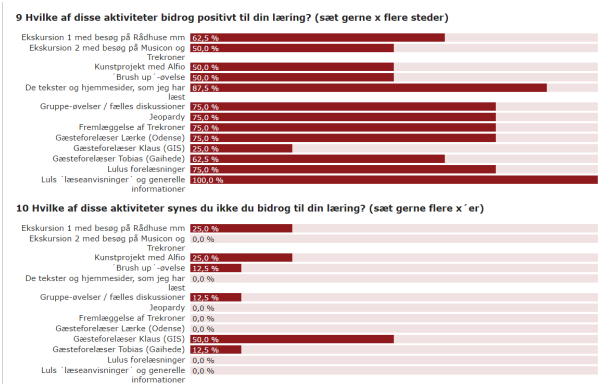
I høj grad	50,0 %
En del	25,0 %
Både og	12,5 %
Lidt	12,5 %
Meget lidt	0,0 %

7 I hvor høj grad har du mærket at der var særlig fokus på at undervisningen var tilrettelagt udfra et princip om at betragte dig som studerende som en ´partner´som aktivt byder ind i undervisningen frem for en ´elev´, der blot skal gøre som ´læreren siger´?

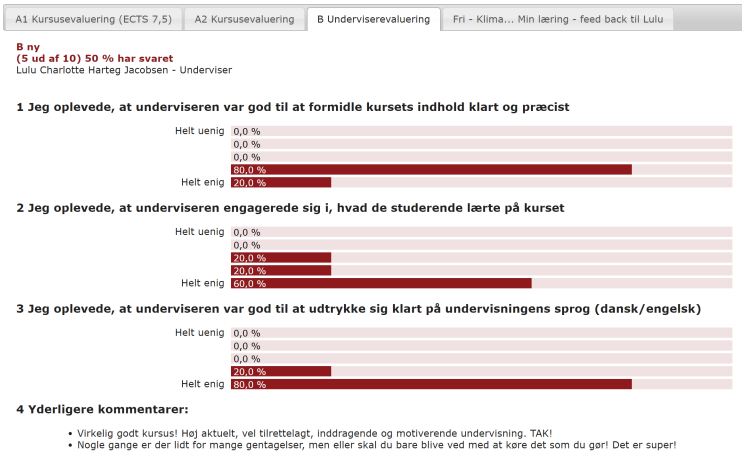
I høj grad	50,0 %
En del	37,5 %
Både og	12,5 %
lidt	0,0 %
Meget lidt / Overhovedet ikke	0,0 %

8 I hvor høj grad tror du at undervisningsformen på kurset har fremmet din undervisning?

I høj grad	50,0 %
En del	25,0 %
Noget	25,0 %
Lidt	0,0 %
Meget lidt/ overhovedet ikke	0,0 %



Jeg har desuden medtaget dette skema fra standard-evalueringen, da det er relevant i forhold til evaluering af min egen rolle og kommunikation i kurset:



D Udtalelse fra pædagogisk vejleder om en kursusdag

Lektion 9, mandag d. 3. okt, kl. 8.30-12.00

Udtalelse fra pædagogisk vejleder lektor emeritus Åse Jespersen, Biologsisk Institut, om undervisningen:

”Indholdet af dagens kursusgang: ”Trekroner, klimatilpasning og planlægning”, var i fuld overensstemmelse med målbeskrivelse og indholdsbeskrivelse for det samlede kursus.

Takket være din omhyggelige forberedelse (udlagt program for dagen samt gruppeopgaver), var de studerende velforberedte og afviklingen af dagens program gik fint. Så vidt jeg kunne skønne, var dine spørgsmål til deres fremlægning en god træning for dem i refleksion over diverse aktørers indsatser og perspektiver, både med hensyn til planlægning og klimatilpasninger.

Din kommunikation med de studerende både under og efter fremlægningerne var god og stort set var alle aktive og bidrog til diskussionerne.

Ideen med ”observatører”, der fremførte ros og ris fra forrige kursusgang er rigtig god. Måske kunne du bruge observatørernes indlæg som en decideret evaluering ved at indlægge specifikke spørgsmål. Vi snakkede om det over frokosten, og deres oplevelse af faglig relevans og din evne til at understrege vigtige læringsmål, kunne måske være konstruktiv for dig.

Der var en glad, interesseret og positiv stemning i lokalet, alt fungerede godt, tidsplanen blev overholdt – eneste lillebitte ting jeg kunne foreslå er at du skal tænke på ikke at sænke din stemme for meget indimellem. En bagatel! Ellers synes jeg du er én af de bedste undervisere jeg har hørt på.”

5

Including practical experience in teaching results in deeper understanding

Charlotte Amdi Williams

Department of Veterinary and Animal Sciences
University of Copenhagen

"Tell me and I'll forget; show me and I may remember; involve me and I'll understand." – Chinese Proverb

The topic of this paper is the value of animal research and practical experience in particularly in the animal science and veterinary degrees. Focus will be on the master level course "Animal Production Science" and the value of gaining practical experience by visiting a farm.

Introduction

Continuous cut-backs have resulted in more and more restrictions on what can be done in a given time-frame. For example, the latest money saving procedure is to make the students write their thesis two and two in order to save time on student consultancies. This in itself is not a problem; however, it is a problem that the direction seems to be for more cutbacks to be made but never any additions. In addition, we do not know the loss of valuable experience for the students when these cutbacks are made. One main question is; what does not only the animal science degree but any degree educating consultants lose out if experimental work is cut from the teaching? In animal science and veterinary science we train academics. The goals of the Animal Science programme is to achieve a basic knowledge about quantitative biology and its methods, but also have to critically evaluate research and results by learning how to analyse problems based on a holistic insight into the connection between the structure of the body, its functions, its ability to perform and welfare. Different teaching methods are used to achieve

this goal for example problem based learning (PBL) and project organized work that both are characterized by a high level of student involvement and work with both practice-based and more theoretical problems (Krogh and Wiberg, 2015). It is difficult to measure the direct outcome of one teaching method against another and most teaching on the animal science degree is a combination of different methods as the above.

For this study I was interested in investigating what the students perceive as being the most useful teaching tool and therefore the hypothesis tested in this study was: *students feel they gain a deeper understanding by including practical work in their learning process.*

The overall aim of this present report was to evaluate whether students found the practical work on the course as important as or more important than lectures and how they rated group work in the overall learning experience.

Methods

Students who had participated in the pig track of the master level Animal Production Science course were asked 6 questions related to the course, the different teaching methods and the learning outcomes. The questions asked were:

1. What have you gained from taking the course Animal Production Science?
2. What have you gained from the group work (your fellow students)?
3. What have you gained from the farm visit(s)?
4. What have you gained from the lectures?
5. What has been the main learning outcome?
6. How have you gained that learning outcome?

In addition, the students were asked to rank the following 3 keywords with what they found most important (1) to least important (3) of lectures, group work and practical work (farm visits).

Results

The following section will give an overview of some of the answers given to questions one to six and the keyword ranking. A total of 9 students that had followed the pig track were asked and 8 responded giving a response rate of 89%.

1) *What have you gained from taking the course Animal Production Science?*

Here all students answered that they had gained knowledge on general pig production in Denmark, with all its different aspects (housing, feeding, reproduction, management etc.). One also mentioned that group work had had a great impact on the overall gain from Animal Production Science and an increased knowledge and understanding on communication with farmers and their situation and preferences. Generally the aim of the course for a holistic understanding of a production system was accomplished. One student further mentioned that *"from a biology background with no livestock knowledge, I gained what I feel like is a very well rounded knowledge of the pig sector from all aspects, from 0 to 100 in 9 weeks"*. Another student said that *"overall, this was the course where you felt that you used all the knowledge you had gathered over the last 3,5 years of school on animal science education. All the knowledge was suddenly used in a practical and theoretical context"* and further added *"in addition; it gave an opportunity to see if consultant work was the way you would like to go"*. This view was also shared by another student who answered; *"The course is fundamental for the education. It combines the academic aspects with the practical world, and teaches problem identification and -solving. It allows us to see things from the farmer's point of view, while still having to use scientific research for improving certain aspects of a production"*. Another student answered that *"the main outcome of the course was to understand the Danish pig production from a systematic (factors of the herd) and scientific point of view. Assessing the problems that the pig farmers face based on a diagnosis of the current state of the farm. And more importantly, to provide the solutions considering the attributes and constraints of the farmer"*. Generally they all felt that they now had an understanding of a full production system and what methods to use to optimize the production.

2) *What have you gained from taking the course Animal Production Science?*

Most students mentioned how knowledge sharing and using the other peers' strengths and competencies had improved the final product. For example one student answered; *"you can discover different advantages from different group members and learn from them"* and another that *"I have gained a better understanding of group work and learnt how to find and utilize the different group members competencies so that we together could achieve the best possible result"*. One added that; *"also every time you work in a group you learn something about yourself, e.g. your weakness and strengths"*. In addition, improving their own writing skills through the process was mentioned and that it was *"super helpful to work with people from different backgrounds, there was always one of us that knew about an otherwise unknown so it was great to share knowledge in that sense"*. In addition one student answered that *"I have gained future peers on my work. I felt like some in the group complemented each other perfectly, which made the group project more exiting and eliminating"*. Another answered; *"It has been very educational to explain and discuss different matters with the group"* and you get *"new aspects and viewpoints on problems in the production"*. Another student added how the international group dynamic had been beneficial as to how they look at the Danish form of pig production and to work with students with other experiences and educational backgrounds than themselves. This was further elaborated by one of the international students who answered; *"I learned how to work in teams and how to properly plan in order to achieve our goals. Additionally, I built a very nice friendship with my group mates. If fact, they were very friendly and helpful, as I was the only one that did not speak Danish"*.

3) *What have you gained from the farm visit(s)?*

Generally the students all thought the farm visits had been very beneficial for example one student said; *"personally I'm a hands on learner, if I see it happening it sticks way better, so farm visits were an invaluable tool for me to learn much faster what I needed to learn about pig production"*. Some of the students also mentioned communication with the farmers as being one of the very beneficial outcomes for example one answered; *"I learned how to interact with the farmers because you have to be very careful with your question while assessing the state of the production"* and another that she had gained; *"a lot of insight into the farming industry in Denmark and also knowledge on how to talk and address the farmer and employees"*. This view on how to address the farmer was shared by most of the students and quite a few answered along the lines of; *"Increased*

knowledge on the farmer's situation and preferences and also a better understanding of communication with farmers". Also *"how farmers have to compromise when trying to fulfill their utility objectives and seeing how academic solutions can be implemented in real life"* was mentioned and a general overview and introduction to the Danish system of production.

4) *What have you gained from the lectures?*

Generally the students answered that the lectures had provided background knowledge, had increased their understanding of pig production in general and had been a useful supplementary tool. For example one student answered; *"lectures were a great way to discuss problems with other groups and pose questions to the expert in each factor, great to get the basics before going and seeing it in reality in a production setting"*. This was also answered by another student who said he; *"gained a lot of knowledge in animal nutrition, pig production, and animal welfare. I really like the high-level of discussion in all lectures. All professors are specialists in their area and they used very updated information"*. Another student answered that she felt that they had given her; a general overview of the different elements within animal production (feeding, housing, vet, etc.), and the possibility of putting the knowledge in relation to the farm visits. Another student also used them as a guideline for what they had to look at on the farm for example *"what a farmer has to consider eg. when they choose a specific diet or what temperature to use in the farrowing unit"*. This was further elaborated by another student who answered; *"The fact that most of the lectures were directed to our specific topic, was very beneficial"* and another student answered *"it gave insight and a direction as to which things to look for on the farm. So a context to refer problems back to"*.

5) *What has been the main learning outcome?*

The answers to this question were divided. Some mentioned the overall aim for example *"combining the practical and academic aspects of pig production"* were mentioned as well as *"increased ability to see and understand the technical things in a larger context"*. Others were more specific; *"a good general and overall understanding of a Danish pig production, with all its different aspects. Both the difficulties in producing pigs, but also the possibilities and gains"*. One answered a more personal outcome; *"Writing skill and sell-study skills"*, whereas one student answered that; *"There is not a simple answer for this, I consider that the course was very*

hands-on and project based, which helps a lot to understand the dynamics of the animal production. Also, it made me realize that I need to develop my knowledge even more. Especially, in nutrition, because this was the area in which I most interested in. The pig production is a complex system that requires the conjunction of different areas of knowledge. Additionally, it is required to be specialist (nutritionist, welfare specialist, farm designer, veterinarian or geneticist) in order to provide the best outcome possible. Additionally, as we work in the project we understood that there are still a lot to do in the pig industry". Another student answered more specifically; *"How to analyse an entire pig herd - using e-controls, feed formulas i.e."*.

6) *How have you gained that learning outcome?*

The students answered very differently to this question. For example one student combined all the teaching methods and answered; *"Through a combination of lectures, reading, farm visits, group work, report writing, meetings with supervisors and studying for the exam. Primarily the group work and the report writing as we therefore in the group have discussed things through"*. Another listed them in order and answered *"1) By scientific reading 2) constant feedback from the professors of the pig area 3) the direct contact with the farm"*. Several mentioned active participation, hard work, searching for information and discussing with group members. One of the international students also mentioned self-studying; *"I have been writing a lot through the course, and there were not many lectures, so a lot of things I need to find in the papers by myself"*. Some also answered that the farmer had played an active role; *"with the farmer's help plus discussions with teachers and the group"* and *"a combination of the farm visits, and actual work on the farm related problems"*.

Ranking of keywords

The students were asked to rank; lectures, group work and practical work from most important (1) to least important (3). Figure 5.1 shows the results of the ranking.

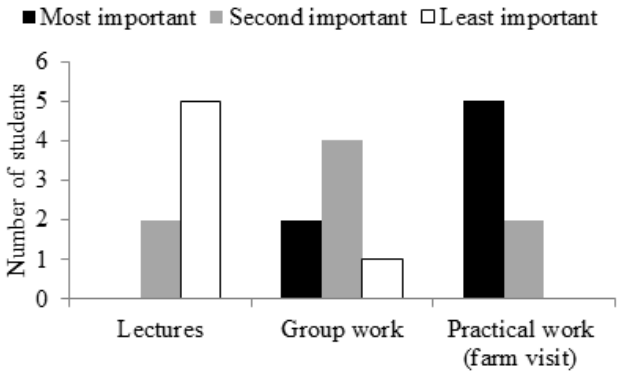


Fig. 5.1: Student answers to what they considered most important to least important.

Generally students ranked lectures last and farm visits/group work were ranked as more important.

Discussion

The hypothesis asked in this study was accepted as most of the students answered that they had gained a more in depth understanding of a pig production system through the practical work. It is expensive and time consuming to include farm visits in teaching however; the value can be directly measured. The results to the question; *How have you gained that learning outcome?* Really showed the different approaches the students learnt by and that how a combination of all actually benefits the greater amount of them. One student put the problem with these broader subjects in a nutshell as he answered; *"The pig production is a complex system that requires the conjunction of different areas of knowledge"*.

The first teaching tool of *"Practical work"* generally seemed to give the students motivation. In order to get the deep learning/understanding it is important to include practical work (R., 2004). One student answered; *"It was very educational to visit the farmer by our own, because we were kind of forced to be ready and do a good job communicating with him"*. This shows how the approach of letting the students try by themselves and visit the

farm by themselves was extremely beneficial. Students generally respond positively towards active learning and research-based teaching (Prince and Felder, 2006; Tomasik, Cottone, Heethuis, and Mueller, 2013).

The second teaching tool of *group work* was also rated as very important by many of the students. Interestingly, some of the students answered that they had now been given a deeper insight into group work and had through this course learnt how to take advantage of the different group members' strengths in order to make the best product. This is in agreement with the information processing theory in the PBL approach that suggests that for effective acquisition of knowledge, learners need to be stimulated to restructure information they already know within a realistic context, to gain new knowledge, and to then elaborate on the new information they have learned, for example by teaching it to peers or by discussing the material in a group setting (Kilroy, 2004). Group work works really well if the group works well as a whole. It can be detrimental though if the members do not work together (Krogh and Wiberg, 2015). In agreement, one student answered; *"It was also educational to be able to discuss the different topics with the group, however; at times it was also very frustrating as the group members had very different backgrounds and working methods"*.

The third teaching tool of using *lectures* as background knowledge was not ranked most important by any of the students. However, although most students rated lectures as being the least important of the three keywords to choose between they all had positive comments on the background knowledge they had gained through the lectures. A few mentioned that they found it hard to rank them as all were beneficial.

To summarise and return to the beginning and the Chinese proverb - *you need to be involved in order to fully understand*, the Animal Production Science course provides different tools and methods that allows deep learning by combining different methods.

Conclusion

Most students felt that the practical farm work and hands on experience gave them a deeper understanding of the subject area. They also learnt a lot through their peers and could through the process, progress to using each other in the way that would achieve the best product. Although lectures were seen as being the least important they still contributed with background knowledge and discussions that were useful for the overall aim.

Overall the pig track on the animal production course works really well with a good balance between theory, practise and group work.

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Part III

Improving feedback to students

6

Peer feedback among international PhD students

Sofie Kobayashi

Department of Science Education
University of Copenhagen

Summary. This presentation of my project mirrors my own development in thinking about feedback and formative assessment. In the first part, Problem statement and intervention design, I discuss peer feedback without defining precisely what I mean by this concept. That is done deliberately as I was not myself very precise in my thinking about feedback at the time of designing the project. In later sections I develop my thinking about feedback, to the broader concept of formative assessment.

Problem statement and intervention design.

This project concerns the introduction of peer feedback at the Introduction course for new PhD students at Science, University of Copenhagen. The course was initiated by the PhD school at LIFE in 2007, and it is a five days' intensive residential course, off campus. The participants submit two assignments, one is an essay on Responsible Conduct of Research and the other is a Personal Development Plan (PDP). Throughout the years the course teachers have provided feedback to course participants on their PDP assignments. The aim was to provide formative feedback in the spirit of helping them to think further and encourage them to use the PDP for the annual Performance and Development Review (MUS) and Progress Assessment Reports (PAR). The cost of the course is covered by the PhD school, but the department (IND) only makes a surplus when the course has more than 19 participants due to the high level of 'confrontation time'. As course responsible I have been asked to cut the time that course teachers spend on

this course, for the department to generate an overhead to fund research. As the feedback on assignments is time consuming, this is an obvious place to cut teacher time. This is not a particular problem for our department, as this quote by Boud and Molloy, 2013, p. 703, indicates: 'The practical dilemma of higher education is that the amount and type of feedback that can realistically be given is severely limited by resource constraints…'

Financial sustainability was the trigger to consider peer feedback on PDP assignments. However, as I engaged with the concept of peer feedback I could see the advantages of using peer feedback to enhance learning. Usually one or two participants seem lost, do not ask for help, and submit very meager assignments. Through peer feedback help will be 'forced' on them, and they get to see other PDPs and can learn from their peers. Further, the process of giving feedback will help them understand the concept of the PDP and the criteria for a good assignment, and this will help them build capacities in self-assessment and self-regulation for their own future competence development. There are a number of studies that indicate that both the one providing feedback and the receiver learn from the peer feedback process, e.g. Althauser and Darnall, 2001; Cho and Cho, 2011; Li, Liu, and Steckelberg, 2010. Hence, by giving feedback to their peers, it is our hope that all course participants will grasp the ideas of the PDP and submit good assignments. This will ease the effort needed for teacher feedback as it is the lower quality assignments that are most demanding to assess and comment on.

Problem statement

The aim of this project is to increase financial sustainability and enhance the learning environment at the Introduction course for new PhD students at Science through the use of peer feedback on assignments.

Before describing the intervention design I will provide a bit more of the context of the PDP assignment. The Intended Learning Outcomes (ILOs) for the course include:

- To position you to take charge of your PhD studies
- To take steps to co-manage the working relationship with your supervisor(s)
- To be able to navigate the personal / individual aspects of your PhD studies (e.g. work/life balance, motivation, stress)

The course activities and the PDP assignment urge participants to think about their present competencies, their career plans and goals, and make plans for competence development throughout their PhD. The PDP also includes sections on work-life balance, networking and collaboration with supervisors.

One objective we strive for under the first ILO, taking charge, is to raise awareness about the kinds of feedback they can get from peers and supervisors as a way to develop their competencies throughout their PhD. We do this through a session about feedback, and we discuss specific vs. general feedback, the idea of constructive feedback, and during the last year also formative and summative feedback (Black and Wiliam, 2009). The main goal is to equip participants to discuss their expectations for feedback with their supervisors, and we aim to achieve this by having them work with assessment themselves. Here we take the constructivist view of learning for granted; that learning is enhanced through active engagement. I find the social constructivism meaningful in this context (Dolin, 2015; Dysthe, 1995), as interaction and communication about feedback enables the participants to ascribe meaning to the types of feedback.

I also believe this is very important for a good PhD process to be able to ask for help, including feedback, and hence also to be able to give feedback to others for reciprocity. It falls under the concept of relational agency, which has been defined by Edwards and D'arcy, 2004, p. 149, as the 'ability to seek out and use others as resources for action and equally to be able to respond to the need for support from others'. The relevance for doctoral education has been established by e.g. Hopwood, 2010. Giving and receiving feedback thus supports the main ILO of the course, taking charge of PhD studies, but it may deserve an explicit new ILO to be added to the course.

Intervention design

The intervention was designed to introduce peer feedback on the PDP assignments through a number of steps:

1. Organising a meeting in the teaching team to explicate the criteria we use in giving feedback on PDPs.
2. Writing up the 'peer feedback criteria' and sharing with the teaching team. The peer feedback criteria should be written in a way that encourages course participants to ask questions that can help the author of the PDP to think further.

3. Testing the peer feedback criteria while giving feedback on PDPs from the June course.
4. Instructing course participants at the September course to give feedback to two peers, so that each participant receives feedback from two others.
5. Comparing the PDP assignments submitted with earlier assignments, to see if we can judge whether the quality increases.
6. Constructing and distributing a questionnaire to get feedback from participants after the assignments have been approved, to learn how they perceived the peer feedback.

Based on these experiences the next iteration of the course will be developed, with reference to experiential learning cycle developed by KolbD, 1984.

Feedback and assessment

In its simplest form feedback is a piece of information, written or oral, given to students, almost synonymous with telling students what to do next. This builds on the assumption that if only students do as they are told, they will improve their performance (Boud and Molloy, 2013. The question is if this is actually feedback, or only information. Boud and Molloy, 2013 continue with discussion of the feedback loop; 'The cycle needs to be completed. If there is no discernable effect, then feedback has not occurred'. A discernable effect requires an assessment of student performance in two subsequent tasks, first an assessment of competencies in one task, and a subsequent task in which the student can demonstrate their learning. This corresponds with the framework of Hattie and Timperley, 2007 where feedback is the assessment of a first task, feed up is setting (reachable) goals for development and identifying the gap, and feed forward is the steps needed to close the gap. While I definitely concur with the idea of the feedback loop, I find it problematic to change the concept of feedback into something that occurs rather than something we give, as it becomes a bit radical to change our everyday language of 'giving and receiving feedback'. But Boud and Molloy, 2013 have an important point in that feedback 'needs to be conceptualized as an explicit part of the design of the course or programme' (p. 702).

Setting *reachable* goals during feed-up (Hattie and Timperley, 2007) refers to Vygotsky's concept of Proximal Zone of Development (PZD) (Dysthe, 1995; Vygotsky, 1978). If the goals are too high, the gap becomes too wide for the learner to fill. The consequence is that feedback needs to be balanced for the learner to find it meaningful to engage with the challenge. In the PZD learners can succeed when getting help from adults/ teachers/ more experienced others. The wider the gap, the more help is required for the learner to succeed. This is referred to as scaffolding, and engaging in dialogue with others is a fundamental aspect of scaffolding (Dysthe, 1995). Topping, 2010 mention other means of scaffolding, like guiding prompts, sentence openers, and cue cards.

It should be clear from above that feedback is not possible without assessment. (An exception may be non-evaluative feedback, which is a very useful approach described by Elbow and Belanoff, 1995, but I am not dealing with that concept here). Assessing the quality of a product or the competencies of a student is necessary in order to facilitate further learning (as in formative feedback). In the introduction I stated that we provide 'formative feedback' for the course participants to take the PDP with them for further use in their competence development. The consequence of taking the proximal zone of development seriously is that students will not get the same level of feedback. If feedback is given based on assessment of each individual student's task and aimed to help them move on from where they are, then reliability of the assessment becomes low. This type of feedback cannot be used for third party as information on students' level, but rather for formative feedback to support further learning. On the other hand, when the feedback is aimed at the individual then validity of the assessment of the individual becomes higher.

The formative – summative divide seems quite clear at a first glance; formative feedback is feedback *for* learning while summative feedback is feedback *of* learning. However, even summative assessment, the assessment of learning outcomes, can be used formatively when students are involved in the process. The concept of formative assessment is broader than assessing a product or competence, and formative assessment involves feedback as one element (Black and Wiliam, 2009). Aspects of *formative assessment* include activating students as resources for one another and as owners of their own learning.

Taking this a step further would be to involve students rather than activate them. This is implied in the model developed by Dolin, 2015 and Harlen, 2013.

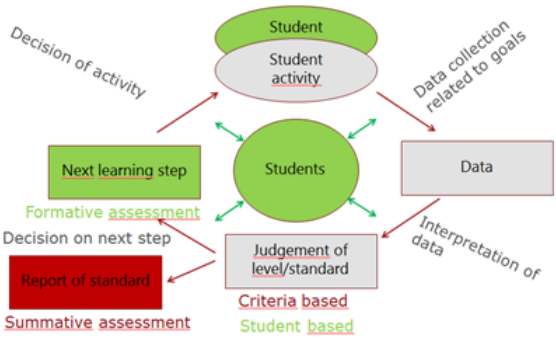

Fig. 6.1: A model of formative and summative assessment, developed by Dolin, 2015 and Harlen, 2013. (reproduced here with kind permission from Jens Dolin)

The formative assessment is indicated in green as students are involved in the whole process of defining criteria, collecting and assessing data (own and peers' performances) and deciding on the next steps in the learning process. Involving course participants in defining criteria would help them engage with the criteria.

A last aspect that I would like to touch on here is the competencies developed through peer assessment. Topping, 2010 points to the 'longer-term benefits with respect to transferable skills in communication and collaboration' (p. 395) as well as 'ancillary benefits in terms of the self-regulation of one's own learning' (p. 396). Boud and Soler, 2016 use the term *sustainable* assessment to indicate assessment with a forward looking dimension that prepares students to meet their future learning needs, thus equipping students for judgement and decision-making beyond the timescale of a course. Both peer and self-assessment could be added as ILOs for the course to emphasise the importance for these competencies in PhD education and beyond.

Implementation

Earlier explication of criteria was mainly done among teachers by sharing old assessments and feedback with new teachers and through co-assessment of PDPs that we were in doubt about. The core team of teachers discussed

assessment criteria that we have (more or less tacitly) used when giving feedback. The criteria have been written up and provided to course participants. The criteria were used for assessment and feedback in the June course, and they were meaningful and useful as reference.

Designing peer feedback groups

Groups were deliberately designed for internal variation based on our experience with assessing PDPs throughout the years. Although we did not make any systematic investigation of reasons for submitting thorough or meager PDPs, we do have insights based on face-to-face feedback sessions with participants in earlier versions of the course. Some participants have difficulties in grasping the idea of making a development plan as they are not used to work with 'soft sides' of their own development (being Scientists), or because the cultural differences constitute a barrier for their understanding. Some also have language difficulties to add to that. Others do not find the exercise meaningful, or sense that their supervisors would not appreciate them spending time and effort on developing a PDP. Others again do not have the time, or do not prioritize the PDP over other tasks. Hence the parameters used for designing internally varied groups were mainly societal (national/educational) background, gender and level of participation during the first course days (engagement) assumed to reflect their potential for working with the PDP. In the September course we made groups with one Dane and one Chinese in each group, and distributed the rest to make variation in gender and engagement.

Technicalities of peer feedback in Absalon

The September course was the first time for us to use Canvas as LMS ('Learning Management System'). Canvas has a function for peer feedback that requires (enforces) peers to give feedback, and I had set up course participants in that system manually, so that each participant would give and get feedback from two others. This system is based on ideas of controlling that participants do what they are supposed to, which actually goes against our aim of putting participants in charge of their PhD studies. I was a bit hesitant to introduce this system during the course, and very relieved when introduced me to another option. Some colleagues from another department had discovered that it is possible to organize participants in groups and assign a sub-site for each group where they can upload and download

documents as they wish. This option was not described in Canvas guidelines, and he and his colleagues discovered it incidentally. This was exactly the kind of feature I would like to use, because it leaves the activities up to course participants to organize. It may take more work to get them to use it, and it may scaffold the insecure participants more, especially if the feedback is set up in rubrics. However, Canvas as LMS asks for grading and counts the marks even if we set it up with space for comments rather than grades. Giving course participants their own space felt more right, based on my gut-feeling more than thorough investigation of possibilities.

On the last day of the course and through an announcement in Absalon, course participants were instructed to upload assignments in their group sub-site folders and give each other feedback. They were given deadlines for the draft PDP for peer feedback, feedback criteria were available to them, and a deadline for the final PDP. The hope (and hypothesis) was that there would be fewer who do not grasp the idea and this will relieve the teachers from some feedback work.

However, I still had the 'Assignments' folder for PDPs available and many participants uploaded their draft PDP in this folder. I manually moved their draft PDPs to their respective group sub-site folder, and informed them accordingly. But obviously, many participants had not found their way to the group sub-sites.

PDP assignments

The PDP assignments in the September course did not stand out as better than average. Four (out of 23) were asked to resubmit, at least 3 were meager, but acceptable, and 4-5 were really good with substantive thinking reflected in the writing. The picture wasn't any better than what we usually see, on the contrary we usually only ask 1-2 to resubmit. Thirteen participants had uploaded draft assignments in the folder for final assignments, including the four we have asked to resubmit. The activity in the group sub-sites reveals that five groups had engaged in peer feedback to varying extent, but there is no clear trend towards a correlation between peer feedback and quality of assignment.

We can gain further insights into possible effects of peer feedback by comparing the draft PDPs, the feedback provided and received, and the final PDPs submitted, and I did this for eight participants. The impression is that the feedback is used actively by those who engage and need feedback. Secondly, reading other group members' assignments also seem to inspire

them. The feedback they provide reveals a lot about their understanding of the task, and using the criteria for feedback probably scaffold the development of understanding for some.

Their experiences of peer assessment

I have distributed a questionnaire to get their experience of how the peer assessment worked. I received 18 responses to the questionnaire from 23 participants. The responses indicate that peer feedback has a potential, as half of the respondents found the peer feedback useful, both in terms of giving feedback, assessing other PDPs and receiving feedback.

Of the 18 respondents, 60% found it meaningful to give peer feedback while 17% found it difficult, and another 17% did not give peer feedback (two found the technicalities of Absalon to be a barrier and two were not confident that they could provide good feedback). Similarly, 60% found the feedback criteria helpful, while 27% found it difficult to use the criteria. Reviewing other PDPs seemed to help the vast majority.

The judgement of feedback they received was slightly lower, in that 47% found the feedback useful. 18% felt they received praise that did not direct them towards much improvement, and another 12% did not find the feedback useful, and 18% did not get feedback. These experiences indicate that much can be gained through training feedback and the use of criteria during the course.

Discussion and next iteration of the course

Overall, this first iteration of using peer feedback in the Introduction course did not seem very successful in terms of higher quality assignments and less need for teacher feedback. Still, the analysis of the sample of assignments and peer feedback, and a questionnaire distributed to participants, indicate that peer feedback has potential in the course. In the following I discuss the experiences from this first iteration in the light of literature about formative assessment, and seek ways to make peer feedback more effective in the course.

Group formation

The parameters we used for group formation are by and large supported by Topping, 2010 who lists academic and social factors to consider when

matching students, like year of study and academic ability, background experience in peer assessment (good or bad experiences), culture and gender. We can be more explicit in matching participants with different background experience. This is most likely connected with educational and societal culture, which we very coarsely identify as nationality. We should of course not make too rigid assumptions based on nationalities, but this is a pragmatic choice. If we combine this with a quick survey on their experience with peer feedback (good, bad, non) we may be able to improve group formation. We could also consider forming the groups to aim at internal homogenous groups with similar experiences and goals. This can be an advantage from a learning perspective, because the participants would (ideally) engage in discussions with others at similar levels, and not rely on the experienced peers to tell or show the inexperienced how to do. However, I would prefer that they get the experience that they can help each other. And, homogenous groups would require teachers to support the inexperienced groups rather than relying on support within groups.

Integrating peer feedback in the course

Boud and Molloy, 2013 emphasise the importance of integrating peer feedback explicitly in the course rather than an add-on of information given to course participants after the course. David Boud has been a source of inspiration for me from the outset of this course in 2007 as he places learner agency as central. Especially his article with late Alison Lee about peer learning (Boud and Lee, 2005) has been essential for my thinking about the course as reflected in the first ILO: To position you to take charge of your PhD studies.

Earlier we provided feedback to participants after the course, formatively intended and balancing the amount of suggestions towards reachable goals, and for a long time supported by face-to-face meetings. What we missed out with this approach was building the competence of self- and peer assessment, developing course participants' judgement beyond the time frame of the course. The framework Boud and Molloy, 2013 suggest for sustainable feedback is characterized by involving students in dialogue and facilitating feedback processes to develop assessment capacities. This implies that feedback needs to be an integrated part of the course where course participants are trained in giving and using peer feedback. Such training is extra important for participants with limited or negative experiences with peer feedback, and as Topping, 2010 mentions 'Students from different cul-

tural background may be very different in acceptance of peer assessment' (p. 397). Developing assessment capacities in the area of generic and scientific competence building (the topic of the assignment) will help doctoral students assess their own competence development during the PhD and beyond.

The consequence of taking the proximal zone of development seriously is that students will not get the same level of feedback. When we assess the PDPs in the Intro-course we take their level as point of departure for the feedback we give, and hence reliability of the feedback is low, but it is not an assessment aimed at third party. The feedback we give is aimed at the individual PhD student and his/her work with competence development. This makes the feedback valid for the individual, and to me that is most important. Because the assessment will not be used by third party in any way, only by each individual, then reliability becomes less relevant than validity. When peers give feedback the reliability issue between assessors becomes an issue; it is doubtful that peers can give the same type of feedback as we aim at, if they did not understand the task in the first place. When reading through the feedback that they have provided each other, some of this is at the level of our own feedback, while other feedback seems somewhat off track. The set-up with groups of three is a way to ensure that all course participants will get sufficient level and quality of feedback, and this makes it important to ensure that all participants engage in the peer feedback exercise. Some provided very sparse feedback, and very few provided kinds of feedback that I felt was misunderstanding of the feedback criteria (or not using the criteria). Two respondents to the questionnaire stated that they did not give feedback because they were not confident that they could provide good feedback. This also stresses the importance of training feedback and working with the criteria during the course to scaffold them in their practice, i.e. integrating feedback in the course, as Boud and Molloy, 2013 argue for.

The feedback criteria were shared with course participants from the first day of the course for guidance and transparency, and this is in line with recommendations from literature (c.f. J. T. Gulikers and Kirschner, 2015) because it guides the learning process and supports the development of self-assessment capacities. Integration of assessment during the course opens opportunities for introducing more scaffolding, and an obvious activity would be to make room (time) for them to give criterion-referenced peer feedback on specific sections of the PDP that they work with during the course. It is also important to let them work in the group sub-sites in

Absalon to make sure that they are familiar with the technicalities. The questionnaire revealed that two respondents said they did not give feedback because the technicalities of Absalon were a barrier.

While the actual PDP assignments that they submitted were not any better than usual, the peer feedback still had an influence on my perception of how much time and effort I needed to spend on giving further feedback. Because they already got feedback from their peers I did not feel the same obligation to comment on every section of their PDPs. The Speed-grader system in Absalon supported that, since it does not invite long paragraphs of feedback. So, instead of writing comments in their PDPs, I wrote the most important points in the Comments field in Speed-grader. So, as for the first aim of this project, to save on teacher time, we did reach that. It can then be discussed whether we have been giving too thorough feedback earlier, and whether the level of feedback we provide now is sufficient. I do not have records of satisfaction to compare what they think about that. Earlier, when we sent comments by email, we often got a reply with a thank you of some sort, but the feedback given in Absalon does not invite for them to react on the feedback.

In the section about the implementation (p. 5-6) I explained my reasoning for choosing the open group sub-sites for peer feedback, and avoiding the enforcement of the Canvas system, making peer feedback required. My feeling was (and is) that enforcement and control will not support the PhD students in taking charge. However, enforcement as an extrinsic motivation may ensure that they all experience that they can give meaningful feedback, and hence lead to personal engagement and support them in internalising the value of mutually giving and taking feedback. Another aspect of this refers to reliability; if some participants get very meager or irrelevant feedback as a result of the peers not feeling adequately equipped to provide feedback, then rubrics may be a good support to ensure that everybody provides more substantial feedback. I would need to try out the rubrics among teachers first, to ensure that technicalities work and that it is perceived as meaningful. My hesitation to use the peer grading and rubrics in Canvas is linked to a sense that it removes a sense of autonomy, which again may diminish their motivation, if we consider the framework for self-determination of Ryan and Deci, 2000. This framework suggests that motivation can be supported through competence, autonomy and relatedness. The Canvas peer grading system and rubrics use a prescribed format for giving peer feedback that leaves very little room for the choosing methods, and no room for collaboration among group members. Hence, we would

miss out an opportunity to support autonomy and an opportunity for them to build collaboration among peers.

The first changes we will implement at the course are to attend to feedback *per se* on the first day of the course integrated with the first session concerning the PDP (competence mapping), and to make time for them to give peer feedback to each other in all the PDP sessions. We should also experiment with involving the course participants in defining the criteria. This will support them in building competence. We need to consider when to share the criteria with them, and avoid that they get the feeling that we 'had the answers' but did not share them. This may be a matter of how the right meta-communication.

Future development points

A question that has lured in the back of my head for some time is the relevance and authenticity of the PDP assignment. Is the PDP something that they can be asked to produce in real life? We suggest to the course participants that they update and use the PDP for their Performance and Development Review (MUS), and some do that and find it meaningful. Compared with the MUS form provided by HR, the PDP is much more elaborate and therefore supports competence development better. Authenticity and relevance is discussed by J. T. Gulikers and Kirschner, 2015, and we could develop the format of the PDP to increase relevance and authenticity, for instance by making the competence mapping in the format of a competence CV. Especially with regards to mapping general competences and giving supportive evidence for their competences is important for those aiming at a career in the private sector.

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7

Does a simple exercise of student-generated take home message activate and thereby improve the attention level and learning outcome of the students during an academic lecture?

Marie Pedersen

Department of Public Health
University of Copenhagen

Introduction

Compared to high school (*In Danish: Gymnasieskolen*) or other lower educational schools, the university is characterized by many hours of self-studying and few hours of teaching during which the students and the teachers are together. Even though most of the learning takes place outside the university, traditional lectures with the person lecturing doing most of talking from some kind of stage, are still a major part of the educational process at most universities.

Lectures are superb to give an overview of a dense curriculum and are among the most cost-efficient teaching method, operating with a teacher-student ratio of up to 1:450. Lectures can be inspiring, motivating and promote high quality learning. Thus, students may look forward to some lectures, either because it's a great topic that they're very interested in, or because the person lecturing is really good and inspiring. Unfortunately, lectures can also be overwhelming (too much information and/or too fast communication) or boring. Traditional ways of lecturing are very difficult and challenged by the low level of student activation and feedback, two essential elements of learning. Long monolog talk without any contact or interactions with the students may easily result in a poor learning outcome due to a high degree of passivity among the students and a documented drop in concentration after 20 minutes (Dahl and Troelsen, 2015). If the lecturing person is not engaged, well-prepared and/or not in tune with the

students the students may feel happy to skip the lecture, their attention shift from the teacher to other activities such as online communication on *Facebook* or *Snap chat*, some students may even leave the lecture hall if they are bored and as a result the learning outcome can be rather limited.

At most universities, lectures are provided in combination with smaller-sized classroom teaching is used (Fig. 7.1) to ensure student activation and student-centered teaching in order to optimize learning and to stimulate deep learning approaches (Herrman and Bager-Elsborg, 2014).

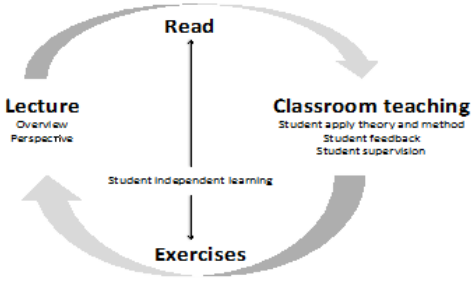

Fig. 7.1: Relationship between lectures, classroom teaching and student preparation (Herrman and Bager-Elsborg, 2014).

Many other factors contribute to the learning outcome of the students of an academic lecture in addition to the relationship between lectures, classroom teaching and student preparation (Dahl and Troelsen, 2015). Some of these factors cannot be modified significantly during a single lecture by the lecturing person such as those related to the students, e.g. their motivation, time, capacity to understand the topic, etc.

The fact that lecturing in existing courses often is required by newly appointed scientific staff at the University can be a challenge because in such situations, the 'guest' lecturing person has no or very little influence on the structural factors related to the curriculum, the intended learning objectives of the course, the schedule, the alignment of the course, the alignment of the education and the alignment of the between teachers as well as time and place of the lecture.

Fig. 7.2 summarizes some of the many modifiable factors that can influence on the learning outcome of the students during an academic lecture

and that are feasible to modify by the lecturing person in a guest lecture settings.

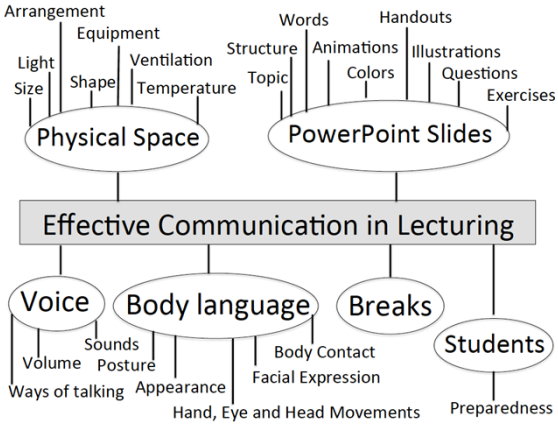

Fig. 7.2: Simplified illustration of different factors that in addition to the spoken word and the context of the lecture may affect the effective communication in lecturing and that may be modified by a co-lecturer in an existing course.

The context as well as a well-structured and engaged presentation is important for the learning outcome. A way for the lecturer to keep the attention of the students and hereby to improve their learning objectives is by changing lectures towards more student activating situations.

There are different ways of activating the students during lecturing such as:

- Introducing variation in the lecture
- Directly engage the students

PowerPoint slides are more and more commonly being used in lectures as they offer many great possibilities of quick presentation using beautiful and entertaining visual illustrations of complex matter. Sound and animations can be used too in order to increase variation in the lecture. Another strength of using PowerPoint slides instead of blackboards is that the person lecturing can face the students and have eye contact. Eye contact is very important for connecting with the students and adaptation of the teaching.

PowerPoint can more easily be read as compared to my handwriting. Furthermore, PowerPoint slides allow the students to prepare in advance and it can save the teacher time as PowerPoint can be read easily so the teacher does not have to remember every detail and can re-use the slides. The main disadvantages relate to the high tempo and overload of information.

It is not straight forward to prepare a good PowerPoint slide presentation, too often the presentations are too dense and there is a risk of going too fast as compared with traditional black board teaching. In my point of view a good PowerPoint presentation is characterized by *less is more*, few words, use large sized text, and many visual stimulating illustrations. Less or no text forces the students to take the notes and they may learn more.

Most students require handouts of the presentations before class. It is good and bad. It may help the motivated student to study deeper, to prepare and take note, but there is a risk that the students pay less attention in class as they already feel the know the lecture and that they only pay attention to the written words not the spoken words.

Variation can also be introduced by the lecturing person though the voice, body language, by changing from a PowerPoint supported presentation to writing or drawing on the blackboard, playing animations or podcasts, showing overheads or simply by moving around in the room.

In a lecture setting students can also be activated by posing questions, through quizzes, games and other exercises such as being ask to present or do specific tasks.

Objectives

The aim of the present report is to evaluate whether the use of a simple exercise of student-generated take home message as part of the traditional lecture to activate and hereby improve the attention level and learning outcome of an academic lecture. I am hypothesizing that it will help the students to pay attention and to recall the context of the lecture when they are actively reflecting about it at the very end of lecture.

Methods

My project is based on an exercise that I used during three lectures I had at October the 10th, 11th and the 24th 2016 during which I was lecturing

on the *Environment, Reproduction, Birth Outcomes and Children's health* as part of an existing, obligatory course for students at bachelor level in Public Health, which is provided in the 5th semester, called *Environmental Factors, Occupation and Health*.

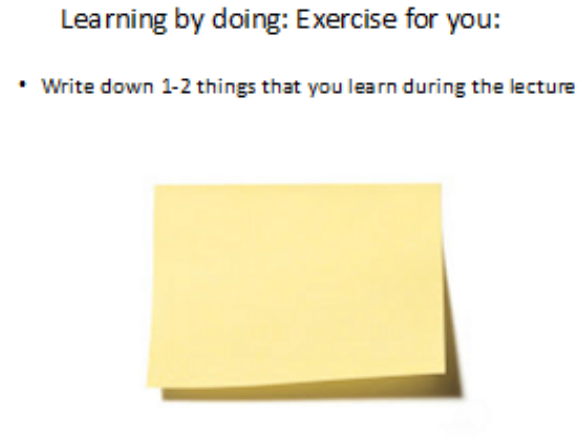

Fig. 7.3: The exercise applied.

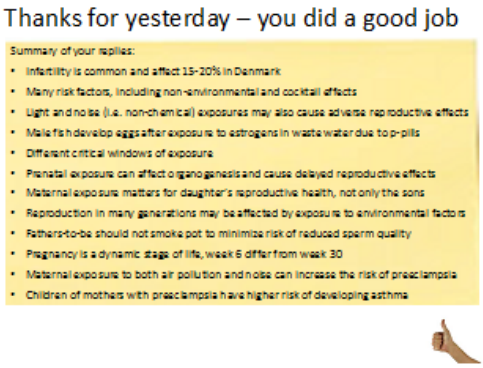

Fig. 7.4: Summary of the students' take-home messages.

When the students entered the room, I greeted them and handed them a note paper and a pen. After introducing myself and the topic of the lecture I presented the students for the exercise. I asked them to prepare their own take-home message (Fig. 7.3). I explained to them that it was important to be able to summarize briefly what you learn and that they would gain from doing so on their own in the future. After the lecture, I collected their notes and in the start of the following lecture I summarized the student's replies (Fig. 7.4) and we discussed if any issues were unclear.

Results and Reflections

The exercise was successfully completed. As expected the exercise was easy to do. It required no preparation from me or the students. All the students wrote a line or two summarizing something they learned. There was some overlap in their replies, but much less than I had foreseen. It was fun for me to read what was important and new information for the students. I did not systematic evaluate what the students thought about the exercise so I can't formally assess the student's perception of the exercise. I simply noted how many notes I got, if the replies made sense and from discussions with the students it is my impression that they liked the exercise. In my own point of view, it worked well to quickly summarizes the students' reply as a wrap-up the key-points of the earlier lecture in the start of the following lecture.

Perspective of the exercise

My goal was simply to activate the students and make them reflect about what they learn being at the lecture. However, the if the goal had been to formally evaluate the learning outcome of students, one could had asked the students if they learn more doing the exercise or one could had given only a random half of the students the exercise and compared their performance in a multiple-choice quiz that I made for the final lecture with the performance of the non-exposed half. Finally, instead of using paper and pens, which I do not recommend as the students kept the pens, one could simply ask the students to e-mail their replies.

The exercise can be viewed as a simple way to active the students which make the students reflect and remember (low level of cognition) and also

evaluate (higher level of cognition) the context of the lecture as illustrated by the Bloom's learning theory (Fig. 7.5).

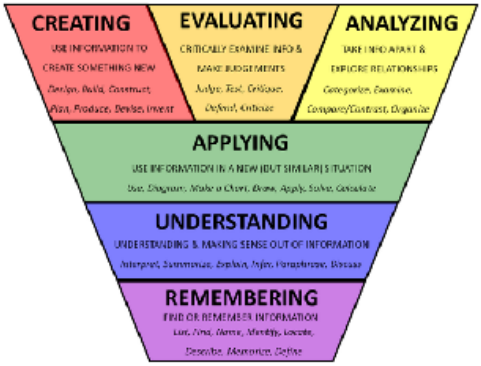

Fig. 7.5

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Part IV

Student motivation and learning

8

Introducing economic classroom experiments to increase students' learning outcome

Ramona Teuber

Department of Food and Resource Economics
University of Copenhagen

Background

Economic experiments have become increasingly popular in recent years and many important economic theories and concepts have been tested in experiments (Kagel & Roth, 2016). This is also true for the field of agriculture, food and health economics, in which economic experiments have contributed substantially to progress the knowledge on consumer behavior (Roosen & Marette, 2011). Thus, experiments belong now to the standard canon of doing research in this field. According to my opinion, this should be also reflected in the way how we teach these topics to students. Based on the growing literature proving guidance on how to use economic experiments to increase students' learning outcomes (Balkenborg & Kaplan, 2009) and my own teaching and research focus, this project addresses how to introduce economic experiments into the classroom for a master level course on agricultural and food policy.

I have been involved in teaching this specific master level course for two years. Last year I prepared two different classes within the context of this course, one on healthy eating (food) policies and one on food safety regulations. Within the food safety regulation class I introduced several failures of rationality (also called bounded-rationality) and linked them to the discussion on determinants of different regulations and accepted technologies across countries. Since most findings on bounded-rationality are based on economic experiments, I presented several results from such experiments to the students.

Based on the thoughts pointed out above, I decided to go one step further and implement this year in-class economic experiments on these specific aspects and concepts in order to (hopefully) increase students' learning outcomes. For the specific course at hand I redesigned one class on *food safety regulations* and one on *market and welfare effects of labels and standards* by introducing classroom economic experiments which might be either carried out directly in the classroom or partially/fully in advance of attending the class (similar to a flipped classroom setting). Since I had the freedom to design these classes fully according to my vision, I implemented these experiments in combination with two other activation strategies, namely skim reading and group work using padlet.com. The latter two activation strategies I implemented last year for the first time and given the students' feedback I consider them as very useful and successful in activating students.

Details regarding the general course structure, students' background, how I redesigned the classes and student's feedback on the redesign on the class and my own reflection are presented in the following.

Course structure, students and learning outcome

The course "Agricultural and Food Policy" is part of the MSc Programmes in Agricultural Economics and Environmental and Natural Resource Economics offered by the Department of Food and Resource Economics. As central learning outcomes of this course are stated (i) to gain analytical skills needed to understand and conduct graduate level analysis on agricultural and food policy issues in OECD and non-OECD countries and (ii) to get familiar with key institutions, historical developments, current policy debates, and learn how to match certain economic analysis methods with practical problems. With regard to skills students should acquire while taking this specific course, it is further stated that students should be able to apply economic analysis methods with practical agricultural and food policy problems and present and communicate these both orally and in writing. The assessment is split into two parts: First, each student hands in a written essay to a food or agricultural policy case. The topic of this essay can be chosen by the students themselves. Second, at the end of the course a two -hour written examination is conducted.

Students in this course are relatively homogenous in that sense that mainly students with an economic background and interest in economic

concepts are attending this course. This has of course a large impact on the design of the specific classes regarding the depth of economic principles, concepts and methods introduced.

Redesign of three classes

Overall, I was teaching this year three classes under the common topic "labels and standards". The first class focused on *food safety regulations and standards*, the second one on *market and welfare effects of standards* and the third one on *trade and development effects of standards*.

With regard to the first class and the topic of food safety regulations, I decided to focus on how to measure and derive willingness to pay (WTP) estimates for food safety regulations and how to determine a statistical value of life (SVL). These are central concepts in cost-benefit analyses of food safety regulations and understanding how to derive these measures are important learning goals.

With respect to market and welfare effects of labels I decided to focus on how to estimate the marginal WTP for labels under different information scenarios employing an experimental auction[1]. This decision was driven by the fact that WTP estimates are an important feature of welfare analyses of labels and standards and there is a large literature employing experimental auctions to derive WTP for different value-added attributes in food. Thus, I concentrated on teaching experiments that are derived from existing research in the field, including my own one. Feedback on both experiments including the presentation of results and how to analyze the data generated was given in the third lecture I was in charge of.

WTP and QALYS – Experiment on valuing foodborne risks

Regarding the topic of food safety regulations I adopted and modified a survey which was used in a research project on valuing food safety in Sweden (Andersson, Hammitt, & Sundström, 2011). These authors estimated

[1] Experimental auctions aim at eliciting consumer valuations for new goods and services by creating an active market environment where participants bid real money on real goods. Thus, experimental auctions have advantages over other value eliciting methods since they are considered incentive-compatible, that is an exchange mechanism is used which creates incentives for people to think about what they will actually pay for the good or service (Lusk & Shogren, 2007).

the value consumers place on reducing the risk of foodborne illnesses by a contingent valuation method. Based on this approach it is possible to estimate the value of a statistical illness and to examine how WTP changes with changes in quality-adjusted life years. These concepts were introduced in that specific lecture theoretically and the survey was chosen to show how researchers determine these rather abstract concepts empirically. Each student received a link to the online survey and filled-out the survey during the lecture so that if something was unclear I could provide immediate feedback. Once the survey was filled-out by all students, we had an immediate feedback round on how the students experienced the survey, i.e. whether certain parts were hard to grasp or fill-out. Since all students had some experience with contingent valuation methods from another course taught at IFRO, they gave very valuable feedback concerning the structure of the survey and potential ways to improve it showing their ability to transfer the knowledge from other classes to this one.

WTP for labels – Experimental auctions in the classroom

In order to derive market and welfare effects of labels, consumer valuations of different product attributes are an important input and thus there is a large literature on WTP for labels. Again as in the case before, the chosen experiment (experimental auctions) was chosen in order to give students the opportunity to actively learn how in empirical research WTP estimates are derived. More specifically, I designed an experimental auction (Vickrey 2nd price sealed bid auction) employing chocolate (100g) with different labels under three different information scenarios. Via different information scenarios it is possible to investigate the impact of information on the marginal WTP for labels. This set-up was based on my own research in the field of consumer economics (Teuber, Dolgopolova, & Nordström, 2016). The auction was set-up in a way that the students submitted their bids electronically via a survey link[2], while real chocolate with different labels was presented in the classroom.

Presentation/Analysis of results

In the third class I presented the results from the two experiments conducted in the two previous classes and discussed with the students about ways to analyze the data and how to interpret the generated results.

[2] For both surveys I used the SurveyXact software.

Student's Feedback and Learning Outcomes

I posed feedback questions directly in the lecture to the students once they had filled-out the survey or participated in the auction. Moreover, at the end of the survey students could place additional comments. The immediate feedback was quite positive and critical comments how to improve the survey design showed me that some students did not only fill-out the survey but critically evaluated the survey design and applied the knowledge from the theoretical part of the lecture and other course taken on similar topics to this specific case. This knowledge transfer is of course very positive.

I consider this immediate critical feedback in combination with the answers students gave in the written exam to an exercise addressing a cost-benefit analysis of stricter food safety regulation standards as two qualitative indicators of a positive outcome of the implementation of these in-class experiments[3]. Furthermore, the rather positive students' evaluations of the overall course and my part of teaching (see Appendix A) might further serve as a proxy for "having done a good job as a teacher" which hopefully resulted in a good learning environment fostering a good learning outcome.

Own Reflection

Looking back on the experience with setting up the experiments for this specific course some points are noteworthy. Overall, I am very satisfied how smooth the implementation of the experiments in class went and also how well the students took part in it. Since new teaching strategies always bear the risk to not work out how they are supposed to work, I consider this already a positive outcome.

However, there is always room for improvement. First, my initial idea was to let the students analyze the survey/auctions results themselves. Unfortunately, due to time and capacity restrictions (the students were already busy with their essay and I had some problems in programming the survey in a way that the students could immediately access the data) I could not implement the experiments this year in this way. Thus, involving the students in the analysis of the data they generated would be my goal for

[3] The optimal case would be, of course, to have a reference or control group in order to evaluate the impact on the learning outcome in a quantitative way. However, given that such an approach was not feasible "softer" indicators of improvement in learning outcome need to be looked at.

the next year. Second, given the feedback by some students I would reconsider to send the link to the survey in advance and let them fill-in the survey before the class. Thus, time in class could be spent on data analysis and interpretation by the students themselves.

Nevertheless, since one of the stated learning goals of this specific course is to gain and apply analytical skills to real-world food and agricultural policy problems, I think that the implementation of the above described economic experiments contribute to achieve this important course goal.

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A Appendix

B Teacher evaluation (Ramona Teuber)

You can fill out the evaluation below. If there are questions that are not relevant to you, you can choose not to answer those.

37 could answer this evaluation schema.
12 have answered this evaluation schema.
The answer percentage is 32.43%. : 12 / 37

1

1.1 In my opinion, the lecturer was good at communicating the course content in a clear and precise manner

Strongly disagree	0	0.0%
	0	0.0%
	2	16.7%
	4	33.3%
Strongly agree	6	50.0%

1.2 In my opinion, the lecturer took an interest in the students' learning outcome from the course

Strongly disagree	0	0.0%
	1	8.3%
	1	8.3%
	6	50.0%
Strongly agree	4	33.3%

1.3 In my opinion, the lecturer was good at expressing him/herself clearly in the language of instruction (Danish/English)

Strongly disagree	0	0.0%
	0	0.0%
	1	8.3%
	2	16.7%
Strongly agree	9	75.0%

1.4 Additional comments:

- *I wish less time was spent during the class to fill out surveys. Maybe we could do this before class starts.*

9

Teaching plant-animal interactions with active student participation and deep learning

Andreas Altenburger

Natural History Museum of Denmark
University of Copenhagen

Introduction

Teachers can improve their performance and thus students' learning outcome through systematic reflection on their teaching (Sølberg, 2015). And teaching and learning can be improved by adding variation in teaching methods and learning activities (Weimer, 1990). This paper reports the results of a didactical research project and is a reflection on planning and teaching a three-hour session for master students in the course 'Plant Animal Interactions. An Evolutionary Approach' in the fall semester 2016 at the University of Copenhagen. I used recommendations described by Peter Stray Jørgensen (Jørgensen, 2015) and Donald A. Bligh (Bligh, 2000) to plan the session. The aim of the research project was to identify teaching methods that improve the student learning outcome of my teaching. I did this by adding five diverse learning activities throughout the session (lectures, microscopy, student experiment, experiment analysis, and presentation of experiment results). The students evaluated the perceived effectiveness of each learning activity immediately after the session in a questionnaire.

Background

Learning outcome of lectures

According to Donald A. Bligh, lectures are relatively ineffective for goals of teaching that go beyond the transmission of information (Bligh, 2000).

Such goals beyond the transmission of information are values, inspiring interest in a subject, teaching behavioral skills as well as personal and social adjustment (Bligh, 2000). Several methods have been suggested to overcome these limitations. Some examples:

- Courses and sessions should incorporate learning objectives and learning outcomes (Biggs and Tang, 2007).
- Students should be recognized in the didactic triangle, with the three corners referring to teacher, student, and content (Gundem and Hopmann, 2002). Teaching is a complex activity and the relationship between teachers and students, the teachers' communicating role, and the students' learning process are crucial to the quality of teaching (Mørcke and Rump, 2015). As content turns the interaction between students and teachers into teaching, the choice of content is fundamental in the didactic triangle (Mørcke and Rump, 2015).
- Teaching should be based on student activities (Biggs and Tang, 2007; Jørgensen, 2015).
- Content overload leads to surface learning. Therefore, sessions should not be overloaded with content in order to allow for deep learning rather than focus on content logic (Jørgensen, 2015).
- The session should be based on questions and key points with relevant models of understanding (Bligh, 2000).

The didactical contract

Guy Brousseau introduced the Theory of Didactical Situations (Brousseau, 1997; Brousseau and Warfield, 2015). Brousseau introduced a didactical contract that contains in essence two parts:

1. A contract of devolution - the teacher organizes and explains a student activity. The students' part of the contract is to commit him- or herself to the activity.
2. A contract of institutionalization – students propose their results and the teacher vouches for the part of their results that conforms to reference knowledge. The teacher connects the new experience with existing knowledge which is useful to solve similar other problems (Brousseau, Sarrazy, and Novotná, 2014).

Variation of teaching methods

Adding a diversity of teaching methods improves the learning outcome of students (Fry, Ketteridge, and Marshall, 2008). Thus, my aim to add several teaching and learning activities to the session in addition to the lectures.

Microscopy: Microscopy was added because it provides the students with a change of focus from their computer or the lecture screen towards the actual organisms that this session was about (Harley, 2004). The use of microscopes gives also a break from listening and provides some practical challenges for the students. For example to get the perfect light conditions, focus plane and the right magnification in place. Microscopy gives a quick motivation for the students to engage in the teaching and it provides an ignition for student teacher interactions on a more personal relaxed level. It gives the students an immediate idea of size and the amount of organisms in a certain volume of seawater. It is also important for the students to experience variation in sample quality, which is usually not shown when using optimal pictures to illustrate certain points in lectures.

Student experiment, experiment analysis and presentation of experiment results: The student experiment was planned because teaching based on student activities supports learning and involves the students more into the session (Biggs and Tang, 2007; Jørgensen, 2015). The experiment makes it possible to improve the amount of physical and psychological energy that the students devote to the academic experience (Astin, 1999). The aim was to increase the students' vigilance and to really draw their attention to the subject matter. This was further accomplished by the circumstance that the students had to present the results of their experiment to their peers at the end of the session, which usually motivates them. The experiments have practically illustrated the knowledge that was transmitted in the lecture just before the experiment, so that the experiments have been an extension to the lecture.

The session

All the above points were considered when planning the session with the aim to facilitate deep learning. Thus, the total amount of content was reduced as much as possible and the important points of the lecture illustrated by examples and by an experiment conducted by the students.

I started the lecture with a short introduction, devolution of the course day and a devolution of the experiments the students were going to do. Then

the students had time to set up the experiments, which was to measure the effect of toxic and non-toxic unicellular algal strains on *Artemia nauplii*. The students divided themselves into four teams. A positive control team with healthy non-toxic algae, a negative control team without algae, a treatment team with toxic algae, and a treatment team with toxic algae that not always produce toxins. As it takes some time to measure an effect of toxic algae on crustaceans the set-up of the experiment were set at the beginning of the session.

The experiment set-up was followed by a lecture about animal plant interactions in the marine environment were the important concepts and organisms were introduced. To look at the organisms covered in the lecture and to give the students some hands-on experience, the lecture was followed by devolution of microscopy. The students had first a little break and then time to look at the organisms in the microscope. As expected this exercise was also used to talk about the topics that were covered in the lecture and to talk about the organisms that were investigated with the microscopes. The microscopy exercise was followed by institutionalization of microscopy.

Next, we had another lecture with more complex plant animal interactions providing all the information the students needed to understand and analyze their experiments. Here they could already see what they were expected to conclude from their experiments. The students had then time to look at their experiments, and analyze the data they gathered. The students presented the findings of their experiments to the group, and the experiments were institutionalized. Finally, the session ended with a summary and conclusion part including the institutionalization of the course day.

Results

Students filled out a questionnaire immediately after the session (Appendix A). It contained general questions about their learning, questions about the course, and more specific questions about the session. Eight out of eight students answered the questionnaire. All students were master students and thus at the right competence level for the course.

The session material was made available for download in the online teaching platform ‘Absalon’ prior to the course day. 50% of the students have had a look at this material prior to the course. The intended learning outcomes have been quite clear to the students (five stated it was clear to an extend of 51-75% and three rated it clear within 76-100

When it comes to learning, the student feedback has been quite diverse. Six students considered lectures in general most beneficial for their learning, followed by practical exercises (five students), reading at home and watching educational movies (three students each).

As for the teaching and learning activities in the session, the students found the lectures most effective for their learning (seven said it to be 76%-100%). Microscopy and experiment set up has been conceived as less effective (five students scored it to be less than 50% effective and three above 50% effective). The analysis of the experiment has been conceived as little effective (25%-50%) by two students and above 50% effective by six students.

The amount of content as well as the difficulty of content during the session was rated good by all students who gave a rating on these questions (seven). The session in general has been rated as good (seven) or excellent (one).

Discussion and Conclusion

The results are based on a small sample with eight students participating in the course and answering the questionnaire. Still it is possible to conclude that students are very diverse in their needs, structure, and learning approaches. There will thus rarely be one single teaching or learning activity that works perfect for all students. This said, I argue the most important finding from my experiment is that students want and need diversity and variation in teaching in order to support their learning.

When it comes to learning, the student feedback has been quite diverse. Most students found the lectures to be most efficient for their learning and the practical teaching learning activities less so. These results may be surprising as the introductory remarks advocate for practical activities during teaching, but they make sense in light of the intended learning outcomes, which focused on the acquisition of knowledge.

As stated in the background information, lectures have been found to be relatively ineffective for goals of teaching that go beyond the transmission of information. The questionnaire however, did focus on learning in general, which I assume, the students who answered the questionnaire, considered exactly to be the transmission and reception of knowledge. Thus, the students could not learn anything about the complexity of marine food webs by looking at single celled organisms under a microscope.

However, they could learn aspects beyond the transmission of information, which have not been made explicit to them during the session or within the questionnaire. Two examples:

1. By microscopy, they learned that it is very difficult to directly observe small scale algae-animal interactions in marine environments, which can be quite frustrating after seeing nice movies and pictures of exactly those interactions during the lecture.
2. Through the analysis of the experiment they learned that it is possible to find unpredicted and new interactions as soon as one sets up species specific experiments.

From the results of the questionnaire, I can conclude that

1. Students preferences on how to learn are different and diverse. Teaching and learning activities that work well for some students might be less effective for others.
2. Variation and diversity in teaching methods will increase the overall student learning outcome.
3. Teaching and learning activities need to be well aligned to the intended learning outcomes.
4. Learning goals that are beyond transmission of knowledge need to be explicit in a questionnaire in order to evaluate them through student questionnaires.

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A Questionnaire:

Student answers are included in grey.

Plant animal interactions in the marine environment 09/2016				
How much of the material provided for the course today did you read before today's lecture?	0 - 25% 4	26-50% 2	51-75% 1	76-100% 1
To what extend is it clear to you what you were intended to learn today?	0-25%	26-50%	51-75% 5	76-100% 3
Which of the following activities do you in general consider most beneficial for your learning?	Lectures 6	Reading at home 3	Practical exercises 5	Watching educational movies 3
To what extend have the activities in this session been effective for you to learn the session's content? (Please choose one percentage per activity)	Lectures 0-25% 26-50% 51-75% 1 76-100% 7	Microscopy 0-25% 1 26-50% 4 51-75% 2 76-100% 1	Set up of the experiment 0-25% 2 26-50% 3 51-75% 2 76-100% 1	Analysis of the experiment 0-25% 26-50% 2 51-75% 4 76-100% 2
How do you rate the amount of content in this session?	Too little	Good 7	Too high	
How do you rate the difficulty of this session?	Too low	Good 8	Too high	
How do you rate the session's material?	Poor	Satisfactory 1	Good 6	Excellent
How do you rate the quality of teaching in this session?	Poor	Satisfactory	Good 7	Excellent 1
Do you have any comments on how this session could be improved?				

B Structure of the session and intended learning outcomes:

Teaching was based on my own research on mixotrophy and the evolution of acquired phototrophy in marine unicellular organisms. This research gives a perfect example of the complexity involved in plant-animal interactions in marine environments. In crude terms, plants in the marine environment are algae, and algae - animal interactions are often difficult to define. One difficulty is, for example, the impossibility to decide if a cell counts as algae or animal as it might have a chloroplast only temporarily in its life cycle. The types of algae animal interactions in marine environments can be categorized as follows:

1. Classical food web: algae get eaten by animals.
2. Classical food web: algae avoid being eaten by use of toxins and/or morphological adaptations.

3. Permanent symbioses between algae and animals.
4. Non-permanent symbioses between algae and animals.
5. Inverse food web. Algae that eat animals
6. Inverse food web. Algae toxins that kill animals

Intended learning outcomes

By the end of this session, students will have a deep understanding of the complexity of marine food webs and plant animal interactions in marine environments. Students will be able to use microscopes and plan and execute small scale experiments. They can explain what makes the marine setting so special in comparison to terrestrial environments, which are covered in other sessions of the course.

The following themes were covered in the session:

- Plants in a marine context are algae -> types of algae
- Distribution and diversity of algae
- Magnitude of biomass and worlds net primary production by algae
- Chemical signals and toxins
- Algae-animal interactions, food webs in the marine environment
- Endosymbiosis
- Trophic modes

Teaching and learning activities

- Lectures
- Movies
- Experiment set up
- Use of microscopes
- Experiment analysis and presentation of results

Structure of the session:

1. Short introduction and lecture (+ devolution of experiments) - 10 minutes
2. Set up of experiments – 30 minutes
3. Lecture – 45 minutes (with 5 minutes break after 30 minutes)
4. Looking at organisms with the microscopes (including devolution and institutionalization of microscopy) – 30 minutes

5. Lecture – 20 minutes
6. Analysis of experiments – 20 minutes
7. Student presentation of experiment results (+ institutionalization of experiments) – 20 minutes
8. Summary and conclusion – 5 minutes

10

Exploring student diversity

Entrepreneurial Intent & Self-efficacy, Personal Characteristics, Creativity, and the Link to Performance in Entrepreneurship and Innovation Training

Karin Beukel

Department of Food and Resource Economics
University of Copenhagen

Summary. Teaching Innovation and Entrepreneurship for natural science or business students is a complex process, where not only knowing the theories of entrepreneurship, the elements of a business plan and financial planning is needed, but also skills in identifying opportunities in the market or exploring own creativity to come up new ideas for future startups can become crucial. Using applied teaching therefore also becomes and exploration of students own personal characteristics. In this paper I investigate the broader skillset and characteristics of the students enrolled in an innovation and entrepreneurship course. To understand the students I focus on studying the variation in a number of innovation and entrepreneurship related factors, namely entrepreneurial intent, entrepreneurial self-efficacy, personal characteristics (i.e. their profile in terms of extraversion/introversion, intuiting/sensing, thinking/feeling, and perceiving/judging.), and their creativity. The results show a highly varied group of students. The work is explorative and based on data gathered at University of Copenhagen (UCPH), the data analysis mainly consists of descriptive data and correlations. Finally I reflect on how the findings direct future teaching in entrepreneurship and innovation.

Entrepreneurship, design thinking and teaching

In their seminal paper, Shane and Venkataraman (e.g. 2000) define entrepreneurship as the as *"the examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited..... the field involves the study of sources of opportunities; the processes of discovery, evaluation, and exploitation of op-*

portunities; and the set of individuals who discover, evaluate, and exploit them." (p. 218 Shane and Venkataraman, 2000). Entrepreneurship is therefore a rather slippery concept (Blundel and Lockett, 2011) which not only in research but also when teaching can take many forms. The Innovation and entrepreneurship elective master-course I teach at UCPH takes its departure in this definition of entrepreneurship, and therefore also takes the students through a process which includes investigating different search processes to seek the discovery of opportunities, iteration processes that enables the student to evaluate the opportunities identified, and applied learning of the skills that are needed to exploit the opportunities identified. This process is, in the case of this course, build around the design thinking process (extensive literature has been published on design thinking, e.g. Brown, n.d.), and also on teaching based on design thinking (e.g. Glen, Suciu, and Baughn, 2014). However, despite the extensive literature little is known of how students of different characteristics perform in such a course setting. Luthje and Franke even suggests that *"empirical research has seldom explored students as entrepreneurial subjects"* (p.138, Lüthje and Franke, 2003). In this short report I take a first steps in uncovering some of the students enrolled in this elective course – from the perspective of entrepreneurship, I focus on their entrepreneurial intent, entrepreneurial self-efficacy, personal characteristics and creativity. In an explorative manner, I examine how these different elements are correlated, and whether there are characteristics that are correlated with higher performance.

Method

To study the students enrolled in entrepreneurship teaching, I choose the setting of the Innovation & Entrepreneurship course held at UCPH fall 2015. This course is offered twice a year at UCPH, and has been running for +5 years, and is the main course on innovation and entrepreneurship to students enrolled at the faculty of Science. During fall 2015 the situation of the course was of particular interest, during this semester a collaboration with Copenhagen Business School (CBS) had been initiated, meaning that the course was a mix of students from both CBS and UCPH. The students are all at master level. In total 69 students were enrolled, 28 from UCPH and 41 from CBS. The course was held from the beginning of September to end October with sessions on Monday afternoons from 13-17 and Wednesdays from 9-17.

A number of tests and surveys were conducted during the course, which is the basis for the data presented in this report. In the group formation process (which is held at second teaching session, meaning early September) the students filled out a form in which they self-assessed their skills in project management and business, as well as their intended workload for the course. In the beginning of the course, at home, the students had also filled out a personality test (JTI - Jung Type Test). This JTI-test is a test which takes approx. 40minutes to fill out, and then a person's individual characteristics are suggested. The last day of the course, the students did a *creativity* test, they filled out a questionnaire which contained questions on *entrepreneurial intent and entrepreneurial self-efficacy*. Their final presentation, which is a presentation of the innovation and entrepreneurship project that the students have invented during the course, were done in front of a panel consisting of three experts (two generalists and one expert belonging to the subject field of the startup proposed), as well as the three teachers that were in charge of the course. The panel assessed the performance, and it is based on these evaluations that the group performance is measured. Below I describe the variables.

Variable description

Performance: Performance is a measure based on five Likert scale questions concerning the project that the students had worked on during their course. The experts evaluated each project based on how innovative it was, how implementable, how market oriented it was, the potential of the team, and the potential of the project. The measure is therefore a project group measure. The test of the scale is adequate with a cronbach alpha=0.85, why the individual questions are summed to one measure *performance*.

Entrepreneurial intent: Entrepreneurial intent is a widely used construct in management research to study the likelihood of individuals becoming entrepreneurs (Bird, 1988; Carr and Sequeira, 2007; Lüthje and Franke, 2003; Thompson, 2009). In this study we rely on scale used in previous studies and explore the construct based on 6 Likert scale type questions concerning the degree to which the respondent have intentions of becoming entrepreneurs (Cronbach alpha=0.88).

Creativity: To measure the students creativity level we use the widely acknowledged divergent thinking test (McCrae, 1987). Students performed the test during the last day of the course.

Entrepreneurial Self-efficacy: To measure the student's entrepreneurial self-efficacy we used a construct based on 19 Likert scale type questions (Cronbach alpha=0.88). Entrepreneurial self-efficacy is a measure of a person's (here a student) own belief in her/his ability in becoming an entrepreneur (Bandura, 1997).

Personal characteristic: At UCPH there are several persons in the carrier team that are skilled JTI-testers and educators. These persons are part of course to help minimize group work troubles, so groups can focus on the teamwork while knowing the "up-and downsides" of their group members. In this report we use the results from the test the student conducted at home. The test focuses on four dimensions *Extraversion/Introversion, Intuiting/Sensing, Thinking/Feeling, and Perceiving/Judging*.

Project Management Skills: At the beginning of the course we had students answer on a 5-point Likert scale their self-perceived project management skills. Business Knowledge: Students rated their own business knowledge on a 5-point Likert scale. Level of Ambition: At the second class students were asked to rate their level of ambition for the course (5-point Likert scale).

Gender: A dummy variable taking 2 if female, and 1 if male.

Age: The age in years of the student.

UniversityBusinessSchool: This variable takes 1 if the student is from UCPH and 0 if from CBS.

Results and Discussion

In Table 10.1 and Figure 10.1 the descriptive statistics of the variables are presented. As expected with an elective course we observe that the students enrolled in the programme is highly engaged, having a mean of 3.85 on a

5 point scale. No students rate themselves below 3. As the descriptive data also suggests, the course was divided almost equally between female and male students, and students with an average age of 25 years. To examine the students' entrepreneurial intent we use the measure *Entrepreneurial Intent*. Descriptive statistics show that 47% of the students 'somewhat strongly agree' or 'strongly agree' that they are ready to do anything to be an entrepreneur. This percentage is slightly higher than what has been observed in other studies internationally (e.g. see paper by Luthje and Franke 2003 that reports on 7 international studies of entrepreneurial intent). Table 10.1 and the histograms in Figure 10.1 also show the diversity of the students in terms of several of the central elements of entrepreneurship and innovation.

Entrepreneurial self-efficacy, the students follow a normal distribution in terms of their own perception of their entrepreneurial skills (See Table 10.1 and Figure 10.1, min=2.368, max.=4.368, mean=3.246). Banduro (1997) argues that self-efficacy can be obtained by applied learning or if persuaded (e.g. from teachers or experts). The questionnaire was done at the end of the training, thereby suggesting that even after the master elective programme not all students felt entirely prepared, having high self-efficacy, to solving entrepreneurial tasks, and this even despite that 47% (as explained above) are eager to become entrepreneur (entrepreneurial intent).

For studying the personality traits of the student we used the tests based on the JTI-typology, there were four different continuums explored: 1) Extraversion versus introversion, where 57% of the students are extrovert, 2) Sensing versus intuiting, where 48% of the students are sensing, 3) Thinking versus feeling, where 37 % of the students were thinking more than sensing, and 4) Judging versus perceiving, where 48% of the students were more judging than perceiving. As the descriptive data shows, three out of the four continuums are almost dividing the class, whereas there is a majority of students that rely more on feeling than thinking. One could think that a class on entrepreneurship would have an overweight of extrovert students, as entrepreneurship often requires heavy investment in networking, however, the data presented here shows that this is not the case.

If we look at the creativity test, the results show a minimum score of 4, maximum value of 16 and a mean of 8 (std. dev of 2.0), suggesting a normal distribution.

In Table 10.2 pairwise correlations are presented. As expected, and following a rich literature stream the correlation between entrepreneurial self-efficacy and entrepreneurial intent is highly correlated. Also the correlation between being a business school student and assessing own business

knowledge is positive and significantly correlated, as expected. Interesting we can also observe that there are certain personality traits that differs according to being a business (CBS) versus being a natural science students (UCPH), UCPH are correlated with being sensing, whereas CBS students correlates with being intuiting. In Table 10.2 we can also see that higher levels of ambition are positively correlated with judging rather than perceiving. The correlations also shows that having a high level of ambition is correlated with entrepreneurial intent, this is interesting, this shows that the students that entered the course with high level of ambitions (as this was the time the ambition question was asked), also were the students that at the end of the course has the intention of becoming entrepreneurs. The data does not tell us that this intention of becoming entrepreneur was developed during the course, it might therefore very well be that the students that had the intention to become entrepreneurs, also from the very beginning were the ones with a high level of ambition for the course. Both explanations could be plausible, and neither are ruled out. Lastly I looked at whether receiving a high performance in the end of the course where related to any of the measures explored. As the projects were done in groups, the rating of the performance was also based on the group performance. The pairwise correlations shows that at a 5% level no variables are correlated with higher performance. However, it also shows that there is positive correlation between entrepreneurial self-efficacy (0.2508) and Creativity (0.1548), two variables that we could expect could be correlated with higher performance.

Implications for teaching

The descriptive results presented in this report showed a highly diversified group of students, with a strong desire to becoming entrepreneurs. In a teaching situation this should be taken into account in the way groups are formed and the types of applied learning processes I as a teacher make the students engage in. First, in terms of setting the most optimal teams, acknowledging the fact that they are a highly diversified group, makes the process important. It is therefore not only a process of ensuring that students with a variety of educational backgrounds end up in the same groups, but there is also a need for ensuring that they accept each other's personal differences and are able to see the benefits of being different, having different competencies will help in the complex process of developing ideas,

assessing them, and implementing them. Doing this is also about making the individual students aware of their own profiles as well as how their profile stands out different from others. Second, entrepreneurship and innovation is not only about generating great ideas, it is also about developing the ideas into business opportunities, as well as setting up a firm. These three elements are very different, and it is likely that students with different profiles will be better at certain elements than others, assigning groups where different profiles are present is therefore essential. Finally, in the evaluation of what the individual student has learned about entrepreneurship and innovation, I as a teacher should also ensure that the students are evaluated based on the curriculum taught. If only basing grades on the projects they come up with, the grade will be much related to the idea generating process, and therefore linked to certain traits that only some students possess. Instead grading and examination should be partly relying on the curriculum as such, giving also the students that does not have a creative mindset an opportunity to perform equally well to the very creative students.

Tables and Figures

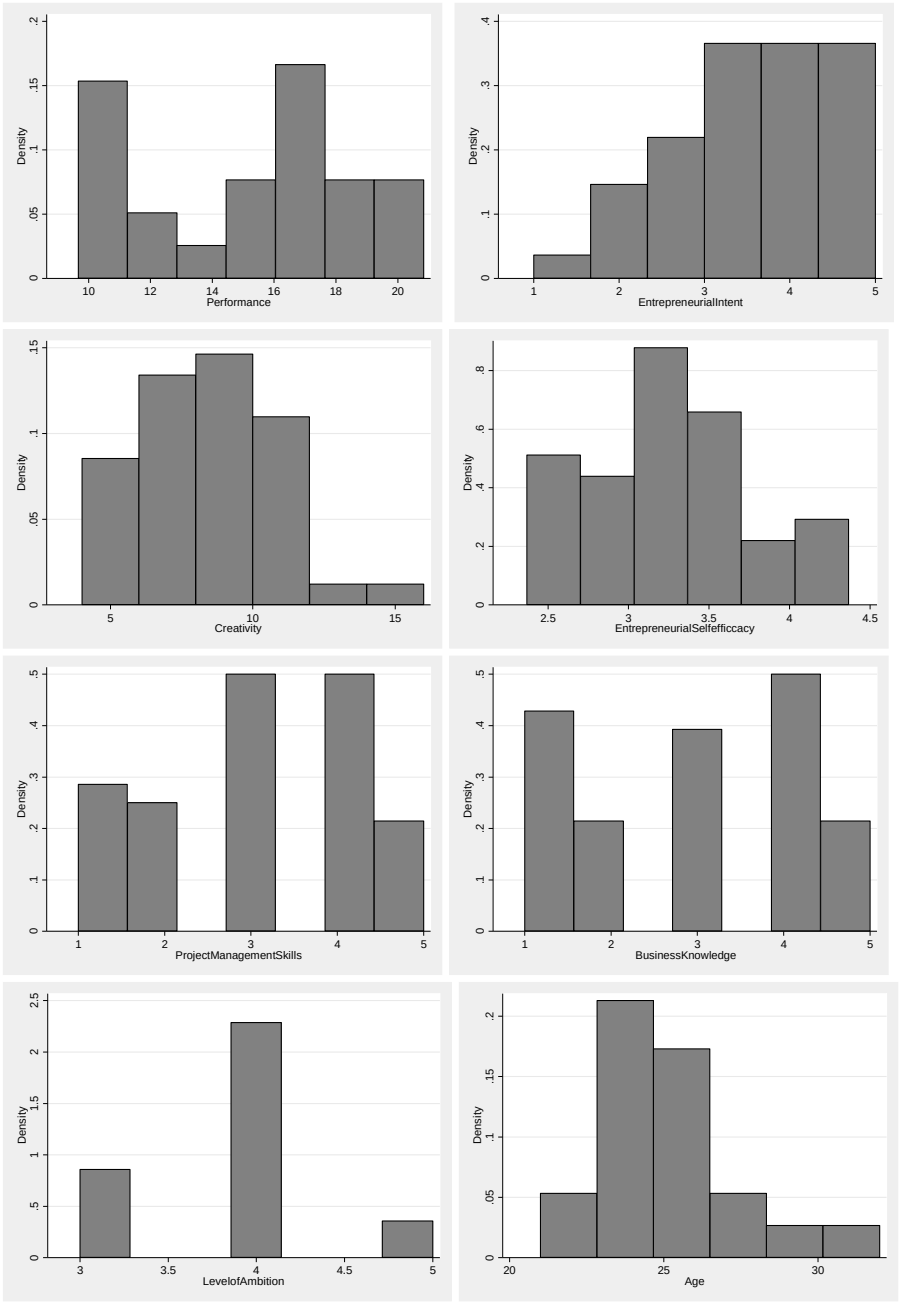

Fig. 10.1: Histograms

Variable	Obs	Mean	Std. Dev.	Min	Max
Performance	49	15.173	3.619	9.666	20.833
Entrepreneurial Intent	41	3.504	.905	1	5
Creativity	41	8.048	2.459	4	16
Entrepreneurial Selfefficacy	41	3.246	.512	2.368	4.368
ExtraversionIntroversion	46	.565	.501	0	1
SensingIntuiting	46	.478	.505	0	1
ThinkingFeeling	46	.369	.488	0	1
JudgingPerceiving	46	.478	.505	0	1
ProjectManagementSkills	49	3.061	1.265	1	5
BusinessKnowledge	49	2.918	1.381	1	5
LevelofAmbition	49	3.857	.577	3	5
Gender	41	1.634	.487	1	2
Age	41	25.048	2.438	21	32
UniversityBusinessSchool	55	.363	.4854	0	1

Table 10.1: Descriptive statistics

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Performance	1													
2	Entrepreneurial Intent	-0.0396	1												
3	Creativity	0.1548	0.2749	1											
4	Entrepreneurial Selfefficacy	0.2508	**0.5006**	0.3074	1										
5	ExtraversionIntroversion	0.0471	-0.2691	**-0.4033**	0.0352	1									
6	SensingIntuiting	-0.1232	-0.1380	-0.1360	-0.1891	-0.1260	1								
7	ThinkingFeeling	0.0673	-0.0883	-0.1756	0.0663	0.0356	0.0784	1							
8	JudgingPerceiving	0.1706	0.2205	-0.2947	0.0854	0.0496	**0.3902**	-0.0118	1						
9	ProjectManagementSkills	-0.1531	0.1975	0.0363	0.2725	0.0928	-0.1253	-0.0237	-0.0546	1					
10	BusinessKnowledge	-0.1552	0.0539	0.0604	**0.3451**	0.0596	**-0.4008**	-0.2727	-0.1160	0.3723	1				
11	LevelofAmbition	0.1549	**0.3835**	0.2517	0.0426	-0.0363	0.0791	0.0747	**0.3022**	0.1834	-0.1455	1			
12	Gender	-0.1736	-0.0343	0.0986	-0.1565	0.0164	0.2582	-0.4667	0.2102	-0.0060	-0.1007	0.0104	1		
13	Age	-0.2965	**0.3527**	-0.0129	0.2184	-0.0861	-0.2606	0.1890	-0.1375	0.1898	-0.1264	0.0731	-0.1738	1	
14	UniversityBusinessSchool	0.1369	0.2452	0.1258	-0.0546	-0.2440	**0.4342**	0.1810	0.1691	-0.2728	**-0.6790**	0.0623	0.1253	0.1474	1

Table 10.2: Pairwise correlations. Correlations in bold are statistically significant at the 0.05 level or lower.

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Part V

Assessment

11

Qualitative formative feedback to the teacher benefits both student and teacher

The use of "LEARN evaluation" a modified "one minute paper".

Melissa C. Lutterodt

Department of of Public Health
University of Copenhagen

Introduction

Good teaching requires good communication. - How does a teacher know if his or her teaching is understandable? – Or if the students achieve the knowledge expected - the intended learning objectives (ILOs)? It is well known that feedback is important for both teachers and learners(SEaabDA, 2004). The point is that teachers do not always know how students experience teaching and where the problems are(Rienecker, Jørgensen, Dolin, and Ingerslev, 2015).

This paper does a summative evaluation on the formative feedback given to the teacher by medical students using "the LEARN paper". The question is - does this evaluation method benefit teacher and students? - And if how?

Summative evaluation is known as external, retrospective and indicates a status or value of the course. While formative evaluation is internal and is made to improve the process of learning(Rienecker et al., 2015).

Evaluation by medical students is usually only accomplished by a standardized summative assessment performed at the end of a course provided electronically by the faculty. But is that kind of summative assessment on its own useful when evolving better teaching and purchasing improved learning among students? One could ask the questions: - how many students do fill in these evaluations? - Are these students representative for the class? Is it useful for at teacher to receive an assessment stating only: *"the teacher*

was disengaged"? - What does that mean? - And does it help the teacher's communication skills? Generalized questionnaire may actually impede educational development. For that reason the teacher need to have a different approach to know what matters in terms of students outcome for the purpose of developing the teaching(Rienecker et al., 2015) By formative feedback the teacher and student can create the best possible conditions for students' learning. Formative feedback can be obtained by several methods i.e. the Delphi Method, reference groups, the Post-It Method, college supervision(Rienecker et al., 2015).

The formative evaluation method used in this study "the LEARN paper" is based on the "one-minute paper" (Cross, 1987).

Theoretical background

What is the one-minute paper?

The one-minute paper is one of the most widely known and used classroom assessment techniques in higher education. It is based on two techniques the *half-sheet response* described by Weaver and Cotrell (1985) (Weaver and Cotrell, 1985)and the *Minute Papers* reported by Wilson (1986) (Wilson, 1986). The one-minute paper described the first time by Cross and Angelo (1988) involves asking students to write brief answers to a couple of specific questions, usually during the last few minutes of class, thus providing instant feedback from students regarding the lesson of the day(Cross, 1987). The two original questions were:

1. What was the most important thing you learned in today's class?
2. What question or questions that you have from today's class remain unanswered?

The questions can be modified in various ways, but they should remain open-ended. If properly focused, the one-minute paper is a manageable way of assessing how well students are learning. The effort it takes to prepare this assessment technique, the time it takes for students to respond, and the time and energy required to analyze the data are low(Angelo and Cross, 1993) The one-minute paper is easily adaptable and is used in lectures, lab and any other type of classroom situation. Vonderwell (2004) has even recently used the one-minute paper technique in an online class to successfully identify the learning needs of her students and to improve her teaching.(Vonderwell, 2004)

What is the LEARN paper?

The LEARN paper is a modified expanded version of the one-minute paper comprising the following five questions asked anonymous:

Q1 What was the most important **I** learned in today's class?
Q2 What from today's class remain unanswered or is still not clear?
Q3 What would **I** like to improve?
Q4 What **am I** going to use in the future from today's class?
Q5 How **did I** feel about today's class?

It is unknown for the author of this paper who has promoted this version of the one-minute paper.

Pedagogical background

Why use the LEARN paper?

The LEARN paper is available for all teachers teaching the "Master's program in General Practice". It is not mandatory but intended as a feedback possibility concerning the teachers teaching. The LEARN paper is only used by few of the teachers possibly just because it has not become a habit for the rest.

The intention for me was to give the best possible teaching with the skills I had. Meaning limited teaching experience and not pedagogically educated most of all autodidact. Therefore as new teacher it was an opportunity and quit demanding for me to receive feedback in terms of optimizing my teaching on-going. With my own former experience of endless frustration due to often poor, demotivating teaching and lectures I was curious about which knowledge for improvement the formative feedback paper could provide my teaching with.

Objectives

Hypothesis: Students motivation for learning in class requires good teaching. Good teaching requires good communication. Improved dialogue between teacher and student by qualitative formative feedback to the teacher both improves teaching and lead to better learning outcomes due to increased student reflection and ownership for own learning.

The aim of this paper is to study what the qualitative formative feedback tool "the LEARN paper" imply for the student's learning and for the teachers improvements. The following questions are explored:

1. Was the feedback useful in terms of teaching improvements?
2. To which degree did the students feel an increased ownership in their own learning as a consequence of using the LEARN paper?

Materials and Methods

Manuscript for every lesson

Before teaching the very first course, I prepared manuscripts with different medical themes for the five lessons that the "Master's program in General Practice" spanned. These were used during the lessons. After each lesson I related the manuscript to the feedback I received from the student's LEARN papers. This experience together with the insight I accomplished during the lesson conducted the base for eventually adjustments of the manuscript. Thus, these assembled experiences were drawn into preparations of the following identical lesson of the next course.

How was the LEARN paper used in class?

During autumn 2015 and spring 2016 I taught the "Master's program in General Practice" four times. The course signified five classroom lessons each of four hours. All four courses were assessed by using the qualitative formative LEARN paper. The medical students were provided with the *LEARN paper* about 10 minutes before the end of each lesson. The LEARN paper was analyzed by me as mentioned above right after the lesson assessing the various feedback of the day.

E-mail conversation

An e-mail was sent to the students before the first lesson. Furthermore e-mails were sent as follow up on each lesson. The e-mails comprised 1) an overview of the ILO's or themes of the day, 2) which ILO's and themes I expected the next lesson would concern, 3) If any consistent problems revealed from the feedback these were answered.

Table 11.1: The number of LEARN papers received during the four courses each comprising five lessons (* lesson that it was unfortunately not possible for me to attend)

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5
Course 1 (team 12)	8	8	6	6	8
Course 2 (team 23)	6	7	7	7	7
Course 3 (team 6)	9	9	9	10	14
Course 4 (team 10)	10	6	10	10	-*

Reflection on what the questions embodied in the LEARN paper imply for student and teacher

First of all the questioning technique of the LEARN paper differs from the one-minute paper by asking the questions in first person *'I'* opposite the one-minute paper using second person 'YOU'. This often appeals to honesty and commitment for the person answering as it appears more personally being asked in first person.

In general question 1 and 2 were answered quiet straight forward and seemed well understood. Medical students attending the Masters Classes are greatly experienced in adapting and understanding new medical knowledge thus ranking highly in Blooms' Taxonomy of understanding(Bloom, 1956). The first question directs students to focus on the big picture, that is, what is being learned, whereas the second seeks to determine how well learning is proceeding. By these questions the students synthesize what they learned before leaving class(Panitz and Panitz, 1999).

The answers gave me, as a teacher, a very good picture of which topics were well understood and which needed further explanation.

The questions 3 and 4 appeals to the students own reflections on the learning outcome. Reflections that lead to the process of ownership or responsibility for own learning. Since the student consider what is useful for 'me' as a physician and hereby assessing which intended learning outcomes are most important or useful for he or she?

Question 5 provides general feedback or informative reasons for why the level of teaching was either to low, high, perfect or out of context or if anything lacking. In addition the very honest comments contribute to gain knowledge concerning the atmosphere in class (which should not be underestimated) and often help to understand the students' on a more personal level. Indeed this approach allows teacher and students to share their

conceptions about both the goals and processes of learning. By this dialogue an invisible contract between students and teacher appears setting rules for both teaching and learning known as the *didactical contract* introduced around 1980 by Guy Brousseau(Brousseau, 2006).

Results and reflections

Regarding aim 1:

The teaching improvements that I implied ongoing was on the basis of the feedback (LEARN papers), the e-mail correspondence, individual as well as dialogues in class and from what I perceived while teaching the class. Some answers quoted by the students in the LEARN paper might appear short or internal - but often these answers gave me a good idea of what they referred to from the lesson. Other times more explanation was needed which could sometimes be possible to get by asking the class by e-mail or simply pick up the issue in next lesson. This would not have happened without receiving the answers from the LEARN papers. I improved my teaching from the knowledge on:

a) what was understood (question 1) or not understood (question 2)
b) the diversity of students in the class and knowledge on which learning styles the specific class needed from one course to the next course
c) how it worked with the overall changes I made from course to course

Regarding the following examples of quotations: I have generally only used one quotation from each question even though several students wrote more than one answer per question.

a) In these examples the first quotations are from different lessons and courses (teams). While the next quotation (student A,B,C,D) refers to the answers from the same lesson and course.

Answers to Q1: What was the most important **I** learned in today's class?

"The communication aspect of the consultation" (student, team 23 lesson 5)

"How you have to think as a doctor when having a patient with lower back pain" (student, team 10 lesson 2)

"*Check the old patients medicine journal" "give space for dialogue concerning feelings when with the patient" (student, team 6 lesson 4)*

Answers to Q2: What was the most important **I** learned in today's class?

"How to handle the clinical questions (used for exam)" (student, team 10 lesson 2)

"Certificates, and sick leave" (student, team 6 lesson 4)

"Exam, how do I prepare best? (student, team 23 lesson 3)

These comments are very tangible in terms of medicine to follow up. They are constructive and telling what to keep in my teaching, what was understood and what needed further effort.

Example: team 6, lesson 3; with themes as: child examination, infections and acute illnesses:

Student A:
Answers to Q1:
"Children in general practice the signs and symptoms to react on and what is normal for this group of patient"
Answers to Q2:
"The PSOAP-model (i.e. a specific way of writing GP journal), but this is probably because it is the first time I'm attending class!"

Student B:
Answers to Q1:
"To distinguish bacteria from virus" and "good ideas to communication technics by watching peers video recordings (the students bring video-recordings of themselves handling patients in general practice)

Answers to Q2:
"Nothing of what we went through today"

Student C:
Answers to Q1:
"Child examination overview and upper tract respiratory infection overview"
Answers to Q2:
? ?

Student D:
Answers to Q1:
"Child examination in general practice the signs and symptoms to react on"
Answers to Q2:
N/A

The later quotations (by student A, B, C, D) show an agreement in the experiences the students adapted from that specific course day. Thus the majority accomplished knowledge about child examination etc. Further concerning this particular lesson the students seemed not to have unanswered questions except student A. Often question 2 was answered with topics that was not well understood nevertheless the most answers were similar. The LEARN paper helped me distinguish which topics to refocus and which to urge the students awareness of not using endless time on.

b) By the following examples of answers to question 5, I got a very good feeling of the diversity of students' in the particular class which differed from course to course. In addition often teaching and learning styles that appeals the most was discovered.

Answers to Q5: How **did I** feel about today's class?

"Interesting! Educative! A bit unclear how we were supposed to do the role play when in groups" (student, team 6 lesson 4)

"Good. Alternatively better time managing on the different topics, instead of using a lot time on the first topic then having to rush through the last ones" (student, team 6 lesson 3)

"Fine, though important to keep it structured when reviewing clinical issues" (student, team 10 lesson 2)

"Really great with coffee in the class – it gives a good and cozy atmosphere which keeps us awake" (student, team 12 lesson 1)

"I lose my concentration if we continue overtime" (student, team 12 lesson 4)

"Comfortable to be in class – the speed which we are taught is high, but we get around much"(student, team 23, lesson 5)

An example of a change I did was: I started every lesson writing the agenda of typically three or four topics on the white board. The students had to agree on the agenda before we moved on and if necessary we agreed on adjustments. Hereby a didactical contract was established. Afterwards the teaching appeared more transparent and structured to both parts and further better time managing occurred due to these adjustments of my manuscript:

Student comment Q1:

"Great with the agenda on the white board" (student, team 6 lesson 3)

Student comment Q5:

"Good, better structure and we are getting around in all corners" (student, team 6 lesson 4)

"Good! Great balance between group work versus plenum and speed as well as level is fine" (student, team 6 lesson 5)

c) Using a manuscript as a tool adding my own comments after each teaching session made it possible to remember my experiences and connect these with the feedback from the LEARN paper. Hereby it was possi-

ble continuously to imply adjustments (i.e. time management or change of learning styles) for the next lesson. Some classes requested more clinical questions or lecture or video-recording others preferred more or less role-play etc. These changes are trackable in my manuscripts covering the four courses and would probably not have been that visible or taking into notice without reviewing the LEARN papers.

The comfortable atmosphere mentioned (several times) by the students' seemed important. Possibly because of the video recordings where the students become vulnerable when exposing themselves. This was one of the reasons why I kept one of the breaks for coffee and bread - the latter brought by the students or me in turns. It was often commented by the student as meaningful to feel in a safe atmosphere.

Regarding aim 2:

What was actually decisive for the increased ownership in own learning that the students became aware of and took on? How much can be ascribed the use of the LEARN paper?

I think at least *four reasons* are to be focused on: a) Probably the most important and not to be underestimated is that medical students attending the "Master's program in General Practice" are becoming doctors within a few months and therefore their motivation for understanding, handling patients, getting all the possible skills needed as a doctor are crucial. b) Thus the LEARN paper might not be ascribed for the increased ownership taken on by the students. Nevertheless the LEARN paper probably helps the process by continuously pushing the students' awareness and reflection. In addition it helps the students' self-assessment on how well they understand what they have been taught and simultaneously supports deciding what is essential or not in the near future as doctors. Especially the LEARN questions 3 and 4 generate this consciousness but even sometimes question 1 does.

Answers to Q1:

"That I need to show reflection and understanding for how one should move on - more than just professional knowledge" (student, team 23 lesson 3)

Answers to Q3: What would **I** like to improve?

"Everything" ☺ "But especially getting better in systematic examination of the patient" (student A, team 6 lesson 3)

"To structure my consultations with patients – this I'm going to practice now" (student B, team 6 lesson 3)

"Giving the patient time to tell his or her story – not asking the patient questions" "asking questions related to the patients feelings" (student C, team 6 lesson 3)

"To make an action plan (together with the patient)"
"Remember the 'safety net' (refers to an agreement with the patient about how and when to react if exacerbation)" (student D, team 6 lesson 3)

Answers to Q4: What **am I** going to use in the future from today's class?

"The advices on how to get in contact and examine children" (student A, team 6 lesson 3)

"Facts from the power point presentations and the 'centor criteria' (specific diagnostic criteria for upper tract infections)" (student B, team 6 lesson 3)

"Lower back pain/ lumbago overview"

"Elastic workout as breaks during a work day – for sure!" (which we did during the course!)(student C, team 6 lesson 3)

"That it is acceptable to 'wait and see' as long as you have provided the patient with a 'safety net'"
"Lean on guidelines and inform the patients about why they do not necessarily need treatment" (student D, team 6 lesson 3)

c) However the exam and alignment of the course undoubtedly have a certain impact on the students to aspire towards the ILOs for the reason of improving performance on the day. This may influence more than usual exams since exposure by video presentation concerning the students' as doctors treating real patients in general practice is a vulnerable situation.

For a few students this might be the main reason for being active in class and does not walk hand in hand with taking ownership for own learning - but rather contextualized by "how do I pass exam". d) I always tell the students during the first lesson that their time is precious why they should only attend the lessons if they find it meaningful. This in fact provokes their reflection on deciding how to take responsibility for own learning. Responses regarding the latter:

Comment to Q5:

"It was cozy and informative. Not waste of my time – I'll come back again☺" (student, team 6 lesson 1)

"So good, that I am very aggravated that it's my first time attending this class" (student, team 6 lesson 3)

Conclusively, the ownership for own learning is obviously present. The main reasons for that are perhaps a) and c), while b) (the effect of the LEARN paper) seems to play a role in facilitating the process.

Discussion and Conclusions

When is it reasonable to use the LEARN paper?

Despite its simplicity the LEARN paper has shown to be a very useful feedback tool especially for me being a new teacher. But still as indicated by others, the concept of the one-minute paper has proved useful for all teachers that wish to improve their teaching based on better dialogue(6, 9).

The pros I experienced **as a teacher** using the LEARN paper was: a) I continuously developed my own teaching skills. b) It helped me establish learning objectives matching learners' needs and skills and follow the extent to which they were met. c) It provided me with information for ideas to potential changes or adjustments of the course design.

For the **student** the pros observed by this study were: a) to be valued and listened to, this in accordance with Cross and Angelos observations using the one-minute paper, reporting that respect for and interest in student

opinion encourages the student's active involvement in the learning process(Cross, 1987). b) To develop reflective thinking which Angelo some years later refers to by the sentence: "to come up with a question, students must self-assess—asking themselves how well they understand what they have just heard or studied"(Angelo and Cross, 1993) which increases the student's ownership in own learning. c) To maximize their learning which happens during their individual feedback as it helps the students' to hold on to the many facets of their reflection after a lot of discussion in plenum. Instead of confusion they accomplish focus on several aspects.

For **both parts** the benefits I perceived: a) Enhancement of relationships and better understanding of each other despite the course was short. These findings are in accordance with earlier studies (1, 9). b) To provide a 'positive' teacher/student partnership or commitment, which enhance the chance of ensuring high quality teaching thereby meeting learners' needs and moreover attaining the didactical contract. No doubt that speaking at same eye level and dare showing respect, curiousness and a degree of humility as a teacher gives you all the benefits to easily harvest honest feedback from the students. Subsequently their motivation for giving feedback is increased greatly by such dialogue. As clarified by Rienecker et al. : *"Students become more engaged in teaching and more conscious of their role in creating a good learning environment if they are involved in a genuine on-going, formative evaluation of the teaching's qualities and shortcomings"*(Rienecker et al., 2015). c) To contribute with another qualitative understanding of the mechanisms of teaching and learning.

In conclusion, the LEARN paper being a simple, flexible and widely applicable technique requiring no technology and producing very beneficial results for a modest amount of time and effort, has for me been overwhelming beneficial regarding the above mentioned aspects during my teaching. Nevertheless, I am aware of that the LEARN paper is only a part of the didactical contract I accomplished with my students which further comprised; The individual talks I had with the students in the breaks, the e-mail correspondence, the dialogue during the lessons and the follow up on my manuscripts. These are all cornerstones in the didactical contract that appeared between me and the students. Being aware of this I strongly recommend using the LEARN paper as feedback tool in teaching.

Perspectives and limitations

Basically the LEARN paper gives great advantaged being a new teacher, as well as an experienced teacher or when starting a new course. If teaching a very long course i.e. classes every week a whole semester, maybe spot evaluations during the semester could be valuable in terms of sensing the students and keeping a respectful and fruitful dialogue. If being a very experienced teacher who has taught a course for several years possibly a period of formative feedback might be an eye-opener for up-grating the course. Even if only used in the very first lesson (perhaps again midterm and at the end of a course) it can be valuable providing better learning outcomes. Moreover, the LEARN paper can be used in any kind of teaching large as well as small classes or lectures as seen with the one minute paper that has been used successfully in lectures with 150 students (Cross, 1987). Though it might be tough to read through 150 questionnaires holding five questions each and thereby perhaps analyzing data is the greatest limitation?

Nevertheless continuously use of the LEARN paper will in time become annoying and stressful for everyone and hereby provide a non-useful tool that may even impede the dialogue, resulting in declining learning outcomes.

As mentioned initially, the technique has been used fruitfully in an online class(Vonderwell, 2004). Which feeds interesting thoughts in the direction, of how to use the five LEARN questions in an interactive digital media such as *'Socrative' or 'TodaysMeet'* during class (perhaps not all question in one). Hereby giving the students the opportunity to reflect on comments from their peers and maybe even during class as formative feedback to peers and teacher.

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Part VI

Supervision

12

Aligning Expectations In Bachelor Research Supervision

Emily Catherine Pope

Natural History Museum of Denmark
University of Copenhagen

Introduction

For many students, the bachelor research project represents the culmination of the first phase of their secondary education. It is their first chance to do 'real science'; an opportunity to take ownership of the knowledge they have gained in their coursework, and apply it with an unprecedented independence. Under the guidance of their project supervisor, students are expected to produce a report that demonstrates their ability to formulate and critically analyze a scientific problem. But what type of guidance do these students require? While certainly the answer to this question depends greatly on the individual student, it broadly requires that the supervisor is familiar with the expected scale of the project, with how well prepared the student is in their third year of study to execute an independent research project, and with the expected quality of the final report.

This study, inspired by my inaugural year advising students in their bachelor thesis projects, aims to define what to expect and what my responsibilities are as an advisor. Guidelines from the SCIENCE study administration state that as a principal supervisor, I am responsible for "Ensuring that the bachelor project is of a scope that can be completed within the specified time frame." As a first-time advisor, and an international researcher unfamiliar with the academic structure and rigor in Denmark, I do not yet have the tools to meet this responsibility.

In order to better understand the role of the bachelor project within the education of Geology and Geophysics at the University of Copenhagen, I completed interviews with an assistant professor at the Natural History

Museum, an associate professor and a professor at the Department of Geosciences and Natural Resource Management, an external censor who regularly examines bachelor projects, and a recent graduate of the bachelor program who is currently a PhD student at the Natural History Museum. In the faculty interviews (Appendix A), we discussed faculty's expectation of workload, in terms of hours spent and the scale of the final project, what skills and competencies they observe their students gaining through these projects and to what extent that helps them as they continue their education, and finally any personal experiences they deem relevant. I compared the answers of the faculty members with the criterion by which the censor evaluates bachelor projects, and the perceptions of the student about the purpose of the bachelor project, the role of the advisor, and the rigor of assessment.

Two clear outcomes emerged from the interviews. First, while there is generally agreement on intended learning outcomes for the bachelor project: to be able to analyze a problem critically, synthesize information from the literature, and present knowledge clearly in a report, the types of projects, level of advisor involvement, and standards for assessment are decided individually by each faculty member. There is no reference to a common rubric or departmental standard, and there is no way to compare outcomes across the faculty. Second, every interviewee identified two critical factors that they observed optimized students achieving these learning outcomes. Students are most successful when they feel ownership of their studies by carrying out their own research project, from developing a hypothesis, to collecting and analyzing their own data. Students also require a significant time to think; the best projects were those when students had more time to analyze their data and synthesize that with what they learned through scholarship.

In the following sections I will briefly introduce the individuals interviewed for this project, review the intended learning outcomes of the bachelor project and how those are perceived by the faculty that I interviewed, discuss how independent research projects optimize those learning outcomes, and explore the role of assessment in the bachelor project. Finally, I offer suggestions to the study administration on methods to improve the constructive alignment between the learning objectives and assessment, and propose a reconsideration of the existing bachelor study plan to better meet the learning objectives of the bachelor project.

The Interview Subjects

It is not within the scope of this study to get a comprehensive and statistically significant overview of how faculty, students and censors perceive the role of the supervisor in bachelor projects. Rather, this work is intended to help me prepare for the role of bachelor project advisor, and develop tools that might help other new faculty as they prepare for the same role. Representatives were therefore recruited to share their individual experiences and impressions of the bachelor project process in order that I might obtain a holistic view of the value, scope and expectations of the bachelor project and how this is taught to faculty who advise, students who participate and censors who assess. Interviewees were selected for their diversity of perspectives on the subject, and include:

Adjunkt: an assistant professor at the Natural History Museum; has co-supervised two bachelor students.

Lektor: an associate professor at the Institute for Geoscience and Natural Resource Management; has advised 15-20 bachelor projects.

Professor: a professor at the Institute for Geoscience and Natural Resource Management; has been a faculty member for 14 years, advises several students each year.

Censor: an emeritus researcher at the Geological Survey of Denmark and Greenland; has served as a censor for about 20 bachelor projects, advised by several different faculty members.

PhD Student: a current PhD student at the Natural History Museum; completed his bachelor project under the supervision of a faculty member at the Natural History Museum for the study program of Geology and Geophysics (offered through the Institute for Geoscience and Natural Resource Management).

All members are working within the study program of Geology and Geophysics. In the interest of privacy for those who participated in the interviews, their names have been omitted, and they are referred to in the subsequent text by their Danish title only.

Intended Learning Outcomes of the Bachelor Project

"I remember that being a major issue, I was looking everywhere and was asking people in the administration what are the … like, how many pages are you supposed to write, what are the rules to the bachelor project? What

do people expect that I do, and I just couldn't find any material on it. No one was really, sort of… no one knew anything." – PhD Student

Every course offered at the University of Copenhagen enters the curriculum only after clear learning objectives are defined by the course responsible, and approved by the relevant study boards. These learning objectives are advertised in the course catalog, and courses are assessed (and educators evaluated) on how well learning objectives were met through class teaching and learning activities. In the bachelor project, learning outcomes are only found in Bilag 3 of the Rules of Study for the BSc program in Geology and Geophysics, available – but not accessible through an obvious link – through the KU intranet. The document is only available in Danish. My own translation of the learning objectives is presented in Inset 1 (see Supplementary Notes for navigation details to the bachelor project guidelines available on intranet.ku.dk).

Of the three faculty I interviewed, none were familiar with the published learning objectives of the bachelor project, or where to find them. Rather, each faculty member identified their intuition and experience as the primary tools they use to guide their advising, and each prioritized a different aspect of the project as the most important learning objective. The Adjunkt felt that the main goal of the project should be teaching students to become self-motivated, so that they are able and eager to take on a research project independently. Learning to navigate the literature and to write a clear and professional thesis was prioritized by the Lektor, whereas the Professor identified one of the most basic and important of geological skills: learning to read the landscape and make observations in the field, as the most critical outcome of the project.

"Why is [the learning objectives] not part of the contract? Whenever we get the contract, why is it not just page 3 stapled onto that?" – Lektor

The result of not having the learning objectives of the bachelor project easily available to all relevant faculty and students, is that each faculty member guides their students based on their personal motivations and attitudes about what is most important. Inexperienced advisors, and their students, are distinctly disadvantaged in such a system. And while it is likely that a bachelor student can find value in their project regardless of their advisor, as each faculty member's personal learning objectives have merit when training a young researcher, it makes it difficult to compare students, and for a censor to know what the basis is for grading. Without being aware of learning outcomes expected by the study program, neither the student, the advisor nor the censor can fully reflect on whether the completed project

is appropriately meeting the aims of the activity. Further, as the censor I interviewed pointed out, at the time of the bachelor project, a student's future career is not yet decided. Thus, training at the bachelor level should give them tools they can use in a variety of professions after graduation, and advisors who emphasize the training of skills that are specific to academic research because that is what they value most, may be doing their students a disservice.

INSET 1: LEARNING OBJECTIVES FOR BACHELOR PROJECT IN GEOLOGY-GEOSCIENCE[3]
(personal translation from Danish)

A student who has completed a bachelor project in geology-geoscience will have the following learning outcomes

Knowledge in:

- How to explain how a geological problem is defined and handled within a given geological discipline, with emphasis on formulating and analyzing the problem
- To reflect on existing or new knowledge within the specific discipline
- To critically evaluate academic literature within the field of geology, as well as theories and models used, and any data (obtained?)

Skills in:

- Analyzing geologic problems, observations and results within their scientific context in a meaningful and comprehensive way
- Compare and contrasting one's own observations with another's observations and analyses based on underlying principles as well as knowledge of a scientific method's strengths and limitations
- Choosing the most appropriate theories and methods to apply to a geologic problem
- Communicating a scientific problem clearly and simply, both orally and in writing, using correct geological terminology, and language appropriate to the audience

Competencies:

- Implement a small research project within a geologic field
- Independently develop their own knowledge and skills related to the subject area in which the project is aimed

The Importance of Independent Research

"I think what they find fun to do is the action. That you can actually be out there and collect your own data, and … we are usually in a place where we know absolutely nothing, or just a little bit. So, it's like a Klondike adventure. … I don't know anything and they don't know anything. I think they are inspired by this puzzle." – Professor

The learning objectives intended for the bachelor project emphasize critical thinking: formulating a problem, choosing appropriate methods to

apply to the problem, evaluating the literature and data, and being critical of your own as well as others' observations. Also listed in the learning objectives, and articulated by each of the faculty I met with, is the importance of developing independence; students must learn to develop and execute their project independently. The observation of the faculty members has been that almost invariably, students who do their own research project in which they collect and analyze their own data, have been more motivated and more successful than those whose projects were solely literature based or used existing datasets.

As the PhD student noted, bachelor students have little opportunity in their studies to do "some sort of real work," and most are eager to get their hands dirty. The Professor I interviewed noted that he receives so many requests from students to do bachelor projects with him, because they know that a project will involve fieldwork, data collection and modeling – and that it will be real research; investigating a problem no one has ever looked at before. In the interest of aligning the learning activities of the bachelor project to the intended learning outcomes, designing the project as a student's first true independent scientific research endeavor makes sense. There are advantages to the faculty advisor, too: bachelor projects have become seeds for masters' projects, they have been incorporated into PhD theses and provided a forum for PhD students to gain experience in co-advising, and they have provided preliminary results that supported funding proposals.

"… the external examiners and myself always find that the students are much more engaged when they are generating their own data, because they understand where they are coming from, and they get a fire going, and become proud of what they are producing and then contrasting that with the literature. So, that makes much better bachelor projects." – Lektor

Despite the pedagogical evidence (e.g. DeHaan, 2005; Seymour, Hunter, Laursen, and DeAntoni, 2004) and anecdotal support of the value of integrating real research into the bachelor project in increasing student activation and deep learning, a recent redesign of the study program for the bachelor in Geology and Geoscience will make it nearly impossible to do. Beginning with the bachelor class of 2018 (students who began their studies in the Autumn of 2015), it will be mandatory for students to complete their bachelor project as a full-time course load in the fourth block of their third year. The current study program allows students to choose a full-time one-block (eight week) bachelor project, or to do their project part-time over a

sixteen week two-block period. All of the interviewed faculty encourage or require their students to do their project over the sixteen week period.

As expressed by the Professor interviewed here, the new rule for the bachelor project is "a disaster." With limited number of analytical equipment and the possibility of maintenance problems, it is impractical for all bachelor students (about 50 to 60) to undertake analytical work within the same short time span. Even if there was enough 'machine time' for each student, eight weeks is too short to do extensive, or in some cases any, experimental work. Already, faculty encourage students to do their fieldwork or begin their sample preparation or analyses before the beginning of their sixteen-week, part time project.

In addition to the logistical hurdles and risk associated with doing research in such a short time scale, critical thinking requires time. As this is usually a student's first experience critically reading the literature, synthesizing large amounts of information, and writing a large and professional manuscript, being forced to work quickly ensures that students will learn less deeply. Among the individuals I interviewed for this study, there was unanimous agreement that requiring the bachelor project to be completed within one full-time study block hinders a students' chances of attaining the learning objectives presented by the program's study board.

"Well, especially when you are dealing with lab work, you want to have time for things to go wrong. Also, doing a research project, you want to have time to absorb things, and with only one block, of course you can dedicate all your time to learning something, but you don't always absorb knowledge the right way, and you might not gain the deeper understanding that leads to more advanced understanding." – PhD Student

Alignment of Assessment with Intended Learning Outcomes

Bachelor projects are assessed by two people: the project supervisor and an external censor. They grade the final written report, the student's public presentation of their findings and their answers during an oral examination. There are no clear guidelines for how students are evaluated (see Supplementary Notes for navigation instructions to information for students on the bachelor project), the scale or rigor of expectations, and what the role of the two assessors are. Through my interviews, and limited experience thus far, each censor and faculty member makes their own interpretation of these

criteria. Some censors simply observe and offer comments but allow the advisor to select a final grade. Other censors act as an external examiner, and expect that their more unbiased review of the student should primarily determine the final grade. Some faculty expect that the report be well written and professionally formatted; others evaluate solely or predominantly on the report's scientific content.

"I don't think I know what the objective requirements would be, but when I see it, then I have a feeling whether they understand what they're trying or not. That's sort of what I take as… but maybe you could say that the whole process could slide and all students because they don't expect much of themselves are doing well on that new scale. So, again, here I think it would be good to have sort of a guideline from the university of what it requires. But I haven't seen that." – Adjunkt

This method of evaluation is problematic, for several reasons. First, the project advisor is not unbiased. They have played a large role in the progression of the thesis, and feel a fair amount of responsibility regarding its outcome. Further, as we have observed, most advisors are unfamiliar with the learning objectives, so their assessment may not be valid (it may have systematic errors) or consistent with the purpose of the bachelor project. Finally, with no common rubric for assessment, the reliability, or consistency across faculty, of the assessment is also significantly compromised. The written reports are not public, so there is no way to compare how students advised by different faculty are being assessed, and there is also no way to evaluate whether faculty are constructive advisors, because the success or failure of one faculty members' students cannot be compared to those of another. Most critically, unless an advisor makes the effort to clearly outline how the student will be assessed, students themselves do not know what they are being graded on, and therefore how to manage their time in preparing their final report and presentation.

Conclusions and Recommendations for Improvement

The study board for the bachelor education program in Geology and Geophysics have designed clear learning objectives for the bachelor project. These should be used as a cornerstone for formulating the project that the student will complete, establishing expectations between the student and advisor for how the project will be carried out and what the final outcome should be, and determining the metrics for how the student should be eval-

uated. It is policy within the faculty of Science that when a bachelor project begins, a written contract is made where student and advisor agree on the project to be completed and the expectations of each party to ensure the project's completion. For my own students, the meeting in which we write the contract will henceforth also include discussion of two documents: the learning objectives for the project, and a rubric that clearly details how the student will be assessed on meeting these objectives. Empirical research has shown that when rubrics are topic-specific and analytic (a score is assigned to each dimension of the task), their use can increase reliability in assessment as well as promote learning (Jonsson and Svingby, 2007). A working draft of the rubric I will use is in Appendix B.

In the interest of increasing the continuity of scale and purpose of bachelor projects across faculty advisors, and the validity and reliability of bachelor project assessment, I would encourage the study board to incorporate the learning objectives and an evaluation rubric similar to the one I have developed (designed or agreed to by the study board), to the formal bachelor project contract so that all advisors and students are asked to work within a systematic framework. I believe this will not only place more of the responsibility for success on the student than the advisor, but it will also optimize their chances for success, as the goals and expectations for their project are made clear from the start.

Further, it is critical that the study board reassess whether the new curriculum format, in which students have only eight weeks to complete a project, is well aligned with the learning objectives for the bachelor project. If the purpose of these projects is to teach students to independently develop knowledge and skills in the field of geology, learn to critically evaluate their own work and the work of others, and prepare a well-executed written and oral presentation of what they have learned, they should have the time to do it. Students who have the opportunity to do their own research, and ideally also their own fieldwork, will have a much greater opportunity to appreciate what they are doing, be inspired by their own success and learn for their own satisfaction as much as for a study program requirement. Making it nearly impossible to carry out a bachelor project in this way diminishes its importance, value, and outcome, and is an enormous loss to the bachelor student.

Supplementary Notes

Transcripts of all interviews are available upon request. Contact: emily@snm.ku.dk.

Information regarding completion of bachelor projects for the BSc program of geology-geophysics at the Department of Geosciences and Natural Resource Management within the faculty of SCIENCE is available through the Copenhagen University internal information web portal, *KU Intranet*. There are two resources available; one for faculty, and one for students, summarized below.

1. Faculty of SCIENCE (intranet ® faculty of science ® study administration ® bachelor projects, theses + other projects ® bachelor project). Discusses administrative policy regarding the bachelor project: which department handles the project, requirement of a bachelor project agreement, administrative responsibilities of the principle supervisor and department.
   The only guidance on what the project should consist of are the following statements:
   a. the principal supervisor is responsible for ensuring the bachelor project is of a scope that can be completed within the specified time frame.
   b. the purpose of the Bachelor project is to allow the student to demonstrate his/her skills in formulating, analyzing and processing issues within a defined academic topic, which is determined in collaboration with the project supervisor(s)
   c. learning outcomes (in Danish only, paraphrased in Inset 1 of this text)
2. Department of Geosciences and Natural Resource Management (intranet ® faculty of science ® for students ® bsc programmes: geology-geoscience ® udannelsens forløb (in Danish only) ® bachelorprojekt) Provides students information on how to complete their bachelor project, specifically focusing on rules and regulations, and administrative steps. The only guidance on project content is the following statement (translated from Danish):
   a. Apart from rules guiding the language and the summary there are no formal requirements for the content, setup or scope of your project report. It is your supervisor's responsibility to ensure that your bachelor project has a scope that is appropriate for you to complete within the required timeframe.

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A Faculty Interview Questions

Interviewee:

Position:

What is your experience advising bachelor students? (e.g. How many students?)

Are there any resources you use from the department, university, etc. to guide your approach to advising bachelor students?

Do you think there is value in advising a bachelor student project? If so, what?

What skills and competences do you observe students gaining through these projects?

To what extent do those skills contribute to their continued education?

Do you think these gained skills are reflected in how the students are evaluated?

What is the faculty's expectation of student workload? What scale is the final project?

(Publishable? Part of a published study? Presentable at a meeting? Just a small exercise?)

What do you think is your role as an advisor? What is your workload?

To what extent do you take responsibility for the success of your students' project?

Any other comments/questions?

B Evaluation Rubric

		Grade: 12	10
SCHOLARSHIP	Review and synthesis of the relevant literature	Student presents an excellent review of the topic, deeply exploring the literature, and synthesizing and analyzing others conclusions as well as placing their own problem into the context of the field.	Student effectively presents a coherent review of the topic, demonstrating a clear understanding of the context of their problem. An appropriate number of literature references are used, with a mix of classics, reviews of the field and recent advances.
	Understanding of theory and methodology	Can explain the reasons for the application a theory or method to geological problem, can properly describe how it works and associated assumptions and uncertainties.	Gives a good summary of theory or method used, can properly describe how it works and associated assumptions and uncertainties.
ANALYSIS	Identification of the geologic problem and its relevance	Student clearly describes the geologic problem, does an excellent job of identifying its importance in the context of the field and how their study will address the problem.	Student clearly describes the geologic problem and identifies its importance, and gives an (imperfect) explanation of how their study addresses the problem.
	Critical evaluation of models, theories or data (from literature or obtained)	Results of model, data or theoretical derivation are clearly and concisely presented in figures and/or tables and summarized in text. Student gives a thorough and critical interpretation of their results, and develops concrete hypotheses, conclusions or suggestions for further study.	Results of model, data or theoretical derivation are clearly and concisely presented in figures and/or tables and summarized in text. Student gives a critical interpretation of their results, and develops some hypotheses, conclusions or suggestions for further study.
	Placing observations and results in its scientific context	Student synthesizes the results of his study with insights from literature review, and draws logical conclusions on how the project outcomes affect the state of the art of the field.	Student makes some clear connections between the results of his study and his synthesis of the literature, and suggests some ideas for how the project outcomes affect the state of the field.
PRESENTATION	Well organized report with concise and formal writing	Report is very well written, in a formal scientific style. Text is concise, clear, and organized properly with sections that follow an academic journal format.	Report is well written, in a formal scientific style. Text is clear and organized, with sections that follow an academic journal format.
	Proper formatting and editing*	Report is clean and well presented. Figures are clear and easy to read with well-written captions. References to figures, tables and sources are consistent and follow journal format. There are little or no spelling or typographical errors. (<1/pg)	Report is clean and well presented. Figures are clear and easy to read with captions. References to figures, tables and sources are consistent and follow journal format. There are few spelling or typographical errors. (1-2/pg)
	Professional, clear and quality oral presentation	Presentation is informative, well organized, well rehearsed, and has clear and logical visual aids (e.g. Powerpoint slides).	Presentation is informative, reasonably organized, well rehearsed, with good visual aids (e.g. Powerpoint slides).

*Essays written in (non-native) English will not be graded negatively for grammar mistakes, but will be graded negatively for excessive spelling or typographical errors.

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Student presents a decent review of the topic, using several literature sources, and minimal dependence on textbooks. A satisfactory understanding of how their problem fits in the context of the field is displayed.	Student reviews the topic using only sources recommended by the advisor, and shows little or no synthesis or independent understanding of the state of the art.	Student does a minimal review of the literature, missing key references, or key concepts required to understand the context of the research problem.
Gives some summary of theory or method used, how it works and lists associated errors.	Describes the theory, but there are gaps in the methodological description, and little to no reference to assumptions or errors.	Gives only a cursory description of the methods or theory behind the study.
Student clearly describes the geologic problem, and attempts to address its importance.	Student explains the geologic problem, but either the problem is not clear, or its relevance to the field is unclear.	Student describes the problem, but gives no indication about why it should be studied.
Results of model, data or theoretical derivation are presented in figures and/or tables and summarized in text. Student makes some reasonable interpretation of their results, and develops some hypotheses, conclusions or suggestions for further study.	Results of model, data or theoretical derivation are poorly presented in figures and/or tables and summarized in text. Student makes little or no interpretation of their results, or presents interpretations inconsistent with their results.	Results of model, data or theoretical derivation are unclear from the presentation. Little or no effort is made at interpretation.
Student attempts to place the results of their study within scientific context, and suggests how project outcomes affect the state of the field, although ideas may be incomplete.	Student makes little attempt to place the results of their study in a greater scientific context, or present clearly erroneous conclusions on the impact of their results to the state of the field.	Student makes only a cursory effort to place their results in a larger context, providing few substantive conclusions.
Report is organized in an academic format, and is written in a formal style. Some content is obscured by poor or unclear writing	Report is not well organized, and writing is frequently unclear or too informal.	Organization does not follow a scientific journal standard, and poor writing or poor organization significantly obscures the content.
Report is well presented. Figures are fairly clear and captioned. References to figures, tables and sources are consistent and follow journal format. There are several spelling or typographical errors. (>2/pg)	The report is not well presented. Figures are hard to read, and formatting is inconsistent. There are enough typographical or spelling errors to make it obvious the report was not proofread.	Report is poorly presented, with little or no formatting, confusing and inconsistent referencing, and/or an unacceptable amount of errors
Presentation can be followed, most visual aids (slides) are good, and project can be reasonably understood.	Presentation is difficult to follow, and little effort has been put into visual aids or rehearsal.	Presentation does not demonstrate that the student has learned the subject or put effort into preparation for the oral portion.