



This is the seventeenth volume in a series of publications of educational development projects made by participants in the teacher development course for scientific staff given 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.

## Improving University Science Teaching and Learning

*Pedagogical Projects 2022*

*Volume 17*

Axel A. Andersen Arias  
Frederik Voetmann Christiansen

# Improving University Science Teaching and Learning

Pedagogical Projects 2022

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# Preface

Frederik Voetmann Christiansen

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This is the 17th 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 ("Universitetspædagogikum" or UP) at the University of Copenhagen. The series is published in both hard copy, print-on-demand at [lulu.com](http://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 in the anthology by using the local search engine found here: [http://www.ind.ku.dk/publikationer/up\\_projekter/](http://www.ind.ku.dk/publikationer/up_projekter/).

This volume consists mainly of project reports written by participants from the August 2020 and January 2021 courses. 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 a number of projects exploring and developing active learning, developing feedback practices, and supporting learning through ICT. A number of projects also address the diversity of students.

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.



**Exploring and developing Active Learning**



# Making it stick: the effect of active learning on knowledge retention

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## Introduction

How do we establish ‘success’ in learning in academic educational environments? According to a family of influential constructivist outlooks on teaching-and-learning environments, successful learning is brought about by aligning teaching and learning components such as teaching activities, forms of assessments, learning objectives, and the classroom environment (Biggs, 1996; Hounsell et al., 2005). More generally, constructivism as a theory of learning holds that effective and productive learning should not aim at the *transmission* of concepts, theory and methods through one-way *instruction*, but should instead promote the capacities for *understanding* in learners by creating a learning environment that prompts learners to *actively build* on a foundation of previous learning (Applefield et al., 2000; Piaget, 1980). These theoretical insights have been translated into a range of teaching methods and strategies that fall under the umbrella of ‘active learning’. Active learning will here be understood in the broad sense of the attainment of knowledge and understanding through engagement in activities that require reflection and invite problem solving (Collins & O’Brien, 2003; J, 2020).

Although it is widely recognized that active learning tends to have a positive effect on knowledge *acquisition* (Freeman et al., 2014; Haan, 2005), it is less evident that it also promotes long-term knowledge *retention*. Standard measures of success in learning such as assessment results and course evaluations only provide insight into short-term memorization and recall, during and at the end of the course. To establish that skills and

competences acquired through active learning will ‘stick’ in the longer term – here defined as >6 months after the learning experience, – longitudinal research is required. Although several research efforts of this kind have been completed, their results are ambivalent.

The present study aims to further probe the question of long-term knowledge retention by examining whether active learning is associated with higher knowledge retention compared to traditional (passive, lecture-based) teaching approaches at around 6 months after the relevant learning experiences have taken place. The study draws on learning experiences from the Philosophy of Science for Geography (Geografiens Videnskabsteori) course that ran in block 2 of 2020/21. This course is compulsory for second-year students of Geography at the University of Copenhagen. The author of the study was course responsible for this course.

## **Knowledge retention and active learning**

Knowledge retention has long been a topic of intense study in cognitive and educational psychology circles. This has yielded an expansive literature on knowledge retention that focuses predominantly on strategies for increasing recognition and recall, e.g. through rehearsal and repetition (Belmont & Butterfield, 1971; Roediger & Butler, 2011), spaced-learning (Cepeda et al., 2008), interleaving of different skills and activities (Carvalho & Goldstone, 2014) summarization (Brown & Day, 1983), and integration exercises (Gholson et al., 2009).

Although the results from most of these studies appear to be robust and well-founded, their wider significance for knowledge retention in academic teaching-and-learning environments is limited. Most of the cognitive psychological studies are based on simple vocabulary or image learning tasks. It is hard to extrapolate from these tasks to educational settings that aim at fostering a deep understanding of complex constellations of concepts, theories, methods and practices. To address this gap, several researchers have in recent years carried out longitudinal studies in genuine academic teaching-and-learning environments. Much of this research has been motivated specifically by the question whether active learning increases long-term knowledge retention compared to one-way, non-collaborative, lecture-based teaching approaches.

The results from these research efforts are somewhat equivocal. On the one hand, there are several studies that have found a clear positive cor-

relation between active learning and increased knowledge retention. For example, a study of clinical reasoning in neurology education has shown that team-based learning enhanced knowledge retention 1 year after the clerkship, even if it had no effect on examination results at the end of the clerkship itself (Alimoglu et al., 2017). Likewise, Hartmann et al., 2015 report that the use of collaborative learning techniques in a physiology course significantly improved retention of learned concepts after 24 months. Similar results have been reported for courses in pharmacotherapy (Lucas et al., 2013), chemical engineering (Bullard et al., 2008) and mathematics (Narli, 2011). On the other hand, there are several studies that have found only very weak or no support for the hypothesis that active learning promotes knowledge retention. For example, Morgan et al., 2000 found “minimal differences in long-term” between lecture-based teaching and cooperative, active learning approaches in undergraduate-level special education courses. Even more interestingly, Emke et al., 2016 showed that active learning was advantageous in the short-term, but not in the longterm. They report that in pre-clinical pediatrics curriculum, students who were educated in an active learning environment showed significantly higher performance at the end of the course relative to students who received lecture-based learning, but that after two years this difference had completely disappeared.

Some of the discrepancies between these knowledge retention studies can likely be attributed to different implementations of active learning strategies (team-based, inquiry-based, etc.) to the kind of knowledge that was the subject of the knowledge retention test (factual knowledge, conceptual knowledge, reasoning skills), and to the methodology that was used to test knowledge retention. Furthermore, some of the differences may be related to variation in the activation and use of learned knowledge in teaching modules or practicals that followed the course but preceded the knowledge retention test. However, there are no systematic reviews or meta-analyses that account for these differences. In sum, it is still an open question under which conditions, to what extent, and in which form active learning can make a positive contribution to long-term knowledge retention.

## **Didactic context**

The present study was carried out in the context of the course Philosophy of Science for Geography (Geografiens Videnskabsteori), which is compulsory for second-year students of Geography at the University of

Copenhagen. In the academic year 2020/21 responsibility for this course was transferred from the Department of Geosciences and Natural Resource Management (IGN) to the Department of Science Education (IND). Along with this change in course ownership, the course was completely re-designed. This included the formulation of new learning objectives and an overhaul of the syllabus to bring it in line with the practice-based approach to philosophy of science research and teaching that has been spearheaded by IND (Green et al., in press). Among the new themes that were adopted for the revised syllabus was a module on philosophical aspects on ‘modeling and mapping’. From this course module, two subtopics were selected to survey the effects of active learning vs. passive (lecture-based) teaching on knowledge retention.

The first subtopic was taught in a traditional, lecture-based teaching format. It concerned a discussion of the ‘epistemic division of labor’ in model-building, which was illustrated using a case from fluvial geomorphology. In the lecture, it was explained that modeling strategies that are useful for making predictions about the flow of specific braided rivers tend to be poor at explaining why braided rivers in general flow the way they do, and vice versa. The lecture was delivered online from a prerecorded video that was posted in the Absalon course environment. The pre-recorded format prohibited direct interaction with the lecturer.

The second subtopic was prepared with a didactic approach of active learning in mind. The topic concerned the difference between the representational and rhetorical (including ideological) roles of map projections, illustrated using the case of a controversial map projection, the so-called ‘Peters projection’, that presents equal areas at equal size, at the cost of severely distorting the shape of countries. Some have argued that world maps based on this map projection are ‘fairer’ than others since, they present countries in the Global South at their ‘true size’ – much larger than on most traditional world maps. Others have argued that world maps based on the Peters projection method are neither very useful nor obviously ‘fair’. Moreover, many of them object to the introduction of other motives than representational adequacy into cartography.

The controversy over the Peters projection was the topic of a 45-minute seminar class section that relied on an active learning approach. After a 5-minute (mini-lecture) introduction to the history of the Peters projection controversy, the students were informed that they would be asked to ‘re-enact’ the controversy in a mock TV-debate based on a fictional, close-to-home scenario. This scenario involved a proposal by The Danish Federa-

tion of High Schools to supply all Danish high schools with new atlases based entirely on the Peters projection, as part of an initiative to decolonize the geography curriculum. The students were told that this proposal had already been met with strong responses for and against from various stakeholders. After sorting the students into groups of three to four members each, they were given a handout that stated which stakeholder they were asked to represent. The handout provided some background on the stakeholder's position in the controversy but required the students to develop this into a clearly articulated position (15 mins) (sample handout in Appendix A). The students didn't know which other stakeholders would take part in the debate, but the description on the handout gave an idea of the kind of opposition they could expect. Each group was asked to send one student as delegate to the debate. The rest of the group could take part in the debate as audience. The debate was moderated by the class teacher (15 mins), who made sure that everyone participant had their say and who tried to involve the audience. The exercise was concluded by discussing and evaluating (in plenum) the arguments for and against that had come up during the debate (10 mins).

## Methodology

To assess whether the use of an active learning approach had a positive impact on knowledge retention, all students that had completed the Philosophy of Science for Geography course in block 2 of 2020/21 were invited to take an online survey. The survey, composed in Google Sheets, tested students' knowledge on the two subtopics from the 'modeling and mapping' theme described above. The survey was launched when the students had completed this course module just over 6 months ago and when they had taken the final exam around 4.5 months ago. By quizzing them on two subtopics from the same course week, it was expected that recency and primacy effects could be avoided. A link to the survey was posted on the Absalon course page<sup>1</sup> and an announcement was posted on Absalon to invite students to complete the survey. A reminder was posted a week later.

The survey consisted of nine questions in total (see Appendix B). Three yes/no questions asked whether they could recall having encountered to

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<sup>1</sup> 'Absalon' is the name of the Canvas learning management system implementation at the University of Copenhagen.

topic of ‘modeling and mapping’ (Q1) and if they could recall the cases (as described above) from the modeling part (Q2) and the mapping part (Q6). Four multiple choice questions quizzed them on some of the specifics from the two cases (Q3 and Q4; Q7 and Q8). The series of questions on each case was concluded with an open question that invited the student to share anything else they recalled having learned on that topic. The survey was structured such that students would receive feedback on their answer to the previous question before being introduced to the next question. For example, students who answered ‘no’ to Q1 were be presented with Q2N, whereas those who answered ‘yes’ would proceed to Q2Y. The same approach was implemented for right and wrong answer to multiple-choice questions. Answer options for the multiple-choice questions were presented in a random order. For a detailed overview of the survey structure, see Appendix B.

Upon completing the survey, the students were asked to leave their email address if they were willing to volunteer for a short follow-up to the survey. With a sufficient response, a group interview with a focus group would be set up. The aim of the focus group would be to assess students’ substantive *recall* of knowledge items, over and above the capacity for *recognition* of that was primarily tested using the survey (Ebbinghaus, 1885). In addition, the focus group could serve to find out how students thought the different teaching methods contributed to improving their skills in critical reasoning – a key focus of philosophy of science training.

## Results

### Online survey

The survey was completed by 35 respondents (53% response rate). All respondents answered the yes/no and multiple-choice questions (Appendix C) and the two open questions received a total of 17 responses (Appendix D). Results were not subjected to any statistical analyses.

94% of the respondents reported remembering that one of the week themes was ‘modeling and mapping’. Regarding the two subtopics, 82% of the respondents reported remembering the case on modeling that was taught in a lecture-based format, whereas 100% remembered the case of mapping that was taught through an active learning exercise. For the first multiplechoice questions on each subtopic, a total of 83% of respondents gave the right answer for the lecture-based case (Q3Y: 26 out of 29 (90%) +

Q3N: 3 out of 6 (50%)) compared to only 31% for the active learning case (Q7Y: 11 out of 35 (31%) + Q7N: 0 out of 0 (0%)). On the second multiple choice question, 77% of respondents provided the correct answer for the lecture-based case (Q4Y: 23 out of 29 (79%) + Q4N: 4 out of 6 (67%)) compared to 89% for the active learning case (Q8Y: 11 out of 11 (100%) + Q8N: 20 out of 24 (83%)). See Appendix C for a complete overview.

The responses to the open questions reveal that some respondents could recall other learning components from the week theme on modeling and mapping in quite some detail. Interestingly, several respondents alluded or referred to the exercise on the Peters projection in their response to first open question (underlined in Appendix D). This was before the respondents had reached the part of the questionnaire that quizzed them on this subtopic.

### **Focus group**

Seven respondents left their email address at the end of the survey. All were invited to take part in the focus group, but none responded to the invitation. After two reminder emails, one student responded to say that they were very busy with other courses and a project. Following this response, the idea of arranging a focus group was abandoned.

### **Discussion and conclusion**

While it is hard to draw firm conclusions from this small study, it is interesting to observe that for both subtopics, overall knowledge retention through recognition appears to be high. With the exception of Q7, 79% to 100% of the respondents reported remembering a subtopic and/or recognize the right answer to specific questions. Moreover, in hindsight there are reasons to think that the answer options for Q7 are ambiguous: apart from answer 7A, 7C could arguably also be counted as a correct answer to the question. Even so, this would only yield a correct response rate of 63% for the first multiple-choice question about the active learning exercise, compared to 90% for the same kind of general multiple-choice question about the lecture. This could be taken to suggest that the lecture-based format was better at bringing across a conceptual/ theoretical distinction than the active learning exercise.

However, this suggestion needs to be qualified in light of the response to the second multiple-choice question for each of the cases. In each case,

this question tested for knowledge about the implications of the conceptual/theoretical distinction that was the subject of the first multiple-choice question. Not only did a larger share of the respondents provide the correct answer to the second-multiple choice for the active learning exercise (89% vs. 77%), it is also striking that of the 69% who answered the first multiple-choice question incorrectly 83% managed to answer this second multiple-choice question correctly. Overall, then, we can perhaps conclude, very provisionally, that the lecture-based teaching achieved higher knowledge retention on bringing across a conceptual distinction, whereas the active learning exercise provided higher knowledge retention on understanding the implications of this distinction in scientific practice.

A more robust study of knowledge retention would test of recall over and above recognition of learned materials, though it is challenging to measure this in practice. In addition, a research design based on two groups that were taught the same topics with different didactic strategies (lecture-based vs. active learning) could overcome the limitations of the present study in formulating comparable multiple-choice questions on different topics. Since the current study was initiated after teaching in the Philosophy of Science for Geography course had completed, it was not possible to adapt the course design to the study design in this manner. Another important limitation of the study design is the brevity of the survey, which makes it hard to generate sufficient data for a meaningful comparison of study approaches. Keeping the survey short was a conscious choice, though, since it was expected that a longer survey would fail to generate a sufficient response from students.

The methodology and results of the study were discussed with a department colleague (Sara Green). It emerged from our discussion that testing for knowledge retention is especially difficult in case of philosophy of science courses, since the focus of these courses is not so much to educate students about key concepts and their applications, but rather to develop their skills in analyzing texts, to hone their critical and analytical thinking skills, and to contribute to a more general sense of self-cultivation in the form of *Bildung*. Thus, even if it had turned out that lecture-based teaching promoted long-term retention of factual and conceptual knowledge about course elements, it could still be that active learning activities were more effective for developing students' critical reasoning skills. A study of the kind that has been conducted will not be able to detect this difference. Since critical and analytical reasoning skills are to a considerable extent domain-general, a methodology based on semi-structured interviews would have been a more

fruitful approach toward gaining insight into whether the didactic approach makes a difference to the learning of these skills. Yet, for reasons of time and access to students, this was not an option in the current study.

## Acknowledgements

I would like to thank Sara Green and Lars Ulriksen for helpful discussion and feedback.

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## A

### Active learning exercise handout example

#### Re-enacting the Peters Projection controversy

##### Who are you?

You are a geography teacher from a high school in Copenhagen. You have been teaching students with the current atlases (which mainly contain Mercator maps) for more than two decades and this has always worked out fine.

##### What is your position?

You are unhappy with the recent proposal by the Danish Federation of High Schools to adopt the Peters projection in the geography curriculum and to introduce new atlases based on this projection into high schools. What is needed is not new atlases, but better education for geographer teachers. You always take time to explain that all map projections introduce distortions. Of course you also point out that the Mercator projection distorts the earth in certain ways. But you know that some of your younger colleagues don't explain this as well. They might not even be aware of some of the technical aspects of map projections that you learned in university, back in the day. You still think that the Mercator projection is a great projection for teaching geography, especially because it shows Europe clearly, which is useful for your teaching (which is mainly about geographical issues in Europe).

##### What can you expect from the others?

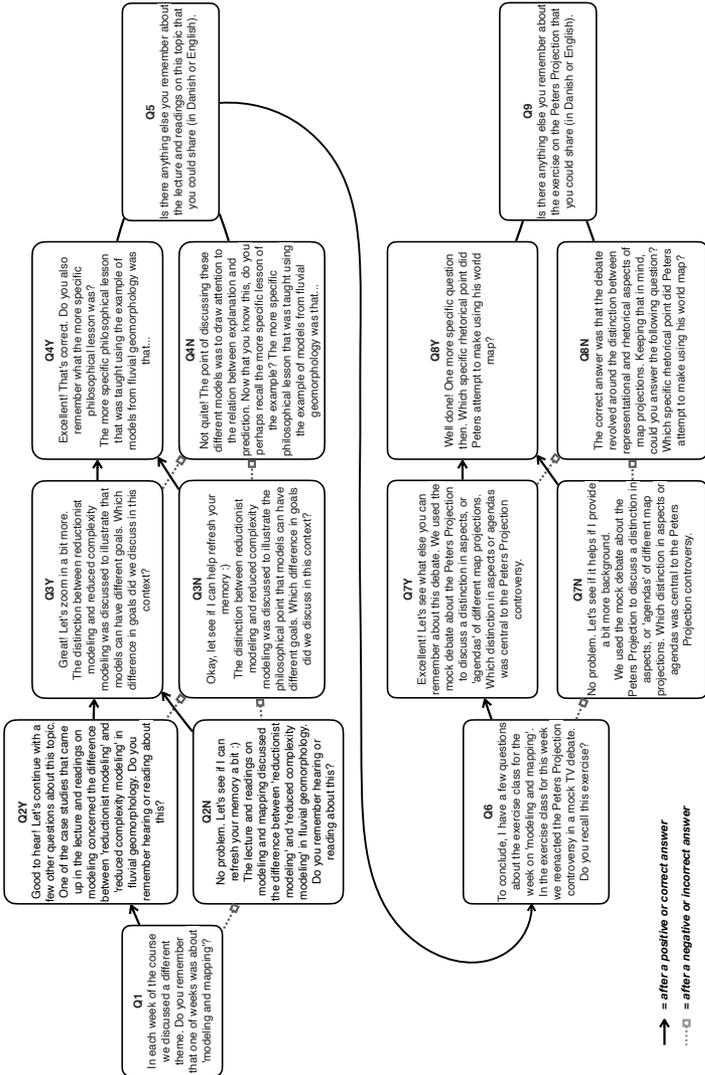
You don't know which others will join the debate, but you do know there is opposition from both sides. Some are also opposed to proposal from the Danish Federation of High Schools, but for different reasons. For instance, you know that some think that the current Mercator-based atlases should be replaced with atlases that contain many different projections. You don't think this would be confusing to the students. You are also aware that others, who support the introduction of the Peter projection maps into Danish high schools, do so as part of a larger effort to "decolonize the curriculum". They want to remove what they regard as the Western, imperialist bias that is inherent to the Mercator projection.

##### How should you prepare?

At the opening of the debate, you will be given about a minute to present who you are and what your position is in this controversy. After all the other participants have introduced themselves, you will debate each other. Try to think of the arguments the others may have against your position, and think of a strategy for how to respond to them.

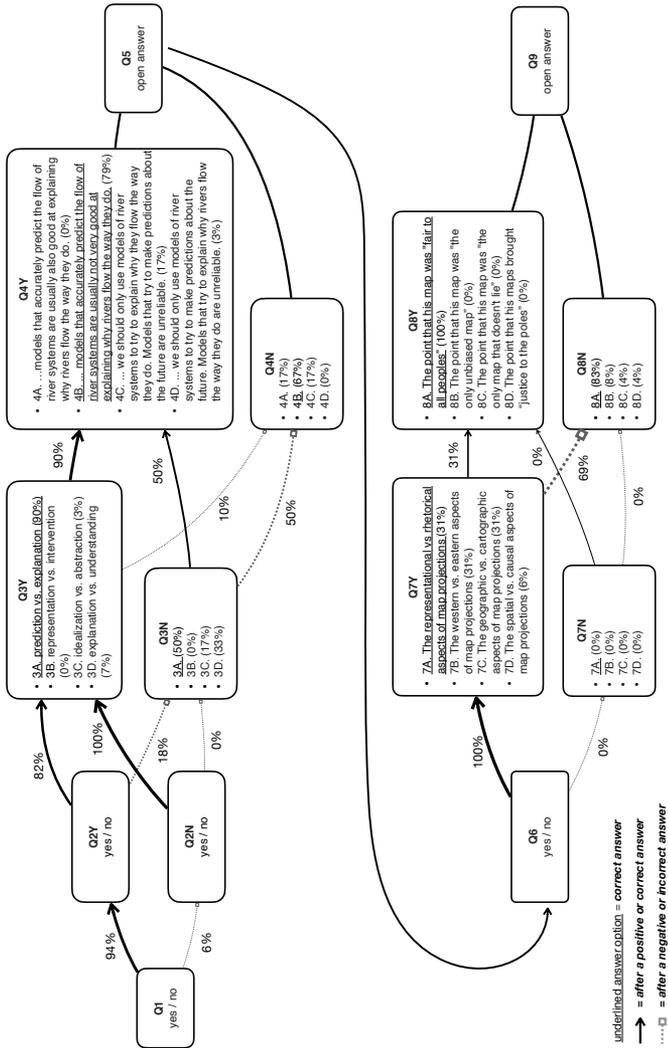
B

Knowledge retention survey – question structure



C

Knowledge retention survey – answer options and results



## D

## Knowledge retention survey open question answers

**Answers to Q5: "Is there anything else you remember about the lecture and readings on this topic that you could share (in Danish or English)."**

- A case about a London map, walking time and constructivism
- London metro maps, 'the orange', history of cartography.
- all of it.)
- den ene slags model var meget stedspecifik og kunne sige meget præcist hvordan en flod bevægede sig i det specifikke sted, men kunne ikke forklare hvad der foregik og kunne ikke appliceres på andre floder. Så høj forudsigelse inden for det specifikke sted, men mindre generaliserbarhed
- Jeg husker at både modeller og kort kan være med til at forklare og forstå virkeligheden, men det er altid forsimpelt og der er taget stilling til hvilke aspekter der er vigtige at have med, og hvilke der er "ok" at udelade.
- Nice picturez
- I really liked the class exercise with the oranges and the map-projections!
- Eksamensspørgsmålet, der lagde op til det handlede om den "epistemologiske arbejdsdeling" af modeller, hvor nogle er gode til at forklare og nogle er gode til at forudsæ.
- I remember we discussed Peters Projection a lot! And the division of cognitive labor
- That the different terms of models "reduced complexity" etc. were hard to distinguish from one another.
- projektioner, abstraktion, idealisering, peters projektion
- The lecture & readings

**Answers to Q9: "Is there anything else you remember about the lecture and readings on this topic that you could share (in Danish or English)."**

- The debate exercise in the class room. That all maps "lie". The purpose is essential - what are we gonna use the map for
- Vi lavede også en øvelse i grupper, hvor vi skulle udpege hvilken projektion, der hørte til et givent billede. Jeg mener også, at vi talte noget om atombombens udbredelse, og hvorfor det ikke bare ville være en rund cirkel på et kort med fx mercator-projektionen.
- kortet var areal-tro mod landes størrelse, men vinklerne/formen var forkerte.
- Vi lavede en diskussion med et panel, der alle på forhånd i grupper havde fået en karakter, hvis holdninger vi diskuterede og så skulle udtrykke i panelet.
- Peters projektion er kritiseret af kartografer, men er brugt af forskellige organisationer, fordi mercator-projektionen, der oftest bruges, anses for at være kolonialistisk.
- That the peters projection for educational purposes in my opinion is a bad map, but that it succeeded in winning over the equally bad for education mercator projection. PR is always important.
- Peter var en god reklame mand, ellers var kortet aldrig blevet så kendt. Var ikke den første der havde lavet denne type projektion.
- The exercise class

## **A comparison of various elements within the student active learning format**

Filip Mundt

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### **Background**

Student active learning (Danish: studenter aktiverende undervisning; SAU) is a teaching format where the students are in focus, where they will drive and form the lecture to a much larger extent than during “classical” lectures. Instead of a more passive acceptance of information the students will discuss among their peers, work in groups for shorter periods of time, and interact with the teacher in a dialogue to reach the subject information of the lecture; SAUs are student-cantered, rather than teacher-cantered and a large part is based on cooperation between peers (Michael, 2006; Springer et al., 1999; Wood, 2009).

The SAU format, or cooperative learning among students, has repeatedly shown to have a multitude of benefits as seen in an increase in test scores (Freeman et al., 2014; Johnson et al., 1998; Prince, 2004; Springer et al., 1999). Furthermore, these benefits seem to be robust to variations in instructor experience, student background, class size, and university ranking (Buck & Wage, 2005). Prince et al., summarizes it nicely when saying that “cooperation is more effective than competition for promoting a range of positive learning outcomes” (Prince, 2004).

### **Aim of study**

In this study I set out to quantify what stimulates a student’s interest/curiosity the most, and which part helps students to learn/memorize the most: in

teacher led lectures, in SAU lectures in general, and in my own SAU lectures.

With the strong evidence showing that the SAU format is a great way for students to learn, I was very excited to try it out in my own teaching and see how the students would receive it. I also wanted to test two exercises during the SAU lectures I had. The two exercises I wanted to compare were one led more by me (still heavily interacting with the students) that I refer to as “teacher-led”, and secondly, one where the students were leading the teaching to a higher degree (peer-to-peer interactions), i.e., “student-led”. The outcome that these would have on students’ “curiosity” and “ability to memorize information” would be measured through a questionnaire.

## Methodology

During the fall of 2021, I was responsible for a SAU group of 22 medical students for five SAU lectures, roughly 2 hours each, at the course of cellular- and tissue biology ‘Medical cell and tissue biology’ (for more information, see Appendix A), which is a bachelor course for second year medical students at the University of Copenhagen.

I wanted to hear from the students which learning format they preferred: “classical lectures” (plenum lectures) or SAU lectures, when it came to spark their interest/curiosity, and when it came for them to learn/memorize information. Furthermore, during my SAU lectures I wanted to see the effect of two different types of exercises within the SAU sessions, and their effect on the mentioned outcomes (interest/curiosity and learning/memorizing). The two exercises I want to compare were 1) led by me (interacting with the students), i.e., “teacher-led”, or 2) where the students were leading the teaching (peer-to-peer interactions), i.e., “student-led”. In the student-led exercises I, the teacher, only facilitate the forum/discussion and tried not to lead it as such.

For example, the *teacher-led exercises* consisted of me presenting the cell cycle on the white board or teaching a topic using power-point slides. For these parts I interacted with the students more than I would in a “classic lecture”, but I still made it more teacher-led compared to the second type of exercise (see below). The SAU format with interspersing group discussions was kept during this part.

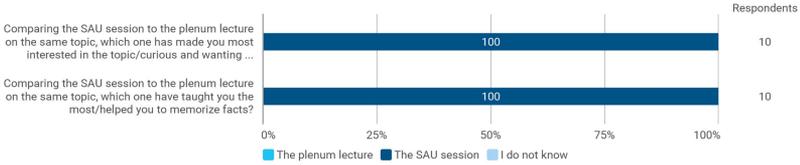
For the *student-led exercises* I had the students, for example, draw cartoons of the various phases of the cell during mitosis, and then have them

going up to the whiteboard and present their drawings to the class, and their peers help them out if anything was missing or not clearly presented. I only facilitated the discussions, akin to a moderator or chair of a round table discussion at a conference.

The outcomes were measured through a questionnaire at the last lecture using the online platform SurveyXact (<https://www.survey-xact.dk/>). For the full questionnaire, please see appendix B. I wanted to focus the questions on which parts of learning motivated the students the most, i.e., made the students most “interested in the topic/curious and wanting to learn more” or “taught you the most/helped you to memorize facts”.

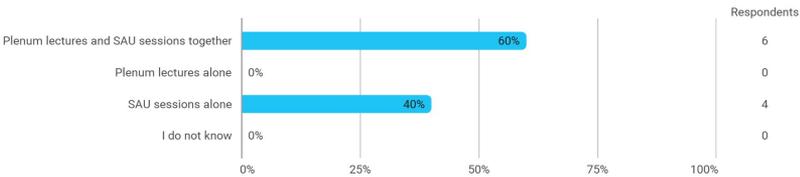
## Results

I had 10 students complete the questionnaire. I will focus on 3 questions and their answers, for full results, please see Appendix C. The first question relates to if the students would rate their experience higher from a “classic lecture” (plenum lecture) or a SAU lecture, related to sparked curiosity and/or ability to memorize information (**figure 1**). Strikingly, all students found the SAU lectures more helpful for both sparking interest and helping them to memorize facts than they found the “classical lectures”. The students had several occasions with paired “classical lectures” and SAU sessions during the run of this course in cellular- and tissue biology.



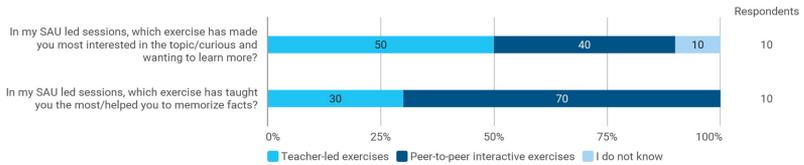
**Figure 1. The SAU format is unanimously preferred among students, when compared to “classical lectures”.** In the top row of the figure, are the answers related to what made the student “most interested in the topic/curious and wanting to learn more”, the plenum lectures or the SAU sessions. And in the bottom row is what the students answered what have “taught them the most/helped them learn facts”, the plenum lectures or the SAU sessions. In both cases 100% of the students (n = 10) answered “the SAU sessions”. Students could also choose “I don’t know” (0%). “Classical lecture” = the plenum lecture.

Secondly, I asked the students if they would prefer a course format that employed both “classical lectures” and SAU lectures, “classical lectures” alone, or SAU lectures alone. Here the answers from the students were more evenly split at 60% and 40% between “plenum lectures and SAU sessions together” and “SAU sessions alone”, respectively (figure 2). Interestingly, no students preferred a course with only “classical lectures”.



**Figure 2. Students prefer SAU lectures in conjunction with plenum lectures, or alone, during the run of a course.** If you had to choose, would you like the teaching with both plenum lectures and connected SAU sessions, or plenum lectures alone, or SAU sessions alone? Six out of ten students (60%) wanted a combination of plenum lectures and SAU sessions together, while the remaining four (40%) wanted SAU sessions alone. Students could also choose “Plenum lectures alone” (0%) or “I don’t know” (0%).

Last question I would like to focus on, related to the structure of my own SAU lectures. For this question I asked if they preferred the “teacher-led”, or the “student-led” elements of the SAU lectures I had taught. When it came to sparking their interest in a topic, 50% said teacher-led, 40% answered student-led (peer-to-peer interactive exercises) and 10% did not know. Seventy percentage of the students preferred the more peer-to-peer interactive exercises, over teacher-led exercises (30%), when it came to memorizing facts (**figure 3**).



**Figure 3. Students liked both the more teacher-led, as well as the more student-led exercises of my SAU sessions.** When it came to which exercise form that sparked interest in the topic/made the students curious, 50% opted for the teacher-led ones, 40% answered the student-led ones (peer-to-peer) and 10% didn’t know (upper panel). The students were leaning more to student-led exercises when it came to memorizing facts, 70% versus 30% for the teacher-led elements, and 0% did not know (bottom panel).

## Discussion

As an experienced teacher stepping into my first SAU lectures, I hope that this short project will give some insight into my process for others in a similar situation, and hopefully it will be helpful. This was my first experience with the SAU lecture format and overall, it was a very positive experience with a lot of back-and-forth between me and the students as well as between the students. The feeling I had after the SAU lectures were that they had a very open and nice atmosphere to discuss the various topics and to facilitate learning. What my limited questionnaire had set out to measure was if the students would, in some form or shape, agree with this. A drawback of this study is of course the limited sample number of only ten participants for the questionnaire, and all from the same SAU group.

The students that answered my questionnaire seemed to agree, with an overall positive attitude to the SAU lectures, both mine and in general. It was even surprising that all students preferred the SAU lectures compared to “classical lectures”! It should be mentioned that these students are a good group to question about on their preference of SAU lectures compared to “classical lectures”, since they have interwoven “classical lectures” and SAU lectures on the same topics all throughout this entire course. I.e., it means that they have a lot of both SAU sessions and “classical lectures” to compare to each other. Furthermore, even though some students wanted SAU sessions together with “classical lectures” through a course, some students would like only SAU sessions, and no student wanted only “classical lectures”. These results speak strongly for SAU sessions when it comes to motivating students as well as to helping them learn and retain information.

Personally, I was very curious to understand more about how the students had responded to my own SAU teaching, and if they preferred the parts of the SAU sessions where I was more in charge, or those where the students took a bigger part of driving the lecture. Overall, there seemed to be a split in the students between the teacher-led and the student-led exercises of my SAU lectures. One thing that I did not query was if the students would prefer a mix of teacher-led and student-led exercises. However, I assume that is the case based on my first-hand experience with this SAU class, and it was also pointed out by one student in the free text of the questionnaire: *“I liked the combination of teacher-led and peer-to-peer exercises”*.

In summary, I am really impressed with the overall positive feedback, and nice atmosphere for learning (and teaching) that SAU-based lectures provide. Indeed, cooperation does seem to be more effective than competition for promoting a range of positive learning outcomes.

### **Oh, and then there was this thing about ‘name tags’**

During discussion with my supervisors, the suggestion of giving the students name tags was proposed. At first, I was hesitant, but I also acknowledged the lack of personal touch when addressing my students. And since I was going to see them on several occasions, the investment in learning their names could very well “pay off”. Providing the students small pieces of paper and pens to write their names on and place in front of them turned out to be a nice icebreaker on its own, and furthermore, I cannot overstate the benefit of addressing people by their own names! It truly transformed

the classroom and made the atmosphere a lot more familiar, which I believe helped the students to feel more comfortable to ask and answer questions. All these benefits were felt during my lectures, as well as evident by some of the free-text answers in the questionnaire:

*“I think the learning enviornment [sic] is nice and it’s stimulating the students to try and maybe make mistakes, which is good in my opinion.”*

*“Overall really good lectures! Empathic and enthusiastic teacher. Uplifting atmosphere.”*

*“I think it was great that we had name cards and I really appreciate that you took the time to learn our names, as none of our other SAU teachers did that.”*

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## A Course description

Kursus i medicinsk celle- og vævsbiologi, medicin (Course in Medical Cell and Tissue Biology, Medicine)

Udbydende institut: Institut for Cellulær og Molekylær Medicin

Udbydende fakultet: Det Sundhedsvidenskabelige Fakultet

Kursusansvarlige: Katerina Tritsaris

Bacheloruddannelsen i medicin – obligatorisk

Målbeskrivelser: Kurset baserer sig på grundlæggende elementer af biokemi, biofysik, celle og molekylærbiologi samt generel histologi med det formål at give en grundlæggende forståelse af cellers struktur og funktion samt organisering af celler i væv.

Efter endt kursus forventes den studerende at kunne:

Viden

- Beskrive og forstå proteiners struktur og funktion
- Beskrive og forstå struktur og funktion af intracellulære organeller, herunder membrantrafik
- Beskrive og forstå struktur og funktion af cellemembraner
- Beskrive og forstå ligevægtspotentialer og membranpotentialer
- Beskrive og forstå salt og vandtransport over biologiske membraner
- Beskrive og forstå organiseringen af cytoskelettet
- Beskrive og forstå genetisk information
- Beskrive og forstå DNA-replikation, transskription og translation, samt disse processers regulering
- Beskrive og forstå genteknologiske metoder
- Beskrive og forstå cellekommunikation og intracellulær signalering
- Beskrive og forstå cellecyklus, cellevækst og celledød
- Beskrive og forstå cancerbiologi og -udvikling, herunder cancercellens generelle karakteristika
- Beskrive og forstå specialiserede cellers struktur og funktion
- Beskrive og forstå organisering af celler og extracellulær matriks i væv.

Færdigheder

- Anvende grundlæggende vævslære til at diagnosticere de fire store vævsklasser ved virtuel mikroskopi
- Anvende grundlæggende principper i bioteknologiske metoder til at tolke videnskabelige forsøg.

Kompetencer

- Anvende opnået viden til at inddrage principper og forskningsresultater, analyseret med basale statistiske metoder, i medicinske sammenhænge og problemstillinger til selvstændig hypotese

## B The full questionnaire

Hi, and thank you for your help!!!

I would like to know what stimulates a student's interest/curiosity the most, and which part helps students to learn/memorize the most; both in plenum lectures, SAU sessions in general, and in my own SAU sessions in particular.

Furthermore, I want to see the effect of two different types of exercises within the SAU sessions and their effect on the mentioned outcomes (interest/curiosity and learning/memorizing). The two exercises I want to compare are either 1) the ones led by me (interacting with the students), i.e., "teacher-led", or secondly 2) where the students are leading the teaching (peer-to-peer interactions), i.e., "student-led". In the student-led exercises I, the teacher, might only facilitate the forum/discussion and try not to lead it as much.

Below are 5 questions for you :)

### PART I: LECTURES v. SAU SESSIONS

Comparing the SAU session to the plenum lecture on the same topic, which one has made you most interested in the topic/curious and wanting to learn more?

The plenum lecture  The SAU session  I do not know

Comparing the SAU session to the plenum lecture on the same topic, which one have taught you the most/helped you to memorize facts?

The plenum lecture  The SAU session  I do not know

If you had to choose, would you like the teaching with both plenum lectures and connected SAU sessions, or plenum lectures alone, or SAU sessions alone?

Plenum lectures and SAU sessions together  Plenum lectures alone  SAU sessions alone  
 I do not know

### PART II: WITHIN THE SAU SESSIONS

For the next two questions (4 and 5), I want you to compare exercises we have done within my SAU sessions (Filip Mundt, block E). The ones that have been teacher-led (by me) or student-led (peer-to-peer interactions); regarding which ones have made you most interested/curious or taught/helped you memorize the most.

For guidance, here are examples of teacher-led exercises during our SAU sessions in Block E:

- Me writing a pathway on the whiteboard, asking (you) the students questions along the way
- Me showing a power-point slide and telling a story as well as asking questions

And here are examples of peer-to-peer interactive exercises during these SAU sessions:

- Group work where the students have to present a drawing and talk us all through it (e.g. stages of mitosis)
- Group work where the students have to guide me to fill in a signaling chart from, for example, Absalon

In my SAU led sessions, which exercise has made you most interested in the topic/curious and wanting to learn more?

Teacher-led exercises
  Peer-to-peer interactive exercises
  I do not know

In my SAU led sessions, which exercise has taught you the most/helped you to memorize facts?

Teacher-led exercises
  Peer-to-peer interactive exercises
  I do not know

What do you think that I can improve in my SAU sessions?

Is there anything in particular you liked about my SAU sessions?

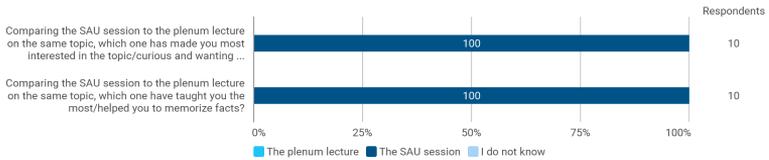
Additional comments

Previous

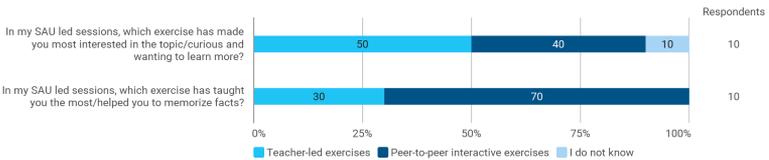
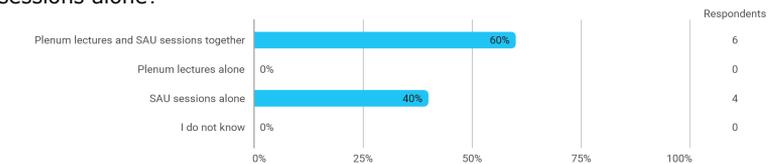
100%

Finish

## C Full results from the questionnaire



If you had to choose, would you like the teaching with both plenum lectures and connected SAU sessions, or plenum lectures alone, or SAU sessions alone?



What do you think that I can improve in my SAU sessions?

- I know it is your first time teaching SAU - and you are good at it!

But I prefer to do all the questions instead of rep of the stuff we can read in the book

- I think it would benefit the students when there is a clear plan of what we are doing in each SAU. Just about the topics and what focus we have.
- Just small things:
  - I feel comfortable with the teacher taking the lead on the structure of the lecture, example: Dont ask do you want a 10 or 15 min break? Just take the lead regarding structure as long as you are (as you already are) open for suggestions.
  - Maybe take some time to look at the exams questions. It gives "ro i sjælen" when the teacher really knows what is coming.
  - Maybe pause a bit when asking questions, so the slow thinkers can follow:)
- Don't question yourself so much, you are a brilliant teacher :-)

Is there anything in particular you liked about my SAU sessions?

- I liked how much peer-interaction there was, both in our peer-to-peer interactive exercises but also when you were leading the session, you asked a lot of questions and included us as much as possible, which greatly increased my understanding of the topics.
- When we were taught about replication
- Very good lessons! Energetic and engaging
- I think the learning environment is nice and it's stimulating the students to try and maybe make mistakes, which is good in my opinion.
- The drawings, that we made. It made it easier to memorize.
- Overall really good lectures! Empathic and enthusiastic teacher. Uplifting atmosphere.
- I liked the combination of teacher-led and peer-to-peer exercises

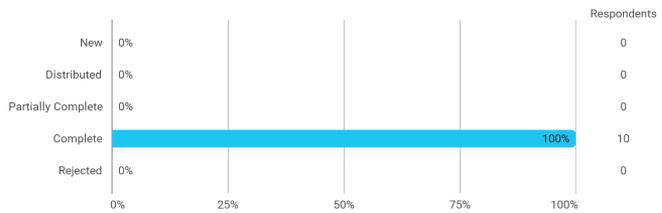
- I liked that your SAU sessions were very interactive and that you made us draw a lot.

### Additional comments

- I think it was great that we had name cards and I really appreciate that you took the time to learn our names, as none of our other SAU teachers did that.
- Very good SAU.
- It was super nice having you as a SAU teacher

### E-mail

### Overall Status



## Flipped learning in a large classroom

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### Introduction

A large classroom teaching ( $n \geq 30$ ) is often found in the university setting targeting a large body of students. Because of the class size, the lecture is often monologue, has a lack of interactions with students, and is difficult to give and receive feedback between students and teachers. Moreover, teachers often experience a lack of time to deliver knowledge and observe passive participation of the student in the classroom. To solve these problems, Mazur proposed flipped learning, which transfers the knowledge before the class so that the class time is used to help students assimilate what they learn prior to the class (Farmer, 2018; Mazur & Hilborn, 1997). In this project, I aimed to experiment the flipped learning focusing on two things: how to deliver knowledge in a given time and how to motivate students, not because of external regulation (e.g., exam or grade), but because of being internally motivated and interested in participating in the class (Ryan & Deci, 2000).

The experiment was conducted in the ‘Register-Based Epidemiology’ class (University of Copenhagen, 2021b) with 42 students: 23 MSc students in the Business Administration and Innovation in Health Care, Copenhagen Business School (CBS), and 19 MSc students in Health Informatics, University of Copenhagen (KU). The class was held in Block 4 in 2021 for 10 weeks, 2 days/week, 4 hours/day. The course aimed to learn epidemiology using Denmark’s register data, and estimate epidemiological measures such as incidence rate and incidence rate ratio of certain diseases using statistical software, STATA (University of Copenhagen, 2021b). The class coordinato

taught Epidemiology, and I taught Statistics and ran hands-on exercises. The experiment of flipped learning was applied to the hands-on exercises.

The project report described the process of the flipped learning classroom, including preparation, experiment, and evaluation.

## **Preparation**

Before the class started, I had a pre-observation meeting to prepare for the experiment with my two supervisors. At the meeting, we planed the flipped learning class that would make students actively be involved in the class, including pre-class and classroom activities.

At the pre-observation meeting, we discussed logistics and practical issues in the flipped learning class. First, we concluded that I uploaded two 5-min pre-recorded lecture videos that students were supposed to watch before they came to the class. We also planned to make students reflect on the video by asking questions to peers in the quiz format. The two supervisors also gave tips regarding the quizzes, such as taking turns to list the quizzes by two different groups (e.g., KU on Tuesday and CBS on Thursday). These questions could be answered or discussed by the rest of the students in the classroom.

We discussed how to help students assimilate what they have watched in the pre-recorded videos. We concluded that I could assign group activities with different topics (e.g., various diseases and subgroups) related to the pre-recorded lecture videos and ask students to present the group work or give feedback to other groups. I also planned how to group the students, how many in a group, how to motivate students to work on the topic in the group. In terms of grouping, the two supervisors suggested a few options for formulating groups, including randomly assigned groups, close-distance groups, or student-made groups. They suggested trying one of them and seeing which one works better than the other ones. We concluded that 4-5 students in a group are ideal for the group discussion, and the group activities must be in the same format but different diseases or subgroups. Finally, I planned to ask students to present their group activities to other groups to have a peer review or discuss any problems or issues.

At the pre-observation meeting, the supervisors emphasized that I need to inform students on the formulation of and expectations from the experiment, learning objectives, and course descriptions. They also suggested

collecting students' evaluations of what works and what to improve after a couple of classes.

## **Experiment: Flipped learning classroom**

From day one to the end of the class, I reminded my intention on flipped learning and my and their expectations from the flipped learning and the intended learning outcomes. I formulated a two-hour flipped learning class, including watching pre-recorded videos and listing quizzes prior to class, 15-min discussion of students' quizzes, 20-min group activities, 20-min student presentation, 15-min evaluation or discussion of the group activities, and 15-min for wrap up or supplementary lecture if needed.

Prior to the class, I uploaded pre-recorded lecture videos. The video lasted 5 or 10 minutes and contained essential information on the content. I used Zoom to record the lecture while I shared the PowerPoint or STATA screen. As I was not proficient in a video editor, I tried to make the video without any edits, which means that I had to try many times to make a final version. Sometimes, I spent two hours making a 5-min video and regretted that I did not try with a video editor. I also tried to make videos short (5 or 10-min) as most Youtube videos lasted less than 10 min and I believed that concentration span time is shorter than 10 min, too. However, if the content is complicated, I made two 10 or 15-min videos. In the video, I tried not to lecture the entire content but to deliver essential knowledge on the topic and motivate students for their hands-on exercises. If they did not watch the videos, they could not follow the group exercises. So I emphasized that it was crucial to watch the lecture videos before they came to the class.

Second, I asked students to list two quizzes for peers, and I used them as topics to discuss in the class for 15 min. The quizzes must be related to the pre-recorded videos. When the students did not bother to list the quizzes, I had few topics to discuss. However, I did not go beyond those quizzes in the discussion because I meant to give the impression that the class was run by the student's participation, not by me. After a few sessions, 3 or 4 students listed a couple of quizzes at every session, which was just enough for 15 min discussion. I first let students talk to their neighbors for a few min about the solutions or answers and then walked around asking for any volunteers to answer them or pointing to a couple of students for the answers. If necessary, I reviewed the slides from the previous classes or pre-recorded lectures to remind students of the content.

Third, students had group activities in the class. I listed the topics for the group activities prior to the class, assigned each topic to a group, and gave 20 min for the group exercise. The topics were slightly different by groups, such as different subgroups or diseases. For example, when I asked students to calculate the mortality rate ratio, I listed several causes of death (e.g., suicide, lung cancer, or ischemic heart disease). After the group work, students presented their results. As STATA programming was a part of the group activities, I provided sample STATA codes for their exercise with an example disease or subgroup and asked students to assimilate the example codes. As we have a 5-hour exam, I also encouraged them to be ready for the exam by practicing the exercise and making their own codes that they can use in the exam. Even though they did not finish the group activity, we still discussed their works, including their plans for the analysis and any issues in coding or the content. In this presentation, I was able to see how much they understood the content and assimilated the lecture videos or template codes. Some students understood the topic easily and exceeded the intended learning objectives in the class. In contrast, other students needed more time to understand the content and used the presentation time as a part of the learning process by asking questions. I also made myself and two teaching assistants available to answer questions and help the groups during the group activities.

Fourth, I made additional step-by-step videos for individual exercises and uploaded them at the beginning of the semester. The individual exercise questions had 10 sub-questions, and every step was recorded in the video. These videos were made in 2019 and reused every year as the class evaluation from students of the last two years highly appreciated the exercise videos. Although the contents of individual and group exercises were very similar, and these individual exercise videos could help students prepare for the class or the group exercise, I realized that students did not use them this year as much as the last two years. I assumed that students focused more on group activities in class rather than individual exercises outside the classroom.

Fifth, I wrapped up the class by taking questions from the students. Sometimes they asked me to make more videos for certain topics, which I happily created additional ones for them. As different groups had different topics, one of the students asked whether they could have a list of solutions for all group exercises. But I asked the student to initiate the work for peers and list all group activities in the google doc. By the end of the semester, I

checked the google doc and found that the students filled solutions for all group activities.

Sixth, although I intended to give aggregated (or internal) motivation to students, students still showed their interest in the exam or grades (a.k.a. external motivation). This year, the exam was 99.9% identical to some of the group activities that students did in this flipped learning class. As their group activities met the intended learning objectives, and we spent most of the time for the group activities in the class, I anticipated that students could achieve their goals in class.

Finally, I asked for students' final evaluation at the last class of the course in addition to frequent feedback after each class. In this evaluation, I used open-ended questions by asking three questions specifically for the flipped learning classroom, neither other lecturer's part nor overall course. The survey was conducted using SurveyXact, including three questions: 'Can you describe what you liked most about the flipped learning classroom?', 'Can you describe what part I can improve in the flipped learning classroom?', and 'Please leave any other feedback.' Some of the students participated in the final evaluation and gave a thorough review of this experiment.

## **Discussion**

I applied the flipped learning classroom to solve two main problems: lack of time to transfer knowledge and motivate students. I planned the class with two supervisors and conducted the experiment for 10 weeks in 2021. I intended to deliver the knowledge prior to class and help students assimilate what they learned from the pre-recorded lectures. Compared to non-flipped learning, it took more time to prepare the class, such as pre-recorded lecture videos. However, I was satisfied that I delivered the knowledge in a given time because I had enough trials and errors while making the lecture videos. The quantitative student participation rate was improved. In 2019 and 2020, 60 and 80 students, respectively, enrolled the course, but only less than 30% of enrolled students participated in the classes. In 2021, 42 students enrolled in the course, and more than 60% participated in most classes. Although there were other factors for the participation rate (e.g., pandemic and infection spread rate), I observed differences in students' activities in the flipped learning class from the non-flipped class. When they were assigned by different topics, most of the students managed to make

the groups immediately and discussed actively, and asked questions to me and teaching assistants when they had any difficulties. When they presented their group activities, they were not perfect but tried to learn. Whenever I saw any common mistakes in the analyses during the presentation, I pointed out the mistakes and discussed the solutions with the presenters or their group members.

Students' evaluation indicated that they got benefits from pre-recorded videos and template STATA codes for the hands-on exercises and questions that came up from other groups during the discussion time. However, some students lost the track of the class if they could not come to the classroom and felt uncomfortable with being pointed out during the discussion.

I also experienced some difficulties in the class, including time for preparation, discussion pressure, and a lack of ways to catch up.

First, recording the lecture videos took so much time. In the first few weeks, I had to spend at least 4 hours per week just recording the videos, and I sometimes was worn out by this one-man show: I was an actor, a director, and a camera director. I thought about writing scripts in addition to making slides and writing STATA codes. However, reading scripts was not easy on both screens (Powerpoint and STATA). As I repeated the recording, I finished it quicker than the beginning. Next year, I can reuse the lecture videos, so it was a good investment.

Second, some students felt uncomfortable with discussions in the class. I often led the discussion by asking some questions, and sometimes the discussion was involved with pointing a certain student. For example, when a student asked me a question, I normally asked back to students to give a clue. Then the conversation was on and on until the student got her or his answers. In this conversation, I must have put some pressure on the student to draw her or his thoughts. Although I enjoyed the type of discussion, some students felt uncomfortable in the discussion. One student from the course noted in the evaluation, 'the atmosphere you created in the class could be a bit more at ease, less fast, and less stressful and more supportive (e.g., instead of putting extra pressure on people, ensuring them verbally from the beginning that it will be tough but ok).' To eliminate the stress, I may need to consider different strategies for the discussion, such as a pair discussion only unless they have common issues.

Third, I started the class by explaining my intention and expectation from the students. However, if the students did not come to the class, they were easily lost in the next class. Several KU students told me that they had a schedule conflict and would catch up with lecture videos or slides.

However, as one student from the final evaluation noted, 'If one misses a class s/he gets really behind', it was hard to follow the lecture if they were not able to be present in the class. Next year, I should not allow any excuses such as the schedule conflict. Not only the schedule, but students also could not make the class physically due to illness such as COVID-19 infection, and were allowed to join the zoom meeting after all. However, I did not prepare for hybrid class group activities. I would better explore other tools.

There were also some other minor issues. The current auditorium classroom was not set ideally for group discussions as students had difficulty sharing their computer screens in the group. Some Mac computers did not have HDMI connections, so students could not present their group works with their own computers. However, these are technical issues and can be resolved easily for the class, reserving another classroom for the group activities and preparing HDMI connections for various devices.

Next year, I can have the flipped learning classroom with a modified discussion format and hybrid group activities. As students often feel uncomfortable to be pointed out, I can have a voting system (e.g., Sendsteps) right after the discussion among pairs or neighbors. When the voting results are far away from the correct answers, I can discuss with students who might see themselves deviating from the rest of the group; otherwise, I can move on to the next question (Lambert et al., 2012). For the hybrid group activities, in addition to the Zoom group room, I can also try with other platforms such as the Google classroom, Gather, or PebblePad. With the modified formulation of the course, I can motivate students in a learning-oriented way and lead students to obtain the knowledge for exploring and analyzing the register data (University of Copenhagen, 2021a).

Finally, I discussed the reflection on the project with one of the supervisors. He agreed that some of the challenges (e.g., discussion pressure) could not be avoided for some students but were necessary to motivate students in the class.

I initiated a new teaching format, flipped learning, by making pre-recorded videos and organizing group activities and discussions in the class. I believe that this practice-oriented project improved my pedagogical competence. In this flipped learning class, I set out clear learning goals and organized the teaching and group activities accordingly. I also acknowledged the students' learning needs and challenges through discussions and quizzes, gave the students feedback on their learning through students' presentations, and designed the exam to reflect the students' work with the learning objectives.

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## **Student's perceptions of active versus passive learning in veterinary oncology lectures**

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### **Introduction and problem**

There is no requirement of any formal "teaching" training before one can lecture on a course for veterinary students and hence, when starting to lecture as a very new graduate yourself, you may tend to use the same methods as experienced during your own university courses without questioning how well these methods actually work. For many, this would mean that they will lecture in the traditional monologue way with minimal student interaction and activation, because that is what they know how to do.

Personally, I started lecturing shortly after I graduated and has now taught yearly on the same course since 2013. Before starting the University Pedagogy course, I did not question how I lectured. Consequently, my lectures in veterinary oncology in the "Medicine, Surgery and Reproduction - companion animals" course have every year been delivered as a one-way monologue, where the I do more than 90% of the talking myself. It is well-known and well-described that only limited information is retained from this kind of lecturing (Hartley & Cameron, 1967; MacManaway, 1970). This becomes very apparent, as I have the same students again approximately 1.5 year later in the companion animal oncology clinic, where most of them appear to have forgotten the information from the lectures or struggle to apply it to actual clinical patients. Accordingly, with this final project I wish to change my teaching format from passive to active learning to hopefully increase the students' gain from my lectures. Active learning is described as student-centered teaching where the students are actively engaged in the learning process (Prince, 2004). Flipped classroom

is a pedagogical approach implementing active learning, where the students have prepared for the class at home using for example written material or videos and the face-to-face time with the students is spent with student-involved activities (Bergmann & Sams, 2012; Gilboy et al., 2015). Converting to a more active teaching environment has been advocated by many as the “*teachers would be able to actually teach, rather than merely make speeches*” (Prober & Heath, 2012).

However, for active learning to be effective, active student participation is crucial (Bonwell & Eison, 1991; Michael, 2006) and in large classrooms like in veterinary school (180 students signed up), it can be difficult to get everyone engaged. From our pre-project (Børresen et al., 2021) we learned that medicine students are generally fond of online multiple choice-style quizzes and consequently, this seemed to be an obvious foundation for a change to an active teaching format, which would simultaneously give the students anonymous real-time formative feedback (Hounsell et al., 2008).

## Context

The "Medicine, Surgery and Reproduction - companion animals" course is a 15 ECTS course in the 4th year for around 180 veterinary students. It is taught once per year and it is divided into clinical topics, where each topic is lectured during a week (2 afternoons). My lecturing topic is "oncology", and we have two afternoons (14-17.00) to cover everything relevant for companion animal oncology. The lectures are divided into 35-minute lectures, and I have 2 lectures: "non-surgical cancer therapy" and "malignant lymphoma and soft tissue sarcomas". The remaining oncology lectures are taught by my oncology clinic colleagues. For the rest of the week, the students have practical courses, which are very time consuming, and which require a lot of preparations and hence, they have very little time to prepare for the class lectures. My experience from previous years is that very few students have read the relatively extensive curriculum prior to the lectures.

The intended learning outcomes (ILOs) for the oncology part of the course focus on the students being able to apply oncological knowledge in a clinically meaningful way and reads: “to be able to form a meaningful diagnostic and therapeutic plan for patients with commonly occurring oncological diseases”. The exam asks the students to both be able to show general knowledge by describing disease prototypes and a deeper under-

standing by explaining for example their diagnostic or therapeutic approach to a patient.

## **Current knowledge**

From previous student evaluations, I know that the students prefer the monologue lecture format and that when some of my colleagues have tried for example "flipped class-room"-styled lectures, the students have evaluated this very negatively. I also know that they prefer for all lecturing to be as "exam-preparatory" as possible and that they find it very difficult to find the time to prepare for the lectures (source: T.M Sørensen: course responsible).

## **Aim of this project**

The overall aim of this project is to change one of my oncology lectures to an active learning format and to evaluate how the students perceive their gain from this compared to a passive learning format. This is the project aim even though veterinary students have previously evaluated the interactive format negatively. There are two reasons for this: 1) the course ILOs ask the students to be able to *apply* knowledge, which an interactive teaching format will probably teach them better than a traditional lecture so it makes sense even to do this, even if the students do not approve, 2) I will strive to both give the students the best conditions for having a high gain from the interactive lecture, for example by producing compendiums, and I will make it very clear to the students why this teaching format is relevant both for their future as veterinarians *and* for their upcoming exam.

## **Materials & Methods**

To increase the chance that the students would have time to prepare for my lectures, short and concise notes regarding the topics that covered both the lectures were produced. These were a total of 12 pages including references and covered the three overall topics: non-surgical cancer therapy (lecture 1), malignant lymphoma (lecture 2) and soft tissue sarcomas (lecture 2). The notes were released on Absalon one week prior to the lectures together with

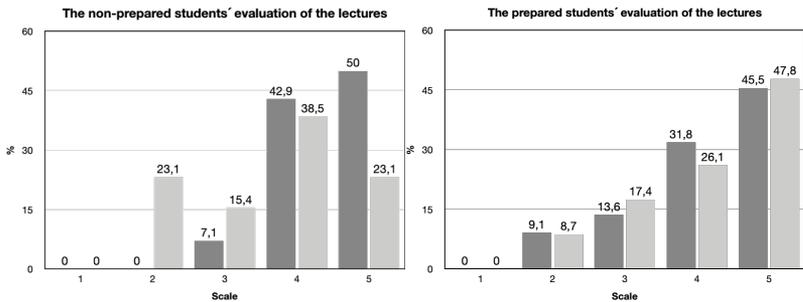
an Absalon announcement stating that the compendium with the notes had been uploaded and that this year one of the lectures would be changed to a case-based interactive format and why. Three days prior to the lectures, I made an appearance in the classroom prior to another lecture to give them an oral reminder to prepare for the upcoming lectures.

One lecture (lecture 1, non-surgical cancer therapy) was kept in the format of previous years, i.e. as a standard monologue with relatively little student interaction part from spontaneous questions from the students. The next lecture (lecture 2, malignant lymphoma and soft tissue sarcomas) was changed to an interactive format. Two cases were produced, one for malignant lymphoma and one for soft tissue sarcoma, which the students should then help diagnose and treat via anonymous online-based multiple choice (Sendsteps.me). The lecture started with an “expectation slide” to let the students know why the lecture format had been changed and to stress how this format was in alignment with the ILOs, their upcoming exam and what they will need to be able to do and know once they graduate as veterinarians. The cases and questions were made so that there was one correct answer and 3-4 distractors, however for a few questions, there was not one correct answer, but multiple, to illustrate to the students that in real life there is often multiple possibilities for each patient and what is “true” for one specific patient may not be true for another. After each question, I went through each answer possibility thoroughly describing why it was true or false. The lecture 2 slides with cases and answers were uploaded for the students following the lecture.

After the lecture, I uploaded a questionnaire regarding the notes and the lectures on Absalon together with an announcement telling the students about the questionnaire and asking them to complete it. The questionnaire asked the students whether they had prepared for the lecture, if not then why, how they liked the compendiums, whether they prefer compendiums or textbooks, whether they prefer standard monologue lectures or interactive lectures and to grade their gain from lecture 1 and 2 on a scale from 1-5 (5 is best). Also, a free text section was added to let the students write their opinions on compendium vs textbook curriculum and standard vs. interactive lecture types.

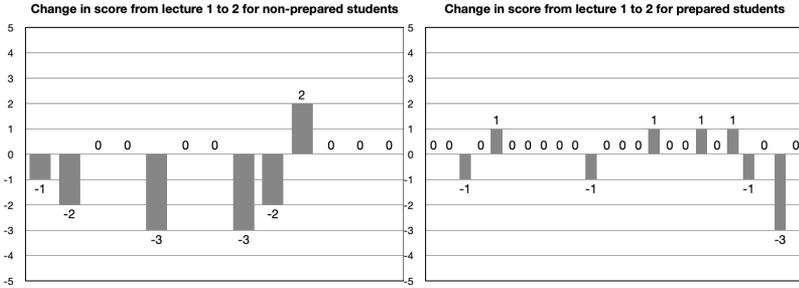
## Results

Questions and answers can be seen in Appendix A. Forty students filled out the questionnaire. About 80 students were present at the lectures (based on the Sendsteps multiple choice) giving an estimated answer rate of 50%. Of these 40, 60% (24) had prepared by reading the compendiums prior to the lectures and 40% (16) had not. Reasons for not having prepared for the lecture were: never prepares for lecture (33.3%), did not find the time (33.3%) and always reads following the lecture (33.3%).



**Figure 1.** The students' evaluation of lecture 1 and 2.

The diagram on the left depicts those students that did not prepare for the lecture, the one on the right depicts those that had prepared for the lecture. Dark grey is lecture 1 (standard) and light grey is lecture 2 (interactive).

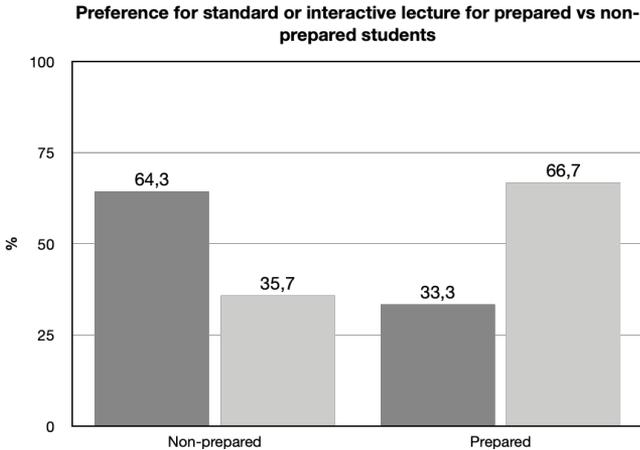


**Figure 2.** Change in score from lecture 1 to 2.

The diagram on the left depicts those students that did not prepare for the lecture, the one on the right depicts those that had prepared for the lecture. A negative score means that the student gave lecture 2 a lower score than lecture 1 and vice versa for a positive score.

The students generally preferred to have their curriculum as compendiums (89.7%) versus textbooks (10.3%) and most students gave the specific compendiums a high score of 4 or 5 (96.6%).

As it can be observed in Figure 1, those that did not prepare before the lectures tended to give a better score to lecture 1 (standard) than 2 (interactive) (score 4+5 92.9% for lecture 1 vs. 61.6% for lecture 2). For those students that had prepared for the lecture, lecture 1 and 2 was graded relatively equally (score 4+5 77.7% for lecture 1 and 73.9% for lecture 2). There were relatively few non-prepared students that thought they had a very high gain (score 5) from lecture 2 (23.1%) compared to the prepared group (47.8%). Also, there was a tendency for more non-prepared students to evaluate lecture 2 lower than lecture 1 (Figure 2), whereas many prepared students evaluated the two lectures equally or with minor differences (part from one student who really did not like lecture 2).



**Figure 3.** Preference for standard or interactive lecture type.

The left part of diagram depicts those students that did not prepare for the lecture, the right depicts those that had prepared for the lecture. Dark grey is standard lecture type, and light grey is interactive lecture type.

When looking at the whole group, there was a relatively even preference for standard monologue lectures (44.7%) versus interactive type lectures (55.3%), however when the group was divided into those that did not prepare versus those that did (Figure 3), there was a clear difference. Those that did not prepare clearly preferred standard lectures (64.3%) versus interactive lectures (35.7%) as opposed to those that did prepare, who preferred interactive lectures (66.7%) versus standard lectures (33.3%).

When evaluating the qualitative part of the questionnaire, where the students were asked to elaborate their opinions, some repeated themes were:

- 1) Some students preferred standard lectures because it can give a broad overview and more curriculum can be covered in less time.

*–“Jeg føler man når mere af eksamenspensum igennem ved en standard forelæsning, og får det på en mere generaliseret måde (eks. generelle symptomer, og ikke bare de to symptomer en patient i en case havde)”*

*–“Case er fede, men det tager ofte ALT for lang tid fra undervisningen”*

*-”Jeg vil hellere have normal forelæsning, da det giver en bedre oversigt over sygdommene”*

- 2) Some only thought interactive/case-based lectures were good, if they had time to prepare beforehand.

*-”Synes ikke jeg har tid til at forberede mig godt nok til at få nok ud af en ren case-forelæsning”*

*-” Foretrækker kun den interaktive forelæsning, fordi jeg havde forberedt mig”*

*-”Jeg foretrækker kun interaktiv forelæsning når jeg reelt har haft mulighed for at forberede mig grundigt”*

- 3) Some thought that case-based interactive lectures are good for activating the listeners, provoking them to think and to provide variation.

*-”Man får mere mulighed for at tænke over tingene selv i stedet for at få dem kastet i hovedet, og så hænger de bedre fast”*

*-”det er dejligt med noget afvekslende”*

*-”Man husker det meget bedre når man skal deltage i undervisningen”*

*-”Nr 2 fastholde min opmærksomhed meget bedre”*

*-”Jeg synes personligt det er meget mere fangende når man som studerende bliver ”stimuleret” til at tænke selv, og svare på send-steps spørgsmål mv :)”*

*-”Jeg foretrækker de interaktive forelæsningsformer da jeg på denne måde selv lige tænker over det jeg lige har lært og på denne måde husker jeg det meget bedre”*

*-”Jeg synes generelt man lærer bedre, hvis man kan være aktiv omkring det”*

- 4) Some students thought that a combination of a standard lecture first followed by an interactive lecture would be ideal.

*-”Jeg foretrækker generelt en blanding af de 2.... Jeg vil langt hellere have en forelæsning om de forskellige sygdomme, og så til sidst have cases”*

*-”Jeg vil gerne have en blanding ift. forelæsningsformatet, så vi først har standard gennemgang af emnet”*

*-”Kan godt lide at få gennemgået og forklaret det mest relevante som ved en standard forelæsning - dertil kunne man evt. tilføje nogle små cases for at støtte op om det forlæste”*

*- "Jeg synes at en kombination er ideel"*

*- "...foretrækker jeg at forelæsningen starter ud med "kort opsummering/oversigt" over emnet og bagefter gennemgang af cases"*

*"Jeg foretrækker interaktiv forelæsning men hvor der er forelæst først i emnerne og så samles op bagefter"*

## **Discussion**

Having the information from the course responsible (TM.Sørensen) that previous veterinary students have been very negative towards interactive lecturing and have a very high focus on exam-preparatory lecturing, it was not a surprise that a relatively high number of students still prefer standard lecturing (44.7%) despite the fact that they will may not remember much of the content. It was interesting however to see the difference between students that prepare and those that do not. Generally, the students that did prepare were much more in favor of interactive lecturing versus those that did not prepare. If you do not prepare for class, obviously your gain from a standard lecture where the curriculum is read out loud may seem to be higher compared to an interactive lecture, where you may not be able to keep up, because you lack the required knowledge to reply to the questions or to be involved in the discussion. To increase the chance that the students would prepare for the interactive lecture, they were supplied with short and concise notes, which most of them enjoyed. Also, to make sure that everyone understood the answers no matter if they prepared or not, all answer options were thoroughly described following each question. This is also something that was stressed to be important in our pre-assignment project (Børresen et al., 2021) and has been noted in previous publications (Mathiesen, 2015). Still, no students, no matter if they prepared or not, thought they had a much higher gain from lecture 2 compared to lecture 1 (max increase in score from lecture 1 to 2 was +1), which was a surprise. Importantly, however, what is measured in the questionnaire is the students' immediate evaluation of their gain from the two lectures and not their deep understanding or long-term memory of the information.

Previous publications have investigated how active learning affects academic performance in veterinary students. In one publication, the students were positive towards the flipped classroom approach, however students taught by a traditional classroom approach actually outperformed the flipped classroom students in multiple choice tests (Mofett & Mill, 2014).

In another recent publication, two cohorts of veterinary students were compared, one taught in the traditional didactical way and one taught using a flipped classroom-style approach (Dooley et al., 2018). Results from this study showed that flipped classroom students were more satisfied with their learning experience and did better in a written exam compared to the traditional group. Similar findings were seen in another recent study investigating active learning in the veterinary classroom (Berrian et al., 2021). And although it has been debated whether the active learning approach results in improved outcomes or not (Andrews et al., 2011; Michael, 2006), a meta-analysis from 2014 evaluated student performance in traditional lecturing publications (n=67) compared to active learning (n=158) publications and found that students in classes with active learning had higher examination scores and were less likely to fail (Freeman et al., 2014). Whether the students involved in the current project will do better in their upcoming exam, or even more important, will have better day-1 oncological competencies once they graduate, compared to previous years will remain unknown for now, as this project was not designed to test this. However, although the immediate evaluation from the students were not uniformly positive, especially for students that had not prepared, it seems likely that this active teaching method will have increased their learning outcome and ability to apply their knowledge in a clinically meaningful way nevertheless.

## **Conclusions**

Students that had prepared prior to the lectures were uniformly happy with both lecture formats (standard and interactive), but most preferred the interactive format if they had to choose. Conversely, students that had not prepared prior to the lectures preferred the standard format. Multiple students wrote in the free text section that they would prefer a combined format.

## **Discussion of results with teaching colleagues**

What was mainly discussed with my colleagues was how overwhelmingly satisfied the students were with the compendiums and how that is something we should probably consider producing for all oncology lectures. Also, we discussed the option of doing video lectures with standard lectures of the information in the compendiums to satisfy those students who

prefers a combined format (standard followed by interactive), as there is not enough lecture time to do both formats in class. Later this year, I will meet with more of the teachers from this course to disseminate the projects' findings and discuss whether a more active teaching approach can be generalized to the rest of the course.

## Future improvements to the course and lectures

Producing compendiums will probably be done for all the oncology lectures. Whether I will do video lectures to add to the compendiums next year is undecided at this point but will depend on discussions with the rest of the course teachers as well as contact to COBL to get information on what it will require.

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## A Questions and answers

Question and answer	Number	Percentage
<b>Forberedte du dig til forelæsningerne?</b>		
Ja	24	60.0%
Nej	16	40.0%
	Total: 40	
<b>Hvis du ikke forberedte dig til forelæsningerne: hvorfor? (vælg den der passer bedst)</b>		
Jeg forbereder mig generelt aldrig før forelæsninger	5	33.3%
Jeg havde ikke tid til at forberede mig	5	33.3%
Jeg læser generelt altid først efter forelæsningen	5	33.3%
	Total: 15	
<b>Hvis du brugte kompendierne til at forberede dig, fandt du dem i så fald brugbare og passende i indhold og længde? Skala 1-5 (5 bedst)</b>		
1	0	0%
2	0	0%
3	1	3.4%
4	14	48.3%
5	14	48.3%
	Total: 29	
<b>Ville du foretrække, at pensum i MKR i højere grad var baseret på specialskrevne kompendier som disse, eller foretrækker du lærebogen?</b>		
Foretrækker kompendier	35	89.7%
Foretrækker lærebogen	4	10.3%
	Total: 39	
<b>Hvis du <u>ikke</u> forberedte dig, følte du så, at du fik noget ud af forelæsning 1 (ikke-kirurgisk cancerterapi)? Skala 1-5 (5 bedst)</b>		
1	0	0%
2	0	0%
3	1	7.1%
4	6	42.9%
5	7	50.0%
	Total: 14	
<b>Hvis du <u>ikke</u> forberedte dig, følte du så, at du fik noget ud af forelæsning 2 (case gennemgang lymfom/sarkom)? Skala 1-5 (5 bedst)</b>		
1	0	0%
2	3	23.1%
3	2	15.4%

4	5	38.5%
5	3	23.1%
		Total: 13
<b>Hvis du forberedte dig, følte du så, at du fik noget ud af forelæsning 1 (ikke-kirurgisk cancerterapi)? Skala 1-5 (5 bedst)</b>		
1	0	0%
2	2	9.1%
3	3	13.6%
4	7	31.8%
5	10	45.5%
		Total: 22
<b>Hvis du forberedte dig, følte du så, at du fik noget ud af forelæsning 2 (case gennemgang lymfom/sarkom)? Skala 1-5 (5 bedst)</b>		
1	0	0%
2	2	8.7%
3	4	17.4%
4	6	26.1%
5	11	47.8%
		Total: 23
<b>Foretrækker du formatet af forelæsning 1 (standard monolog forelæsning) eller forelæsning 2 (case-baseret studenter interaktion)?</b>		
Foretrækker standard forelæsning	17	44.7%
Foretrækker interaktiv forelæsning	21	55.3%
		Total: 38



## **From specific-to-general at university courses: Reinforcing and connecting the dots to see the bigger picture**

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### **Introduction**

Our brains are programmed to forget. Forgetting helps to reduce outdated information, preventing overfitting and promoting generalization (Richards & Frankland, 2017). Both forgetting and remembering occur simultaneously in order to facilitate learning. However, for a number of students at the University, retaining specific concepts of the curriculum might be a challenge. For others, the burden might be on the generalization across concepts.

Dealing with that specific-to-general tradeoff is particularly challenging in sequential courses, as they build knowledge upon previous knowledge. Pedagogic activities aim to consolidate the nodes of information in a logical order. Teachers, as knowledge facilitators, deliver specific instances during lectures and exercises that are partially stored across student's neural networks. Without reinforcements, synaptic connections are likely to be pruned (Murre & Dros, 2015). What was taught at the beginning might be forgotten at the end of the course, breaking the links of interconnected dots and thus risking the visualization and understanding of the bigger picture.

During examinations, teachers and external examiners ask from specific-to-general questions and vice versa, testing for the full understanding on the subject. In our course, every year a number of students do not reach a good performance during the examination, failing to retrieve specific and/or general learning outcomes from the curriculum.

In order to improve student learning and exam performance, a number of strategies have been proved to facilitate reinforcement and thus retention of information, including:

- **Peer learning:** The use of learning strategies in which students learn from each other increases retention and promotes active learning (Boud et al., 1999)
- **Repetition and spacing effect:** Having reinforcements, spaced out over time, generally leads to superior learning than having the reinforcement immediately after information acquisition (Kang, 2016)
- **Self-evaluations and testing:** Practicing the retrieval of something learned (e.g. by using quizzes) is likely to boost learning (Anderson et al., 2013; Benjamin & Pashler, 2015)
- **Visualization of concepts:** Linking concepts to an image or diagram facilitates a deeper understanding on the matter, regardless of the structure-building ability of the person (Bui & McDaniel, 2015; Glensberg & Langston, 1992)
- **Immediate feedback:** For students, being able to know the right answer immediately when doubts arise, improves learning (Kehrer et al., 2013)
- **Class discussions:** Conversations and debates among students –with or without teacher participation– improve student learning (Hollander, 2002)
- **Formative assessment:** Gathering immediate data and information during lectures leads to informed teacher decisions, who can adapt their instructions in order to meet students' needs and advancing their learning (Trumbull & Lash, 2013)
- **Others:** Problem-based learning, changing learning environments (e.g. teaching and learning outside) or using analogies and metaphors among others, might improve learning (Biggs & Tang, 2011)

The aim of this study was to design, implement and assess activities –combining the strategies mentioned above– in order to improve learning across scales –from specific to general content knowledge– and thus exam performance.

## Methodology

### The course: Environmental Impact Assessment

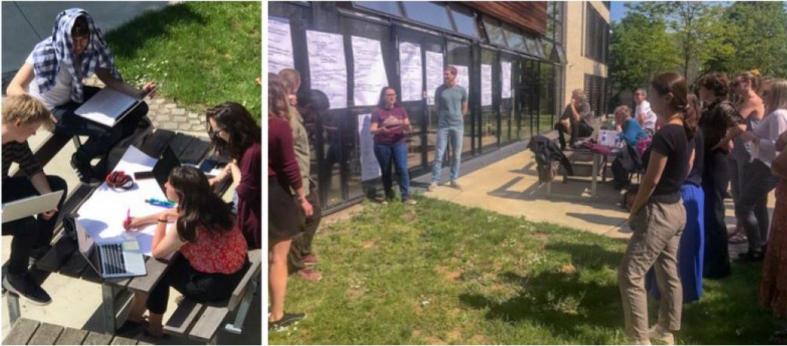
In spring 2019, I taught the course Environmental Impact Assessment at the Faculty of Science, University of Copenhagen (LNAK10010U). Every year, the course is eligible for six different MSc Programs, indicating its interdisciplinary nature. Its objective is to introduce the components and the structure of an Environmental Impact Assessment (EIA) –a tool developed to minimize negative social and environmental impacts of human activities– as well as discuss how national guidelines and requirements for EIAs influence the outcome. The course includes a comprehensive overview and thorough knowledge of EIA procedures and methodologies. The course follows the steps or stages of an EIA process. These are sequential, taught in lectures and exercises, one after the other, building the knowledge to understand a whole-EIA process. The steps are the following: (1) Initial work; (2) Screening; (3) Scoping; (4) Assessing; (5) Mitigation and impact management; (6) Reporting; (7) Reviewing; (8) Decision making; and (9) Monitoring/implementing/auditing.

As a result of more than 20 years of iterations on the course –aiming for a constructive alignment (Biggs & Tang, 2011)– the course curriculum is well lined up with lectures, exercises and assessments. Lectures include a combination of teaching followed by case studies, role games, group work and individual preparation. The assessment consists out of written mandatory group reports (40%) and a 20 minute individual oral exam (60%). For the current edition, I designed, implemented and assessed two pedagogic activities –a poster session and a quiz session– which together include the strategies mentioned in the introduction (peer learning, repetition and space effect, self-evaluations, visualization of concepts, immediate feedback, class discussions and formative assessments among others), aiming to improve students' learning and exam performance.

### Poster session

Inspired by Scientific Conferences, the poster session aimed to reinforce all the stages –and interactions among stages– of the EIA process. I hypothesized that activity would help the students to acquire the general, bigger picture of the whole-EIA process. The session took place after all the course lectures. Students, in groups of 4, had 45 min to prepare and summarize

–visually when possible– one of the eight EIA stages. A poster template was provided to the groups and the steps were previously assigned during the instructions (Appendix A). Furthermore, the group had to write two single-choice questions on their EIA stage for the quiz session. When all the posters were ready, we had a poster session outdoors where each of the groups delivered a 3 min presentation of their poster. The poster presentation was followed by 2 min of questions from the other groups (figure 1). All posters were uploaded afterwards to the course platform.



**Figure 1.** On the left, a group of students working in their poster. On the right, a group presenting their poster.

### Quiz session

The quiz session, as the last activity of the course, aimed to promote student self-evaluation and formative assessment on specific content before examination. I hypothesized that students would be able to identify their weaknesses and clear doubts before the exam preparation. The quiz was built and implemented using Socrative, a licensed electronic voting system (EVS), which can be accessed from smartphones and computers. The quiz consisted in 10 single-choice questions –some of them selected from the ones that the groups wrote during the poster session– and 10 open questions designed to promote discussion (see Appendix B). Discussions followed the questions when there was no agreement among students on the right answer. Teaching was implemented when there was a need for clarification

or a lack of consensus. Corrections on the student's submitted answers was uploaded to the course platform after the session.

### **Assessment of the sessions**

Using Google Forms, I distributed an online questionnaire among the students. The questionnaire consisted of 10 questions, five similar questions for each session.

Two of them gathered the student feedback on the sessions' appropriateness for providing the general overview on the EIA process and identifying weaknesses in their understanding, by answering within a rating scale from [(1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; to (5) strongly agree].

- *Did the poster/quiz session help you to get a good overview of the EIA process?*
- *Did the poster/quiz session help you to identify weaknesses in your understanding of the whole-EIA process?*

The third question aimed to assess the success of the sessions on the clarification of doubts, by answering [yes/no/or other answer question].

- *Did you clear your doubts (if any) during the session?*

Last, two open questions assessed the learning outcomes behind the sessions and what could be improved for coming years.

- *What was the most useful thing from the poster/quiz session?*
- *What could be improved in the poster/quiz session from a learning perspective?*

Besides the questionnaire, the oral examination was also indicative of students' performance.

## **Results, discussion and reflections**

### **Poster session**

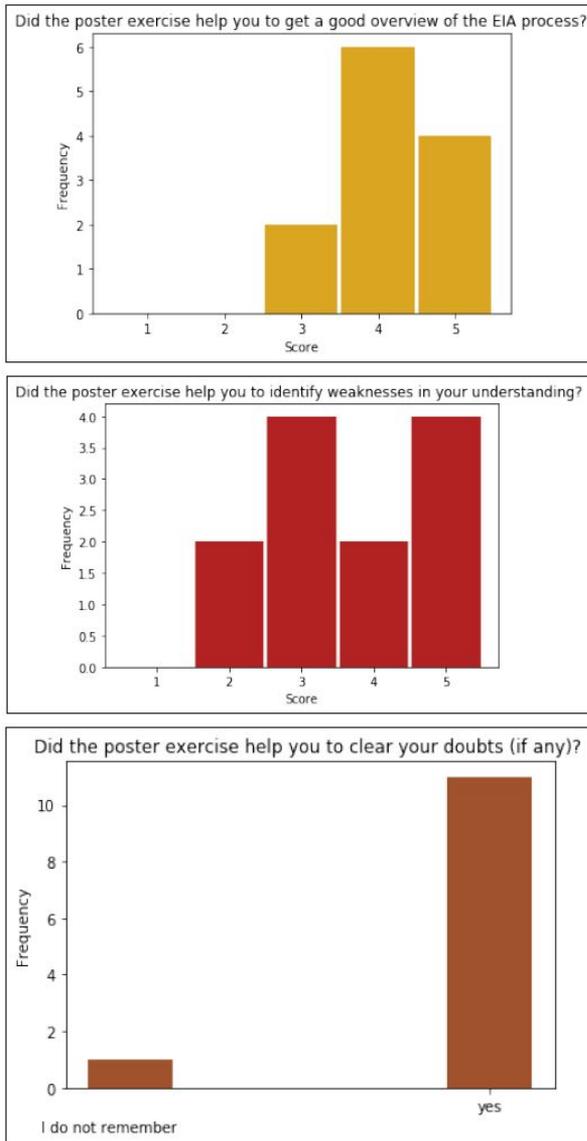
The poster session reinforced the general knowledge content of the course, by providing a visual summary and linking all steps of the EIA process.

Twelve students gave feedback on the exercise (figure 2). Although some of them mentioned that they were representing their whole group, they were counted as individuals. In the scale from 1 (Strongly disagree) to 5 (Strongly agree), 83% of the students acknowledged the poster session enabled a good overview of the EIA process (scores of 4 and 5). As an activity to identify weaknesses in their understanding, only 50% found the poster session helpful, 33% did not agree or disagree, and 16% did not find it helpful. However, most of the students (91%) considered that the poster exercise cleared their doubts.

When the students were asked the open question *what was the most useful thing from the poster exercise*, most of them referred to the clear overview on the whole process (figure 3). The exercise provided a visualization and an explanation of each of the eight steps of the EIA process in one session, refreshing and reinforcing what was learnt during the course. Other answers pointed at peer learning directly and indirectly, recognizing the benefits not only of learning from other students, but also the active learning by being part of the poster design and explanations (Boud et al., 1999). Some others appreciated the possibility of asking questions and receive immediate feedback on their doubts, during the two minutes reserved for questions. Immediacy is likely to improve learning when compared to other delayed forms of feedback (Kehrer et al., 2013). These were some of the student reflections related to the strategies for improving learning, that the poster session succeeded to bring together.

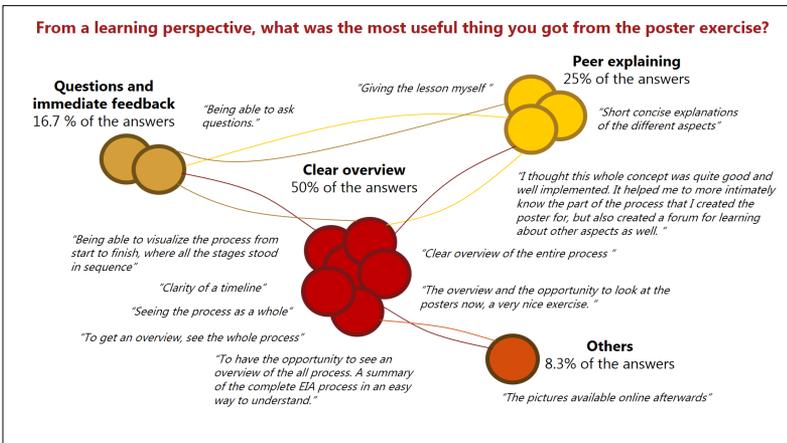
Among other benefits, designing the posters provided an opportunity to visually, summarize content. Though some groups might be more creative than others in their diagrams, the sole exercise of summarizing one of the components of an EIA in a limited space already provided a learning outcome. During the 3 min presentation, students had to organize ideas and generalize them in order to explain the key points of their EIA process. Furthermore, the whole exercise served as a formative assessment, identifying general misconceptions and the need of further teaching (Trumbull & Lash, 2013). The change of environment, teaching outside of the class, was positively valued by most of the students.

There were a number of things that can be improved for future poster sessions, according to the students (table 1). Among them, the lack of time was commonly mentioned. While it is true that there was a limited time (and space in the poster), it also promoted –as a learning outcome– the need of summarizing content to reduce the cognitive load and thus provide the general perspective. Although keeping the time along the session was



**Figure 2.** Responses to the questionnaire assessing the poster exercise. Scores range from (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree.

my main concern before the session, it worked out and I succeeded with the Scientific Conference format of 3 min presentation + 2 min questions. I also asked the students to write a couple of questions for the quiz from their specific EIA step, which added some extra pressure. The questions generated were simple and general, not aligned with the aim of the quiz, so this question task could be removed.



**Figure 3.** Representation of the student’s answers to the question: From a learning perspective, what was the most useful thing you got from the poster exercise? The student’s answers are clustered in four categories: 1) Questions and immediate feedback; 2) Clear overview; 3) Peer explaining; 4) Others.

While being outside was initially received with enthusiasm for most of the students, it was a bit warm to be outside, especially on the sun. This generated some distractions, as some of the students were uncomfortable, protecting themselves from the sun rather than paying attention to their colleagues. A shaded area would have been a better location, keeping the benefits of a change of environment (Biggs & Tang, 2011).

Last, using the oral examination as feedback on student learning, some students mentioned that *“the poster exercise was key to improve their understanding of the EIA process and therefore their performance during the exam”*. Also, the external examiner noticed a good performance of the stu-

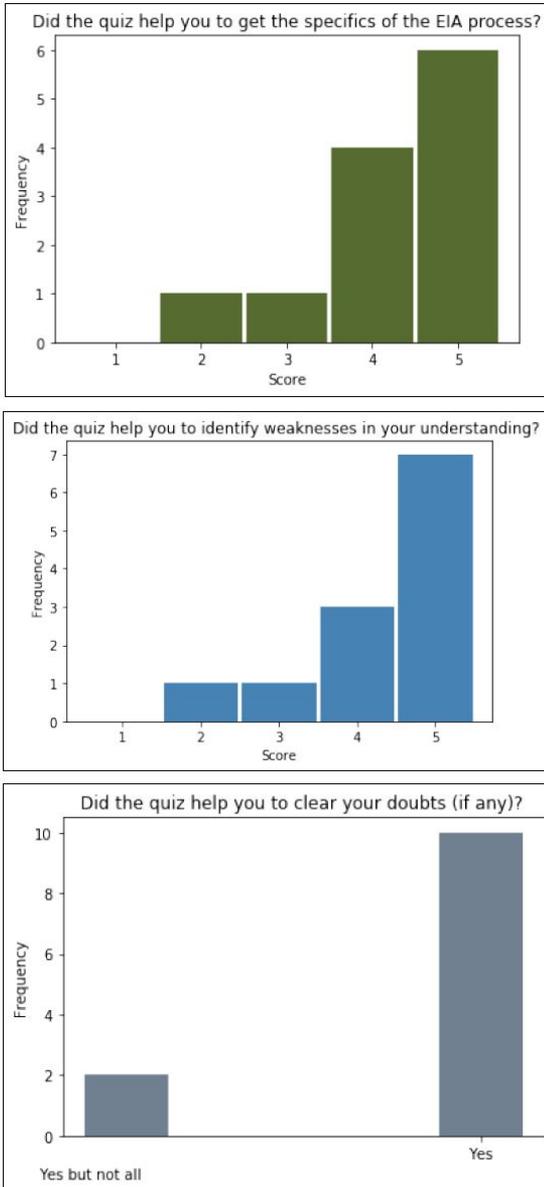
dents when recalling the whole-EIA process, in comparison with previous years.

**Table 1.** What could be improved in the poster exercise?

<i>"Not focus solely on your part, engage more in the other parts as well"</i>
<i>"Be more time-efficient"</i>
<i>"Maybe do it inside? It was nice outside but it got a bit too warm"</i>
<i>"More time, better speeches"</i>
<i>"Maybe a bit more time?"</i>
<i>"I liked the whole thing. No complaints"</i>
<i>"Not to stand with the sun backing on the posters. Chose the shade"</i>
<i>"In a more shaded area. Having a chance to be quized (multiple choice) during or after this session, to test retention"</i>
<i>More time to do it, so it is not so much stress, also that you don't have to do the quiz questions at the same time since it adds to the stress</i>
<i>I think as a whole it was a good activity. I think it works good.</i>

## Quiz session

The quiz session aimed to help the students to reinforce the specific contents, by self-evaluating and identifying weaknesses in their acquired knowledge during the course. Twelve students provided responses to the assessment and 83% of them considered that the quiz achieved the objective (scores of 4 and 5) (figure 4). Unlike the poster session, most of the students (83%) considered that the quiz exercise helped them to identify the weaknesses in their understanding. Those can be used as key points to reinforce for exam preparation. Furthermore, the quiz itself is a way to transfer knowledge, and questions tested and discussed are more unlikely to be forgotten (Anderson et al., 2013; Benjamin & Pashler, 2015). All the students considered that the quiz provided a good way to clear their doubts, though two of them could not clear all their doubts.



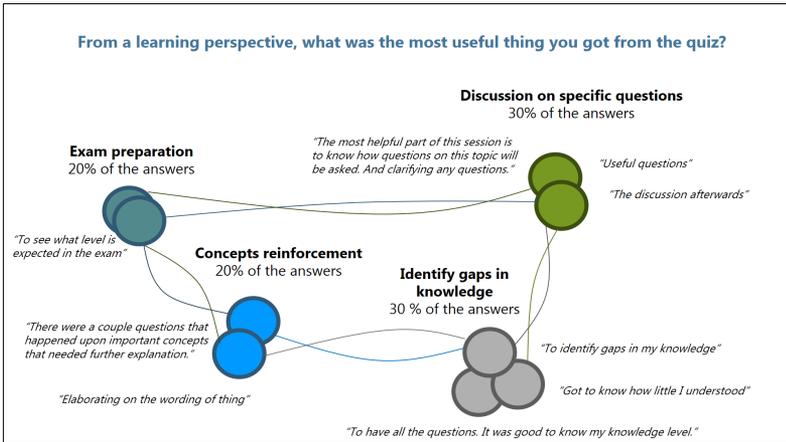
**Figure 4.** Responses to the questionnaire assessing the quiz exercise. Scores range from (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree.

From a learning perspective, students found the quiz session as an appropriate tool to identify gaps in their knowledge (figure 5). The exercise facilitated the students to deepen their understanding and retrieval from memory to find the answer to the questions. When there was a disagreement among students in the answer, my role as a teacher was to moderate the discussion and provide the right answer when necessary. This was used as a formative assessment (Trumbull & Lash, 2013). If something was still not clear, then I taught, which resulted in an efficient teaching. Concepts reinforcement was also mentioned by the students, especially for those concepts that were introduced at the very beginning of the course. As an applied course, students work in specific cases, and the theory –or the why are they doing what they are doing– might be forgotten. However, in the exam, the student performance to recall these concepts is evaluated, and students valued the quiz exercise as an excellent tool for exam preparation. Among other benefits for learning, having exam questions without the pressure of an exam, with other students and the teacher providing immediate feedback, facilitated a good atmosphere for learning.

Students were asked also for improvements on the quiz session. A number of improvements should be made for future editions of the course. Time efficiency, proper formulation of the questions, more questions and more sessions like this were among the answers.

As a teacher reflection, some of the answers of the students were distant from the right, expected answers. These specific themes and concepts were obviously not reinforced during the course. The quiz session not only helps students, but also us, teachers, to identify weaknesses in our teaching.

Last, during the feedback on the oral examination, some students mentioned *“a feeling of more confidence thanks to the quiz exercise”*. Whether it was because of an improved learning, or because they got a sense of the type of exams questions, or both, will have to be asked in future editions.



**Figure 5.** Representation of the student answers to the question: From a learning perspective, what was the most useful thing you got from the quiz? The student’s answers are clustered in four categories: 1) Identify gaps in knowledge; 2) Discussion on specific questions; 3) Exam preparation; 4) Concepts reinforcement.

**Table 2.** What could be improved in the quiz session?

<i>Be more time-efficient</i>
<i>The formulation of the questions should be more clear</i>
<i>I think it would have been better to have a quiz prepared by the examination team. This would give more confidence that these were legitimate questions, and that we were covering concepts that are actually important to know.</i>
<i>More questions, multiple choice. Or another session in the middle of the block</i>
<i>If people were more quiet, and if we got more precise answers on what was actually right, it was a bit hard to hear/know sometimes</i>
<i>Better clarity on right or wrong questions</i>
<i>I think to review the options in the multiple options choice, some of them were a bit odd, but I know the questions were formulated by the group.</i>

## Conclusions and perspectives

We had the concern in our course that, every year, a number of students were not able to reach a good performance during examination. They were failing to recall specific and general content knowledge of the curriculum.

There was a need to facilitate the learning process through different teaching strategies. The poster session was able to gather together peer learning, repetition and spacing-effect, visualization of concepts, immediate feedback and change of environment (teaching outdoors) among others, mimicking –and using the analogy– of a Scientific Conference. It succeeded to assist the students to get the bigger picture –the whole-EIA process and the interactions among stages– under the hypothesis that it would be easier to remember a sequence that has been previously reinforced and visualized. On the other hand, the quiz session combined self-testing and formative assessment, which were key for students to identify their own knowledge gaps, always relevant for exam preparation. The quiz aimed for the specifics, the dots that are necessary to be reinforced and connected to see the bigger picture. Fomenting the discussion among students, clearing doubts and teaching when necessary, were also the ingredients of a successful session. A number of improvements on the activities were identified –from timing to questions formulation– providing the roadmap for the coming editions. This is part of an iteration process –edition after edition, through evaluations and aiming for a constructive alignment with the course curriculum– which will yield a more effective teaching while fostering student engagement and learning.

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A

**Recap of the whole-EIA process**

**Poster session**

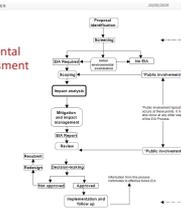


**Today**

- Recap of the whole EIA process through a poster session (preparation + presentation + questions)
- 45 min to prepare the posters
- 3 min presentation per poster
- 2 min questions per poster

**International Conference on Environmental Impact Assessment (EIA)**

Copenhagen  
20/05/2019



**Keynote speaker**



[https://youtu.be/PWAMP\\_jrK0T](https://youtu.be/PWAMP_jrK0T)

**Poster Session**



3 min presentation + 2 min questions

**Poster TEMPLATE**

<b>TITLE (EIA STAGE)</b> <b>RATIONALE</b> (FOR THIS EIA STAGE)
<b>RESPONSABILITIES</b> (IF ANY)
<b>METHODS</b> (e.g. EXERCISES YOU DID IN CLASS)
<b>RESULTS</b> (OUTPUTS OF THIS EIA STAGE)
<b>LIMITATIONS</b> (e.g. BARRIERS, SHORTCOMINGS)

**Poster distribution**

- Strategic Environmental Assessment (SEA) Group F
- Public involvement Group F
- Screening Group E
- Scoping Group E
- Assessing Group D
- Mitigation Group C
- Reporting Group B
- Reviewing and decision making Group B
- Monitoring and auditing Group A

**For the exam quiz**

Write two questions about your EIA stage for the exam quiz

The answer should be multiple choice with 4 options

e.g. When is public involvement taking place in the EIA process?

- Screening
- Mitigation
- Scoping
- Scoping and review

Environmental Impact Assessment (EIA) ... Total Questions: 20  
Most Correct Answer: #8 Least Correct Answer: #5

9. Who is responsible for conducting the Strategic Environmental Assessment (SEA)?

12/18  Parliament  
0/18  Local authorities  
17/18  The government  
0/18  NGOs

2. What are the expected results of SEA?

20/18  Information  
20/18  Information to policies, programs and budgets  
0/18  Decide whether an EA is needed  
0/18  Register public opinion

3. What does the screening determine?

25/13  An EA is needed  
0/18  If the project should happen or not  
0/18  If the project will be ready, pending or rejected  
1/18  If the needs of the project justify money cost  
4/18  If the project is worth the money cost

4. What is the outcome of the scoping phase?

27/18  The terms of reference  
0/18  The feasibility study  
0/18  The EA  
0/18  The bid

12. What is the function of the 0-alternative?

The alternative highlights the impacts on the project location in the **absence of the project location** which is what occurs in the location if the review goes in alternative.

Complete the sentence when you do not do the project:

To assess the severity of the impacts, establishing the **project versus no intervention**.

Application of the 0-alternative helps you to **eliminate the impact of doing nothing** it is a way to view the contribution of the baseline.

13. What is a baseline study in an EA and why do we need it?

A baseline study is the **starting point** of the assessment where the project will take place. It is necessary to ensure **comparable conditions between the project and the environment** and mitigate effects due to natural causes in the baseline.

A baseline study assesses the **pre-existing conditions of the project area**. **Baseline of the environment** A baseline study is necessary to identify what are the project's impacts on the area.

Describe the scope of the assessment before the project. Establish **spatial boundaries and need to measure the relevant changes**.

A baseline study **determines the current state of the area** (physical, chemical, biological/ecological, socio-economic) and compares it with the baseline of the project. We need to compare the impacts of the alternatives to and to compare the effectiveness of monitoring.

16. At which stages in the EA process are the alternatives considered and why? or when?

**Proposed in the scoping phase. Absence of the EA considered before decision-making** to assess if there is a more feasible, viable, realistic project alternative.

17. Who is responsible for the monitoring?

**Project proponent** and relevant authorities.

**Projector**

**Projector of the project**

Whoever is **responsible for the EA** e.g. a proponent, government, subcontractor

5. What do you need to do during the scoping phase?

9/18  Involve the public, with workshops for example  
0/18  Assess the impacts  
5/18  Gather data to allow high-quality data  
7/18  Write a detailed report explaining the major impacts

6. What is most often required for mitigation?

27/18  Awareness  
1/18  Interest of the project  
1/18  Information  
0/18  Total community

7. What is NOT included in an Environmental Management Plan (EMPP)?

0/18  Accountability  
1/18  Mitigation measures  
16/18  Timing of impacts  
12/18  Timing of mitigation

8. When do you mitigate in the EA report?

0/18  After scoping  
3/18  After reporting  
0/18  After decision-making  
20/18  After assessment

9. When does the monitoring phase take place in the EA process?

1/18  Before scoping  
5/18  After scoping  
18/18  After decision-making  
4/18  Impact of the EA

14. What are the purposes of the Environmental Management Plan (EMPP)?

**Identify mitigation measures and implement**  
**Establish a system and procedures for the project**  
**Monitor the effectiveness of mitigation measures**  
**Set action when unforeseen impacts occur**

The EMPP is the practical backbone of the EA as it covers the **how** (people involved, time constraints), **monitoring**, **assessment** and the responsibility.

To outline the measures that need to be taken for avoiding, minimizing or offsetting significant adverse impacts from your plan to the project and what the monitoring, review and checking as well as the responsibility of the project. It also includes remedial actions for mitigation.

18. Can the decision-maker ignore the EA report?

No. The decision-maker has to take into account all the relevant documents regarding the project.

**Not they cannot ignore the EA**

15. What are the differences between an Environmental Management Plan and an Environmental Monitoring Plan?

The **management plan is used to describe mitigation measures** while the **monitoring plan describes a system for the monitoring of the mitigation measures**

10. Auditing involves:

2/18  The scope of the processes for establishing terms of Reference (TOR) and boundaries for the TOR  
24/18  Reporting impacts predicted with those that actually occur  
3/18  Identify the risks and establish costs in the EA  
6/18  Decide whether a project requires EA or not

11. At which stages is the public the public involvement required and why? (required as mandatory)

During **scoping** the public interests are identified, the public is encouraged to understand the project and its compatibility with their values.  
During the **scoping** the public can evaluate the acceptability of the project and its impacts.

The public involvement takes place over the course of **scoping**.

**Public Involvement**

The public must be included because they are one of the primary stakeholders and need to have an opportunity to be consulted **before** to **avoid** that **concerns** **regulations** etc. Furthermore, they may need to be consulted.

During scoping we need to include the concern of the public. To do this, **meeting** **before** the report because we need to have the public agree with the content of the project.

11. What is a cumulative impact? (Give an example)

Cumulative effects, also referred to as cumulative environmental effects and cumulative impacts, can be defined as changes to the environment caused by the combined impact of past, present and future human activities and natural processes. **Cumulative effects of environmental and climate change will often occur in significant environmental effects.**

Cumulative impact results from the given project will impact the area alongside other existing projects.

Cumulative impacts: When you have the same impact in different projects, but in the same area as both such as climate change impacts. Example: A new road project will have more than one impact on the area.

When multiple projects in the vicinity that to which the impact of the proposed project might add up to a significant impact. Example: A new road project will have more than one impact on the area.

When multiple projects impact on the same environmental components in such a way that the partial impacts add up to a significant impact. Example: A new road project will have more than one impact on the area.

Its impact that is not so significant but when placed with added pressure of the same or other impacts becomes significant. An example: a long-term project in an area where there is a problem (climate, small etc.)

20. Who is usually undertaking the review of the EA report?

**Auditing team and independent experts**

**The responsible authority**

## Student Activation in a Large Bachelor-level Math Course

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### Introduction

Bachelor-level introductory science courses have been mostly taught using traditional lectures, often referred to as ‘live’ lectures, an approach which existed since early days of modern academic systems and continues to predominate other alternatives. Its most classical form was delivered using blackboard presentations, which were superseded by various forms of slide presentation, e.g., overhead projectors and modern computers. Modern technologies continue to make computer-assisted slide presentations a much more attractive way to students and instructors alike, in particular, in large courses with 100+ students. Although modern slide presentations gave a remarkable boost to traditional blackboard lectures, the efficacy of such lectures, irrespective of the media used, has been questioned by many researchers; see, e.g., Mazur, 1997. Traditional lectures are argued to suffer from several drawbacks, which could negatively impact the learning process. A typical and recurrent problem is low participation. Another notable drawback is that students could lose the thread at some early point<sup>1</sup>, thereafter they follow less and less (Mazur, 1997). Yet another one is that maintaining a good and universally accepted lecturing pace is difficult, if not impossible: some students find it slow and boring, and others simply cannot follow the class.

A well-recognized approach departing from the traditional lecturing system is *flipped classroom*, also known as “inverted classroom” or “re-

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<sup>1</sup> This is context-dependent, but a rule of thumb says it happens after 20 minutes.

versed instruction”, which aims to shift the teacher-centered learning process to a student-centered one (Bergmann & Sams, 2012; Tucker, 2012). There seems to be little consensus on the definition of the flipped classroom (Schell & Mazur, 2015), but its most universal definition reads (Bergmann & Sams, 2012): “Basically the concept of a flipped class is this: that which is traditionally done in class is now done at home, and that which is traditionally done as homework is now completed in class”. Some researchers argue that flipped classroom is a more a mindset than an approach; see, e.g., Schell and Mazur, 2015. The flipped classroom approach admits a broad range of implementations, but most of which strive to use tools to activate students in the class, and thus promote students’ involvement in the learning process. In doing so, *peer instruction* is a prominent pedagogical technique (Lymna, 1981; Mazur, 1997), which has been around for more than three decades. Peer instruction allows for more interaction between both peers (i.e., students) and student-teacher, and whose key target is to activate all participants in the class making them involved in the learning process. There is a rich literature reporting the success of peer instruction in enhancing the learning performance in various courses; see, e.g., Mazur, 1997, Cortright et al., 2005, and Giuliodori et al., 2006.

This study presents an alternative design for a large bachelor-level course with the aim of activating students, and ultimately promoting their involvement in the entire learning process. The course under study is ‘Introduction to Numerical Methods’ (abbreviated hereafter as *NumIntro*), which introduces students to the realm of numerical analysis, and thus, plays a vital role in applications of mathematics in practice. It is essentially relevant in every situation where some form of computation is performed in a computing system, or where some mathematical model is implemented in real-life. It is therefore an important course bridging theory and practice, and has thus both practical and theoretical elements.

My aim in this project is to present ideas on how to restructure the basic course elements of NumIntro so that the teaching approach becomes more aligned with the flipped classroom approach. In so doing I make use of several core in-class activities carefully designed to activate students in the class. The common aspect of the core activities is their aim to boost students’ involvement in the class, while some of them implement some degree of peer instruction. The core activities incorporate feedback from departmental and educational supervisors when trying similar activities in another course of similar nature, but also consider students’ evaluations of

the last edition of the course. At last, the choice of activities and students' involvement are supported and discussed considering relevant literature.

## **Context of the Study: Course Description of NumIntro**

### **Style and Organization**

Offered by the Department of Mathematical Sciences (MATH), NumIntro is a 7.5 ECTS bachelor course taken by students from various disciplines including mathematics and physics (course website: <https://kurser.ku.dk/course/NMAA09005U>). It is a large bachelor-level math course, typically with 100+ students. In the 2020 edition of the course, 135 students signed up for the course, most of whom successfully completed the course. The course is usually taught by two instructors. Its 2020 edition was taught by Mogens Bladt (Professor, MATH) and myself (Assistant Professor, DIKU). It also had four teaching assistants (TAs). The course materials and activities can be categorized into two parts: theory and programming. The programming language taught in the course is Python, a high-level computer programming language widely used in scientific computing. Offered to a wide range of students, NumIntro assumes no prior background on computer programming.

The course takes place in Block 1, and I am responsible for the first 3 weeks of the course, a total of 6 sessions. Conventionally, each of these sessions is divided into two parts: the first part is devoted to theoretical aspects of numerical computation whereas the second deals with teaching the basics of computer programming (Python) to implement numerical methods in computer. The rest of sessions, taught by the other instructor, mostly deals with the theory part. Following each lecture, there are a few (in 2020, four) parallel, identical exercise sessions where TAs solve pre-assigned theoretical and programming exercises. Each TA is responsible for a pre-assigned group of around 35 students. TAs also help students debug their Python programs.

### **NumIntro's Intended Learning Outcomes (ILOs)**

According to NumIntro's course description, a student, upon completion of the course, acquires knowledge on (a) standard numerical methods for

solving equations, approximation of functions, integration and differentiation, etc., and (b) simple programming in an imperative language (in recent years, Python), including procedures/functions, variable, sentences, numerical expressions, scope (and beyond). More precisely, NumIntro strives at achieving the following:

*“On the completion of the course, the student, will be able to: (i) explain what distinguishes “exact mathematics” from “numerical mathematics”, (ii) set up standard methods for numerical solution of non-linear equations, linear equation systems and eigenvalue problems, (iii) set up simple models for approximation of functions, differential quotients and integrals, (v) use an imperative programming language to write and execute small programs, and in particular, implement and solve methods in (i)-(iii) using that language.”*

The theory part of NumIntro deals with methods geared with the practical aspects. This feature together with the programming part make NumIntro a bit special, and perhaps not directly comparable to most other bachelor-level math/physics courses.

## **Assessment**

The assessment consists of a three-hour written exam and a compulsory hand-in, each counting for 50% of the total grade. The compulsory hand-in is a one-week individual take-home exam, usually taking place in Week 6, and comprises a well-designed theoretical problem followed by some relevant programming tasks. In contrast, the written exam only contains theoretical questions. Prior to the written exam, the students receive written feedback on their compulsory hand-in.

## **The Last Edition of NumIntro**

In pre-2020 editions of NumIntro, the theory lectures followed a traditional classroom approach, mostly using a blackboard. This was no longer the case in the last edition of NumIntro (in 2020), which was taught entirely online due to restrictions posed by the Covid-19 outbreak. In this last edition, which was my first experience with NumIntro, I organized each session into two parts: First, I would give a live slide presentation over Zoom (Zoom Video Communications, 2021) to teach the theory part. It was followed by a live programming session, where I would first introduce some concept of Python orally (i.e., with no slides) and then directly examine

them in computer. Live programming would be implemented in a proper pace so that student could do programming simultaneously. For example, I would teach how to define a variable and do some small calculations. Then I would write a small script and run it, and so would do the students. Recorded videos of both parts made available after each session. The other instructor took a different approach however: He divided each session into several sub-sessions, where for each he recorded a short video clip (10-20 minutes long). In the videos, he used slide presentation trying to mimic the step-by-step derivations of mathematical formulas as in blackboard presentation. These pre-recorded videos were made available on Absalon one week before the class. He would then organize a one-hour Q&A session (in Zoom) in each week, where students could show up and ask questions about the covered topics.

The course implementation also featured an element which was not affected by the outbreak: Prior to each week, we posted a weekly slip ('ugeseddel') listing: (i) the topics to be covered in both theory and programming parts to a detailed extent as well as their corresponding reading assignments from the textbook; (ii) some theoretical exercises, mostly selected from the textbook; and (iii) programming exercises aiming to implement theoretical part taught within each week. The students were encouraged, but not obliged, to read the materials before the class and try to solve the exercises.

### **Lessons Learned**

Each instructor had the complete freedom to choose his preferred mode of teaching, and trying different approaches were by no means coordinated to, e.g., boost the learning performance or conduct some experiments to identify the superior one. Nonetheless, students' evaluations revealed that they preferred pre-recorded videos to live lectures. Under normal circumstances where student life is not affected by the quarantine, this observation is consistent with what the literature reports. This was nonetheless surprising to me as I expected that a live lecture could to a great extent resemble a traditional lecture in a physical classroom, of which students were deprived. I could argue that the lonesome student life arising from the Covid-19 quarantine could be remedied when the students virtually gather, and this helps amend sense of community, which has become fragile in the quarantine days. Students' feedback proved otherwise, however.

## Description of the Activity

The 2020 edition of NumIntro turned out to be a valuable experiment revealing some precious and encouraging results. These key observations motivated us to adopt a flipped classroom approach for the entire course in the next edition (in Block 1, 2021). Although one instructor followed a flipped classroom approach in the last edition, the involved Teaching Learning Activities (TLAs) were still mostly *teacher-managed*, in view of the terminology in Biggs and Tang, 2011. In order to enhance the learning performance, I propose to use some well-tailored and solid activities. This section aims to make these activities more precise. As preparatory task, for each session, there will be some reading assignment and the main material will be catered in the form of a series of 10-20-minute-long video lectures, which be uploaded to the course page in Absalon a few days before the class. Reading assignments are considered optional, however. In contrast, watching videos is compulsory as they constitute the main pre-class teaching element. The topics in both theory and programming parts lend themselves very well to this implementation. In particular, for the programming part, pre-recorded videos cover definitions, language constructs and commands, and other syntactical elements, as well as some small programming examples. At the heart of my proposal are a number of core activities designed to be conducted in the class, which I shall generically call *in-class activities*. I specifically consider 4 in-class activities discussed below.

### In-class Activity 1: QnA

The first core activity is Question and Answer (QnA), in which students are given the opportunity to ask questions related to the topics covered in the reading assignment and pre-recorded videos. The length of QnA could be adaptively chosen depending on, among other things, the number of questions as well as the difficulty and importance of the topic covered. Although this is an in-class activity, the students are also encouraged to pose questions in advance of the class via the features available through the course page. QnA might sound dull, and its implementation may seem trivial. However, it is crucial to be included in each session, and its implementation involves some subtlety. Dedicating QnA a separate activity helps make its importance more salient to the students.

### **In-class Activity 2: Conceptual Quiz**

The second activity is what I call conceptual quiz – though the terms may already exist in the literature. It features a quiz comprising a few multiple-choice questions or questions with short answers, which is supposed to be completed by students individually. It is not supposed to deal with complicated math/programming exercises, but rather with questions related to core concepts covered. There are several ways to implement this, and nowadays this activity can be administered easily and cheaply, thanks to the widespread use of online platforms tailored to this purpose, such as Padlet (Wallwisher Inc., 2021) and Socrative (Showbie Inc., 2021). These platforms also allow for preserving anonymity and ease in contrasting responses. I intend to use such platforms to implement quizzes in a sequential fashion, where questions will appear one by one on the screen and for each, students, who are connected to the relevant platform, will be given some short time to commit to an answer (in the case of multiple-choice question) or write a short answer otherwise. Then, the correct answer together with a short supporting discussion will appear on the screen (in a physical or virtual class), while the instructor will elaborate on the correct answer and perhaps contrast it with some potential wrong answers. I stress that my ‘Conceptual Quiz’ is not identical to ‘ConcepQuiz’ of Mazur (Mazur, 1997), despite the similarity between the two terms.

### **In-class Activity 3: Exercise Solving in Breakout Sessions**

As its name suggests, this activity involves solving a theoretical exercise in a breakout session. In a physical class, a breakout session involves discussion among neighbors, whereas in an online class, this involves discussion among students put in some virtual room. For instance, in Zoom, this can be implemented using the breakout room function. Students will work with their neighbors on a well-designed exercise. First, a theoretical exercise related to the covered topic is presented (e.g., via slide presentation or blackboard). Once the task is clear, the instructor lets the students to reflect and work on it together with their neighbors, collaboratively. Each group is supposed to report its solution to some shared platform (e.g., via GoogleDoc). Once breakout sessions are closed, the instructor discusses the solution and provides feedback on the reported solution by each group. The sessions could then resume for further discussion among peers. This structure is consistent with the various phases of the TDS model, that is, Devo-

lution, Activation, Formulation, Validation, Institutionalisation (Brousseau & Balacheff, 1998).

### **In-class Activity 4: Live Programming**

This activity consists of on-the-fly programming in the class in order to *individually* solve a programming exercise. More specifically, first the instructor presents a programming task related to the covered topic. The students will be given some time to reflect *in small groups*, but then are asked to individually write a computer program solving the task. Once the time is over, the instructor presents a possible solution (a computer program) in the class, visible on the screen, and runs the code. Next, the instructor discusses possible errors students may have.

### **Session Synthesis**

Having introduced the core in-class activities, I proceed to present some possible plans for the class (relevant for the first 3 weeks). Each session is divided into three sub-sessions. The first is devoted to QnA, which could last for some time depending on the topics covered. My intent is that QnA precedes the other activities. The second sub-session, which concerns the theory part, is devoted to exercise solving in breakout sessions. Furthermore, in every other lecture, it features a conceptual quiz, too. The third sub-session concerns the programming part and features a series of live programming activities. (For a summary, see Figures 1 and 2.)

Mogens Bladt, the current course responsible for NumIntro, is onboard with the suggested plan and is as eager as me to implement it, thus ensuring the congruence. To respect the didactical contract, at the beginning of the next edition, the students will be informed of restructuring of the course elements.

### **Discussion and Outlook**

Students' evaluation in the last edition revealed their admittance of the flipped classroom approach. For instance, students admired various flexibility degrees freely endowed with pre-recorded video lectures: that they could pause videos to reflect or take some break, to control the pace, and to rewind, if necessary, though they were deprived of asking questions on the

fly. Considering this, a flipped classroom approach for the entire course is no doubt worth trying.

before class	in-class		
pre-recorded videos	QnA	exercise solving in breakout session	live programming
	sub-session 1	sub-session 2	sub-session 3

**Figure 1.** Session design 1.

before class	in-class			
pre-recorded videos	QnA	conceptual quiz	exercise solving in breakout session	live programming
	sub-session 1	sub-session 2		sub-session 3

**Figure 2.** Session design 2.

The efficacy of the proposed plan will be examined in next edition of NumIntro taking place in Block 1 (2021-2022). However, its design and the choice of in-class activities could be supported in light of existing literature as well as some prior experience of implementing similar activities in other courses. Below, I discuss some positive aspects as well as some words of caution in implementing the plan.

## QnA

QnA might seem dull or even redundant, but I argue that it is a crucial and viable in-class activity. The literature on flipped classroom strongly supports activities like QnA, often called Q&A, and it turns out that some variant of Q&A is a recurrent in-class element in flipped courses; see, e.g., Zheng et al., 2020 and Lim et al., 2014. The latter work reports a flipped classroom implementation for two math courses, ‘Calculus 2’ and ‘Nonlinear System Theory’, where Q&A was the main in-class activity.

In a live lecture, students ask questions of various kinds: some are superficial whereas some others are deeper and well-elaborated. There always are unclear points in the presented materials, e.g., unclear notation,

abbreviation, or some confusion with respect to previously taught materials. Most matters like these are immediately resolvable in live lectures. Although questions during a live lecture tend to interrupt the instructor's flow, most instructors would admire them as they are often feedback resourceful: they indicate whether students are following, but they also give clear pointers to misleadingly presented items. Further, many questions asked during live lectures could be a reflection trigger for the others. It is unfortunate that pre-recorded video lectures lack this feature, despite their promising positive aspects. Therefore, by devoting a sub-session to QnA, I strive to compensate for this lacking element. Devoting a reserved slot for QnA conveys an explicit message to my *video-watchers* that they are not left out, and hopefully encourages them to actively participate in the class (and hence in QnA). Afterwards, the hope is to get some feedback from the students as in live lectures, but it notably gives them some time to formulate their questions more solidly. This is also supported by the literature. For instance, Lim et al., 2014, who uses Q&A as the sole in-class activity for two flipped math courses, report some encouraging observation: Respondents in their course evaluation admire that they reviewed their questions before raising them in the class, which led them to prevent asking questions irrelevant to the class.

Perhaps one overlooked benefit of QnA is that it gives the instructor an opportunity to teach students ways to concretely and precisely formulate their questions. For instance, this can be done by paraphrasing the original question. While in a live lecture, questions are asked orally, here it seems a good idea to benefit from online platforms (even in a physical class) allowing students to post their questions in advance of the class, which brings anonymity as an option. As a final note on the importance of QnA, I refer to some advice from my pedagogical supervisor (Grønþæk, 2021): A key goal of “teaching” is to teach the students to ask questions: encouraging their continual curiosity, helping them delve into the topic, and finally helping them elaborate on their questions with the aim of learning to frame their lack of knowledge into a valid, clear question.

## Conceptual Quiz

Quizzes constitute a popular form of in-class activities in a plethora of flipped classroom practices and whose use is supported well by the literature. They have been deployed in a variety of courses, e.g., introductory physics (Mazur, 1997), computing courses (Maher et al., 2015), and evo-

lutionary process (Awidi & Paynter, 2019). In these works, quizzes have been used for various purposes: For example, Mazur, 1997 and Maher et al., 2015 make use of quizzes as a proxy to cheaply and rapidly gather feedback on the number of students completed the reading assignment. The purpose of quizzes may not be just to examine the depth of students' understandings; well-elaborated quizzes can be used as a medium, different than the main lectures, to convey knowledge (e.g., Awidi and Paynter, 2019; Maher et al., 2015). Further, Maher et al., 2015 redistributes quizzes to others for peer grading, a feature absent in my proposal.

Ease of implementation, thanks to availability of online platforms, is perhaps a promising feature of this activity. Prior experience of trying a similar activity in another bachelor course indicates that the participation rate is fairly high, even among those who are reluctant to be active in other activities. Anonymous implementation is a key to increase participation. Perhaps a remarkable feature here is that the cheaply gathered feedback has shown to be effective in discovery and clarification of misconceptions (Maher et al., 2015). At times, such misconceptions are experienced to be difficult to identify otherwise. It is worth remarking that such an activity can be used within live lectures to incorporate a change of mode to boost students' participation and regain their attention.

In view of NumIntro's ILOs, trying too many such quizzes could introduce some incongruence or jeopardize the alignment between assessment and the learning activities. The reason is that it is not always easy to design good questions being well-aligned with the ILOs or the assessment. That's the reason why I tend to limit the frequency of them (e.g., in every other lecture or even less). Finally, it is worth noting that some degree of peer instruction (as in, e.g., Maher et al., 2015) could be easily incorporated into in-class quizzes, though my proposal for Activity 2 does not involve any.

### **Exercise in Breakout Sessions**

This activity is no doubt rewarding and its efficacy for introductory Physics courses, among other introductory science courses, is supported well by a plethora of works, the notable reference being Mazur, 1997. Among the proposed activities, this is the one directly implementing a form of peer instruction and provides the best opportunity for the students to really engage in some problem solving: Not only does it involve *individual reflection* about the task, but it also sets the stage for the students to gain skills on how to collaboratively solve a (theoretical) problem. Prior experience of

such breakout sessions shows the success in achieving these goals in similar large bachelor courses (Pedersen, 2021).

Despite all such promises, breakout sessions turn out to act like a double-edge sword: They are arguably difficult to control and could easily become rewardless. One big challenge involved is due to those having little, if not none, incentive to actively participate. Surprisingly, this challenge could turn into a rewarding aspect of such activities (e.g., Lucas, 2009; see discussion below). Assignment of students to groups turns out to be a key factor to determine the level of participation, and in turn, success. Therefore, for sessions with random or blind peer assignments, devising many such activities could be deemed a waste of time.

The literature advocating benefits of breakout sessions, similar to Activity 3, combined with various forms of peer instruction abound, e.g., Lucas, 2009, Gok, 2012, Zingaro and Porter, 2014, to name a few. The positive aspects reported include significant impact of students' self-confidence (Gok, 2012; Zingaro & Porter, 2014), creating a lively classroom atmosphere, and success in engagement of passive students in college math courses (Lucas, 2009).

Among the other in-class activities, breakout sessions are the most time and resource consuming. Students might perform slowly or providing feedback to them in the plenum could take longer than predicted. Therefore, maintaining one breakout session activity with enough feedback time could lead to superior results, in terms of achieving ILOs, than greedily provisioning two or more such activities.

I conclude this note by some remarks. Instructors may be eager to try different modes of teaching, inevitably incorporating too many in-class activities. However, it is critically important to consider well-being of students. For instance, some studies have reported that some students find breakout sessions anxiety provoking. This was the case when they are put to spontaneously formed groups, and they found talking to strangers anxiety provoking (Palner, 2021), which could happen in large courses. Implementing some moderate level of activities could be good but trying too many activities might decrease the learning performance. For instance, students' evaluation in a Physics class shows that students admired a moderate use of class activities, and most respondents would prefer to have some degree of blackboard presentation (Haerter, 2020). Finally, introducing various activities gradually over various editions of the course seems very reasonable but is also advisable to ensure the alignment between ILOs, TLAs, and the assessment.

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## **Developing a short list of guidelines on the importance and best use of student presentations in classroom teaching**

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Key abbreviations. AL: active learning, SDL: student-directed learning

### **Overview**

#### **Background**

Student-directed learning (SDL) has emerged as an important learning concept in higher education. The goal of SDL is to promote more active learning (AL), a better sense of responsibility, a higher-level of learning, and, ideally, should empower students to become life-long learners. Student presentations are an important AL component of SDL that have been implemented in many courses at universities in Denmark and abroad. Usually, students are given a topic that they have to familiarize themselves with and then teach the topic to their peers. This not only requires an understanding of the topic at a level that enables students to teach, and ideally, also answer questions and lead discussions, but also requires a general understanding of how to best prepare and successfully present a topic.

#### **Rationale and Goal**

Some students, especially those that have just entered higher education may find it difficult to understand the benefits of student presentations and to acquire the skills needed to present in a way that not only engages their

fellow students but yields a positive learning outcome. The goal of this project was to develop a concise list of guidelines on the usefulness and best approach for student presentations using first-year medical students enrolled in the human biology course at the University of Copenhagen as example.

### **Summary of methods and main findings**

First-year medical students were taught for one semester in human biology (3909-E20 basal humanbiologi) at the University of Copenhagen, a course that included, among lectures and some practical sessions, a weekly student-activated class (SAU) in which students had to present various topics to their peers. At the end of the semester students evaluated the SAU class. This revealed that while students were generally satisfied with the class, for some students, student presentations caused frustration and dissatisfaction. Based on this negative evaluation and additional conversations held with students and teachers, a short set of guidelines for student presenters and teachers was developed. These could be used in the human biology class or any other class that includes student presentations in the curriculum.

### **Conclusions**

Student presentations are an important part of SDL that have significant potential in enhancing (long-term) learning outcomes. However, students are not trained teachers and, if left without sufficient guidance or feedback, student presentations may result in frustration and negative learning outcomes for some students. Thus, a concise set of guidelines may help improve the use and perception of student presentations in the future.

## **Introduction**

### **Student presentations are a component of Active learning (AL)**

Student presentations are one of several activities that are commonly grouped under “Active learning” (AL). Active learning, as described by Bonwell and Eison (Bonwell & Eison, 1991) is "a method of learning in which students are actively or experientially involved in the learning process and where

there are different levels of active learning, depending on student involvement." As such, AL describes any type of learning during which students are not passively listening. Examples are debates, round tables, group work, quizzes, role plays, and student presentations.

The principle of AL is based on the basic idea that students require more than mere listening in order to acquire, critically evaluate and retain knowledge. This includes reading, writing, and discussing (Bean, 1996) but also higher-order tasks such as problem-solving and evaluation (Renkl et al., 2010). AL has been shown to be superior to classical lecture-based teaching in many teaching environments and disciplines, including science, engineering and mathematics (Freeman et al., 2014), medicine (Michael, 2006), humanities (Mello & Less, 2013), and economics (Dorestani, 2005).

Because of its widely proven beneficial effect on learning, AL has become an important part of educational theory and practice. Despite its usefulness, AL can be challenging to effectively implement under certain circumstances.

### **Challenges of AL**

Some of the reported possible challenges of AL are a lack of a focal point that is typically represented by the teacher, the presence of multiple distractions in the classroom, and students that may be reluctant to engage in AL (Petersen & Gorman, 2014). Additionally, some teachers, particularly those new to teaching may restrain from AL because they have less control over what will happen in the classroom when compared to giving a lecture that can be well prepared in advance (L. Rienecker & Ingerslev, 2015). Furthermore, students taught in larger classrooms may not be as convinced by the benefits of AL as those in smaller or medium-sized classes (Juergensen et al., 2016).

Conclusions that can be drawn from these studies are that, in order to take full advantage of the benefits of AL, students may need to be more aware of the theory behind the use of AL in order to appreciate various types of activities in the classroom. Educators, especially those new to AL may need more courage to try out different activities, thereby gaining more experience, and institutions could reconsider how to redesign classroom layouts and curricula to facilitate the incorporation of AL.

## **Student presentations are a component of Student-Directed Learning (SDL)**

Student presentations require students to independently learn specific topics to the level of understanding needed to transfer the acquired knowledge to their peers. Thus, the topic of student presentations is directly connected to the theory of SDL. This section provides a brief summary of this theory.

Student-directed learning as defined by Knowles (Knowles, 1975) describes “A process in which individuals take the initiative (...) in formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes”. Instead of playing a passive role in the learning process, by assuming the role of the teacher, students are thought to have better, higher-level learning outcomes. Later, several educators, including Hiemstra (Hiemstra, 1982), Zimmermann (Zimmerman, 1990), Claxton (Claxton, 1996), further argued that the learning processes and environment should be structured in a way that fully enables students to take responsibility for their own learning, and that, if successful, SDL will create life-long learners (**del1996international**).

While SDL has become an important concept in educational theory and practice, very little field and experimental research data has become available to show the effectiveness of SDL in the classroom. What has been repeatedly reported on, however, are some of the main challenges of SDL.

### **Challenges of SDL**

SDL assumes that students can regulate their learning in various ways, “such as goal-setting, time management, learning strategies, self-evaluation (...), seeking help or information, and important self-motivational beliefs, such as self-efficacy and intrinsic task interest” (Zimmerman, 2002). However, students are not trained teachers and may lack the skill set needed to effectively direct their own learning. In their 2001 review, Oser and Baeriswyl (Oser & Baeriswyl, 2001) state that in order to make SDL an educational goal, teachers have to guide the students in choosing suitable learning strategies. As found in several studies on this topic (Boekaerts & Simons, 1993; Kember, 1997; Lunenberg & Korthagen, 2005; Vermunt, 1997) this is often not the case.

Conclusions that can be drawn from these studies are that educators should offer students some level of guidance, and that educators may need more training in determining the type of support that should be provided.

## **Student presentations – opportunities and challenges in the context of AL and SDL**

Student presentations are student-directed and executed activities and, as such, have the same or very similar opportunities and challenges as described for AL and SDL. One additional benefit and challenge to the ones listed above is that students have to learn to be able to effectively present their learning to other students. While repeated student presentations will ultimately enable students to become better presenters, for some students, this may cause stress and anxiety which may have to be addressed by the teacher.

## **Project Goals**

The overall aim of this project was to develop a concise list of best-practice recommendations to enhance the perception and learning outcomes of student presentations.

The specific goals of these recommendations are to

1. help students and (new) teachers understand and appreciate the use of student presentations in the classroom
2. enable students to tailor their presentation to best motivate and engage their peers and facilitate high-level learning
3. encourage students to become better presenters
4. encourage students to reflect and receive feedback on their presentations

## **Methods**

### **Subjects**

The subjects of this project were a subset of the ~ 350 first-year medical students enrolled in the course human biology (3909-E20 basal humanbiology) at the University of Copenhagen in the fall of 2020. This course consists of ~14 lectures on various topics of human biology with a focus on the physiology and anatomy of the human body. Each lecture is accompanied by

a student-activated class (SAU-24) consisting of a small group of ~24 students. At the beginning of each class, two groups, each consisting of 2-3 students, give a presentation on the weekly topic to their peers. The purpose of the SAU-24 class is to gain a better, more in-depth understanding of some of the learning objectives. Additionally, the students have a series of practical sessions on a select number of topics.

## **Material**

At the end of the semester, students evaluated the entire course and their particular SAU-24 class. In addition to this written evaluation, SAU-24 students elected a class representative who, after having a joint discussion with the class, provided additional feedback to the teacher during a one-hour discussion. Several SAU-24 teachers were also asked about their experience with student presentations.

Future material: Following the completion of this project, the herein developed guidelines will be shared with the course coordinator, other interested teachers and future students of this and potentially other classes. This will facilitate a future survey or discussion of the usefulness of these guidelines.

## **Analysis**

Since there was no overlap between the time provided to prepare this project and teaching of this class, it was difficult to conduct a quantitative survey. Instead, written evaluations, informal discussions with the student representative and several teachers, and literature on the benefits and challenges of student presentations in the context of AL and SDL were used to formulate the guidelines. Note: evaluations written in Danish were translated into English which may have slightly changed the exact content of the written text.

## **Findings**

One of the major issues that emerged from the written evaluations was that students did not seem to fully appreciate student presentations, particularly regarding the benefit for the (student) audience.

Extract from the overall course evaluation: *“The many student presentations in SAU only activate the individual student, so a suggestion is that there should not be so many in the future, or that presentations are better integrated with the rest of SAU.”*

Extract from the individual SAU-24 evaluation: *“The presentations at the beginning of SAU were not the best, it was extremely good for those who presented, but less good for those who did not present, so maybe you one make smaller groups, divide the class into 4, so that one presents a small part of a topic to each SAU.”*

Additional insight on the students’ perception of student presentations were gained from the discussion with the student representative of the SAU-24 class:

*“The good thing about the presentations is that you get another viewpoint than when just being taught, it forces us to really dig into something (...) but “Sometimes it was obvious that students did not prepare their presentations well. In general, presenters did very well with topics that required some level of understanding compared to topics that can be learned by heart.”*

Furthermore, the discussion revealed that students preferred topics and presentations that were as closely as possible aligned with the competencies needed to pass the course. One suggestion that was strongly voiced was that student presentations could help prepare the other students for potential exam questions by discussing and presenting potential answers to a selected pool of past exam questions.

This would then not only help students prepare for the exam but ensure that the audience was motivated to listen, thereby increasing the likelihood of the presentation being perceived as important and generating positive learning outcomes. Students were generally able to find the required literature, material, and software tools needed for preparing and giving their presentations, and there did not seem to be any concern about the format of the presentations.

Finally, conversations with other teachers revealed that it could be helpful to have some guidance on how to design and discuss student presentations with the class. In general, student presentations were perceived as a useful and important part of SAU because of their pedagogical value. Additionally, teachers mentioned that one benefit was that students serve as assistants to the teacher by taking care of a few topics that teachers do not need to cover themselves. There was no specific consensus as to what topics may be best suited for student presentations and some teachers preselect

the topic from the list of learning objectives, while others let their students select a topic from this list themselves.

## **Guidelines for Student Presentations**

Based on the pedagogical literature on AL and SDL, student evaluations, and conversations with students and teachers a set of short guidelines was formulated that may help in creating a more positive perception of student presentation and better learning outcomes in the future:

### **GUIDELINES FOR STUDENTS**

#### **GENERAL INFO ON STUDENT PRESENTATIONS**

Student presentations are an integral part of what is defined as active learning (AL) and student-directed learning (SDL) in pedagogy. Numerous studies have proven measurable benefits of AL and SDL as supplements to teacher-directed learning.

Some of the known benefits for you as a student presenter are: 1) better, higher-level learning outcomes (more deep learning, increased content knowledge, enhanced critical thinking and problem-solving abilities); 2) enabling you to take responsibility for your own learning, thereby becoming a life-long learner; and 3) strengthening your relationship with other students through direct student-student interactions.

Additionally, you are likely to become a better presenter through the repeated practise of giving presentations, a soft skill that has become increasingly important in nearly all professional disciplines.

It is important to keep in mind that you are not a trained teacher and are not expected to know the presented topic in great depth or detail. Instead, because your background knowledge is more similar to your fellow students than your teacher's, you have the advantage of being able to provide more practical, and sometimes better advice and point out useful resources to your peers than your teacher could. Furthermore, you are often more capable of activating your student audience because you know the interests and preferences of your peers better than most teachers do.

In order to take full advantage of these benefits of student presentations, you should consider the following recommendations:

#### **RECOMMENDATIONS**

- Prepare your presentation well but do not try to become an expert in the topic. Ideally, select or ask for a topic that requires some level of understanding (e.g., how does our body respond to danger?) rather than a topic that can be easily learned by heart (e.g., the names of cranial nerves).
- If possible, teach the topic in a way that is of high relevance to your peers. For example, present an exam question on a topic that interests you, or a case study as it could appear in your exam.
- Your presentation does not have to follow a classic lecture-style theme with a chalkboard or PowerPoint slides. You can be creative regarding the format.
- Try to activate your audience, for example by including one of the following activities: questions to the audience, quizzes (Kahoots), handouts, debates, games, interesting media (animations or sound bites). For more ideas go to: [https://www.queensu.ca/teachingandlearning/modules/active/12\\_exmples\\_of\\_active\\_learning\\_activities.html](https://www.queensu.ca/teachingandlearning/modules/active/12_exmples_of_active_learning_activities.html)
- Try not to cram too much content into your presentation. Instead, focus on ensuring deeper understanding of a specific topic.
- Don't worry if you are nervous. Many people are nervous when presenting in front of others. This will get better with more practice and positive experiences.
- Reflect on your presentation in order to make adjustments for future presentations. You can also ask for feedback from your teacher and your peers.

## **GUIDELINES FOR TEACHERS**

### **RECOMMENDATIONS**

- Provide a brief overview of the potential benefits of student presentations at the beginning of the course, and potentially revisit them again mid-term. This may help students see student presentations as relevant additions to the class. The guidelines provided above could be shared to serve this purpose.
- Consider the type of topic that should be presented: Is it relevant for the students' performance in the class (e.g., example exam questions on a specific topic?). Does it align with the learning objectives? Is it an engaging topic? Can the topic be taught in a student-activated manner? Will students be able to present the topic well enough without being

experts? One idea would be to hand out exam questions or cases for specific topics that students can present on.

- Provide some guidance on how to present (e.g., slides, hand-outs, Kahoots etc.).
- Encourage students to be well prepared for their presentation, thereby not only taking responsibility for their own learning but also for the learning outcomes of their peers.
- Provide feedback. Only consider implementing peer feedback if there is enough time to teach students in how to give constructive feedback.
- Encourage reflections.
- Consider conducting an informal mid-course evaluation of the student presentations in order to potentially make adjustments.

## Conclusion

Student presentations can be a useful addition to classroom teaching but can lead to frustrations among some students, particularly those who are not presenting but are in the audience. The latter appears to prefer teacher-led presentations. To potentially enhance the perception and performance of student presentations in the future, this project generated a list of guidelines for students and their teachers that could be used in courses containing student presentations as AL components.

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## **Rammesætning som pædagogisk praksis? Eksperimenter med rammesætning for at styrke sammenhængen i undervisningen og skabe læringsanledninger**

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### **Indledning: Rammesætning af undervisningen**

Igennem mit pædagogikumforløb har jeg været optaget af, hvordan man som underviser bedst muligt præsenterer, hvad man vil med de studerende, hvorfor det man vil er vigtigt, og hvordan det afspejles i kursets aktiviteter og organisering. Min interesse i dette opstod, fordi jeg fik nye undervisningsopgaver, hvor jeg ikke umiddelbart kunne se, hvad formålet var med de forskellige kursusdele, hvordan de hang sammen, og hvordan jeg skulle præsentere aktiviteterne på en måde, så de studerende umiddelbart forstod, hvad de skulle.

Samtidig har jeg igennem mit seneste forskningsprojekt og nye undervisning haft lejlighed til at observere forskellige undervisere, og det gjorde mig nysgerrig på, hvordan man kan motivere og *frame* undervisningen på forskellige måder. Min tese var, at der i princippet godt kan være en god sammenhæng mellem et sigte, en aktivitet og en måde at organisere et kursus, men at en sådan en sammenhæng kan kommunikeres på forskellige måder – eller være helt implicit. Jeg tog afsæt i det, man inden for kommunikation kalder *framing* eller 'rammesætning' og brugte det som en *heuristik* for underviserens arbejde med at ekspliciterer, sætte scenen for og motivere undervisningens formål, aktiviteter og organisering. Dvs. som et midlertidigt ord, der kan tjene til at benævne nogle praksisser, men også

kræver videre undersøgelse (Abbott, 2004). I mit pædagogikumforløb har jeg taget hul på dette videre arbejde.

Med afsæt i antropologen Gregory Bateson, sociologen Erving Goffmann og uddannelsessociologen Basil Bernstein's begreber om *framing* og *frame* satte jeg mig for at undersøge, hvad begrebet rammesætning rummer i social- kommunikations- og uddannelsesvidenskaberne. Mit sigte var at få en forståelse for, hvad et begreb om rammesætning kunne rumme i en pædagogisk praksis. Desuden ønskede jeg at eksperimentere med at rammesætte undervisningen på forskellige måder og derved forbedre mine egne kompetencer i rammesætning i undervisningen.

Undervejs er jeg blevet opmærksom på, at der er en tæt forbindelse mellem det jeg her kalder rammesætningen af undervisningen og så det pædagogiske tema, der handler om at skabe *sammenhæng* i undervisningen – eller det der sommetider kaldes *alignment* mellem læringsmål, aktiviteter og eksamen (Biggs og Tang, 2007, s. 11) eller *congruence* i et undervisningsmiljø, der udover sammenhængen mellem læringsmål, aktiviteter og eksamen også sigter på at skabe sammenhæng mellem studerendes forudsætninger, støtten til læring og kursusorganisering (Hounsell m.fl., 2005, s. 3). Endvidere er rammesætning beslægtet med idéen om, at underviser og undervist indgår i en *didaktisk kontrakt*, der kan påvirkes af underviseren (Brousseau & Warfield, 2014). Når jeg stiller skarpt på idéen om rammesætning her, sigter det imidlertid på at kaste lys over nogle af de kommunikative praksisser, der er forbundet med at betone denne sammenhæng eller etablere en bestemt didaktisk kontrakt.

Mine eksperimenter med rammesætning har spændt vidt og omfattet både præsentationen og motiveringen af samspillet mellem formål, aktiviteter og organisering af kurset, styring af øvelser, samspillet mellem to undervisere, beskrivelsen af forventningerne til studerendes måde at engagere sig, tilrettelæggelsen af undervisningsprogram, placering af borde, billeder på slides, typer af spørgsmål, kropsholdning, stemmeføring, baggrund på Zoom. Alle disse indsatser har handlet om, hvordan man kommunikerer og arrangerer undervisningsmiljøet på måder, der synliggør, hvad der er hensigten med aktiviteterne, og hvordan de studerende skal engagere sig. Som vi skal se, er rammesætning for mig altså dels et spørgsmål om kommunikation med ord og krop, og dels den kommunikation, der ligger i en bestemt måde at organisere ting og mennesker i tid og rum.

I denne opgave fokuserer jeg på to eksempler på mine indsatser med at rammesætte undervisningen og hvad det affødte. Begge eksempler er funderet i uge-kurser for ansatte på de naturvidenskabelige og sundheds-

videnskabelige fakulteter på Københavns Universitet, nemlig et introduktionskursus for PhD-studerende på Science, og et introducerende kursus i pædagogik for universitetsundervisere. Det ene handlede om gennem ord at optegne sammenhængen mellem formål, aktiviteter og en eksamensopgave. Det andet handlede om at betone og understøtte en organisering af et kursus med både fysisk og online undervisning, og dermed gøre denne organisering til en læringsanledning.

Det spørgsmål jeg sigter på at besvare med denne opgave er: *Hvilke aspekter rummer begrebet rammesætning hvis vi trækker på kommunikations- og socialvidenskaberne, samt den pædagogiske forskning om 'frame' og 'framing'? Og hvordan kan rammesætning som pædagogisk praksis bidrage til at skabe bedre sammenhæng og betone læringsanledninger i undervisningen?*

På de næste sider vil jeg først indkredse begrebet rammesætning i relation til en pædagogisk praksis og dernæst vil jeg diskutere to eksperimenter med rammesætning. Sluttelig vil jeg pege på, hvad disse to eksperimenter viste mig om, hvad rammesætning kunne betyde for at skabe sammenhæng i undervisningen, og hvordan rammesætning af en bestemt kursusstruktur kunne styrke muligheden for, at det blev en læringsanledning.

## **Begrebet *framing* - og rammesætning i en pædagogisk praksis**

Begrebet *framing* handler om den betydning eller det motiv, der skabes omkring det vi siger eller gør - eksempelvis i en undervisningssituation, på et psykiatrisk hospital eller i folketingsalen. I udviklingen af idéen om *framing* har antropologen Gregory Bateson spillet en central rolle (Bateson, 2000, s. 186 & Hjarvard, 2015, s. 106). For Bateson er *framing* en form for *meta-kommunikation* – dvs. det er et ekstra lag af kommunikation, der foregår sideløbende vores handlinger og fortæller om, hvordan de skal forstås, hvilket motiv de skal tillægges. *Framing* virker altså på samme måde som en ramme omkring et billede, der giver et signal om, hvordan beskueren skal forholde sig (Bateson, 2000, s. 187).

En vigtig pointe hos Bateson er, at begrebet *framing* ikke kun omfatter verbal kommunikation, men også om nonverbale kommunikative handlinger. I Batesons oprindelige udvikling af begrebet, ser han på, hvordan aber kommunikerer med hinanden med blide bid og slag. Hermed siger de 'dette er leg' og ikke alvor. *Framing* kan altså udgøres af forskellige former

for meta-kommunikation, både verbale og nonverbale, der giver signal om, hvordan det andet, der foregår skal forstås (Bateson, 2000, s. 187).

Idéen om *framing* er videreudviklet, bl.a. i den amerikanske sociale interaktionisme af sociologen og antropologen Erving Goffman med hans bog *Frame Analysis: An Essay on the Organization of Experience* (Goffmann, 1986). Her beskriver Goffman *framing* med reference til den amerikanske sprogteoretiker J. L. Austin's berømte essay om, hvordan man kan 'gøre ting med ord' (ibid. 7). Ideen er, at det vi siger eller skriver ikke alene er beskrivelser af verden, men faktiske handlinger i verden. Det vi siger er *performative udtryk* (performative utterances), der får konsekvenser for andre følgende handlinger (ibid. 44). Goffmans pointe var, at *framing* påvirker vores interaktioner med hinanden, fordi den ramme, der sættes organiserer vores erfaringer og derved virker som en slags retning eller et motiv, der får os til at gøre bestemte ting, og ikke andre.

For både Bateson og Goffman er *framing* dermed ikke bare kommunikation, men også styring. Det er kommunikation, der sætter præmissen for den måde mennesker opfatter handling og den vej en samtale eller interaktion bevæger sig. Denne abstrakte betydning af begrebet *framing* er dermed ret forskellig fra den mere konkrete betydning at indramme noget. Hvor en billedramme ofte sættes omkring et maleri en gang for alle, så er rammesættende kommunikation ikke nødvendigvis overstået en gang for alle, men kan skifte karakter fra situation til situation. I undervisningen betyder det fx, at man godt kan sige, at her har vi et legende rum, men i det øjeblik, man nævner eksamenskravene, kan situationen ændres helt og fokus skifte for, hvordan de studerende forholder sig. Ved at nævne eksamen sættes der en anden retning eller et andet motiv for samtalen, og den måde studerende engagerer sig.

I uddannelsesforskningen har begrebet *frame* også haft betydning. Eksempelvis har den britiske uddannelsessociolog Basil Bernstein arbejdet med begrebet *frame* i forbindelse med spørgsmål om styring i uddannelse og pædagogik (Bernstein, 2003). Inspireret af sin tids kommunikationsteori, anskuer Bernstein kurrikulum som et besked-system – *message system* (2003:159). Hans begreb om ramme, *frame*, beskriver konteksten for, hvordan viden overføres og modtages. Nærmere betegnet bruger Bernstein begrebet *frame* til at stille skarpt på den pædagogiske relation mellem underviser, undervist og den viden der skal indfinde sig hos den underviste. Han er interesseret i ”den grad af kontrol underviser og undervist har over udvælgelsen, organiseringen og tidsstyringen af den viden der overføres og modtages i det pædagogiske forhold.” (ibid. 158-159, *min oversættelse*).

Er der en ”stærk ramme” har underviser mere kontrol, og undervist mindre kontrol (ibid.). For Bernstein handler begrebet *frame* altså om graden af kontrol over eller styring med, hvad der kan læres og hvordan, og den pædagogiske konteksts betydning for denne kontrol. I denne pædagogiske tilgang forbindes begrebet *ramme* derved med et spørgsmål om styring og kontrol – og hvorvidt en undervisningsproces er stærkt lærerstyret eller mere elevstyret.

Der er en række overlap mellem denne måde at anskue *ramme* hos Bernstein og så det, den franske matematik-didaktiker Guy Brousseau kalder *Den didaktiske Kontrakt* (Brousseau & Warfield, 2014). Selvom Brousseau ikke direkte nævner ramme, er han som Bernstein optaget af relationen mellem underviser og undervist, og hvordan spørgsmålet om kontrol bliver afgørende for, hvordan den studerende agerer. I sin mest generelle formulering består det Brousseau kalder *Den didaktiske Kontrakt* af den mere eller mindre implicite aftale underviser og studerende indgår om, at den studerende forventes at lære noget, og at underviseren forventes at undervise (Brousseau og Warfield, 2014; Christiansen og Olsen, 2006; Skott m.fl., 2009, s. 421). På den måde beskriver ideen om *Den didaktiske Kontrakt* en form for gensidig forventning til, hvad underviser og studerende skal gøre i en undervisningssituation.

Idéen om *Den didaktiske Kontrakt* gør det muligt at se, at der altid vil være en forventning til de roller underviser og studerende tager i en undervisningssituation, og at man som underviser kan søge at påvirke denne forventning eller kontrakt gennem forskellige tiltag. Dette er et vigtigt aspekt, hvis vi skal forstå, hvad det indebærer at som underviser at sætte rammen i sin undervisning. Imidlertid peger *Den didaktiske Kontrakt* ikke i sig selv på, hvad disse tiltag kunne indebære, eller den kontekst, der indvirker på, hvordan disse tiltag gøres. Her kan begrebet *framing* eller rammesætning hjælpe til at tegne et billede af de forskellige former for kommunikation, både verbale og nonverbale, der giver signal om, hvordan studerende skal forstå og agere på det, der foregår. Dermed giver det også nuancer på de didaktiske handlemuligheder, man har som underviser.

Ved at stille skarpt på begrebet rammesætning i en pædagogisk praksis får vi kort sagt et blik for, at vi kan påvirke kommunikationen om, hvordan bestemte handlinger skal forstås og ageres på. Rammesætning er den verbale og nonverbale kommunikation, der påvirker eller styrer andres erfaringer og handlinger i et videre forløb ved at give dem et særligt motiv. Rammesætning handler derved også om, hvordan vi arrangerer undervisningsmiljøet på måder, der synliggør, hvad der er motivet eller hensigten

med aktiviteterne, og hvordan studerende skal engagere sig. I denne forstand er rammesætning både et spørgsmål om, hvordan man kommunikerer verbalt og nonverbalt med ord og krop, men også den kommunikation, der ligger i en bestemt måde at organisere ting og mennesker i tid og rum.

## **To eksperimenter med rammesætning som pædagogisk praksis**

I det følgende vil jeg præsentere to eksempler på mine erfaringer med rammesætning som en pædagogisk praksis. Her vil jeg beskrive to indsatser, der gav mig nye erkendelser om, hvordan rammesætning kan bidrage til at skabe bedre sammenhæng i undervisningen, herunder også hvordan man kan rammesætte en bestemt organisering i tid og rum som en læringsanledning.

Min første indsats var på *Introduktionskurset for nye PhD studerende på Science*, hvor jeg og et hold af undervisere arbejdede med at tydeliggøre forbindelsen mellem kursets mål, organisering og en eksamensopgave. En indsats, der til vores overraskelse højnede kvaliteten af opgaverne, og også gav forbedrede evalueringer. Den anden var en indsats på kurset *Introduktion til Universitetspædagogik*, hvor jeg og mine medundervisere søgte at styrke rammesættelsen af en ny kursusstruktur – med skiftende fysisk og onlineundervisning – som en læringsanledning.

Mit datagrundlag baserer sig på tre materialetyper. Dels mine refleksionsnoter og mails fra undervisningen, dels en øvelse, hvor deltagerne skulle opliste fordele og ulemper ved online og onsite skiftet, og dels evalueringer og eksamensopgaver.

### **1. Rammesætning af en refleksionsopgave om kompetenceudvikling i introduktionskursus for nye PhD studerende**

**Baggrund:** Kort efter min ansættelse som postdoc på Institut for Naturfagenes Didaktik, begyndte jeg som underviser på et kursus for nye ph.d.-studerende på Science. Dette kursus havde tidligere været en del af et 5 dages internat, og et af hovedformålene var at skabe sociale bånd. Pga. covid-19, var kurset imidlertid omlagt til ren online undervisning, da jeg kom med på holdet.

Kurset har 24 deltagere og kører 7 gange om året. Det er velkonstrueret i en temmelig fast struktur med en introduktionsdag og to en halv dag

med forskellige undervisere, en del udefra. På lærermødet på dette kursus i foråret, havde vi en god snak om formålet med kurset, og den opgave, de studerende skulle aflevere, og den kursusansvarlige forklarede, at dette kursus har haft et lidt turbulent liv, hvor noget kunne være gået tabt under overlevering og omorganisering. I det første kursus, vi underviste ændrede vi lidt i programmet den første dag for at give mere plads til at introducere kursets formål. Jeg gjorde jeg ikke så meget nyt, da jeg skulle lære kurset at kende.

Da jeg skulle undervise i august, havde jeg besluttet at arbejde med rammesætning. Her talte jeg med min medunderviser på kurset, om hvordan kursets formål og refleksionsopgaven kunne rammesættes på en måde, der kunne bidrage til synliggøre sammenhængen mellem kursets formål, organisering og eksamensopgaven. Min medunderviser oplevede også et behov for at rammesætte og motivere kursets formål klarere, og vi aftalte at formulere et formål for både kurset og opgaven, som vi ønskede skulle: "create reflection on what do you want with your PhD" and "to create a space where PhD students can be more conscious of their own say in their PhD process and making it meaningful learning process, rather than primarily a performance pressure."

Vi lavede en ny rammesætning af mandagens centrale øvelse som vi nu kommunikerede som et spørgsmål om at blive bevidst om, at ph.d.-processen er en læringsproces. Endvidere præsenterede jeg eksamensopgaven, Den personlige Udviklingsplan, med en beskrivelse af sammenhængen mellem kursets temaer og program, og de forskellige dele af den personlige udviklingsplan og sigtet med kurset. Vi framede idéen med denne plan som et spørgsmål om at skabe refleksion over, hvilke valg deltagerne kan tage og hvilke muligheder for at lære og kompetenceudvikle, de skaber for sig selv undervejs i deres ph.d.

**Resultater:** Vi undervisere oplevede, at der var en god og engageret stemning i rummet, og kurset fik rigtig gode evalueringer. Men det væsentligste skete nogle uger senere, hvor vi skulle til at give feedback til opgaverne på kurset. Her fik vi en e-mail fra en kollega, der skrev, at han netop havde givet feedback til opgaverne på dette hold. Han skrev, at han har givet denne feedback i en årrække, og han havde aldrig set et bedre sæt opgaver. De var meget mere detaljerede og introspektive på måder, der for ham at se var frugtbare, skrev han, og sluttede af med at sige "whatever you did, share it with others who teach about writing the PDPs."

## 2. Rammesætning af en ny kursusstruktur med skift mellem fysisk og online undervisning som læringsanledning

**Baggrund:** Mit andet eksperiment handlede om at styrke rammesætningen af en ny kursusstruktur på kurset Introduction to University Pedagogy, IUP, så et nyt format med skift mellem fysisk og online undervisning blev gjort til en læringsanledning, snarere end et nødvendigt onde eller et tilfældigt forhold.

Kurset, IUP, har 24 deltagere og kører 20 gange årligt. Det er velkonstrueret i en temmelig fast konstruktion opbygget omkring studenteraktiverende didaktiske principper samt deltageres egne praktiske afprøvninger af disse principper i en undervisningslektion. Kurset får gode evalueringer i de skiftende konstellationer af undervisere blandt en lærerstab.

Under COVID-19 lock-downen fra foråret 2020 har IUP været omlagt til online-undervisning. Evalueringerne har i perioden med online undervisning været lige så gode som under den fysiske afvikling. I efteråret 2021 startede undervisningen i et nyt format, hvor der var tre dage med fysisk fremmøde og to dage online. Dette skyldtes dels lokalemangel, men rummede også en pædagogisk ambition om at give nye deltagere indblik i de muligheder og udfordringer, der er i et online undervisningsmiljø.

Fordelene ved denne konstruktion med to dages online undervisning i løbet af ugekurset var imidlertid ikke entydige. Til lærermødet om kurset i juni vakte det debat om et sådant skifte var en god idé fra et pædagogisk synspunkt. Nogle mente, at fysisk tilstedeværelse altid uomtvisteligt vil give den bedste læring. Andre påpegede, at dette var en mulighed for at give nye undervisere erfaringer med aktiverende undervisning i et online-miljø. Den nye konstruktion rejste derved spørgsmålet om, hvordan underviserne rammesætter et sådant format med dage med fysisk fremmøde og dage med online undervisning, så det pædagogiske potentiale, det rummer, udnyttes bedst muligt.

Da denne nye konstruktion gik i luften i efteråret 2021, skulle jeg undervise på fire uge-kurser. Dette gav rig mulighed for at afprøve forskellige aspekter af, hvordan skiftet mellem fysisk og online undervisning kunne rammesættes. I det første kursus havde jeg rollen som tredje underviser, der giver feedback på deltageres 30-minutters sessioner, hvor de afprøver de undervisningsprincipper, de introduceres for i kurset. Dernæst var jeg sammen med en forskellige mere erfarne undervisere ansvarlig for undervisningen på tre kurser.

Læringsmålene for kurset indeholdt allerede et mål om at reflektere over forskellene mellem fysisk og online undervisning. Jeg var imidlertid interesseret i, om man ud over disse nedskrevne læringsmål, der var formuleret for kurset, også i selve undervisningen kunne rammesætte skiftet mellem fysisk og online undervisning som en læringsanledning, samt også sikre igennem organiseringen af kurset, at denne læring fandt sted. Jeg lavede tre indsatser, der havde til hensigt at rammesætte dette format med skiftende fysisk og online undervisning som en læringsmulighed og skabe mere viden om og refleksion over de forskellige betingelser, der er for aktiverende undervisning i et fysisk og online undervisningsmiljø.

**Første indsats - mundtlig forventningsafstemning:** Min første indsats sigtede på med en eksplicit mundtlig forventningsafstemning at gøre det klart, hvordan vi forventede at deltagerne stillede sig over for skiftet mellem fysisk og onlineundervisning – nemlig aktivt afprøvende, nysgerigt og reflekterende. Det tog afsæt i ideen om, at man kan påvirke den didaktiske kontrakt, og gik ud på at sikre, at kursusdeltagerne på første dag fik en begrundelse for, at undervisningen både foregik fysisk og online. Hvor dette skifte på det første kursus, jeg deltog i, blev nævnt som et vilkår, diskuterede jeg med min medunderviser, om vi snarere end at præsentere dette som noget, der ikke kunne være anderledes eller tie om det, kunne lægge op til, at det var en mulighed for refleksion. Min medunderviser og jeg blev enige om en rammesætning, der var autentisk, men samtidig lagde op til refleksion over skiftet som en læringsmulighed. Vi sagde i gennemgangen af programmet første dag, at undervisningen både foregik fysisk og online, dels pga. lokalemangel, men også ud fra et ønske om at give deltagerne erfaringer med aktiverende undervisning i både et fysisk og online læringsmiljø.

**Anden indsats - understøttende undervisningselement:** Den anden indsats jeg afprøvede for at rammesætte skiftet mellem fysisk og onlineundervisning til en læringsanledning var at spørge en kollega, om han ville holde en session, der introducerede til online-undervisning, som han har undervist, mens kurset har kørt online. Sigtet var, at det skulle gøre det mere meningsfuldt, og et egentligt fokuspunkt og læringsanledning, at kurset også foregik online. Min kollega var med på idéen og resten af efteråret kom denne lektion med i alle kurser. Vi rammesatte denne session som et springbræt til at reflektere over forskellene mellem fysisk og online undervisningsmiljø. Desuden var tanken med skabe en undervisningslektion, der introducerede til online-undervisning, at den skulle underbygge, og eksemplificere, hvordan man kunne lave aktiverende undervisning online. Flere

deltagere tog bolden op og eksperimenterede med forskellige digitale teknologier. Billedet i evalueringerne var, at de fleste meldte, at de fik et stort udbytte ud af denne lektion, og den måde den illustrerede en alternativ måde at bruge online teknologier og aktiverende undervisning.

**Tredje indsats - løbende refleksion:** Min tredje indsats handlede om at skabe løbende refleksion i løbet af kurset om forskellen mellem fysisk og onlineundervisning. Sigtet var at skabe opmærksomhed omkring, hvordan deltagerne erfarede forskellen mellem fysisk og online undervisning og derved at skabe refleksion over betydningen implikationerne for undervisningen af disse forskellige rum. Dette affødte flere gode debatter. På to kurser opstod en diskussion om, hvordan deltagerne selv oplevede, at de ikke var så fokuserede i undervisningen, når de havde deres computer hos sig, eller sad online. Vi talte om, hvordan man kunne tackle dette som underviser. Vi talte også om behovet for pauser og former for styring af aktiviteterne i hhv. et fysisk og online undervisningsmiljø. Disse refleksioner gav både deltagerne og mig en større forståelse for de forskellige betingelser for aktiverende undervisning i en fysisk og et onlinemiljø.

**Resultater:** I grove træk lykkedes mit eksperiment om at styrke den rammesættende kommunikation og skabe en *framing*, der styrkede idéen om, at dette skifte mellem fysisk og onlineundervisning var en læringsanledning. I både mundtlige tilbagemeldinger og evalueringer gik deltagerne med på præmissen om at skiftet mellem fysisk og online undervisning kunne give noget til dem som deltager. Samtidig var der generelt positiv feedback på lektionen om online undervisning, og den gav sammen med de mere uformelle refleksioner grobund for at diskutere forskellen mellem aktiverende undervisning fysisk og online.

Der skete imidlertid også en udvikling hen over efteråret fra at deltagerne mundtligt og i de skriftlige evalueringer var mere skeptiske over for online undervisning til at de i stigende grad accepterede, at dele af undervisningen foregik online. På det sidste kursus jeg kørte, arrangerede deltagerne gættekonkurrence om morgendagens smittetryk, og både i deres mundtlige og skriftlige kommentarer, var der en overvægt af beskrivelser af, at selv om fysisk undervisning var at foretrække, kunne de godt se det gav mening at kvalificere også i online undervisning. Denne udvikling gjorde det klart, at den bredere kontekst spiller en afgørende rolle for muligheden for at 'frame.' Selv om flere på de sidste hold var ubekvemme med online undervisning, blev det formentlig opfattet som legitimt, fordi corona-smitten udviklede sig, og der var stort smittetryk.

Mine eksperimenter med at rammesætte skiftet mellem fysisk og online undervisning som en læringsanledning bragte altså også nye erkendelser om den betydning det har for rammesætningsarbejdet, at studerende og undervisere har forskellige forudsætninger, og at andre kontekstuelle forhold spiller ind på om en bestemt rammesætning opfattes som legitim.

## Konklusion

Overordnet er det igennem undersøgelsen af begrebet 'framing' og mine eksperimenter blevet klart, at et bevidst arbejde med rammesætning kan være givtigt som en del af en pædagogisk praksis. Jeg har fået øje på, at meta-kommunikationen med ord og krop, samt den kommunikation, der ligger i en bestemt måde at organisere ting og mennesker i tid og rum har indflydelse på, hvordan studerende opfatter intentionen med undervisningen, og hvordan de engagerer sig – og formentlig i sidste ende lærer.

Hvor idéen om rammesætning overlapper med en række etablerede pædagogiske og didaktiske principper, eksempelvis idéen om at skabe *alignment* eller *congruence* eller arbejdet med den didaktiske kontrakt, sætter idéen om rammesætning fokus på den betydning eller det motiv, der skabes omkring det vi siger eller gør i en undervisningssituation, og hvordan vi kan styre den.

I mine eksperimenter på de to kurser så jeg indikationer på, at mine rammesættende indsatser skabte en bedre sammenhæng, og nye muligheder for refleksion. På introduktionskurset var det sammenhængen mellem formål, aktiviteter og eksamensopgaven, der blev motiveret og fik retning, og det betød, at de studerende greb idéen om at lave en refleksionsopgave efter kursets afslutning, ikke kun for at bestå, men på måder, der virkede som om de tog alvorligt, at opgaven om at reflektere over deres ph.d. var en anledning til at tænke over udviklingen af deres kompetencer. På det universitetspædagogiske kursus bidrog de rammesættende indsatser til at skabe sammenhæng mellem kursets forskellige læringsmiljøer og gøre dem til genstand for refleksion – og dermed en læringsanledning.

Arbejdet med rammesætning har dermed vist betydningen af at styre den strøm af kommunikation, der indvirker på, hvordan studerende opfatter intentionen med undervisningen, hvordan de engagerer sig og i sidste ende lærer noget. Dermed giver rammesætning som pædagogisk praksis en række handlemuligheder og opmærksomhedspunkter for, hvordan vi som

undervisere kan agere i de komplekse dynamikker, al undervisning rummer.

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## **Pedagogical considerations for converting a research-oriented course into a research-based course**

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### **Background**

Methods in Behavioral Sciences is a 2.5 credit course that is part of the Master of Health Science Master's Program. There are up to 30 students in the class who come from diverse professional backgrounds: psychiatry, physical therapy, nursing, and midwifery. They are professionals who have returned to university to gain more skills in research. The objectives of the course are as follows:

#### Knowledge:

- Describe and explain basic concepts, methods, and theories in behavioral science methodology, measurement theory, and effect evaluation.
- Demonstrate a broad knowledge and overview of the areas of the above areas that are particularly central to the health sciences.

#### Skills:

- Demonstrate skills in applying basic concepts, methods, and theories in behavioral science methodology, measurement theory, and impact evaluation.
- Demonstrate the ability to independently integrate and reflect on the subject's concepts and issues and their relation to other disciplines in the health sciences.

#### Competencies:

- The student must have acquired knowledge in behavioral science methodology, measurement theory and effect evaluation to an extent that enables new knowledge to be acquired in these disciplines and to take a critical position on the use and relevance of this knowledge in relation to health science practice, research, and development.

The course aims are research-oriented as they seek to develop research and inquiry skills and techniques (Healey & Jenkins, 2009). I taught this course for the first time last year and employed the teaching methods that had been used in the past, which was primarily lectures and little student activity. This meets Healey & Jenkins (Healey & Jenkins, 2009) research-oriented model in that students are frequently the audience, and in this case, they were. The formal student evaluations and the course evaluation meeting provided the following suggested content adjustments: “The teaching was at an explanatory level, but the exam was more debating. Students demand tools to reflect and discuss. This could be achieved by discussing the use of different analyzes and thus creating better links to practice.”

Based on the above, it is clear that the research-oriented pedagogical approach did not meet the students’ needs, as they were primarily the audience in their education and not receiving the link to practice.

## **From research-oriented to research-based**

The course has been research-oriented (RO), which is characterized by a learning environment in which the educators demonstrate the methods to address research problems, mainly through lectures with the student as the audience. The student activities focused on research content (gaining new knowledge) (Dohn & Dolin, 2015). In contrast, research-based (RB) teaching is characterized by the students formulating the research questions themselves and apply scientific methods to solve them. In an RB learning environment, the students are the participants and the activities are work that involves research problems and methods (Dohn & Dolin, 2015). This approach would best amend the disconnect between student learning. Moreover, it fulfills higher aim and responsibility that we have as educators: “Universities have a responsibility to prepare students for professional life... In short, how are they to be prepared to cope with the ambiguities and super-complexities of twenty-first century society?” (Brew, 2013). To convert the class from RO to RB, the students will develop and validate a new instrument. This student-inquiry based project will be the red-thread

that connects all of the classes and used to exemplify and apply theories and course content. The students will learn about and develop research skills by conducting research. The class will collectively create a new measure, respond to it, and then assess the psychometric properties. Table 1 outlines the topics and content of the classes and the student learning activities and integration of RB teaching. This was assessed by instructors and students for acceptability and feasibility, received positive evaluations, and will be implemented in August 2020.

**Table 1.** Methods in Behavioral Sciences as a Research-Based course

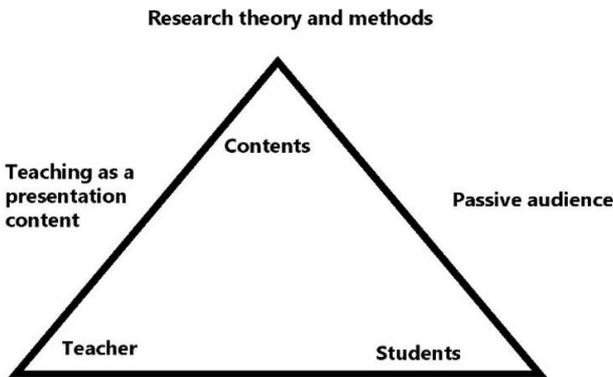
Class and Topic	Student learning activity & integration of research-based teaching
1. Basic concepts	<ul style="list-style-type: none"> <li>Teacher: Introduction to the course and the new teaching approach</li> <li>Teacher and students: Alignment of expectations and discussion of tensions/considerations</li> <li>Teacher and students: Creation of workgroups of 4 students</li> <li>Students collaborate to develop the research question and topic</li> </ul>
2. Scaling and test development I	<ul style="list-style-type: none"> <li>Students work in groups to write the items for the instrument and response options</li> <li>Students work in groups to assess the validity of the items created by other groups</li> </ul>
3. Scaling and test development II: Criterion, Content, and Construct Validity	<ul style="list-style-type: none"> <li>All students create a word cloud with a student-response system (like Sendsteps) to identify similar constructs for the survey</li> <li>Students will work in groups to select pre-existing(validated) measures to include in the survey to assess construct validity based on the results of the word cloud, this exercise is a real-world practical application of psychometric theory</li> <li>(After class)The teacher prepares the online survey of the items created by students and sends the link to students</li> <li>(After class) Students respond to survey</li> </ul>
4. Validity II	<ul style="list-style-type: none"> <li>(After class) The teacher prepares database for classes 5-9</li> </ul>
5. Factor analysis and dimensionality	<ul style="list-style-type: none"> <li>Data from the student-created survey are used in class to assess the dimensionality of the instrument, learn about factor analyses, and apply relevant theory</li> </ul>
6. Reliability	<ul style="list-style-type: none"> <li>Data from the student-created survey are used in class to assess the reliability of the instrument and apply relevant theory</li> </ul>
7. Generalizability	<ul style="list-style-type: none"> <li>Data and items from the student-created survey are used in class to assess and learn about generalizability</li> </ul>
8. Bias	<ul style="list-style-type: none"> <li>Data and items from the student-created survey are used in class to assess biases</li> </ul>
9. Effect sizes and norms	<ul style="list-style-type: none"> <li>Data from the student-created survey are used in class to calculate effect sizes, percentile ranks and compare with norm data</li> </ul>
Assessment: Exam-3 hour written exam	

## Pedagogical considerations

Student-centered learning is an approach to teaching and learning that focuses on the student's perspective and has been demonstrated to be effective (Kember, 2009). Student-centered learning accompanied by a deep ap-

proach has been touted as best practice, moreover, two factors that have been found to most likely foment deep learning are learner activity and interaction with others (Biggs, 1999). Educators should create a learning environment that is both student-centered and promotes deep learning. By listening to the student’s feedback, constructive alignment can be improved, and a learning environment that is student-centered and promotes deep learning can be implemented. The conversion of the course from RO to RB seeks to meet these aims. Stemming from a student-centered approach, how do students perceive the relationship between research and teaching? The literature demonstrates that “students value learning in a research-based environment” (Dohn & Dolin, 2015) and student feedback further supported the literature.

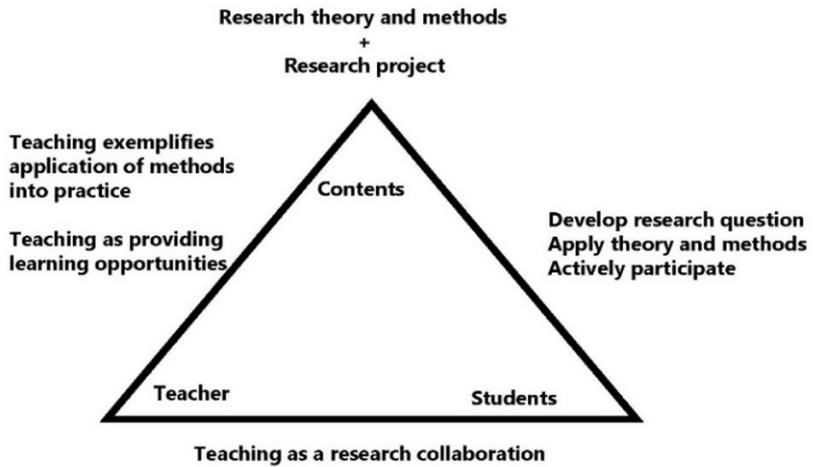
### The Didactic Triangle



**Figure 1.** The Didactic Triangle in Research-Oriented Teaching.

The didactic triangle is profoundly influenced by the teaching approach and by converting the course from RO to RB, this must be taken into account. In RO teaching, there is a disconnect between the teachers and the students as the primary actor is the teacher and the role of the student is minimal. It does not place the students as the central actors. However, in RB teaching, there are several changes. First, the content is expanded to include a

research project and the inclusion of inquiry-based teaching. This centers the students as primary actors in determining some of the content. Second, the teaching shifts to the exemplification of the application of methods into practice and to provide learning opportunities to the students with the research project organization and implementation. Finally, and most, importantly, the role of the students now includes developing the research questions, application of theory and methods, and active participation (see figures 1 and 2) (based on Dohn & Dolin, 2015).



**Figure 2.** The Didactic Triangle in Research-Based Teaching.

### **Challenges in implementing research-based teaching**

The changes to the didactic triangle by employing RB teaching instead of RO teaching pose pedagogical considerations in reference to constructivism. Constructivist theory holds that learning is a process of creating and transforming conceptions and knowledge structures rather than passively assimilating knowledge (Borda et al., 2014). How students learn is changed from passive assimilation to an active process and the role of the instructor from a transmitter of knowledge to accompanying students in their learning process when transitioning a course from RO to RB. An instructor must be aware that this may constitute a “cultural dilemma” as it may challenge stu-

dents' beliefs about what a learning environment looks like (Borda et al., 2014; Windschitl, 2002). Research has found that constructivist approaches are more effective in meeting intended learning outcomes; however, student satisfaction can be lower than with traditional methods (Borda et al., 2014). Therefore, aligning expectations and negotiating the didactical contract is key for adopting an RB approach. Several considerations must be made explicit to the students according to Beckman & Hensel (Beckman & Hensel, 2009) and Brew (Brew, 2013).

The first is the purpose of employing RB teaching, is it student, process-centered or outcome, product-centered? A related consideration regarding a process-centered vs product-centered focus relates to the consideration of the audience. As in this case it is process-centered, the audience is the class itself. If the students expect that the use of research in the classroom is to produce a "perfect" or publishable final product for a professional audience, the misalignment of expectations can be problematic. It is important to make it clear to the students that it is process-centered and that mistakes, errors, complexities, ambiguities that arise during the process allow for the best learning opportunities. There are so many things that can go wrong with this project, the reliability may be low, the factor analyses may not yield strong results, and the dimensionality may not be what we had planned for. . . Nevertheless, this where deep learning can happen and students can learn through error how and why these theories and concepts are important. On the first day of class, the discussion of these tensions and the processes centered focus and to highlight that "failure is an iteration of success" (Henderson, 2019) is necessary for student engagement and learning.

The second consideration is student-initiated vs faculty-initiated- who decides the focus/designs the research project? Henderson (Henderson, 2019) argues that projects should be open-ended in that they have not been entirely predetermined by the teacher and the student should be at the center of the project and actively involved in all aspects, including design, implementation, and assessment, as this will promote student learning and hopefully a passion for the material. Moreover, students are more likely to engage in the learning process if their curiosity is stimulated by the research question (Beckman & Hensel, 2009), thus by the students generating the research question, the direction of the RB project and course will be determined by their curiosity.

The third consideration is originality. In this context, as the RB learning activities are process-centered, the instrument that the students create

and validate does not need to be original to the discipline nor the students. This also must be clarified with the students during the introduction of the course. The fourth consideration is multi/inter-disciplinary vs. discipline-based. The students come from a wide range of disciplinary backgrounds and this strength should be capitalized upon. Many research environments in health sciences are interdisciplinary. Thus when introducing the project and creating the workgroups the first day, an introduction and discussion on interdisciplinary will take place with the students. The workgroups for the course will comprise students of differing backgrounds to simulate a real-world research setting. Moreover, the next consideration is collaborative vs. individual work, in this course, the work will be collaborative to simulate and prepare students for practice after their studies.

There are some additional challenges regarding the implementation of this RB design. Firstly, with the student-inquiry based project, there could be ethical concerns with personal data in analyzing their own responses, thus the educator must ensure that the final topic and items selected do not constitute ethical concerns. Secondly, lesson planning and time management are affected, as less time can be spent on lecturing and explaining topics to make time for the project. The educators are forced to make careful considerations when editing and selecting the material, this may ultimately have unintended negative consequences on the ILOs. In order to prevent negative consequences, educators must engage in continuous and ongoing evaluation and assessment to ensure that the ILOs are being met. For example, informal check-ins (e.g. asking the students to explain/define a concept) and student-response systems like Sendsteps can be used. If ILOs are being met, then the overall design is meeting its objectives. In this way, educators can evaluate the RB design itself. The RB design could be considered a failure or in need of improvement if students are not engaging in the activities due to confusion, incomprehension of the task at hand, disinterest or the like, and not learning the knowledge, skills, and competencies of the course objectives. The continuous evaluation of both the students achieving the ILOs and the RB design provides a space and opportunity to redirect if need be. For example, if on day 2 when the students are working to assess the validity of their classmates' items, the educator must go around and check-in with each group. If the educator notices that students do not understand the concept of validity, how to assess it in this context, or are not applying the concept correctly, they must suspend the activity to explain the knowledge, model the skill, and evaluate comprehension before reactivating the activity. Educators need to be flexible and reorient lessons

as needed, which can be complicated to navigate. It is especially complicated to do so in a way that foments a supportive learning environment and does not discourage students. The RB design could be considered a success if the students engage with the material, apply the concepts and theories, make mistakes and later recognize how and why they are mistakes (this is where the aforementioned flexibility is important), discuss and debate the difficulties, problems, and ambiguities that occur in research, the ILOs are met, students are prepared for professional life after the course, and students' passion for research is fueled. The first time the RD design is implemented, perhaps not all of these markers of success are achieved but through reflection, learning from the process, and improving upon it, the design can be strengthened, student learning can improve, and all of these aims can be met.

## Conclusions

There are multiple pedagogical considerations when implementing RB learning activities. The success of the implementation, as defined by student learning, relies upon thoughtful analysis and application of these considerations/tensions and changes to the didactic triangle. Careful planning and attention to these topics on the first day of class and throughout the course will create a student-centered learning environment that promotes deep learning and maximizes the probabilities of meeting the course objectives.

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**Improving outcomes of practical exercises**



## Translation of a practical laboratory exercise into a theoretical laboratory exercise

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### Background and introduction to teaching intervention

Within STEM fields (science, technology, engineering and mathematics), experimental laboratory work is an essential part of university degree level curriculums (Russell & Weaver, 2011). This is also the case for the Bachelor's Degree in Pharmacy at the University of Copenhagen (Københavns Universitet, 2021).

The learning outcomes of laboratory teaching are multidimensional, but can be categorized into five competency clusters: *Disciplinary learning*, *experimental competences*, *affective outcomes*, *higher-order thinking and epistemic learning*, and *transversal competences* (Agustian, Finne, et al., 2021; Agustian, Nielsen, et al., 2021).

For several reasons it can sometimes be necessary to translate a practical laboratory exercise into a theoretical laboratory experiment, e.g. due to lack of laboratory space and time, lack of equipment and instrumentation or lack of teaching personnel. This will inevitably change the learning outcomes, and especially the learning outcome of “experimental competences” will decline, while the learning outcomes of other competency clusters ideally will be elevated.

In the course, “Evaluation of Pharmaceutical Substances”, the second laboratory module contained too many sub-exercises. This resulted in stressed students due to time pressure and strained teaching personnel. Furthermore, most of the teaching personnel's time was mainly used to solve practical questions, without having time to bridge the practical laboratory exercise with the theoretical part of the course (Trabjerg, 2020).

To mitigate this challenge one out four sub-exercises in the second laboratory module was adapted into a theoretical laboratory exercise. Whilst similar in design to a practical exercise, a theoretical laboratory exercise does not require the students to perform the exercise themselves. Instead, they are provided with experimental data, which should be used to prepare a report scheme.

The purpose of the current study was to describe the development and evaluation of a theoretical laboratory exercise concerning a complexometric titration. Due to the COVID19 regulations, it was not possible to fully investigate the effectiveness of the new alterations in the second laboratory module. Thus, it is not known if they would have resulted in a reduction of the time pressure on the students and the strain felt by the teaching personnel. Hence, the evaluation is focused on the students' learning outcome of the adapted exercises.

## **Course description**

The course "Evaluation of pharmaceutical substances" is a mandatory course for second semester students in the Bachelor's Programme of Pharmaceutical Sciences. Approximately 240 students enroll each year. The course is structured around four laboratory modules and a final laboratory project. Each module has a different theoretical focus, e.g. pH titrations, titrimetry, spectrophotometry and quantitative analysis of "large biomolecules". Around each laboratory module there are several other teaching activities, e.g. one lecture, one intro class-based teaching situation (45-90min) and one outro class-based teaching situation (45-90min).

## **Approach and method of analysis**

A laboratory exercise in the course "Evaluation of Pharmaceutical Substances" concerning complexometric titration was converted from a practical laboratory exercise into a theoretical laboratory exercise.

To evaluate the learning outcome of the adapted exercise and the students' experience of the adapted theoretical exercises three semi-structured interviews were performed with groups of 2-3 students.

The interviews were separated into two different segments. The purpose of the first segment was to assess the students' learning outcome of

the theoretical exercise (complexometric titration) compared to their learning outcome of a practical exercise (redox titration). The two exercises were conducted simultaneously by the students in the second laboratory module. Practically, the interview groups were asked to draw mind-maps or to generate word association list of the two different exercises. The resulting mind maps and word association lists was used as a proxy to assess the learning outcomes of the students and their knowledge of the underlying theory (Appendix A).

The purpose of the second segment of the interview was to further investigate the students' experience of the theoretical laboratory exercise to identify positive and negative factors that affect the students' learning outcome of a theoretical laboratory exercise. Relevant statements concerning the aims of the current study from the interview was transcribed and structured by themes.

The interviews were conducted in Danish and the author translated all quotes from the interviews presented here.

## Results

### Development of teaching material

Three new teaching materials were prepared to improve the learning outcome of the students: redesign of the laboratory protocol, production of a video to visualize the exercise and the development of a report scheme that was tailored a theoretical exercise instead of a practical exercise.

The new laboratory protocol was redesigned to accommodate the translation of the exercise into a theoretical exercise. The focus on the protocol was on the different steps of a complexometric titration and the associated materials. A video of the exercise was produced, where all steps and materials in the complexometric titration was shown, with emphasis on the color change at the end point of the titration.

Finally, the report scheme was modified to accommodate the translation into a theoretical exercise. As the *experimental competences* will not be developed in a theoretical laboratory exercise, it leaves room to focus on some of the other *competency clusters*. Especially *disciplinary learning* and *higher-order thinking*. *Disciplinary learning* was promoted by focusing on bridging of the experimental and theoretical part of the course. While *higher-order thinking* was promoted by incorporation of a table in the report scheme, where the students should explain the purpose and function

of all steps and materials used in the exercise (Appendix B). The development of the table was highly inspired by the recent use of flow charts to promote improved learning outcome in an laboratory exercise described by Grosskinsky and colleagues (Grosskinsky et al., 2019).

### **Comparison of mind maps and word associations lists**

A qualitatively assessment of the mind maps and word association lists (Appendix A) was performed. It is evident that two out of three groups have comparable learning outcomes of the practical and the theoretical exercise, while the last group had a markedly decreased learning outcome of the theoretical exercise compared to the practical exercise.

For the two groups with a similar learning outcome the associated words points not only towards the execution of the theoretical exercise, but also the underlying theory. Both groups mention “back titration” as the titration principle. Furthermore, both groups also included other qualified theoretical discussions. To mention a few: the importance of affinity of the secondary metal ion towards *EDTA*, and the mechanism of action of the metal ion indicator *Mordant Black*.

### **Analysis of semi structured interviews**

The theme structuration of the interview resulted in eight different themes. I have chosen to focus on two overarching themes, as these seems most important in a successful translation of a practical laboratory exercise into a theoretical exercise: tailoring of teaching material and curriculum and de-prioritization of a theoretical laboratory exercise.

#### **Tailoring of teaching material and curriculum**

For a successful adaption of a practical laboratory exercise to a theoretical laboratory exercise, it is important that the teaching materials were tailored towards the new format of the exercise. Several times the students underlined the importance of even more detailed and step-by-step exercise protocols than for practical exercises, as the connection with the practical setting is lost.

Furthermore, all groups highlighted the importance of a visualization of the theoretical exercise, as the most important single parameter to promote understand and improve the learning outcome of a theoretical exercise. The

more visual the exercise is the better, e.g. a color change, a precipitation or a similar change that is easy to observe.

*I do believe that it makes a big difference, when you actual can see a color change... It is just easier to understand the importance of every material, instead of just reading it on a piece of paper... I do also think that videos are a really good idea.*

Several of the students also noticed that it is extremely important that a thorough introduction to the underlying theory should be conducted before the theoretical exercise to promote a positive learning experience. To perform a practical exercise, without any previous introduction of the underlying theory is demanding, but feasible, given the right teaching material. However, to perform a theoretical exercise without prior introduction to the underlying theory are extremely difficult, and is according to the interviewed students not a positive experience.

*I did miss some theory... Just to conduct a theoretical laboratory exercise, to some theory that we have not been taught yet. I thought it was really difficult...*

### **De-prioritization of theoretical laboratory exercises**

The second major finding in the current study is that the theoretical exercise was highly de-prioritized by the students. This concerns both the preparation phase and when they entered the teaching laboratory.

*... Cool, now we can focus on A, B and C, and then number D, that is just; yep, yep, yep, let us just get some numbers...  
... I have first looked at it (the theoretical exercise) afterwards...*

The de-prioritization of the theoretical exercise is also evident in the students' study approach to it. Several students described a surface approach to the theoretical exercise, as they did first look at the exercise and report scheme after they left the teaching laboratory. Furthermore, they primarily focused on how to fill-out the report scheme instead of focusing on understanding the exercise and the underlying theory.

*... you read the report, read the questions, answer the questions and then forget everything again...*

*... what you learn at the university is to be solution oriented. We have to prepare this report scheme, and then we find the answers, without reflecting further...*

Several of the groups also pointed out that a way to mitigate the students' surface approach towards learning and the theoretical exercise is to tailor the report scheme, in a way that a deeper understanding of the exercise and the underlying theory is needed to complete it. The students highlighted the table in the report scheme, where they had to describe the function of every single step and materials used in the exercise, as a way to promote deep learning of the underlying theory and general chemical principles (Appendix B).

*It was really good. Because I can remember how EDTA worked, which we should use in the protocol (for the final project in the course). And the reason why I knew it, was because I have learned it in the exercise concerning aluminum sulfate. It worked quite good that we had to write, why you had to do it. It sticks...  
... (the table) forced you to think about the mechanisms behind, instead of just answering the assignment. Of course, it was a part of the report scheme, but you were forced to learn more about these things...*

## Discussion

The learning outcome of the theoretical laboratory exercise were, for the majority of the groups, kept at a similar level as a comparable practical laboratory exercise. However, for one group a markedly lower learning outcome was achieved. The current analysis points toward the importance of mitigating the internal de-prioritization of the theoretical laboratory exercise by the students. This can be done by active intervention by the laboratory supervisor and by the design of the teaching material, especially the assessment part.

The laboratory supervisor can mitigate the de-prioritization by 1) articulating the importance of the theoretical laboratory exercise and 2) making specific time slots for every single group in the confrontation time in the laboratory, where the laboratory supervisor facilitates a discussion of the theoretical exercise. By articulating this before the actual laboratory module, the students will hopefully prepare the theoretical exercise beforehand

and a discussion will allow the supervisor to discuss the underlying theory and bridge the laboratory exercise with the theoretical part of the course to promote high-quality learning.

The importance of tailoring the teaching material is not a surprising finding in the current study, and is accordance with two prominent models on how to promote high-quality learning: Biggs' model of *constructive alignment* (Biggs, 1996) and the concept of *congruence* developed by Hounsell and co-workers (Hounsell et al., 2005; Hounsell & Hounsell, 2007). Both models describe, that alignment between teaching activities, intended learning outcomes and assessment are crucial to promote high quality learning. The teaching material can be seen as a part of the teaching activities and should be aligned with the intended learning outcomes and the assessment.

Furthermore the “back wash” effect (Biggs, 1996), which describes how the assessment affects the students learning focus are also highly evident in the current study. This further highlights the importance of how the report scheme is designed to mitigate a surface approach to learning, which several of the students articulated in the conducted interviews.

Although not the focus of the current study, a possible positive aspect of theoretical laboratory exercise that could be explored further is that the format is highly flexibility and markedly enlarges the room for creativity. In a theoretical exercise, it is possible to develop exercises that will resemble real-world laboratory work either in a research lab or in an industrial setting. In a teaching lab most exercises are developed to provide the students with expected and useful data in at least in 90% of the time. However, this is not the case in a research laboratory. Here, not all experiments are working at first try, and way more time is used on troubleshooting an experiment and the associated instruments. In an industrial setting, e.g. in a quality control laboratory, the educated pharmacist will not themselves be conducting the experiments, but will troubleshoot the experiments, when non-expected results are achieved.

## Conclusions

The current study has highlighted some pitfalls and ways to mitigate these in the process of adapting a practical laboratory exercise into a theoretical laboratory exercise. First, the teaching material needs to be tailored to accommodate the theoretical nature of the exercise. Ideally, the teaching

material should contain a thorough step-by-step protocol and a video of the actual exercise.

Secondly, it is important, that the assessment (e.g. report scheme) promote higher-order thinking to elucidate the connection of the exercise with the underlying theory.

Finally, it is crucial that the supervisor stresses the importance of the theoretical exercise and actively engage in discussion with the students concerning the exercise to mitigate students' internal de-prioritizing of a theoretical laboratory exercise.

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## A

## Mind maps and word association lists

### Interview group 1



Figure 1: Mind Map or word association concerning the practical laboratory exercise "Quantitation of acetyl cysteine".



Figure 2: Mind Map or word association concerning the theoretical laboratory exercise "Quantitation of aluminum sulfate".

*Interview group 2*

Kvantitativ Bestemmelse af  
Acetylcystein i en råvare

Manuel titrering  
Iodimetrisk titrering  
Reoxtitrering  
Kolormetrisk  
Lilla farveskift  
Ækvivalensvolumen 8,5mL  
Titrant: Triiod

*Figure 3: Mind Map or word association concerning the practical laboratory exercise “Quantitation of acetyl cysteine”.*

Kvantitativ Bestemmelse af  
Aluminiumsulfat

Metalion  
Tilbagetitrering  
EDTAtotal-EDTAoverskud  
 $n, EDTAoverskud = n, Zinkioner$   
Zinkioner, skal have en lavere  
ligevægtskonstant/kompleksdannelsekonstant.

*Figure 4: Mind Map or word association concerning the theoretical laboratory exercise “Quantitation of aluminum sulfate”.*

Interview group 3



Figure 5: Mind Map or word association concerning the practical laboratory exercise “Quantitation of acetyl cysteine”.

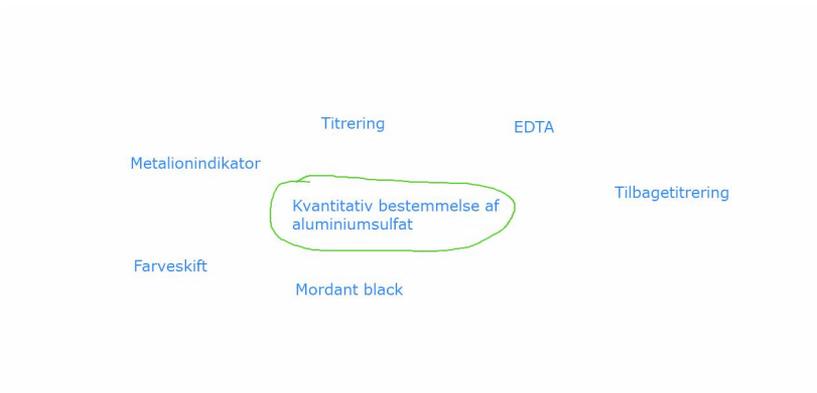


Figure 6: Mind Map or word association concerning the theoretical laboratory exercise “Quantitation of aluminum sulfate”.

## B

**Table describing the function of the single steps and materials in the theoretical exercise**

*Text in gray are the correct answers in the boxes that should be filled-out by the students.*

Udfyld de tomme felter i nedenstående tabel ud fra informationer fra Ph.EUR. som vist på s. 67 i kompendiet. Beskriv de enkelte skridt, som indholdsbestemmelsen af aluminiumsulfat i Ph. Eur. består af.

(Anmærkninger til uddrag fra Ph.EUR. på s. 67 i kompendiet:

- Under "Assay" er skrevet "dissolve 0.500 g in 20 mL of water R". Denne sætning erstatter sætningen i kap. 2.5.11. Complexometric Titrations – Aluminium "Introduce 20.0 mL of the prescribed solution into a 500 mL conical flask".
- Udsagn i Ph.EUR. "1mL of sodium edetate is equivalent to 17.11 mg of  $\text{Al}_2(\text{SO}_4)_3$ " henføres til den mængde af EDTA, som er blevet kompleks bundet til  $\text{Al}^{3+}$ -ionerne)

Skridt	Handling inkl. reagenser og anvendt udstyr	Reagens	Funktion af reagens / handling
1	Afvej 0.500g aluminiumsulfat i en vejebåd på en analysevægt (differensafvejning) og overfør råvaren til en 500 mL Erlenmeyer kolbe.	Aluminiumsulfat	Analyt
2	Opløs råvaren i 20 mL demineraliseret vand afmålt med et måleglas.*	Demineraliseret vand	Opløsningsmiddel
3	Tilsæt 25.0 mL af 0.1 M natrium-EDTA opløsning til opløsningen af aluminiumsulfat afmålt med en fuldpipette (eller burette).	0.1 M natrium-EDTA	EDTA tilsættes i overskud for at undgå udfældning af aluminiumhydroxid
4	Tilsæt 10 mL af en 1:1 opløsning af 155 g/L ammoniumacetat og 120 g/L eddikesyre afmålt med måleglas	1:1 opløsning af 155 g/L ammoniumacetat og 120 g/L eddikesyre	Buffer (pH ~ 4.76)
5	Kog opløsningen i 2 min og afkøl den til stuetemperatur	-	Sikre fuldstændig reaktion mellem EDTA og $\text{Al}^{3+}$ -ionerne
6	Tilføj 50 mL ethanol afmålt med måleglas	Ethanol	Sikre opløseligheden af dithizon
7	Tilføj 3 mL af en ny fremstillet 0.25 g/L opløsning af dithizon i ethanol afmålt med måleglas	0.25 g/L opløsning af dithizon i ethanol	Metalionindikator
8	Titrer den overskydende mængde EDTA med 0.1 M zinksulfat indtil opløsningen ændrer farve fra grøn-blå til rød-violet. Til titreringen benyttes en burette.	0.1 M zinksulfat	Titrant

## **Course segment redesign: Practical exercises with live animals**

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### **Introduction**

A competency after graduating from the Animal Science programme at the University of Copenhagen is to be able to link theory and practice for the sustainable use of animals for the benefit of humans and animals. To this end, graduating students are expected to acquire basic knowledge about quantitative biology including the relevant methods, while acquiring the ability to critically evaluate research and results. The foregoing involves learning how to analyse problems through a holistic insight into the relationship between the structure of the body, its functions, its ability to perform as well as its welfare and surroundings.

Different teaching and learning methods such as lectures on key points, seminars, problem-based learning, laboratory demonstration, and practical exercises are used to ensure students achieve the goals. However, decreasing university funding and money-saving procedures present challenges concerning what can be done for practical work. For instance, for the last 2 years, it has been rather difficult to do demonstrations on quantitative energy and protein metabolism in one of the segments of a master level course within the Animal Science programme since the research farm was phased out due to the cutback. Further, no ongoing research project and shortage of staff have presented a challenge in conducting practical exercises for this segment. To address this issue, students are taken on a tour to the defunct university research farm to see the facilities and explanation provided on the operation on each piece of equipment. However, one of the criticisms regarding course alignment, in the recent student course evalu-

ations, was with this segment, whereby a majority of the students thought the field trip to see the research facilities is a waste of time if no real activities are going on (Course evaluation, 2020). Thus, suggesting discord between the intended learning outcomes (ILOs) and teaching and learning activities (TLAs) for this segment due to the disconnect between its lecture and practical exercises. One can question whether visiting nonfunctional research facilities to see previously used equipment translates into learning the necessary practical skills to operate that equipment. Therefore, it was imperative to include a cost-efficient and easy-to-conduct animal experiment in the practical exercises to get the segment more interesting and for students to learn more from the practical exercises thereby strengthening the overall congruence (between ILOs and TLAs) for this segment. Thus, the objectives of the project reported herein were to (i) provide students a cost-effective practical exercise involving live animals to provide hands-on experience, (ii) motivate them via the new practical activities to ensure they achieve the ILOS, and (iii) increase the overall relevance of the course and make it more beneficial to students with regards to the real-world.

## Methods

### Context and Course description

The intervention was carried out for one of the segments of the course “*Experimental Animal Nutrition and Physiology*” (EANP), where the course evaluation from previous students has suggested a redesign of the practical exercises to further strengthen the alignment and congruence between teaching elements. The EANP is a full degree master course offered for students in the Animal Science programme and is designed to introduce students to experimental techniques commonly used for assessing functions and nutrient metabolism at the whole-animal and organ levels (Course description). Students are introduced to the principles required for planning and implementing *in vivo* or *in vitro* experimentation and how to critically evaluate the results from such experiments. The course also has elements that make it possible for students to fulfill the educational requirements of an EU directive and the Danish National Authority, “Dyreforsøgstilsynet”, for persons working with experimental animals or assisting in animal experimentation (Course webpage). Within this context, students are expected, among other ILOs, to be able to describe; (i) the principles behind specific

methodologies for animal experimentation, (ii) the methods for measuring digestibility in different segments of the digestive tract of livestock animals, (iii) the appropriate experimental designs and statistical approaches used for specific methodologies, and (iv) the relevant legislation, handling, and management of laboratory animals. Three TLAs are used to ensure students achieve the ILOs. Thus, (i) lectures to present theories on principles, experimental design, and techniques for conducting animal research, (ii) theoretical exercises for students to summarize laboratory-generated data and interpret their findings using the theories from lectures, and (iii) laboratory demonstration and practical exercises on live animals, depending on the course segment.

### **Description of the intervention and activities**

The segment, in which the intervention was carried out deals with quantitative energy and protein metabolism in livestock and companion animals. Two other teachers and I carried out the project described herein. This year, the goal of this segment was to provide more hands-on experiences for students. Therefore, the decision was also to re-design the lecture session to focus more on the practical parts, i.e., the theory and application of the different methods for quantitative measurements of energy and nutrient metabolism. To be cost-efficient, the practical exercise was moved to the Frederiksberg campus. Four pigs were bought through the Department of Experimental Medicine and housed in one of the animal stables on the Frederiksberg campus. The pigs were used to introduce the students to animal handling during experiments following research protocols. They were also used for demonstrations on how to use stable isotope methods to study energy metabolism (based on carbon dioxide measurement via gas mask) and how to conduct a nutrient balance experiment to determine energy and protein metabolism in live animals.

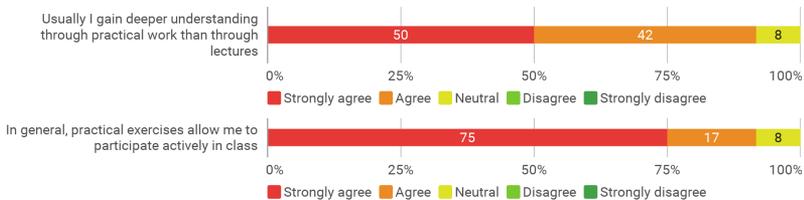
Seventeen, out of the 18, students who enrolled in this course participated in the practical exercise. The students were divided into 4 groups and each group carried out the carbon dioxide measurements using a gas mask and the sample collection for the nutrient balance experiment. At the end of the practical exercise, students were provided with 10 standard survey questions (Appendix A) to complete. Seven questions required responses based on a linear scale (1 to 5, strongly disagree to strongly agree) to collect quantitative data, and 3 questions required respondents to provide short responses (qualitative data). SurveyXact was used to create the survey and

the link was distributed to the students to complete anonymously. There was also an open-discussion session at the end of the segment for students and teachers to discuss their impressions or thoughts about the TLAs and ILOs of the segment along with ideas and suggestions for future segment planning.

## Results

Twelve out of the 17 students who participated in the practical exercises completed the survey questions giving a response rate of 71%. It should also be noted that one respondent corresponds to approximately 8% of the total respondents of a survey question presented in what follows.

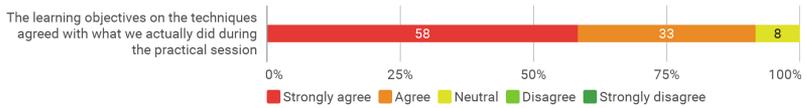
The first 2 questions requested students' general opinions on practical exercises. Here, when asked if they gain a deeper understanding through practical work than through lectures, nearly all the respondents (50% strongly agreed and 42% agreed) at least agreed, whereas 8% indicated neither agreed nor disagreed (Figure 1). Further, 75% strongly agreed, while 17% agreed that practical exercises allow them to participate actively in class. (Figure 1) Two of the questions to collect quantitative data were



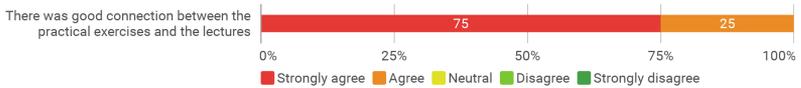
**Figure 1.** General opinion on practical exercises.

Almost all the respondents at least agreed (58% strongly agreed and 33% agreed) that the learning objectives for the practical section were aligned with the practical activities carried out (Figure 2). Concerning alignment between course elements, all the respondents agreed (75% strongly agreed and 25% agreed) there was a good connection between the practical exercises and the lectures (Figure 3). It was also apparent that the students appreciated the need to have a hands-on experience on methods discussed

in the lecture section. For example, one student indicated, “*It was nice to try the methods explained during classes, as I feel I have a much better understanding of how to conduct the methods now*”. Another student commented, “*I gained a better understanding of the different experiments used to determine protein and energy metabolism in domestic animals*”. Another 2 students commented, “*I have gain knowledge on how the experiment is carried out and I have gain knowledge on how to handle the animals*”, and “*The practical demonstrations really give a better understanding of all the work that is put into such experiments*”.

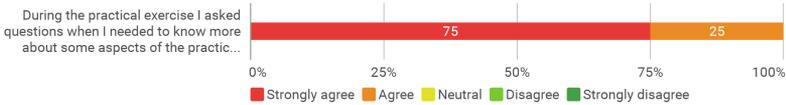


**Figure 2.** Alignment between learning objectives and practical activities.

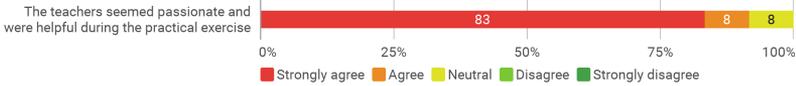


**Figure 3.** Alignment between teaching formats.

All the respondents agreed (75% strongly agreed and 25% agreed) that they had a good interaction with the teachers during the demonstration and asked questioned whenever necessary (Figure 4). One student commented, “*Everything went smoothly. The professors answered all my questions regarding specific parts of the theoretical/practical parts*”. Regarding teachers’ enthusiasm, a majority of the students also agreed (83% strongly agreed and 8% agreed) the teachers appeared passionate and helpful during the practical exercises (Figure 5), whereas 8% indicated neutrality when responding to this question.

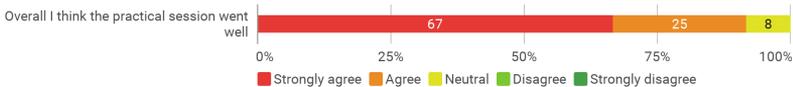


**Figure 4.** Interactions during practical exercises.



**Figure 5.** Teachers’ enthusiasm during practical exercises.

Regarding the question on students’ general impression of the practical exercises, 67% strongly agreed and 25% agreed the practical session went well (Figure 6). Examples of some of the comments from the students are “*I learned how to make breath tests with live animals and how to handle animals during experiments*” and “*I especially liked the breath trial because I had the feeling of doing an entire experiment [.....]*”. However, 8% of the respondents neither agreed nor disagreed on whether the practical session did go well (Figure 6).



**Figure 6.** Overall impression of the practical exercises.

***What have you gained from this practical exercise?***

Here, all the students answered that they have gained knowledge on how to handle animals for experiments and understanding of the techniques that were discussed during the lecture session. For example, one student mentioned, “*More knowledge about how to handle animals (especially pigs) when using them for experiments. And also how important it is to not have a stressed animal*”. Another student commented, “*I have gain knowledge on how the experiment is carried out and I have gain knowledge on how to*

*handle the animals*". Other comments such as *"I understand the methods better now"*, and *"More knowledge about the two methods we tried. For example what the methods are used for and which advantages and disadvantages there is with the trials/methods"* were also made.

### ***What did not work well for you?***

Most of the students mentioned that they had some challenges getting breath samples from the animals. For example, one student commented that *"Getting the breath samples was not easy, but that was due to the pig being stressed"*, and another *"The breath test was a bit difficult to do, because the pig was not trained so well, so we were not able to get all samples"*. This is natural when an inexperienced person attempts to obtain samples from experimental animals for the first time and had little to do with the practical exercise set up. Indeed, one student commented, *"A little more time with the pigs before handling them for the actual trial, could perhaps make it easier to collect samples"*. Another student mentioned, *"my group was confused on how to collect some to collect the [.....] it would have been nice to get a "check" from the supervisor to see if it was done properly"* and commented further saying *"But of course we could also have asked"*. Another student also commented, *"It was a bit chaotic when all groups were in the process of labeling the different containers for collection and lab samples during the balance trial demonstration"* and another mentioned, *"there were too many people present in the animal stable in the same time [.....] it was difficult to hear the instructions from the teachers"*.

### ***What would you change or suggest for improvement?***

One student mentioned that more time with the animals before handling them for the actual trial could make it easier for them to collect samples. This was also the main topic for discussion during the open-forum discussions. Some students also felt the manual for the practical exercises was not thorough enough and need to be revised for the future. For example, one student mentioned, *"The manual for the balance trial demonstration could have been more thorough in describing[.....]. It would have been nice with an exact description of all materials needed"* and another commented, *"It would be nice to get a more detailed description of how the theoretical exercise [...]".* Finally, some students mentioned that it

would be nice to have carried out the laboratory analysis and used the results for the calculation/theoretical exercises and another student suggested the number of animals should be increased for the practical exercises. The latter 2 suggestions were also discussed during the open forum and it was agreed that would be difficult to implement due to time and expense.

## Discussion

Learning science should not be a passive process, but rather an active one. It is, therefore, not adequate that science students learn only theories and understand the relevance of those theories. They should also learn how to put theories and concepts into practice. This will help them gain a deeper knowledge of theoretical concepts and increase their ability to see and understand technical things in a larger context (Millar, 2004). The foregoing concurs with the results of this project, where the students agreed to have gained a deeper understanding through the practical work. Further, the current findings confirm how students appreciate hands-on experiences through practical exercises and how they find them extremely beneficial. The comments regarding what students gained from the practical exercises also confirm how students are more than willing to be engaged and actively participate in their learning through interaction with their teachers instead of being “spoon-fed” with information. These comments are also consistent with the report of Prince (Prince, 2004), indicating that engineering students prefer to be engaged in their learning and that this strategy increased their memory of course content and promoted critical thinking.

In this study, 8 % of the respondents (representing 1 student) neither agreed nor disagreed when answering questions on impressions about practical exercises in general and the current practical exercise. Reasons for this finding are not apparent because all the students who completed the questionnaire provided positive feedback when they were asked to comment on what they gained from the practical exercise. It is also not clear if it was the same student, who provided a neutral response to questions on impressions about practical exercises. Nonetheless, it has been reported that not all students find research-based teaching beneficial, especially students who prefer a surface approach to learning (Dohn & Dolin, 2015). In conclusion, the practical exercise introduced in this segment was successful in helping the students achieve the ILOs. The findings also offer support to the need for research-based teaching in higher education.

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## A Survey questions

**1. Usually I gain deeper understanding through practical work than through lectures**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**2. In general, practical exercises allow me to participate actively in class**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**3. The learning objectives on the techniques agreed with what we actually did during the practical session**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**4. There was good connection between the practical exercises and the lectures**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**5. During the practical exercise I asked questions when I needed to know more about some aspects of the practical exercise**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**6. The teachers seemed passionate and were helpful during the practical exercise**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**7. Overall I think the practical session went well**

Strongly agree  Agree  Neutral  Disagree  Strongly disagree

**8. Describe what you have gained from this practical exercise and your reasons**

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**9. Describe what did not work well for you in this practical exercise and why**

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**10. Describe would you change about this session or suggest for improvement**

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## B

### Commentary on knowledge gained from the practical exercises

#### Describe what you have gained from this practical exercise and your reasons

1. A good understanding of handling of smaller pigs when doing trials with them, and what the outcome of the trial is good for.
2. More knowledge about how to handle animals (especially pigs) when using the for experiments.  
And also how important it is to not have a stressed animal.
3. Try to work in real life with the animals, that was really Nice to do in this course.
4. I gained a better understanding of the different experiments used to determine protein and energy metabolism in domestic animals
5. I gained practical knowledge next to the theoretical knowledge gained from last class.
6. I have gain knowledge on how the experiment is carried out and I have gain knowledge on how to handle the animals
7. More knowledge about the two methods we tried. For example what the methods are used for and which advantages and disadvantages their is with the trials/methods.
8. It was nice to try the methods explained during classes, as I feel I have a much better understanding of how to conduct the methods now. Even when preparing the materials, it got more clear why we should have the different steps and what we investigate in the different steps - and much easier to remember when discussing these methods later on.
9. The practical demonstrations really give a better understanding of all the work that is put into such experiments.

I especially liked the breath trial because I had the feeling of doing an entire experiment from the preparations of the  $^{13}\text{C}$ -bicarbonate for oral ingestion, labeling the breath bags, taking the breath samples and watching them get analyzed in the lab with the infrared spectrometry and discuss with the teacher how the results are actually used.

I think we also gained a good understanding of how important it is to train the animals well before the beginning of a trial in order for sampling to be as easy as possible and avoid stressing the animal which could affect the results of such a trial.

10. I learned how to make breath tests with live animals and how to handle animals during experiments. It was nice to actually make the balance cage experiment ourselves instead of just read about it, because it gives a better understanding on all the requirements for that kind of experiment.
11. I understand the methods better now
12. I gained knowledge about how to handle experimental animals. Being calm and understanding for the animal

## C

### **Commentary on aspects of the practical exercise that did not work for students**

#### **Describe what did not work well for you in this practical exercise and why**

1. Getting the breath samples was not easy, but that was due to the pig being stressed.
2. My group had a misunderstanding of how to collect the feces and afterwards the "cleaning sample", maybe it would have been nice to get a "check" from the supervisor to see if it was done properly. But of course we could also have asked.
3. Nothing I can think about
4. There could have been some better communication between students and lecturers
5. Everything went smoothly. The professors answered all my questions regarding specific parts of the theoretical/practical parts.
6. Everything about the practical exercise worked for me
7. I would have liked to use the samples from the animals more, however, I know it is expensive and that it depends on the animals --> if they deliver a sample or not ;)
8. I think some of the things we investigated was a bit complicated. I mean the methods were easy enough to conduct, but I am still not comfortable with the theory behind for instance the isotope-breathing methods.
9. It was a bit chaotic when all groups were in the process of labeling the different containers for collection and lab samples during the balance trial demonstration because only some of it were actually mentioned in the manual and some of it were just told by the teachers.

I think the balance trial demonstration seemed a bit unfinished. I really liked the part in the stable where we got the understanding of how to practically work with the animals and the balance cages. But after we had collected the samples that was sort of it and I missed a better ending to the demonstration.

10. The breath test was a bit difficult to do, because the pig was not trained so well, so we were not able to get all samples. I did however understand the method, so it was not too bad.
11. xxx
12. The amount of people

## D

### Student suggestion for further improvement of the practical exercises

#### Describe would you change about this session or suggest for improvement

1. A little more time with the pigs before handling them for the actual trial, could perhaps make it easier to collect samples.
2. I don't really think there is that much need for improvement as it gave a good insight in how to use the method we have discussed during the segment.
3. Nothing I can think about
4. I believe we were too many people in the stable at the same time. It was difficult hearing the instructions at times because of noise from other students. Moreover there was some misunderstandings about how to collect the samples from the balance trial, so we did some minor mistakes that would have been good to know about beforehand.
5. If there are more animals to work on, the teams can get cut down to 2-3 people and the practical part will be absorbed better as a learned technique.
6. It would be nice to get a more detailed description of how the theoretical exercise was calculated either before hand (on Tuesday) or earlier on Thursday
7. More general information about the theoretical exercises. On the other hand, I know that we are going to talk about the results from these on Tuesday.  
Generally, it was a very good day!
8. It would have been nice to use our own results and make calculations on those instead of the pre-given during the exercises. Just to get that last understanding from for instance the balance trial.
9. The manual for the balance trial demonstration could have been more thorough in describing what needed to be done during the preparations. It would have been nice with an exact description of all materials needed.

After the collection of samples in the balance trial I think it would have improved my further understanding if we had talked more about what happens with the samples in the lab. I am aware that we probably would not have the time to do the actual lab analyses but for example the teacher could have showed us the lab equipment used to analyze the samples and give us a chance to talk a bit about that. I think this would also give a better connection to the theoretical exercises where we used results from a balance trial to calculate N-balance.

10. I like the session how it is. It was nice to have lectures on the methods and then do them in practice ourselves. The teachers were good at helping out with handling the animals and collecting samples.
11. Allow the students 15 mins to reread the instructions for the experiment
12. Maybe a little more clearer introduction



## Aktivering af dyrlægestuderende under de praktiske øvelser i Speciel patologi

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### Kontekst

Projektet tager udgangspunkt i kurset Speciel patologi og fjerkræsygdomme, som er placeret sidst på bacheloruddannelsen i veterinærmedicin (“Kursusbeskrivelse for SVEB13031U Speciel patologi og fjerkræsygdomme – Teori”, 2022; “Kursusbeskrivelse for SVEB13032U Speciel patologi og fjerkræsygdomme – Praktisk”, 2020). Jeg underviser udelukkende på den del af kurset som omfatter Speciel patologi (sygdomme hos huspattedyr) hvorfor, den del som omhandler fjerkræsygdomme ikke beskrives her. Kursets formål er, at de studerende opnår færdigheder og kompetencer i; 1) at foretage sektion og præparere organer i forbindelse med obduktion af huspattedyr samt 2) at vurdere læsioner og reaktioner i væv, organer og organsystemer hos huspattedyr med henblik på udredning af ætiologi, patogenese, komplikationer, patoanatomisk diagnostik og differentialdiagnoser (“Kursusbeskrivelse for SVEB13031U Speciel patologi og fjerkræsygdomme – Teori”, 2022; “Kursusbeskrivelse for SVEB13032U Speciel patologi og fjerkræsygdomme – Praktisk”, 2020). De praktiske øvelser foregår i sektionssalen på Frederiksberg campus, med 13 studerende pr hold og to undervisere. Undervisningsmaterialet består af selvdøde eller aflivede huspattedyr indsendt hovedsageligt af KU’s dyrehospitaler samt slagtepræparater fra svin og kvæg. De studerende skal foretage sektion og præparere organerne, hvorefter de skal redegøre for læsionernes art herunder en patoanatomisk diagnose, ætiologi og patogenese. Hver hold studerende har øvelser af to omgange (5 sammenhængende dage efterfulgt af 3 sammenhængende dage senere i kursusforløbet). Ud over de praktiske øvelser består undervis-

ningen også af en række forelæsninger og histologiske øvelser, men denne opgave tager udgangspunkt i de praktiske øvelser.

## Problem

Til de praktiske øvelser i Speciel patologi er formålet, at de studerende selvstændigt skal udføre obduktioner af pattedyr for derigennem aktivt at tillære sig korrekt obduktionsteknik og diagnostik. Som undervisningen er tilrettelagt i dag udfører de studerende obduktion af dyr typisk i **grupper af 4-6 studerende**. Udfordringer vi oplever ved den nuværende undervisningsform er, at 1) der opstår ventetid, da det ikke er muligt for alle studerende at være i gang på samme tid, 2) de studerende gør ikke obduktionerne helt færdige, og 3) de studerende er tilbageholdende med at deltage aktivt i opsamlingen i plenum. Alle tre forhold påvirker de studerendes udbytte af undervisningen i negativ retning. Ventetiden forhindrer de studerende i at være aktive og er derfor en udfordring af mere praktisk karakter. De ufærdige obduktioner betyder, at de studerende ikke fuldt ud udnytter undervisningsmaterialet. Den manglende lyst til at præsentere i plenum påvirker alle studerende i det den fælles diskussion og opsamling lægges over på underviseren, som kan få svært ved at gennemskue hvor han/hun skal lægge sit fokus.

## Formål

Formålet med projektet er at undersøge hvorvidt indførelsen af en individuel opgave (obduktion af mindst ét grisekadaver per studerende) kan forbedre de praktiske øvelser i Speciel patologi, så de studerendes udbytte af undervisningen øges.

## Hypoteser

At give de studerende mulighed for mindst én gang i løbet af sektionsovelserne individuelt at udføre en obduktion af et grisekadaver vil 1) øge tiden hvor de er aktive, 2) resultere i at obduktionerne færdiggøres og 3) øge de studerendes mod på aktivt at indgå i opsamlingerne i plenum.

## Baggrund for interventionen

Ifølge modellen Dale's Cone of Experience er den mest effektive måde at lære på at få lov at udføre en reel og relevant opgave (Anderson, 2021). Under øvelserne får de studerende lov til at udføre obduktioner på rigtige cases og resultatet bliver videregivet til de indsendende dyrehospitaler. Under de praktiske øvelser har jeg ofte oplevet studerende give udtryk for at være nervøse for at "ødelægge" kadaveret. Samtidig er det mit indtryk, at studerende i store grupper oftere mister overblikket over obduktionen end studerende i små grupper gør. For nyligt havde vi (min faglige vejleder og jeg) et hold hvor meget få studerende mødte op til øvelserne (sandsynligvis fordi deres øvelser lå lige op til en eksamen). På disse øvelsesdage var der så få studerende, at de som mødte op fik lov til at obducere hver deres kadaver. Det var vores oplevelse, at de studerende var både effektive, grundige og i høj grad havde lyst til at forklare deres medstuderende, om de forandringer de havde fundet til gennemgangen i plenum. Dette var en positiv oplevelse særligt fordi det vides, at man lærer ved at skulle forklare sig til andre (Rienecker m.fl., 2015). Lysten til at præsentere afspejlede muligvis, at de studerende havde overblik over alle patologiske forandringer i dyret, de havde kigget på og de derved følte sig i stand til at formidle det til deres medstuderende. Oplevelsen danner baggrunden for mine hypoteser og den intervention, jeg ønsker at implementere og evaluere i dette projekt.

## Intervention

I august 2021 indsamles døde og aflivede grise (op til 20 kg) i en udvalgt svinebesætning. Kadaverne opbevares på frost til undervisningen begynder i september. Et antal kadavere optøes til hver undervisningsdag således, at alle studerende minimum én gang (og gerne flere gange) i løbet af ugen **individuel** udfører en obduktion. Den enkelte studerende skal på egen hånd foretage en fuld obduktion herunder udtage vævs- og mikrobiologiske prøver på indikation samt vurdere læsioner og reaktioner i vævet med henblik på til slut at stille en patoanatomisk diagnose og redegøre for dennes ætiologi og patogenese.

Inden de studerende går i gang demonstrerer jeg teknikkerne på et kadaver og udleverer en tjekliste over organsystemerne. Forud for undervisningen opfordres de studerende til at gennemse videodemonstrationer af sektionsteknik samt læse i lærebogen. De studerende arbejder individuelt,

men kan naturligvis sparre med hinanden undervejs, ligesom at jeg som underviser hjælper ved behov som en dialogpartner.

Kadavere (primært hest, drøvtyggere, hund og kat) indsendt fra KU's dyrehospitaler vil stadig indgå i undervisningsmaterialet og vil blive prioriteret, da dette også er en del af den diagnostiske service som faggruppen yder. Da sektion af store dyr er tidskrævende vil studerende blive sat sammen i **grupper af to til seks** (afhængig af dyrets størrelse). Desuden vil slagtepræparater fra svin og kvæg fortsat anvendes i den praktiske undervisning således, at vi kan sikre os, at de studerende ser et bredt udsnit af forandringer i flere forskellige dyrearter.

Interventionen vil blive afprøvet på ét hold på undervisningsdag 1, 2, 3 og 5. På undervisningsdag nr. 4 er det besluttet i faggruppen, at undervisningsmaterialet udelukkende skal bestå af slagtepræparater. Dag 4 evalueres ikke i denne opgave.

## **Hvordan understøtter interventionen studerendes læring?**

Interventionen vil forhåbentligt give anledning til, at de studerende i højere grad tager ansvar for deres egen læring til de praktiske øvelser i Speciel patologi. Den enkelte studerende er ansvarlig for at få gennemført en obduktion. Interventionen vil betyde, at den enkelte studerende er aktiv under hele øvelsen, hvilket udover at træne deres praktiske færdigheder giver dem et overblik over de patologiske forandringer i dyret, som de ikke nødvendigvis altid opnår, når de er en del af en større gruppe. Dette overblik er afgørende for, at kunne stille patoanatomiske diagnoser, udrede ætiologi og patogenese samt træffe beslutning om yderligere undersøgelser (f.eks. histologi eller mikrobiologi). Forhåbentligt vil interventionen også bevirke at de studerende føler et ejerskab over deres fund og derved i højere grad har lyst til at være en aktiv del af opsamlingen i plenum.

## **Evaluering**

Interventionen evalueres ved antalsregistreringer, en overvejende kvantitativ spørgeskemaundersøgelse og overvejende kvalitative interviews. De tre punkter i hypotesen afprøves derfor således:

- 1) Hvorvidt interventionen kan minimere ventetiden for de studerende (dvs. øge tiden de er aktive) undersøges ved en spørgeskemaundersøgelse og ved kvalitative interviews.
- 2) Hvorvidt interventionen resulterer i, at de studerende færdiggør obduktionerne undersøges ved dagligt ved øvelsernes afslutning at registrere antal fuldstændige og ufuldstændige obduktioner.
- 3) Hvorvidt interventionen øger de studerendes lyst til at indgå aktivt i opsamlingen i plenum undersøges ved at registrere antal studerende, som deltager aktivt, ved spørgeskemaundersøgelse og ved kvalitative interview.

Registreringer: Hver øvelsesdag registreres antal studerende som arbejder individuelt eller i grupper, antal færdiggjorte obduktioner og antal studerende, som deltager aktivt ved opsamlingen.

Spørgeskema: På sidste øvelsesdag udleveres et spørgeskema til alle studerende (Bilag A). De studerende udfylder anonymt skemaet i undervisningstiden således, at så mange som muligt deltager. Hensigten med spørgeskemaet er at undersøge de studerendes oplevelse af undervisningen herunder oplevelsen af ventetid, individuelt kontra gruppearbejde og opsamlingerne i plenum. Spørgeskemaet består overvejende af lukkede spørgsmål og enkelte åbne spørgsmål (Cohen m.fl., 2011). For at sikre validiteten er spørgsmålene afprøvet på en kollega med kendskab til undervisningen, jævnfør anbefaling i Horst et al. (Horst m.fl., 2013).

Interview: I den følgende uge gennemføres kvalitative interview med de studerende som har lyst til at deltage. Interviewene gennemføres ud fra en interview guide (Bilag B), som tillader undertegnede at tilpasse spørgsmålene undervejs inden for en i forvejen fastsat ramme (Cohen m.fl., 2011). Hensigten med interviewene er at få et mere nuanceret billede af de studerendes oplevelse af undervisningen. Ved at spørge dem sidst på ugen håber jeg, at have opbygget en relation således, at de ikke føler sig pressede til at deltage (Sølberg, 2013). Interviewene gennemføres enkeltvis, så de studerende ikke påvirker hinanden, enten over zoom eller på campus afhængig af hvad de vil foretrække (Sølberg, 2013). Af resurse-mæssig årsager vil jeg interviewe dem selv. Ulempen ved dette er, at de studerende ikke er anonyme og selvom de ikke bliver bedømt på deres præstation til øvelserne, er de muligvis mere tilbageholdende med kritik (Sølberg, 2013). Fordelen ved mig som interviewer er, at jeg vil have opbygget en relation til dem i løbet af ugen og vil have lettere ved at stille opklarende spørgsmål sammenlignet med en ”ukendt” interviewer.

## Resultater

I alt besvarede 10 ud af 13 studerende spørgeskemaet. I den efterfølgende uge gennemførte jeg kvalitative interview med 5 frivillige studerende (3 studerende blev interviewet enkeltvis og 2 studerende ønskede at blive interviewet sammen). Opgørelse af de daglige registreringer, kommentarer fra spørgeskemaundersøgelsen og uddrag fra de kvalitative interview er vedlagt som Bilag C-E. Et datasæt indeholdende resultatet af hele spørgeskemaundersøgelsen kan rekvireres hos undertegnede. Antal studerende, gruppestørrelser og undervisningsmaterialet fremgår af tabel 1.

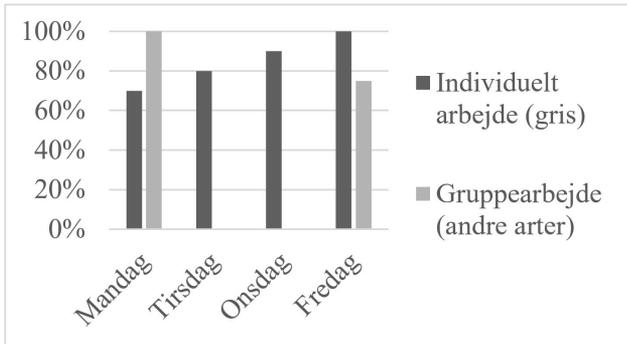
**Tabel 1:** Oversigt over antal studerende, grise og andre dyrearter for hver dag under øvelserne.

	Mandag	Tirsdag	Onsdag	Fredag *
<b>Antal studerende</b>	12	12	9	10
<b>Antal grise</b>	6	12	9	1
<b>Andre arter</b>	1 hest	-	-	1 hund, 1 kat
<b>Gruppe str.</b>	6 stud.	-	-	2 stud. pr hund/kat

\* 5 studerende arbejdede med slagtepræparater og de resterende 5 arbejdede med hele dyr (gris, hund og kat).

1) De studerendes oplevelse af ventetid under øvelserne: Baseret på spørgeskemaundersøgelsen mener 9 ud af 10 studerende, at de slet ikke eller i ringe grad oplevede ventetid under øvelserne. Dette stemmer overens med de kvalitative interview hvor de studerende giver udtryk for ikke eller næsten ikke at have oplevet ventetid men, at de var aktive under øvelserne.

2) Færdiggjorte obduktioner: Baseret på spørgeskemaundersøgelsen vurderer de studerende, at de i høj (n=3) eller nogen grad (n=7) færdiggjorde obduktionerne. Min vurdering af i hvilken grad at obduktionerne var færdiggjorte fremgår af fig. 1. I de kvalitative interview giver nogle af de studerende udtryk for, at de som ugen skrider frem bliver i stand til at færdiggøre obduktionerne. Citat fra interview: *Jeg kunne mærke, at jeg blev bedre for hver dag. Til sidst nåede jeg at blive helt færdig på den afsatte tid.*



**Figur 1:** Min vurdering i % af hvor fuldstændigt de studerende havde udført obduktionerne enten ved at arbejde individuelt med grise (mørke søjler) eller i grupper med andre dyrearter (lyse søjler). Tirsdag og onsdag bestod undervisningsmaterialet udelukkende af grise, i det der ikke blev sendt dyr fra dyrehospitalerne.

3) Lysten til aktivt at deltage ved opsamlingen i plenum: I et af interviewene siger en studerende: *Plenum opsamlingerne var gode. Det var godt at få lov at præsentere alt det man nu kunne og så få hjælp, dvs. blive spurgt ind til resten af underviser.* Ydermere fremgår det af interviewene at nogle studerende opfattede plenumopsamlingen som en tryk ramme (Citat: *Jeg var tryk ved plenumopsamlingen. Vi er sammen med stamholdet, dvs. vi har haft andre øvelser sammen før og kender derfor hinanden fra tidligere fag*) hvorimod andre anfører, at de særligt i begyndelsen af ugen var nervøse for at fremstå uvidende over for undervisere og medstuderende. To studerende siger blandt andet: *Jeg følte mig kun klar til at gennemgå i plenum, hvis jeg havde talt med jer (underviserne) inden opsamlingen og Først på ugen var jeg lidt bange for at fremstå dum over for jer (underviserne) og de andre studerende, men sidst på ugen var jeg meget mere rolig.*

I spørgeskemaundersøgelsen angiver 6 af de studerende at de i høj grad deltog i plenumopsamlingen hvorimod de resterende svarer henholdsvis i nogen grad (n=3) og i ringe grad (n=1). Halvdelen af de studerende påpeger at de sandsynligvis kunne have taget større del i opsamlingen hvis de havde haft en større teoretisk viden forud for øvelserne. Dette hold har øvelser i begyndelsen af kurset, hvilket betyder, at de kun lige er begyndt på den teoretiske undervisning (forelæsningerne). På grund af årgangenes størrel-

se (mere end 180 studerende pr årgang) er vi nødt til at afholde praktiske øvelser under hele kursusforløbet.

## Diskussion

Aktivering af studerende: Brugen af grise i den praktiske undervisning, som et supplement til det øvrige undervisningsmateriale, øger tiden hvor de studerende er aktive og hovedparten af de studerende giver udtryk for, at de stort set ikke oplevede ventetid under øvelserne. En øget aktivering af de studerende burde ifølge teorien øge de studerendes udbytte af undervisningen (Anderson, 2021).

Individuelt kontra gruppearbejde: I løbet af ugen blev de studerende dygtigere og hurtigere til individuelt at udføre fuldstændige obduktioner på grise (Fig. 1). Under interview nævner flere, at de kunne mærke, at de blev bedre for hver gris, at det var en fordel selv at bestemme tempoet og at de oplevede at have et overblik over de forandringer, de havde fundet i deres gris. Oplevelsen af at mestre noget giver de studerende en tro på egne evner og virker motiverende og øger deres indsats og udholdenhed (Skaalvik & Skaalvik, 2015). Eksempelvis var der én studerende som allerede tirsdag selv tog initiativ til at præsentere sin gris. Den største ulempe ved at anvende mange grise i undervisningsmaterialet var, at særligt de studerende der ikke fik mulighed for at obducere andre arter, savnede afveksling.

Fordelene ved at lade de studerende arbejde i en gruppe var en oplevelse af tryghed, mere dialog studerende imellem og særligt i forbindelse med hesten nødvendigt for at kunne nå at gennemføre hele obduktionen. Ulemperne ved gruppearbejdet var at de studerende ikke i samme grad, som ved de individuelle obduktioner, oplevede at have et overblik over forandringerne forud for gennemgangen i plenum. Ydermere kan dynamikken i en gruppe være således, at én studerende bliver for dominerende. En studerende som udførte obduktion på en kat i samarbejde med én anden studerende beskriver det således: *Samarbejdet var ok, men jeg følte at min makker pressede tempoet op, da hun var lidt hurtigere end mig. Jeg havde ikke styr på forandringerne i katten, da jeg ikke havde talt med jer inden opsamlingen og jeg lod derfor min makker præsentere i plenum.*

Opsamlingerne i plenum: Efter min opfattelse deltog de studerende i stigende grad i opsamlingen som ugen skred frem. Først på ugen afhang deres deltagelse af, at vi undervisere bad dem om at gennemgå deres fund, men senere og særligt på den sidste øvelsesdag var de studerende mere

deltagende ikke kun om deres eget dyr. En del af de studerende bekymrer sig om at fremstå uvidende over for underviser såvel som de medstuderende og holder sig tilbage i plenum. Dette hænger måske sammen med den performance kultur og konkurrence, som man kan fornemme findes blandt dyrlægestuderende. Baggrunden for denne kultur er helt sikkert mangeartet, men en af faktorerne, som kan spille ind, er, at karakterer opnået på bacheloren bliver afgørende for valg af differentiering på kandidatdelen.

Viden og kunnen opbygges gennem aktiv interaktion med stof og dialog (Rienecker m.fl., 2015). Under opsamlingerne er det underviserens rolle at facilitere en dialog, som netop giver de studerende mulighed for at demonstrere og afprøve deres viden. Jeg kan ikke fjerne alle studerendes bekymring for at fejle, men jeg kan forsøge at modvirke det ved at opbygge et trygt undervisningsmiljø, herunder skabe en god relation til de studerende, eksempelvis lære deres navne, italesætte at det er ok at begå fejl, og arbejde på at alle føler sig trygge og bliver hørt (Horst & Ingerslev, 2013). Derudover kan det i nogen grad også handle om at få de studerende til at tage ansvar og komme ud af modtagerrollen (Krogh m.fl., 2013). Fra interviewene er det tydeligt at de studerende følte en hvis overraskelse over øvelsernes indhold. Forud for øvelserne har de studerende fået en skriftlig og en mundtligt introduktion, men vi (underviserne) må overveje, hvordan vi gør det mere tydeligt, således at de studerende ved hvad der skal til for at møde velforberejede op og kan tage ansvaret på sig. Dette er sandsynligvis lettere for de hold som har deres øvelser senere på kurset og derved har en større teoretisk baggrundsviden.

## Konklusion og perspektivering

Jeg har løbende diskuteret projektet med min faglige vejleder, og særligt i forbindelse med udformningen af interventionen. Baseret på resultaterne af projektet er vi blevet enige om fremover at supplere undervisningsmaterialet med grisekadavere.

Det er gavnligt at lade øvelserne indeholde individuelt arbejde og gruppearbejde i det der er fordele ved begge så længe underviserne sørger for en ligelig fordeling af dyrene. At lade de studerende udføre obduktioner individuelt aktiverer dem under hele øvelsen, resulterer i mere fuldstændige obduktioner og har en positiv indflydelse på de studerendes mod på at indgå i opsamlingen i plenum. Fordelen ved at lade de studerende arbejde indivi-

duet med obduktion af grise er også, at de lærer sig at mestre en metode, som de vil få gavn af som fremtidige dyrlæger.

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## A

## A.1 Spørgeskema udleveret til de studerende på den sidste øvelsesdag.

**EVALUERING AF PRAKTISKE ØVELSER I SPECIEL PATOLOGI**

Jeg har deltaget i undervisningen:

 Alle dage    Mandag    Tirsdag    Onsdag    Torsdag    Fredag

Har undervisningen levet op til dine forventninger?

 I høj grad    I nogen grad    I ringe grad    Slet ikke

Begrund gerne: \_\_\_\_\_

Jeg har i løbet af ugen udført sektion af en gris (individuel):  ja    nejJeg har i løbet af ugen udført sektion af andre kadavere (hest, hund osv.):  ja    nej

Hvor tilfreds har du været med undervisningen i forhold til?

	Meget tilfreds	Tilfreds	Utilfreds	Meget utilfreds	Ikke relevant
Undervisningsmaterialet					
- Sektion af gris	<input type="checkbox"/>				
- Sektion af andre kadavere	<input type="checkbox"/>				
- Slagtepræparater	<input type="checkbox"/>				
Undervisesnes...					
- Demonstration af sektionsteknik	<input type="checkbox"/>				
- Tilgængelighed under øvelserne	<input type="checkbox"/>				
- Opsamling i plenum	<input type="checkbox"/>				

 Hvordan vurderer du undervisningens faglige niveau?    For højt    Passende    For lavt
Nåede du at færdiggøre obduktionerne?    I høj grad    I nogen grad    I ringe grad    Slet ikke
 Opnåede du et overblik over forandringerne i de dyr du obducerede?    I høj grad    I nogen grad    I ringe grad    Slet ikke

 Opnåede du et overblik over forandringer i de dyr du ikke selv obducerede?    I høj grad    I nogen grad    I ringe grad    Slet ikke

 Kunne du stille en patoanatomisk diagnose på de dyr du obducerede (forud for gennemgangen i plenum)?    I høj grad    I nogen grad    I ringe grad    Slet ikke
Oplevede du ventetid under øvelserne?    I høj grad    I nogen grad    I ringe grad    Slet ikke
 Deltog du aktivt i opsamlingen i plenum?    I høj grad    I nogen grad    I ringe grad    Slet ikke

I tilfælde af at du til ovenstående spørgsmål svarede "I nogen grad", "I ringe grad" eller "Slet ikke":

-Hvad var årsagen til at du ikke deltog (mere) aktivt i plenum?

-Hvad kunne få dig til at deltage mere i plenum?

 |  
 Skriv gerne på bagsiden hvis du har flere kommentarer eller forslag til forbedringer. Tak for din besvarelse!

## B Interviewguide

1. Var du til øvelserne alle 5 dage?
2. Havde du nået at forberede dig til øvelserne? Hvordan?
3. Hvor mange grise obducerede du på egen hånd (altså individuelt)?
4. Hvor mange andre dyr var du med til at obducere? (Hvilke arter + Hvor mange studerende var I om det?)
5. Hvordan oplevede du det var at udføre sektion af en gris individuelt?  
*Udfoldende, svarlinkende, kontekstafhængige og fortolkende spørgsmål afhængig af den studerendes svar: fordele/ulemper, nervøsitet, samarbejde/ sparring, ventetid, overblik*
6. Kunne du afgøre om der var sammenhæng mellem forandringerne i dyret?
7. Kunne du stille en patoanatomiske diagnose, afgøre patogenese og ætiologi?
8. Blev du helt færdig – hvis ikke var det så fordi der ikke var tid nok?
9. Hvordan oplevede du det var at skulle samarbejde om at lave sektion af andre dyrearter?  
*Udfoldende, svarlinkende, kontekstafhængige og fortolkende spørgsmål afhængig af den studerendes svar: fordele og ulemper, nervøsitet, samarbejde/ sparring, ventetid, overblik*
10. Kunne du afgøre om der var sammenhæng mellem forandringerne i dyret?
11. Kunne du stille en patoanatomiske diagnoser, afgøre patogenese og ætiologi?
12. Blev du helt færdig – hvis ikke var det så fordi der ikke var tid nok?
13. Skal jeg forstå det sådan at... du fik mest ud af sektion af grisen alene?; du fik mest ud af sektion af et kadaver sammen med en medstuderende?; du fik lige meget ud af at lave sektion individuelt såvel som sammen med en medstuderende?
14. Hvordan oplevede du opsamlingerne i plenum sidst på hver øvelsesdag?  
*Udfoldende, svarlinkende, kontekstafhængige og fortolkende spørgsmål afhængig af den studerendes svar: Hvor aktiv oplevede du selv du var (præsentere, besvare eller stille spørgsmål); Var du lige aktiv alle øvelsesdage? hvornår og hvorfor?; Tryghed / lyst til at være med; Underviseren måde at håndtere plenumopsamlingen på; Er der noget der kunne få dig til at tage større del i gennemgangen i plenum?*
15. Tror du at dine medstuderende har samme holdning som dig til den praktiske undervisning i sektionssalen?

## D. UDVALGTE SPØRGSMÅL MED SVAR FRA SPØRGESKEMAUNDERSØGELSEN.

### C Opgørelse af de daglige registreringer.

	Mandag	Tirsdag	Onsdag	Fredag
<b>Undervisningsmateriale</b>				
Grise (antal)	7	12	9	1
Hest/drøvtygger (antal)	1	0	0	0
Hund/kat (antal)	0	0	0	2
Slagtepræparater	-	-	-	Ja
<b>Studerende</b>				
Total antal studerende	12	12	9	10
Studerende der arbejder individuelt (antal)	6	12	9	1
Studerende der arbejder i grupper	6	0	0	9
Gruppestørrelse spænd	6			2
<b>Obduktioner</b>				
Færdiggjorte obduktioner individuelt (%)	70	80	90	100
Færdiggjorte obduktioner gruppe (%)	100	-	-	75
<b>Plenumopsamling</b>				
Studerende som deltager antal (og %)	7 (58%)	12 (100%)	7 (78%)	10 (100%)

### D Udvalgte spørgsmål med svar fra spørgeskemaundersøgelsen.

Hvad var årsagen til, at du ikke deltog (mere) aktivt i plenum? Vidste ikke hvad jeg skulle sige;

*Deltog om egne dyr; Manglede viden; Jeg var uvidende på området; Næde ikke at gennemgå tarne og andre udtagne organer pga. usikkerhed og mangel på tid*

Hvad kunne få dig til at deltage mere i plenum? Hvis jeg var bedre teoretisk klædt på; Synes det var fint; At jeg har læst på forhånd; Mere baggrundsviden - hvis vi var længere i undervisningsforløbet.

## E Uddrag fra kvalitative interview. Studerende A, B, C interviewet enkeltvis, D+E i gruppe.

Var du til øvelserne alle 5 dage?

A: Ja / B: Ja / C: Ja / D+E: 4 og 5 dage henholdsvis

Havde du nået at forberede dig til øvelserne? Hvordan?

A: Ja, jeg havde set videoerne.

B: Jeg havde ikke set videoerne forud for øvelserne, men jeg så dem mandag aften.

C: Jeg havde set videoerne (sektionsvideoer) 2 gange inden, og så dem så igen i løbet af ugen.

D+E: Vi havde begge set videoerne inden

Hvor mange grise obducerede du på egen hånd (altså individuelt)?

A: 2 grise / B: 3 grise / C: 3 grise / D+E: 2 og 3 grise henholdsvis

Hvor mange andre dyr var du med til at obducere? (Hvilke arter + gruppestørrelse)

A: 1 hest (6 i gruppen) og 1 hund (2 i gruppen) / B: 1 hest (6 i gruppen) / C: 1 kat (i gruppe på 2) /

+E: Slagtepræparater (i gruppe på 2)

Hvordan oplevede du det var at udføre sektion af en gris individuelt?

A: Jeg vidste ikke helt hvad vi skulle, men det var egentlig meget fedt, at blive kastet ud i opgaven.

*Jeg var glad for at arbejde individuelt. Det gav mig ro til at gøre tingene i mit tempo. Jeg var lidt nervøs for at lave fejl og ødelægge grisen. Det kunne måske være undgået hvis I sagde at fejl var ok. Vi (de studerende) hjalp hinanden og der var ikke ventetid. Jeg fik et godt overblik over forandringerne særligt efter opsamlingerne i plenum.*

B: Jeg var lidt overrasket over, at vi skulle stå med hele dyr. Jeg havde forestillet mig, at det ville være præparater. Men det var ok – vi kastede os jo bare ud i det. Jeg var glad for at stå med grisene alene. Jeg fik meget ud af det og kunne også se at jeg blev bedre i løbet af ugen. Jeg var ikke nervøs – dyrene er jo døde. Vi (de studerende) snakkede ikke så meget sammen, men vi kunne lig hjælpe hinanden lidt. Jeg tænkte over hvad der var med min gris og jeg synes også jeg havde overblik.

C: Jeg var spændt lige op til øvelserne, men ikke nervøs undervejs. Jeg følte mig klar og øvelsernes indhold var som jeg forventede, men det var jo første uge af kurset så min teoretiske viden var begrænset. Jeg oplevede næsten ikke ventetid. Arbejdet med grisen gav mig styr på det sektionstekniske og jeg oplevede også et vist overblik, men var også hæmmet af ikke at have været igennem det teoretiske.

D+E: Vi var i tvivl om hvad der skulle foregå til øvelserne. Altså hvorvidt vi ville få et helt dyr eller organer. E: Til at begynde med var jeg nervøs for at ødelægge dyret og derved ødelægge noget for mig selv. C: jeg er er enig. Vi fik rigtig god træning i at lave sektion på gris, men ville også gerne have haft andre dyr. Vi savnede lidt afveksling. E: Jeg kunne mærke, at jeg blev bedre for hver dag. Til sidst nåede jeg at blive helt færdig på tiden. D: Jeg var der ikke om mandagen, og det var svært at lære sektionsteknik baseret på videoen alene. Heldigvis havde jeg K, som tirsdag hjalp mig meget.

Hvordan oplevede du det var at skulle samarbejde om at lave sektion af andre dyrearter?

- A: Ved hesten (første dag) var jeg lidt nervøs, men jeg synes vores samarbejde fungerede godt. Det var passende at arbejde sammen 2 og 2 om hunden.
- B: Jeg kiggede på hoved og led og fik ikke overblik over resten før til plenumopsamlingen. Det var en stor opgave, så det var nødvendigt at være mange. Jeg oplevede ikke ventetid. Vi var i gang hele tiden.
- C: Da jeg skulle lave sektion på en kat var jeg lidt mere opmærksom, men ikke nervøs. Jeg var mere opmærksom for der netop kun var én kat og at vi ikke skulle ødelægge noget som de andre så ikke ville få set. Vi kunne ikke have været mere end 2 om katten pga. pladsmangel. Samarbejdet var ok, men jeg følte at min makker pressede tempoet op, da hun var lidt hurtigere end mig. Jeg havde ikke styr på forandringerne i katten, da jeg ikke havde talt med jer (underviserne) inden opsamlingen og jeg lod derfor min makker præsentere i plenum.

Skal jeg forstå det sådan at... (se bilag 2 spørgsmål 13)

- A: Jeg kunne bedst lide at arbejde sammen med én, altså 2 og 2. Det gav mig tryk og vi kunne sparre med hinanden.
- C: Jeg fik lige meget ud af at arbejde individuelt og i grupper. Fordelen ved at arbejde individuelt var at jeg fik en hel del håndværksmæssig øvelse og kunne gøre det i mit eget tempo. I gruppen var der mere sparring og det var rigtig godt.

Hvordan oplevede du opsamlingerne i plenum sidst på hver øvelsesdag?

- A: Plenum opsamlingerne var gode. Det var godt at få lov at præsentere alt det man nu kunne og så få hjælp, dvs. blive spurgt ind til resten af underviser. Først på ugen var jeg lidt bange for at fremstå dum over for jer (underviserne) og de andre studerende, men sidst på ugen var jeg meget mere rolig.
- B: Jeg var glad for opsamlingen. Det gav mig indtryk af hvad de andre havde fundet og det var rart hvis der nu ikke var så mange forandringer i mit dyr. Jeg var tryk og ikke nervøs, da det jo er i en lille forsamling.
- C: Jeg kan lide faget og var motiveret for at deltage. Jeg følte mig ikke utryk ved at deltage i plenumopsamlingerne. Jeg kunne godt have tænkt mig hvis I (underviserne) havde brugt tavlen noget mere til at understrege de vigtigste diagnoserfund. Derudover ville jeg gerne have haft mere tid til at kigge på de andres dyr. Det manglede især ved gennemgangen af hesten, hvor jeg ikke fik fat på det hele.
- D+E: D: Jeg følte mig kun klar til at gennemgå i plenum hvis jeg havde talt med jer (underviserne) inden opsamlingen. Det var 1 uge af hele kurset, så det havde måske været lidt anderledes hvis øvelserne havde ligget senere. E: Jeg var tryk ved plenumopsamlingen. Vi er sammen med stamholdet, dvs. vi har haft andre øvelser sammen før og kender derfor hinanden fra tidligere fag. D+E: Vi var begge aktive under opsamlingerne.

Tror du at dine medstuderende har samme holdning som dig til den praktiske undervisning i sektionssalen?

- B: Nej, nogle er mere nervøse ved at tale i plenum. Folk er forskellige.
- C: Jeg var tryk ved at tale i plenum. Det tror jeg de fleste var, men der er jo altid nogen som er mere generete.



**Accommodating the diversity of students**



## The diversity of our students

Michela Gambino

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University of Copenhagen

### Rationale and aim of the project

Diversity is a topic of increasing relevance in our daily life: in the last years the #MeToo and Black Lives Matter movements lead the public to discuss social exclusion and discrimination. Diversity has been also a recurrent discussion point during the university pedagogical course. We discussed how the pandemic affected students in very different ways (Various authors, 2021), we learned how a diversified approach can address students with a different preparation or capability (presentation from Kim Splittorff), and we discussed several times the difficulty to teach in large classes with students with different background. In addition, in the pre-project we aimed to investigate how diverse are students' needs across groups and learning situations. We interviewed only four students, but it was very clear that unmet needs impacted their well-being and learning process.

When we think about diversity, we often think about their personal background (ethnicity, geographic origin, sex, age, residence, mother tongue, culture) of a person, but even in apparently homogenous class there is a diversity that is relevant for the learning process. Each student joins the class with his/her own prior educational experiences, levels of competency and preparedness, but also his/her ambitions and interest for the specific topic, thus affecting the learning outcome (Tinto & Cullen, 1973). In addition, each student has his/her own preferred learning style, i.e. how to fulfill academic tasks and to process information (Biggs et al., 1994): each student use preferentially an approach to solve problems, to study, to face exams and to collaborate with peers.

All these aspects that make our students diverse, contribute to students' integration and satisfaction at the university, so much to affect exams failure rates and drop-out from academy (Johannsen et al., 2015). According to Tinto's longitudinal model (Tinto & Cullen, 1973), students' satisfaction and integration at the university relies on social and academic integration. The social integration builds on the feeling of belonging to the social system of the university<sup>1</sup>. The academic integration is based on students' academic performance (formal; the university provides feedback to the students with grades and exams) and the relevance that the discipline has for the students (informal; students can see or not their academic experience as a process of intellectual development). Thus, the diversity of our students might be key to understand their social and academic integration, and thus their learning process, and to help them to improve their learning outcome.

## Preliminary data

The course in Fødevarer og ernæring (NFOB14028U) is part of the "Bachelordannelsen i fødevarer og ernæring", a collaboration between University of Copenhagen (KU) and Technical University of Denmark (DTU), and it is accessible to students from three specializations: Sundhed og ernæring; Kvalitet og teknologi; Fødevareingeniør. Last year it was attended by 70 students with a background in food engineering and biology. Of the 28 students that filled out the questionnaire on the course last year, seven declared that the level of the course was too high. Despite the majority of students are satisfied with the course, few comments reveal they felt unprepared:

- *"Jeg følte lidt vi manglede noget baggrundsviden omkring forskellige begreber der blev brugt gennem kurset. Måske det bare er mig. Men jeg har haft svært ved at finde rundt i selektive/ indikative principper, osv"*
- *"den del af kurset kunne måske ligge på et senere tidspunkt? når man derved ville have lidt mere viden på forhånd? her tænkes ift. cases"*
- *"Dog fandt jeg det lidt overvældende med alle de øvelser/cases/krydsord osv. der var at finde i de 3 uger her."*

The question is why these students felt unprepared? How they are different from the others? Since the level of the course is good for most of the

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<sup>1</sup> The social integration is the aspect that the COVID pandemic put more at risk.

students, can we slightly modify our teaching in this course to meet also their diversity?

My proposal is:

- to verify how students perceive their diversity and if it affects their social integration
- to get an insight of the informal aspect of students' academic integration for this course
- to meet the students' diversity diversifying our teaching

The success of the intervention will be evaluated with the feedback on my teaching in the final questionnaire for the course and with the discussion of my teaching activities with my supervisors.

## Students perceived diversity and their social integration

This year 87 students enrolled for the course, all from the University of Copenhagen. The students are free to choose their own colleagues to form 18 teams to work in the laboratory and to solve cases. For my intervention it would have been very interesting to have new mixed groups, but it has been decided not to add an additional stress factor to students in a period when they had to stand changes and restrictions because of the COVID19 pandemic.

I prepared a survey (Figure 1) to investigate: 1) if the students see themselves in homogenous (not diverse) or heterogeneous (diverse) groups, 2) if it was hard to work with that group, and 3) if the reason was because of the diversity/not diversity of their group. I chose to use many open questions to let the students open up and share freely what they perceive as diversity, and to provide their own perspective.

Seventeen students answered the survey: one from Biotechnology, three from Biology, thirteen from Food and Nutrition. A summary of the data is available as *Appendix A*, and I am offering here a comment.

Eight students answered they are in a homogeneous group (44%) and nine in a heterogeneous group (56%). When respondents answered they are in a heterogeneous group, they revealed they think about different studies (*“different backgrounds”*, *“What we want to study in master”*), but also personality, origin and age (*“personalities”*, *“we are different types of persons”*, *“where we are from, age etc.”*, *“live different places in Dk”*). Likewise, respondents answering they are in a homogeneous group refer to their

Hello! Welcome to my questionnaire about diversity. My name is Michela Gambino and I work as assistant professor at KUJ. I am taking my pedagogical course and this questionnaire is part of my project where I investigate how students diversity can effect learning. The collected results will be kept confidential and anonymous. In the next questions I will ask a bit about you and how diverse is the team you worked with during this course.

What are you studying?

Why did you choose this university curriculum?

Let's talk about the team you are working with. Is your team

not diverse (homogeneous)

very diverse (heterogeneous)

In what it is not diverse/diverse?

Did others in your group study the same as you?

Working with others in your team was

very easy

easy

sometimes difficult

difficult

Why was it easy/hard with others in the team?

Did you have troubles understanding each other?

Did you learn something from others in your team that you did not know?

Do you want to add anything else?

[PREVIOUS](#)

[FINISH](#)

100%

**Figure 1.** Survey about students' diversity.

studies (“*We are all studying the same*” and “*we’re all biologists*”), but mostly about their gender, ethnicity and origin (“*Around the same age and all from Denmark, mostly girls*”; “*were all white and straight, vanilla*”, “*100% monoethnic - male, around same age with common interests*”, “*we are all “pure-breed” Danes, so not a lot of diversity going around*”).

Thirteen students are in a group where others studied the same. Most of the respondents say that working with that team was very easy (35%) or easy (53%), while only two of them answered that it was sometimes difficult (12%). Notably, the two respondents answering that it was sometimes difficult were in groups with students from Biology, and the different background and education made them feel uncomfortable in the discussion:

- “*Their background is Biology, so it comes easier for them, which can make me feel dumb sometimes or left behind*”
- “*The ones from biology are at a higher biology level than me, and therefore understand somethings easier/quicker, maybe because they already know it*”

This is reinforced by their answer to the following question, where one of them answered that sometimes is difficult to understand each other because “*Sometimes the biology students don’t mention something, because they presume that we know it because it is clear for them.*” Except for a respondent highlighting that it can be difficult to work together because “*not everybody puts in the same work*”, the other groups get on well because they know each other from before or from outside university, or simply because “*people are good at listening*”, “*people are open*” and “*we discuss easily and without interrupting each other*”.

Feeling comfortable is certainly important for the students to discuss, but one could argue that we learn more when we challenge ourselves. In addition, learning to work with people from different disciplines is considered an excellent skill, especially nowadays that the field of food and nutrition became so interdisciplinary. One of the reasons for having heterogeneous groups is that the students could learn from each other (Christensen, 2015). Eleven students answered that they learned something from others that they did know before and, among these, three specified that they learned a way of thinking or of working:

- “*I work best with others, talking about the topics makes my brain work best*”
- “*often, new aspects and ways of thinking*”

- *“I’m learning to slow down, and maybe read stuff more carefully, decreasing my error rate”*

Both in the heterogeneous and in the homogeneous groups, six students (75% of each group) answered they learned something from others, thus confirming the importance of team work, but not necessarily supporting the necessity of having heterogeneous groups. The additional explanations provided by three students suggest the diversity we are looking for when assembling the groups is not in their background, but in the way of working and of thinking. Unfortunately, this might be hard to establish and use to form teams for a course.

### **The informal aspect of students’ academic integration**

The informal aspect of the academic integration is about how relevant students find the course for their intellectual development and future (Tinto & Cullen, 1973). To get an insight of the students’ interest in this course, in the survey described above, I asked why they chose this curriculum. Thirteen respondents find the course interesting (81%), and seven of them explained that they are truly passionate about food. The general interest of the students for the course is also something both I and the responsible of the course could notice after the first classes, since the students participate actively to the activities, for example by asking and answering questions. The general interest about the topic in the class is a great contribute from the students’ side to the success of the course. On the other side, the students answering the survey revealed they have very different motivations. Some aim to find a well-paid job, others dream to become enologists or microbiologists, and another one seems to work already in the brewing sector. To satisfy so many different expectations, the use of different teaching approaches and materials is recommended, in order to increase the probability that each student will find what works best for him/her (Fleming, 1995; Prithishkumar & Michael, 2014).

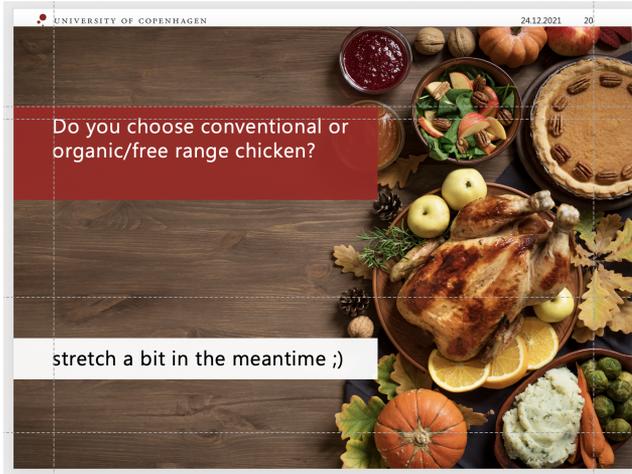
### **Meet diversity with diversity**

In this course the students are exposed to seven different teachers at different stages of their career, from two departments at KU, thus proposing very

diverse ways of teaching and presenting data. Diversity in the teachers' gender could be instead improved (6 men and 1 woman), since we know professor gender has a powerful effect on female students' performance in science (for example, Carrell et al., 2009).

Our section is responsible for the teaching in three weeks when, in addition to classes, we have two fundamentally different activities: exercise in the laboratory and case solving. Classes, exercise in the laboratory and case solving are different not only from a planning and teaching perspective, but they also activate students in different ways. For this reason, I will briefly analyze these activities from the point of view of the student learning style by using the VARK model. VARK is the acronym of Visual, Aural, Read/write, and Kinesthetic, and it refers to four different modalities that each student use to learn (Fleming, 1995). Respectively, each student can prefer to learn by pictures, graphs and diagrams (Visual), by listening to a speech (Aural), by reading and writing a text (Read/write), or by using their senses, thus by doing things or by analogies with something they can experience with other senses (Kinesthetic).

Classes are classically based on speech, thus students preferring the aural approach are greatly favored, and, depending on how the presentation is prepared, the use of text or graphs and pictures will help the students working well with read/write or the visual information. For my class on *Campylobacter*, I prepared a presentation with more text and additional information for the students to study, and a cleaner and shorter version cutting most of the text for the in person class, but with more visual aids (Figure 2). Aiming to maintain students activation, during the class I talked with the students about barbecuing and ask them to raise hands to answer which kind of chicken they prefer (don't eat chicken/ organic and free range/ conventional): this could have been important for the students that like the kinesthetic approach to link the class with their own sensorial experience.



**Figure 2.** A slide of the *Campylobacter* class that might help establish a connection with students preferring the visual and kinesthetic approach.

Students with a preference for kinesthetic input will instead greatly appreciate the exercise in the laboratory, with the olfactory and tactile modalities deeply involved since they should analyze the food also by touching and smelling it, in addition to listen and talk to colleagues and supervisors.

The case solving is the most flexible activity in terms of planning. The students received in their material the description of eighteen foodborne outbreak cases. We asked them to identify the possible pathogen and food source for the outbreak and to propose solutions to avoid a similar case in the future. We discussed together the last four cases, unfortunately on Zoom for safety reasons. The case study session started with a group work in breakout rooms to discuss about the case, taking notes on a google document. In this phase, students were free to analyze and contribute to solve the case with the approach they preferred. After the discussion, they all came back to the main session, and I quickly read the case again. According to my plan (Figure 3), a representant from each team was supposed to make a sound every time that I read a hint, but the students felt too ashamed to do

it, a pity for those preferring the kinesthetic approach<sup>2</sup>. Nevertheless, this helped them break the ice: they stopped me every time there was something noticeable to say and we started our discussion from their observations.

## Plan for today – on Zoom

### 11:00 to 11:45 CASES 14, 15 and 16

- breakout rooms with your group
- 15 min to read and take notes on the google doc with your group – a text from me every 5 min

<https://docs.google.com/document/d/10zuiCB7xW6iHP2JVtHDdY2M546PtB33v6gggratFreAI/edit?usp=sharing>

- elect one representant from each group and find a sound ☺
- discussion to solve the cases – sound to answer and challenge another team

**Figure 3.** Plan for the case study.

The discussion on Zoom favors those students comfortable with aural information, but the use of metaphors and images can also help students preferring kinesthetic and visual aids. In the slide below, for example, I used a metaphor with pictures of chocolate and Nobel prize to explain what multivariable means (Figure 4). Hopefully, those students frequently using other senses to learn will remember the metaphor by associating it to the taste and the smell of chocolate.

The preference of one modality in a specific course or class does not exclude that others will be preferred in different situations, or that the best solution could be a combination of several modalities. The student preference for one modality should not be regarded as a fixed trait or characteristic, but rather a possibility for offering very diverse activities and being creative in our teaching tools.

<sup>2</sup> The following comment in the survey convinced me I should try this again: “I think your “sound game” for the cases would have worked great physical, but failed online”

## Case 17

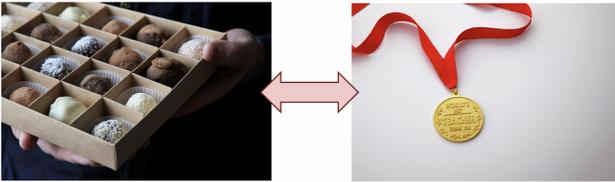
**TABLE**

Univariable and multivariable results of the Danish and Swedish case-control studies, adjusted for age and sex, sorted by most common exposure, Sweden\* and Denmark\*, March 2019

Food exposure	Denmark						Sweden					
	Cases exposed		Univariable <sup>a</sup>		Multivariable <sup>a</sup>		Cases exposed		Univariable <sup>a</sup>		Multivariable <sup>a</sup>	
	Proportion n/N	%	aOR	95% CI	aOR	95% CI	Proportion n/N	%	aOR	95% CI	aOR	95% CI

univariable vs multivariable: with multivariable, we account for confounding factors

aOR= adjusted odd ratio; not only descriptive, it controls for other predictor variables in a model, giving an idea of the dynamics between the predictors.



**Figure 4.** An association with chocolate might have helped students preferring kinesthetics or visual aids to learn about multivariables.

## Conclusion and future plans

In this project, I aimed to investigate students’ diversity in the course of Fødevarer mikrobiologi, because it might explain why few students felt unprepared for the exam the previous year.

I observed that students thought themselves as diverse in terms of studies, but also about personality, gender, ethnicity and age. The team work seemed to be important for their social integration within the small community of the course. Some recognized that a different background could sometimes create difficult dynamics in team works, but other groups highlighted that the gap created by diversity was easily solved if the peers were open to discussion. They confirmed the importance of team work to learn from each other, but the students do not necessarily appreciate the importance of working in groups heterogeneous in terms of studies, or personality/ gender/ ethnicity/ age. This is unfortunate, since collaborating with

experts from different disciplines and background is a valuable qualification for their career and life. On the other side, some students pointed out that they liked to learn new ways of thinking and working, so it might be proficient to form heterogeneous groups after a personality test result. Another possibility could be to modify the working groups after each module. After some weeks of work together, students could choose to form new groups, to merge two groups to establish new working dynamics, or to split groups to give more responsibility to each peer.

Regarding the informal aspect of students' academic integration, students regarded the course as relevant for their future and career. The motivations for their interest was nevertheless quite different. The use of diverse teaching activities and material could help meet this and other diversities, since it naturally offers a broad range of tools that students can use. The analysis of our activities with the VARK model highlights the strength of integrating the classes with the exercise in the laboratory and the case solving, thus offering information to the students in different forms to make it their own, depending on their VARK preferences. In addition, the team work in the exercise in the laboratory and in the case solving gave space and freedom to each students to adopt his/her preferred way of learning. A further improvement in this sense would require a preliminary evaluation of students preferences with the VARK models or a study process questionnaire (SPQ; Snelgrove, 2004) to tailor the course towards specific students' needs. Nevertheless, this might be unnecessary if we are able to offer diverse activities and flexibility for the students to adopt and learn in the way they naturally (and maybe unconsciously) prefer.

Finally, it worth highlighting that an additional effort from the teacher is needed with the online setup that limits the range of tools one can use to deliver information to the students. In this case, it is even more important to diversify our materials, suggesting podcast or videos or activities that the students can do by themselves. Providing the recording of the lectures can be also an important tool that they students can use to learn in the way that suits them best.

Further inputs are expected from the students evaluation of the course.

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## A Summary of survey answers

*Why did you choose this university curriculum?*

- I am interested in how food contribute to global environmental issues, food waste
- I have a big interest in chemistry in food, I find it very relatable and I also enjoy cooking a lot, so knowing the chemistry behind is
- really cool
- found it interesting
- To become more qualified in the brewing industry
- i like food, and find production of food interesting
- Interest and its mandatory
- You will get a good pay when you get a job
- i like the STEM-field as a whole and this specific curriculum provided excellent job opportunities.
- dont know
- Because I want to become an enologist
- it sounded interesting and relevant, as I want to specialise in microbiology
- I want to work with food technology/safety
- Limited selection of courses, this courses was the most interesting choice
- Because it's compulsory for my study.
- Of interest
- Because it sounded interesting
- i moved to copenhagen and science had my interest

*Let's talk about the team you are working with. Is your team*

- not diverse (homogeneous): 44%
- very diverse (heterogeneous): 56%

*In what it is not diverse/diverse?*

- different backgrounds
- Around the same age and all from Denmark, mostly girls
- in gender, we are 5 girls around same age and so on
- personalities
- were all white and straight, vanilla
- We are all studying the same - only diversity is gender
- we are different types of persons
- We're all "pure-breed" danes, so not a lot of diversity going around.
- 100% homoethic - male, around same age with common interests.
- What we want to study in master, where we are from, age etc.
- we're all biologists
- different studies, live different places in Dk
- We have different Education backgrounds
- My group is a mix of different studies; fødevare og ernæring and biology.
- Lots of meanings and different perspectives
- I'm not sure that I understand this question?
- we are very different in working style and personalities

*Did others in your group study the same as you?*

- Yes: 70%

- No: 12%
- Not all: 18%\*

*Working with others in your team was*

- very easy: 35%
- easy: 53%
- sometimes difficult: 12%
- difficult: 0%

*Why was it easy/hard with others in the team?*

- maybe disagreements
- We all have same ambition and are friends outside the uni
- People fit different roles naturally
- I've done it many times, and i knew the people on my team beforehand
- We have worked together before and know each other
- they are all nice people
- We've known each other for a while and get along really well, during schoolwork and personally
- same ambitions makes the work easier.
- Because not everybody puts in the same work, or participate all the time.
- I've studied with them before :)
- We discuss easily and without interrupting each other, worked with each other for a few weeks
- Their backgrounds is Biology, so it comes easier for them, which Can make me feel dumb sometimes or left behind
- The ones from biology are at a higher biology level than me, and therefore understand somethings easier/quicker, maybe because they already know it.
- We know each other and our values
- Because we all get along pretty well eventho we come from different educations
- people are open

*Did you have troubles understanding each other?*

- Yes: 0%
- No: 88%
- Sometimes: 12% \*
- \*Sometimes, but people are good at listening
- Sometimes the biology students don't mention something because they presume that we know it because it is clear for them.

*Did you learn something from others in your team that you did not know?*

No; I do not know: 25%

Yes; Other: 75%\*

\* i work best with others, talking about the topics makes my brain work best. so not directly  
\* often, new aspects and ways of thinking.

\* i am learning to slow down, and maybe read stuff more carefully, decreasing my error rate

\* Probably

\* Sure, but I guess it wasn't because of them, but from the course - just at different paces.

\*Hmm I don't know

## **Challenges and Possibilities for English-speaking Teachers Instructing a Group of Danish Students**

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### **Introduction**

The academic world is international and the University of Copenhagen (UCPH) is no exception with staff and students from all over the world. Teaching at UCPH is in Danish or English with the number of classes given in English increasing in the last few years (Nissen, 2019). More teaching in English is considered a necessary step in the internationalization and English-mediated instruction could help students succeed in a global workplace (Thøgersen, 2013). On the other hand, transition to English Medium Instruction (EMI) is associated with challenges for teachers as well as students and the effects of EMI is an active field of research (Nissen, 2019).

EMI research focuses mainly on programs and courses where English is the stated language of instruction and the expectation from the students is that teaching is in English. At the same time, the large number of foreign researchers at UCPH means that there will be English-speaking teachers in programs and courses normally taught in Danish. Consequently, there will be cases where students expect a Danish-speaking teacher but get instruction in English. At the Faculty of Health Sciences (SUND) Danish is the main language of instruction in Bachelor level courses while Masters level courses are often taught in English. Teaching in the Bachelor program in Medicine is, according to the program description<sup>1</sup>, mainly in Danish but students should be prepared to read academic texts in English (see footnote

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<sup>1</sup> <https://studier.ku.dk/bachelor/medicin/undervisning-og-opbygning/>

for original text in Danish<sup>2</sup>). A similar statement<sup>3</sup> is found in the course description of the Stomach, Intestine and Liver (Mave, Tarm og Lever, MTL) course, which is given during in the fourth semester of the Medicine program<sup>4</sup>. The program is large and the MTL is an extensive course, which means that, in total, over 60 teachers teach around 280 students divided into 13 groups. Therefore, each group of students will interact with a number of different teachers with different language skills. Some groups may have only a few lectures with English-speaking teachers while for other groups English-speaking teachers may be in majority.

The MTL course is divided into three sections; Anatomy, Physiology and Biochemistry with a final test, covering all sections, which determines the students' grades. Biochemistry is the largest part and entails 24 hours of lectures, and 29 hours of teaching in smaller groups of 12 or 24 students (referred to as SAU classes). The SAU classes consist of problem-based classroom teaching and a lab exercise. I teach SAU classes in the Biochemistry section, meaning that I spend around 30 hours with the same group of 24 students. As a Swedish national with only two years of experience in the Danish academic system, I understand spoken and written Danish but I teach in English.

## Aim

Before I started teaching the course, other teachers advised me in informal discussions that, in general, the students prefer Danish-speaking teachers. They will accept it if you make it very clear that you will teach in English but they like being able to express themselves in Danish. In this study, I aimed to get the students' perspectives on instruction in English and see how they matched the information I got from my colleagues. In addition, I wanted to test if I can use Danish in more ways in my teaching without fully mastering the language. The goal was to use my results to help other teachers that face a similar situation to understand the students' perspective on having an English-speaking teacher and to provide guidelines and tools

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<sup>2</sup> På bacheloruddannelsen i medicin foregår undervisningen overvejende på dansk, men du skal være forberedt på at læse akademiske tekster på engelsk.

<sup>3</sup> Undervisningssproget er dansk – men engelsktalende undervisere kan forekomme i mindre omfang.

<sup>4</sup> <https://kurser.ku.dk/course/smeb12013u>

an English-speaking teacher can utilize when instructing a class of Danish students, who may expect and prefer someone else in their place.

## Methods

My teaching of SAU classes in the MTL course was adapted to follow the informal advice from my colleagues and to test ways to introduce Danish by an English-speaking teacher. My oral and written communication with the students was always in English but I introduced elements of Danish into the teaching and learning activities (TLAs) in the following ways:

1. The students could choose to use Danish or English in all oral or written communication with me.
2. Problems and questions were given in Danish
3. Subject-specific terms that were different between Danish and English were translated and shown in both English and Danish

One week before the first TLA, I sent an e-mail to the whole class with information about what to expect from the Biochemistry SAU classes. The first two paragraphs were:

*My name is Martin and I will be your teacher for the Biochemistry SAU classes. I apologize in advance for a long e-mail but I just wanted to give you some information prior to the first class on Tuesday so you know what to expect. First of all, I am originally from Sweden and came via the US to Denmark less than two years ago. Therefore, I am not proficient enough in Danish to write or speak, which means I will teach and write in English. However, I understand written and spoken Danish so you should feel free to speak Danish in class and write to me in Danish or English.*

This e-mail contained a lot of additional information since the teaching was temporarily moved online due to the Covid-19 pandemic but the language information was at the top. In the first TLA, I repeated this information orally and on a power point slide. The general format of a TLA was that I (the teacher) gave some background and then introduced either a clinical case or a problem, the students worked with questions related to the case/problem in breakout rooms and we then discussed the answers in a teacher-led session.

After the last TLA, I interviewed three students about their experience with the TLAs and specifically the use of Danish and English. In addition to the interviews with students, I questioned the MTL course leader about his experiences with the students' views on having an English-speaking teacher and how this is reflected in written course evaluations and oral feedback from the students.

## **Results**

### **Early and clear establishment of the pedagogical contract before and at the beginning of the first TLA is very important**

In the interviews, I asked the students about their feelings before the first TLA and their reaction to the information they got over e-mail and at the beginning of the first class. Two of the three students said they reacted negatively when they found out they would not have a Danish-speaking teacher. However, both mentioned that their concerns vanished after the first TLA once I had explained why I teach in English and saw what it was like in practice. The third student did not consider it a problem but got the feeling that other students did. All three students agreed that the written information in the e-mail and the oral information at the beginning of the first TLA was very important to accept the situation and one student mentioned negative experiences with teachers that just "show up and start teaching in English".

### **Mixing Danish and English did not lead to confusion**

I then asked the students what they thought about the use of language on the slides. I had questions and cases in Danish, since this was provided to all teachers and students ahead of the course but whenever I added information to a slide, I did so in English. This meant that there was a mixture of Danish and English and some slides contained information in both languages, which could potentially be confusing. However, when asked none of the students saw this as a problem or something they had given much thought. One of the students mentioned that it helped with note-taking to have some Danish on the slides even if the rest of the information was in English.

### **An English classroom may reduce participation but a challenging subject is a bigger obstacle**

In my e-mail and in the first TLA I told the students that they should feel free to communicate with me in English or Danish, whichever they preferred. I was somewhat surprised that, despite this, the majority of the students' oral communication was in English. The comments or questions in Danish were often not specifically about the subject, for example, asking me to stop and go back to the previous slide or suggestions how to divide the groups for the practical exercise. Subject-specific comments, for example answers to questions, were almost exclusively in English. Written communication to me from the students was equally split between English and Danish and all lab exercise reports were written in Danish. All three students mentioned that it felt good to know that you could express yourself in your native language but, based on the language used in class, most students felt comfortable speaking English. In fact, one of the students who mentioned feeling comfort in the possibility to speak Danish was one of the more vocal in class and only spoke English.

Throughout the TLAs, I felt that the group was quiet and that only a few students participated in the discussion in the common Zoom room. On the other hand, I could see that the students were more vocal in breakout rooms of 4-5 students where they communicated with each other in Danish. I asked the students if they were less likely to speak in class with an English-speaking teacher and if they thought this contributed to the low participation. One of the students did not speak less and the two others were unsure. They speculated that maybe some students talk less when they have an English-speaking teacher. On the other hand, they mentioned that the level of participation in this group is quite low also in other classes. In addition, many medicine students find Biochemistry to be a difficult and complex subject, which makes them less likely to speak in class. Other students put the same points (complex subject, low oral participation also in other courses) forward in shorter one-to-one discussions I had with them during the course. This picture was further supported by an evaluation I did with the group halfway through the course. Taken together with the comments from the interviews, this suggests that language may have provided a slight barrier to oral participation but that it played a secondary role compared to the difficulty of the subject.

### **Translation of key terms and expressions can help the students' understanding**

When there were key English term or expressions, which are different in Danish, I put the Danish translation in parenthesis. This was not something I stated in the e-mail or first TLA but when these words came up I repeated the word in both languages. When I asked the students about this, they did not seem to have noticed it. I also realized during the course that the number of occasions where words were significantly different enough to warrant a translation was lower than I initially expected. One of the students actually brought translation of words up as suggestions for something that would have helped with understanding the content. His point was that having to translate adds an additional level of difficulty to an already difficult subject. I think this suggests that providing translations could still be helpful but that it should probably be more systematic, maybe by providing a list of words. It bears mentioning that the students can choose between Danish and English Biochemistry textbooks. Students that use an English textbook may find translations to be a less important in the TLAs.

### **Students do not think their learning is negatively affected by having an English-speaking teacher**

In the end, the most important outcome of teaching in any language is the students' learning. In this study, I had no way of evaluating the effect of English instruction on the learning outcome of the students. I still asked the students if they thought that having an English-speaking teacher affected their learning. All three students said no, and two of them with very strong emphasis. Participation in the majority of the SAU teaching is voluntary and based on discussions with the MTL course leader, the attendance of TLAs is a good indicator of how the students perceive the teaching. Throughout the course, the average attendance was around 75%, which is average for the course and suggested that having an English-speaking teacher did not have a negative effect on the turnout.

### **Clear and loud communication to understand an English-speaking teacher**

One of the potential issues with teaching in English is that the language provides an extra barrier to learning a complex subject. All three students

said no when I asked if there was ever any problems with understanding due to the language of instruction. However, one of the students mentioned that in one TLA where I had some problems with the sound it was hard to understand. This may seem like a parenthesis and unrelated to the subject of this study; the sound would have been bad in Danish as well. However, I think this is a very important point. If you are an English-speaking teacher, it is even more important to make sure that your speech is loud and clear and that the sound is good if teaching is online. In fact, based on my discussion with the course leader, not understanding the teacher is the main complaint from the student in course evaluations. This is not necessarily related to the students understanding of English but to the way the teacher speaks or, as in my case, the quality of the sound.

## **Discussion**

In this study, I investigated how Danish students react and adapt to having a non-Danish speaking teacher and tested tools an English-speaking teacher can use when teaching a class of Danish-speaking students. Course evaluations and my interviews with students supported the generally held view among my teaching peers that the students prefer instruction in Danish. However, none of the interviewed students felt that being taught in English affected their learning and their concerns about having an English-speaking teacher vanished after the introduction I gave at the start of the first class. This is consistent with the information I obtained from my colleagues. The most important factors in accepting a teacher is not the language but that the teacher through clear communication establishes how the teaching will be done leading to alignment in expectations between the teacher and the students. From the students' perspective, having an English-speaking teacher can be viewed as a breach of the didactical contract, as described by Brosseau (Brosseau, 1997). This contract has been implicitly formulated based on prior courses as well as the course and programs descriptions. By clearly establishing the format of the teaching, in this case the language, the contract is reformulated and can be accepted by the students.

The students reacted positively to the elements I introduced in Danish. They mentioned specific benefits, for example, note-taking being easier with Danish on the slides. However, they gave few concrete examples of how introducing elements in Danish benefited them. Even if they were given the option to speak Danish in class, they rarely did. I think this sug-

gests that the benefits of introducing Danish was likely related to the students feeling that the teacher had a strong commitment to their learning. When you, as an English-speaking teacher, make an effort to introduce elements in Danish, you show that you value the students' perspective and is dedicated to their success in the course. This shows the commitment of the teacher to follow the established didactical contract. Introduction of Danish elements shows that formulation of the contract is not a one-way process solely based on the teachers' language proficiency. Instead, it is a negotiation involving the needs of the teacher and the students, which can give a feeling of inclusion and aid the acceptance of the reformulated contract.

As relayed by the course leader, students' complaints about teaching in English frequently relate to problems with understanding the teacher. This is consistent with the findings by Jensen et al. (Jensen, 2013) who found that students' attitudes toward an English-speaking lecturer correlated with language skills. When students perceived the teacher to have poor English skills it also negatively affected their views on the teacher's general lecturing skills and vice versa. Klassen (Klaassen, 2001) reached the same conclusion in a study of Dutch engineering students. The study by Klassen also showed that clarity was the most important factor in determining success of an English-speaking teacher. The students did not have problems understanding my English but I have spent most of my academic life (>10 years) in the United States and, from a teaching perspective, English is my first language. However, this is not the case for all teachers and presents an additional obstacle for teachers who are not used to teaching in English. Jensen et al. argue that this is an issue that should be acknowledged and addressed by teachers but also at an institutional level (Jensen, 2013).

It is important not to solely describe students' concerns with English-speaking teachers as related to expectations and acceptance of instruction in English but also a genuine concern for their learning. Even if the interviewed students did not perceive instruction in English affected their learning they represent only a small subset of the MTL students. There is some support in literature for instruction in English negatively affecting students' learning. For example, a study of Swedish physics students showed that even if students did not perceive there to be any differences between lectures given in English and Swedish, they asked fewer questions and had to focus more on note-taking when instructed in English (Airey & Linder, 2006). Some of these issues could potentially be ameliorated by introduction of elements in Danish, for example, one student mentioned taking notes as one thing that was easier with Danish text on the

slides. Klaassen showed that instruction in English had a negative effect on learning outcomes (Klaassen, 2001) and Airey showed that learning of first-year physics students with a low English competency is negatively affected by instruction in English (Airey, 2010). There are few studies on this subject and the ones referenced above focused on lectures. Further studies are needed to determine if the conclusions also apply to problem-based teaching in smaller groups. Either way, with the large number of foreign academics at the University, situations similar to the one described in this study will continue to be frequent in the MTL course and elsewhere. The goal with the study was to find out how to handle the current situation in the best way and provide a hopefully valuable resource for other teachers facing similar challenges in the future.

## Conclusions

The conclusions from the study can be summarized in three suggestions for English-speaking teachers instructing a group of Danish-speaking students:

1. **Make sure there is an alignment of expectations.** Your interactions with the group will differ from the course description and the interactions the students have with other teachers in the course. Be very clear that the teaching will be in English, both in writing before the first TLA and orally at the beginning of the first TLA.
2. **Show the students that you are making an effort to facilitate their learning in Danish even if you speak English.** This could be by, for example, inviting answers or providing questions in Danish. The accessibility of these tools depend on how familiar the teacher is with Danish but, for example, taking a minute translating a word from English to Danish is something that any teacher can do independent of their Danish skills.
3. **Make sure that your communication with the students is loud and clear and make an effort to articulate.** Not understanding the teacher is a frequent complaint from students and can mask the subject expertise and didactical skills of the teacher.

These points are always important to consider but as an English-speaking teacher in a course like MTL, where the students expect and hope for instruction in Danish, they are crucial.

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## **Diversity in the classroom: Addressing diverse learning and creating inclusive spaces for interdisciplinary interaction**

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### **Introduction**

Most European Universities are adopting an “internationalization” agenda that grants access to higher education to a larger and heterogeneous students (Hultgren et al., 2014, p. 4). International masters’ programs are increasingly attracting students from different academic, linguistic and cultural backgrounds (Doiz et al., 2012; Van der Walt, 2013).

The University of Copenhagen, one of the European leaders in the provision of higher education in English (Mosneaga and Agergaard, 2012; Wächter and Maiworm, 2014, p. 46), has promoted an internationalization agenda since the early 2000s, and strategically aims at attracting more international, especially non-European, students and staff in the future<sup>1</sup>. However, little effort has been made into addressing the linguistic, cultural and academic background of students and how this affects classroom dynamics and learning. The University staff face the consequences of the internationalization policy decisions made at higher levels, without having the resources to address the students’ diversity in a meaningful way (Mosneaga & Agergaard, 2012). As a result, the students that have different previous academic experiences often clash with local ways of teaching, learning and participating, which may frustrate Danish, international and staff members alike (Nissen, 2019).

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<sup>1</sup> University of Copenhagen, Talent and collaboration – Strategy 2023. See <https://about.ku.dk/strategy2023/>

This study tests participatory research methods to address diversity in learning and to create awareness of the students' personal needs and their classmates' needs. Thus, the methods applied aim to promote a safe, inclusive and comfortable space for teaching and learning in international higher education programs. Ultimately, the study aims to help establish the internationalization strategy of the University of Copenhagen in practice.

## **State of the art: Science of teaching and learning**

Students enter international higher education programs with a diverse range of academic backgrounds (natural, technical, medical, social, and human sciences), cultural backgrounds (national and international students) and diverse personalities and learning preferences.

### **How academic backgrounds affect teaching and learning**

Each discipline has its peculiarities, and therefore different teaching and learning approaches. Apart from general teaching forms, e.g. one-way lectures, reading the syllabus and discussing in plenum, or doing group work to solve a specific problem, there are teaching forms that are better suited to specific disciplines. Humanities range from factual disciplines to philosophical and cultural disciplines and benefit from memorable activities such as collective analysis, discussions and constructions (Rienecker et al., 2015, p.251). Teaching empirical applications of social sciences, i.e. when teaching activities include empirical data and how it exemplifies the 'real world' as a not-exact science, the complexity increases and therefore, using real case studies and debate exercises are beneficial to motivate students and increase their learning outcomes (*ibid*, p.253). Natural sciences also encompass difference disciplines that measure empirical data and use a systematic knowledge validation methods. Many of natural science disciplines use practical work, often in labs or fields, and often uses advanced technologies for data collection and analysis. Teaching methods that are advantageous in natural sciences are flipped classrooms (e.g. virtual labs) and building concept maps to learn theory (*ibid*, p.254-255).

The examples above show the variety of teaching methods that students are exposed to in their respective fields. And when students continue into higher educations (e.g. an interdisciplinary Masters' degree in Environment

and Development) that draw from theory and practices of multiple disciplines, students will be differently challenged due to their previous knowledge and experience.

### **How cultural backgrounds affect teaching and learning**

Apart from disciplinary differences, the environment where students undertake their studies shape their learning approaches to learning (Rienecker et al., 2015, pp.98-99). This environment is related to the cultural teaching context.

Local and international students go through an extensive psychological formation process throughout their education that form their 'experiences' (Nissen, 2019, p.37). These past experiences adapt how students learn and participate in class. In some countries, such as Denmark and Sweden, the relationship between teachers and students is closer and critical thinking and participation in class is highly promoted. Whereas, in other European countries, such as France or Italy, the teacher-student distance is larger and the teaching methods are teacher-centered, instead of student centered (See results below).

### **How the student type affect teaching and learning**

Students develop different learning approaches depending on the context: the learning activities and environment. Student's learning approaches may be 'deep' or 'surfaced', which will determine their learning outcomes. Teachers can shape the learning environment, and the associated learning outcomes, by using different teaching techniques (having students as audience vs. participants, and focusing on research content vs. process) (Rienecker et al., 2015, pp. 49&99).

In addition, the students' family background, the skills and abilities and prior schooling shape the intentions, goals and commitment of the students. The goals and commitments affect the academic performance, the interactions with the teachers, and *vice versa*. The continuous relational loop between these elements results in different degrees of academic integration, i.e. whether the student is legitimately acknowledged by an institution and whether the student effectively learns. The institutional acknowledgement comes through exam grades and degree completions. In addition, if the student finds the education interesting, reflects on its contents and formative feedback, and engages in learning and sharing knowledge, then they will

achieve a full academic integration. This reinforces the goals and commitments of the students and their personal departure decision (Tinto, 1987, p.114).

## Aim of the study

The overall aim of this study is to make students **aware of how their previous academic and cultural teaching experiences** have shaped their learning, and formulate their **needs** to help them participate in class and learn. Through the use of participatory methods, the goal is to create a **common understanding** of their peers' background and needs, and build a safe, inclusive and comfortable learning environment that helps the internationalization strategy of higher education programs.

## The 'Practicing Interdisciplinarity' course and the exercise

Practicing Interdisciplinarity<sup>2</sup> is a 7.5 ECTS course situated in Block 1. The course is mandatory for first year MSc students from the Environment and Development program. The course touches upon topics which are relevant to both specializations of this MSc program, namely Agriculture and Ecology, and Livelihoods and Governance. In 2021, 35 students from all over the world and representing diverse academic backgrounds were enrolled in the course.

In order to bring awareness of the diversity of the students' academic and cultural backgrounds I used quantitative and qualitative methods. First, I shared a questionnaire survey to be filled in before the exercise. The aim of the survey was to collect data on students' preferred *learning styles*; which *academic discipline(s)* do they feel closer to; whether they have ever *felt left out* in the classroom, and under what circumstances; whether they have felt left out in *online teaching*; what they thought that was affecting *inclusion and participation* in online learning. This data served to understand the classroom composition.

Second, I grouped together the results of the questionnaire and I presented them in class to spark discussions and gather qualitative data. Before presenting the results, I made a short introduction about the difference

<sup>2</sup> See course description here: <https://kurser.ku.dk/course/NIFK20006U>

between inclusion and integration, and why it is important to embrace diversity, get inspired by students' diverse backgrounds, identities, learn from each other and support each other. In essence, *integration* refers to something that is wrong and needs fixing, for example, "students with special needs". While *inclusion* means that we are all diverse, and that we all have different needs and competences, as a way to celebrating diversity.

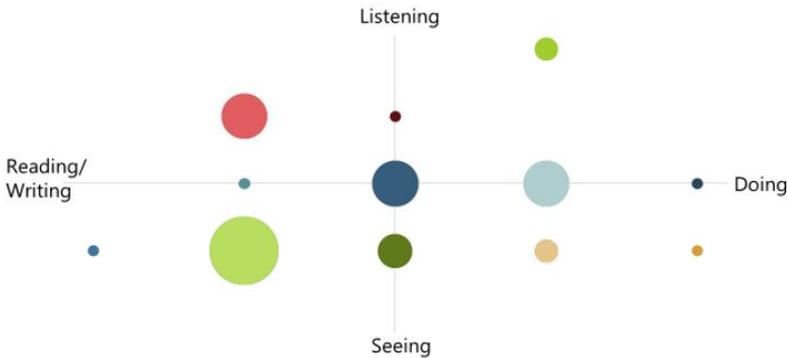
We discussed the results of the questionnaire and students were prompted to give their opinions about them. Thereafter, the students conducted an exercise where they needed to reflect individually about how did participation in class work where they studied their bachelor/other studies, and share their experiences in small groups. Each student wrote post-its with statements about their teaching culture and associated locations (optional) and placed them on a flipchart. In the following exercise, they were asked to write down anonymous post-its with their 'personal needs': what would help them participate and feel included in a group or class discussion.

Third, I planned to discuss the results of the exercises in plenum, with the aim of creating awareness of each other's needs, customs, and incorporate this into the students' group-work dynamics. This exercise was aimed at helping students draft a set of guidelines for their group-work.

## **Results and discussion**

The results of the questionnaire survey showed that all students have different preferences to learn and retain information (Figure 1). Based on these (expected) results, I explained the students that during the module that I was going to teach in the consequent two weeks, I had planned teaching methods to cater for different learning styles. Some students would enjoy reading the scientific papers before class, while others will learn with hands-on exercises, I also offered theoretical lectures and watching videos as teaching methods.

## Results from the survey on diversity – Learning styles



**Figure 1.** Results of 23 responses to the following questions: ‘How do you usually prefer to learn: by reading/writing or by doing/experimenting?’ and ‘by seeing (observing pictures, diagrams, written directions), or by hearing (listening to lectures, documentaries)?’ Bigger circles represent higher number of respondents.

Most of the students participating in this course were feeling closer to the disciplines of social sciences (80%), some to humanities (30%), some to natural sciences (30%) and few to the business sector (10%) (Students could choose more than one academic background). This denotes that the class was diverse, but highly dominated by social scientists.

Many of the students (43%) claimed not to feel left out in class; however, almost as many feel left of sometimes due to their lack of knowledge in the subject (40%). Fortunately, this course includes a wide variety of subjects belonging to different disciplines, and therefore, students will experience both ‘easy’ and ‘challenging’ days. And even in they feel behind in one course, they will feel on top on another where they are closer to their domain. Many of the students feel left out due to their introversion (30%), and some because of language/communication skills (10%). Some people mentioned that their cultural background and customs makes them feel left out (7%). These concerns raised by the students denote the importance of doing these kind of exercises of reflecting and sharing personal needs to feel supported and overcome shyness to ask questions and share opinions in class. Opening up this discussion can also raise awareness among those

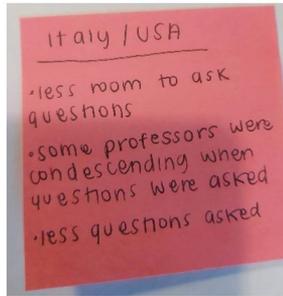
who do not feel left out, that others might have a harder time participating and need to have the space to share.

In 2020, online teaching was predominant and therefore assessing how students felt with this form of teaching was crucial. Half of the students have experience with online teaching and do not feel left out. However, some students do feel left out in online teaching, and we do not know how the people who do not have experience yet may feel about it.

When students were asked if they have noticed differences with online teaching when it comes to diversity, learning and inclusion, 33% of them answered affirmatively and raised very good points. For example, three students wrote that the distance between teachers and students is wider in online teaching, and it is harder for teachers to understand student's needs for learning. Two students mentioned that it is harder to participate (break into the debate) and hear everyone's voices in online teaching. On a similar note a student wrote that it is "harder for shy people to participate and it is easier to 'hide' ". A student mentioned that "One cannot rely on body language and eye contact" in online teaching and another wrote "Closed cameras complicate teaching and participation". Finally, one student wrote that "People tend to listen more in classrooms, but many are more daring to ask questions digitally". These are very interesting reflections on online teaching, and denotes the importance of having cameras open, addressing people by name to know who is being addressed, working in break out rooms to have more voices heard, and using creative ways to make students participate.

When discussing the results of the questionnaire in plenum, it was evident that students from social science and humanities backgrounds were more used to these kind of discussions (Rienecker et al., 2015, p.251-253), and they tended to dominate all open discussions. Nevertheless, very few of them spoke up in plenary discussions. Perhaps because they did not know me yet, or because they did not understand that this was a simple exercise to get to know their opinion.

The exercises using post-its worked much better than the discussion in plenum, as it allowed time for self-reflection and writing before sharing with their small groups. The students had time to share about their previous experiences in groups of five, and the conversations were lively and engaged. They said that they learnt a lot from each other's teaching culture.



**Figure 2.** Example of students’ experiences of teaching culture in their previous institutions.

The results showed big differences in the teaching culture between Scandinavian countries and the rest of the countries (mainly Italy, France, Spain, USA and China). Students coming from abroad do not have much experience with small classrooms, open and critical discussions, and in general, an informal relationship with their professors. Students had different group work experiences, and regardless of country of origin it was mainly unstructured. According to Nissen (Nissen, 2019), group work often causes problems between international and Scandinavian students. The different group dynamics students are used to often make international students adopt a passive role and local students position themselves as ‘experts’ regardless of whether this is true or not. This was not observed in the classroom where I taught. Group discussions were driven by outspoken and international students and Scandinavian, often the ones with good domain of English.



**Figure 3.** Example of students’ needs to participate in class discussions.

The students expressed what would help them participate more in class discussions. The results are summarised here into five themes:

- Needs related to **personal knowledge and skills**: knowing the subject and being fluent in the language of instruction
- Needs **required from professors**: e.g. being approachable and engaging, giving feedback and addressing students by name
- Needs related to the **teaching method**: e.g. having time to think/reflect their answers, having discussion starters (readings, videos) and providing knowledge about the topic before discussion, time for group discussions prior to discussing in plenum, clear guidelines, randomised groups
- Needs related to **classroom environment**: create a good atmosphere, a safe space where one can be wrong and will not be judged, where all ideas are welcome, there is positive reinforcement. A space for “stupid questions” [which means asking that they have not understood something, not *stupid* after all]. Having a casual discussion culture, without hierarchies.
- Needs **related to the other students in the class**: knowing that the other students are paying attention and appreciative of the input of others. Classmates should be free of judgement and be respectful. Having highly participative students encourages others to also participate. Knowing that everybody would have to come up with an answer to the question and that everybody now has the ability to answer it. Knowing the other classmates.

I was planning to analyse the results of the two previous exercises meanwhile they were on a break, but it proved harder to group and find patterns than what I expected. Therefore, I summed up some of the points written in the post-its and moved on to the final exercise, coming up with guidelines for group-work. The last exercise aimed at creating a respectful discussion dynamic that would respect the needs and customs of each individual.

My department supervisor read my project proposal before the teaching session and suggested to let the students express why they think it is important to address diversity in the classroom. Therefore, I raised this question at the end of the class and students mentioned that it is important to have ‘open discussions’, understand cultural taboos and overcome assumptions or prejudices, to bring in different perspectives and understand the concerns that others might have.

We ended the teaching session, with a round of sharing to evaluate the exercises. The students agreed that it was nice to have time for self-reflection before discussing in small groups. They would have liked to have more time to hear about the teaching cultures from the other groups, and less time to develop the group-work guidelines – which I will change the next time I teach.

## **Final reflections and concluding remarks**

I used the outcomes of the exercises during the two weeks that I taught these students. For example, before a brainstorming exercise or an open discussion, I reminded them what they wrote about how important it is for them to feel that the others are listening, that all ideas are good ideas, and that this is a safe environment. I also reminded them that most of us are not native English speakers and that the goal is to understand each other, therefore they should not feel judged if they do not speak grammatically perfect.

I noticed a huge change in the discussion dynamics over the two weeks: initially only a handful of them participated in open discussions –the same that had dominated the discussion in the lectures prior to my module-, and by the end of the two weeks all students felt comfortable sharing their thoughts.

The exercises I planned fulfilled the goal of making students aware of their previous academic and cultural teaching experiences, their own needs and those of their peers. Using a questionnaire survey and post-its allowed for all voices to be heard, and this helped the most shy or introvert students to have their chance to communicate without having to speak up in front of the class.

In conclusion, through participatory methods, the teacher can create a favourable context for all student types, who come different cultural and academic backgrounds, to have their voices heard, participate in class and achieve deep learning. Understanding and respecting different cultures and departing points for the students can create truly inclusive spaces for learning and achieve the internationalization of higher education in the full meaning of the word.

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## **Student mental health and engagement of students in a large online classroom setting during a global pandemic**

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### **Preface**

This project addresses student mental health and student engagement in a large online class setting. The challenge of engaging a large group of students during lectures has been exacerbated by the global SARS-CoV-2 pandemic, which has resulted in excessive E-learning. Online teaching formats restrict the classical didactical tools, however new ones are being introduced.

This project was motivated by the challenge of engaging a large crowd of students over zoom during these “corona” times. Now, more than a year into the pandemic, I assumed that the students might be very tired of this format, potentially suffering from “zoom fatigue”. Therefore, I planned to engage the students via the online response system Mentimeter during zoom lectures and introduce “walk-and-talk” to allow students to build relationships in smaller groups while at the same time increasing their energy level and their creativity. Simultaneously, mounting accounts of declining student mental health due to social distancing and online teaching and an email from a concerned student spurred me to have an increased focus on student mental health.

## **Background**

This report addresses the course Microbiology, NPLB14012U, which is taught in year 1 or 2 of the B.Sc. programs Biotechnology, Natural Resources, and Animal Science at the University of Copenhagen. Approximately 130 students enroll each year. The course is divided into four modules of two-week laboratory exercises in addition to lectures and theoretical group work. I taught the first module, consisting of laboratory exercises, a group-based laboratory report and theoretical group work and gave five of the lectures. I also graded the assignments for module 1 and designed and graded a part of the written exam. Just weeks prior to course start, the University of Copenhagen decided that we would be teaching exclusively online.

## **Research question**

I aimed to address student mental health and to test and evaluate different learning tools for engaging a large group of students over zoom. My aim was for the students to feel motivated and engaged during my teaching activities to better facilitate their learning process and at the same time counteract “zoom fatigue”.

## **Methods**

I intended to engage the students in a large online classroom using the online student response system Mentimeter to allow students to ask questions anonymously and to create interest/maintain focus during zoom lectures by introducing variation in my teaching e.g. via quizzes. I also planned to use “walk-and-talk” while splitting the class up in smaller groups in breakout rooms. I assessed outcomes by evaluating the quantity of questions/engagement via Mentimeter, the zoom chat, and oral participation via the microphone in zoom, combined with student feedback via a questionnaire in Mentimeter.

## **Walk-and-talk**

Famously, physicists Lise Meitner used long walks in the woods to come up with some of her most wild and groundbreaking ideas, such as nuclear fission. Tech entrepreneurs, the late Steve Jobs and Mark Zuckerberg

both used walking meetings to help them spark new ideas. Oppedo and Schwartz showed that the practice of walking, does indeed improve creative thinking during- and shortly after periods of walking, whether it be indoors or outside. Notably, while walking increases ones capability to generate new ideas or come up with creative solutions, defined close-ended problems are better solved while working stationaryly (Oppedo & Schwartz, 2014).

### **Zoom fatigue**

“Zoom fatigue” is a condition caused by prolonged video chats via online platforms such as Zoom. The phenomenon has become common due to online teaching and meetings during the social distancing efforts to mitigate the consequences of the pandemic. Bailenson has argued for nonverbal overload as potential cause of zoom fatigue and highlighted four key aspects of prolonged video chats that cause zoom fatigue (Bailenson, 2021). These are:

1. Prolonged eye contact. Everyone can constantly see everyone else and the image of the speaker can become unnaturally large in size on a monitor, causing the brain to interpret that as a threat.
2. Seeing oneself on camera. Constantly seeing oneself is stressful and increases self-awareness.
3. Reduced mobility. The natural physical movement is limited during video chats.
4. Increased cognitive load. Nonverbal communication is more challenging to send and receive during video chats.

I imagine that walk-and-talk would be particularly useful for addressing all these points, while also increasing energy levels and creativity.

## **Results**

### **Mental health**

I was concerned that many of the students would be dealing with mental struggles due to excessive online teaching and social distancing. An internal UCPH survey reported on September 18 2020 that during the 2020

lockdown, many students experienced a lack of social and curricular activities, which resulted in a lack of motivation. International studies similarly show that students are suffering (O'Byrne et al., 2021). Therefore, I chose to address this challenge that many of the students might be facing by creating an anonymous poll in Mentimeter. To the statement "I am totally fine mentally" with 1=strongly disagree, 5= strongly agree, 77% of students answered and the average score was 3.2. Four students stated that they strongly disagreed, which was highly concerning. I followed up by presenting student counselling resources available at UCPH, a free counselling organization for youths and young adults (Headspace.dk), and a website with information to increase sleep quality (JustHuman). Next I explained that I would be using Mentimeter to vary my teaching, and to allow the students to pose questions anonymously (in order to decrease anxiety with speaking in public) and that I would use walk-and-talk to get the students to get fresh air, to get acquainted with the others in their 3-4 person groups and also increase their energy level for the remainder of the afternoon of zoom teaching.

A student noted anonymously: *"you have been particularly good at being aware of our mental health and I feel that you have captured our motivation and have included everyone. Really cool with walk and talk! Some of the best teaching I experienced in a while"* (This quote and all other student quotes have been translated from Danish).

## **Mentimeter**

One pedagogical challenge for teaching large groups of students is to create a welcoming and respectful teaching environment, which will allow all students to feel confident in participating actively. From an earlier interview with students, I learned that speaking up via the microphone during zoom can create more anxiety of speaking up compared to the physical classroom setting. Moreover, in a physical classroom, shy students can approach the teacher before or after the class to pose questions without everyone else listening. This option for direct answers or feedback one-on-one is not readily available during online teaching of a large group of students. Therefore, I chose that the students could pose questions via anonymous speech bubbles in Mentimeter, via the zoom chat, or via their microphones, whichever option was more comfortable to them. These different degrees of anonymity offered the students a range of options for participating according to their comfort level and mental capacity.

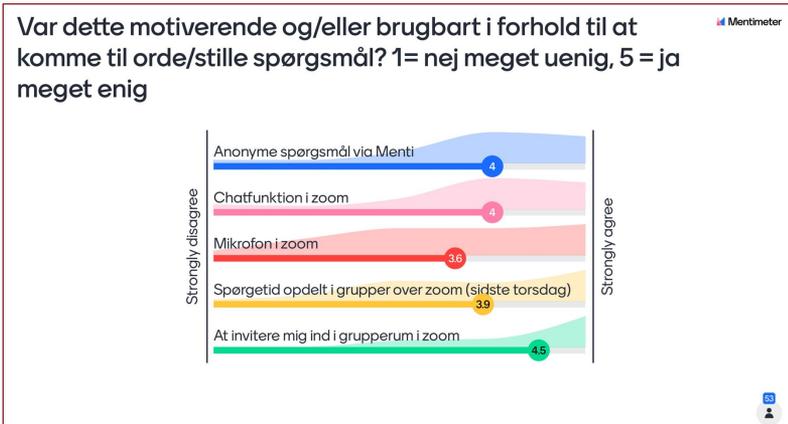
I observed that in connection with my first lectures, students initially posted questions via the anonymous option via Mentimeter, as I answered questions from Mentimeter and affirmed and validated their questions, more students posed questions via Mentimeter and via the chat function. Eventually, during later lectures, students began commenting on each other's questions in the chat and some students also voiced follow up questions orally via their microphones. This pattern suggests that the students initially felt more comfortable posing questions anonymously and that they progressively became more comfortable with posing questions connected with their name via the zoom chat or orally via the microphone. After the first two-week module, I asked the students to rate the degree to which they found anonymous questions via Mentimeter, the zoom chat, and orally via the zoom microphone function motivational/useful for posing questions, with 1 being strongly disagree and 5 being strongly agree. 41 % of students answered and they scored 4.0 in agreement with Mentimeter and the zoom chat being motivational/useful, suggesting that most students were comfortable with these two options. The answers regarding using the microphone were more diverse with a score of 3.6, indicating that the students were less comfortable with this option (Figure 1).

A student noted anonymously: *"I experienced... clear engagement regarding answering questions from the chat, and also by using Menti a lot to engage us during the lectures."*

In addition to lecturing during the first module of the class, I also gave the final lecture. During that lecture, I noted that most students preferred posing questions via the chat and their microphone, compared to the anonymous Mentimeter option, suggesting that by the end of the course, the students had collectively gained more confidence in being able to voice their questions in connection with their name.

One student noted anonymously: *"You have managed to create a good and safe space for us, which I have not experienced during zoom teaching, so thanks!"*

This statement, in connection with my observation that the students progressively preferred to ask questions directly, suggests that initially allowing students the option of anonymity in a large class setting can create an environment where also students with anxiety of voicing their questions can contribute, and potentially over time gain confidence and participate orally.



**Figure 1.** Evaluation of different didactic tools allowing students to ask questions and participate orally. Translation: "Was this motivational/useful in relation to having a say/posing questions? 1=no strongly disagree, 5=yes strongly agree. 1. Anonymous questions via Menti. 2. Chat function in zoom. 3. Microphone in zoom. 4. Office hour divided in groups over zoom (last Thursday). 5. Inviting me into breakout rooms in zoom." The students filled out this evaluation during the final day of the first two-week module during the course. 53 students (41%) evaluated the walk and talk.

## Walk-and-talk

In an attempt to mitigate zoom fatigue among the students and to allow them to get acquainted in their 3-4 person groups, before having to write reports and do assignments together, I chose to introduce a walk-and-talk. I planned this on the 2<sup>nd</sup> course day, which was a full day of morning lectures from 8 AM and group work in the afternoon until 4 PM. I scheduled the walk-and-talk after the two morning lectures, to change the physical environment and increase the students' energy levels for the afternoon group work.

Regarding the timing of the walk-and-talk, students noted anonymously:

*"Walk and talk was also a good way of getting to know the group before group work started (I was new in my group)."*

*"I really like Nina's lectures. Especially Walk-n'-talk. It is scheduled on a pretty good time point (during the day and thematically)."*

*“Walk and talk was fun and I feel that it was a useful element – because these days there is only time for efficient zoom teaching and the “recess” has been taken away from us – walk and talk was like a recess – nice that one was allowed to talk to others.”*

The first statement suggests that introducing the walk-and-talk served as an ice-breaker for the students within the groups prior to the more challenging groupwork that followed, an opinion shared by the majority of the students (Figure 3). The other statements indicate that planning a walk-and-talk in the middle of an all-day zoom teaching session can be perceived as a much-welcomed break, although the students were very much engaged with learning during the walk-and-talk (Figure 2).

Since walking is great for enhancing creative problem solving, but not for solving very specific problems, I designed questions with multiple answers, where the students could draw from engaging with- and analyzing their physical environment, demonstrate how to use their theoretical knowledge from my previous lecture and from the curriculum, and apply these skills in group discussions: “Where do I find compounds that inhibit bacterial growth. 1. In my kitchen, 2. In my bathroom, 3. During my walk, 4. On my body”



I asked the students to evaluate the walk-and-talk during the afternoon the same day, and the students were generally very satisfied with this teaching and learning activity (Figure 3). Beyond the students engaging actively in with the topic, which is conducive of learning (Illeris, 2000), the vast majority of the students reported that it increased their energy levels, which likely served to mitigate zoom fatigue during the group work later in the afternoon.



**Figure 3.** Evaluation of walk and talk. Translation: “Walk and talk: if you participated, to what extent do you: 1=strongly disagree, 5=strongly agree. 1. Walk and talk increased the collaboration in the group (e.g. icebreaker). 2. Walk and talk gave a better sense of being present with the group compared to an ordinary zoom breakout room. 3. Walk and talk helped find creative answers. 4. Walk and talk boosted by energy. 6. I would like more walk and talk’s via zoom during this course. 6. I would like to have walk and talk in person in future courses.” 36 students (28 %) evaluated the walk and talk.

Regarding the group work that followed after the walk-and-talk ice-breaker, I introduced the assignment in plenum and answered immediate questions from the students. Then I sent the students into their groups via breakout rooms. I stayed on zoom and the students could invite me into their zoom rooms as needed. Most groups did this during the 3h group work ses-

sion. I noted that almost all students had their cameras on, which indicates that this interaction was less intimidating and/or less mentally draining for the students. The interaction and the questions from the students in this more intimate setting resembled the interactions I have with smaller groups of students in the physical classroom. The students rated this activity at a 4.5 out of 5, which shows that they felt engaged during this activity (Figure 1). This indicates that even in a large online classroom setting, the use of breakout rooms, under the right circumstances, can create meaningful learning settings for the students.

## Discussion

Student participation in polls via Mentimeter ranged from 28-77 % for the data presented here. There is a risk that the students who did not participate in the surveys had opinions that differed significantly from the average student answers that I have based this report on. Nonetheless, the students who did answer gave very detailed feedback, which has enabled this analysis.

While Mentimeter is easy to use for students because it is compatible with multiple devices (computers, smartphones ect.) and shows the replies in real time and anonymously, one student was very vocal about not liking the platform, which disturbed the teaching situation to some extent. Switching between slides, the zoom chat, and Mentimeter, while being relatively easy, still consumed a bit of the time for discussion with the students. Therefore, the use of such technology should be used thoughtfully and introduced only where it facilitates inclusivity or enhances student engagement and intended learning outcomes.

It can be argued that students should be able to participate in an academic debate and pose questions aloud. However, many students, particularly those who have speaking anxiety or suffer from imposter syndrome, will rarely speak up in a large class setting. Montgomery, in her book on academic mentoring, states that when we fail to care for a plant, we do not judge it for its inability to thrive. Instead, "*the caretaker must be able to recognize its current and evolving needs and then identify and acquire the necessary resources.*" She argues that in the same way, when students are not thriving, we should not presume that they are weak or have personal deficits, but rather identify and adapt their environment, so that they can grow (Montgomery, 2021). I observed that during my first lecture, most students preferred the option of using Mentimeter for posing questions anony-

mously and progressively during my teaching and particularly during my final lecture at the end of the course, the students preferred to ask questions with their name associated in the zoom chat or aloud. This indicates that allowing students the option of anonymity for posing questions in a large class setting can create an environment where also students with anxiety of voicing their questions can contribute, and as the students grow comfortable in the teaching environment, they are more likely to speak up.

Regarding the walk-and-talk, I worried that most students might not be familiar with this format, and thereby it could cause technical issues. Another risk with this format was that students without a portable zoom compatible device could not walk outside. This could contribute to inequity during the exercise. However, these students would still be able to participate in the breakout room from their computers and stand or walk around, and therefore I judged that the benefits on student engagement as a whole by participating in this exercise would overall outweigh the risk of detrimental effects. Contrary to this worry, this format turned out to be inclusive for a SARS-CoV-2-positive and quarantined student, who was able to participate in the group work, which would not have been possible prior to the recent explosion in online teaching platforms. Therefore, online tools can be used in the future to facilitate group work for students who are for whatever reason homebound.

I introduced walk-and-talk in the first module of the course, and because it was not continued throughout the course, it could be perceived as confusing and not in congruence with the rest of the course. However, as most students found that it served as an ice-breaker for the subsequent group-work, which in itself has merit.

## **Conclusion**

My initiatives to increase student engagement in a large online teaching setting were overall successful. The students appreciated that I addressed their mental health. They also generally reported that Mentimeter worked well for allowing them to pose questions and to engage them during zoom lectures. Lastly, the students were extremely positive about the concept of walk-and-talk. They reported that the walk-and-talk facilitated their collaboration in the groups, increased their energy levels, and increased their creativity. Unexpectedly, one student even reported that this teaching and learning activity felt as a “recess”.

## Perspectives

Prior to the global SARS-CoV-2 pandemic, poor student mental health was a concern, but the ramifications of the pandemic has now underscored the importance of this topic is for students' wellbeing and ultimately for their learning. The response from the students regarding my focus on their mental health suggests that it would be beneficial to address this topic with the students in the future, and especially during times of enhanced stress. I imagine that addressing student mental health systematically and particularly during major events such as a pandemic or thesis work would benefit the students.

Although this report addresses student engagement in a large online setting, my findings are transferable to the physical classroom as well. Specifically, the use of Mentimeter to engage the students during lectures and as an option allow all students to pose questions anonymously in front of the class, will both serve to increase student learning and also facilitate active participation by students suffering from speaking anxiety, and thereby make the teaching environment more inclusive and allow diverse students to thrive.

Lastly, the students enjoyed the walk-and-talk greatly, in spite of the students communicating virtually while walking. In-person walk-and-talks will likely promote students' group interactions even more when in-person.

## Acknowledgements

I would like to acknowledge the brave and hardworking students whom trusted me by engaging in my exercises, by sharing their experiences with me, and offering me their opinions and feedback throughout the Microbiology class of 2021. I have learned a lot from them and I hope the rest of their education will be filled with meaningful in-person teaching activities and "recess".

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A



“Online teaching and expectations. 1. I am totally fine mentally. 2. I am ready for more online teaching. 3. I expect to learn the same theoretically as with in-person teaching. 4. I worry that I will [lack specific technical skills]”. 1=no strongly disagree, 5=yes strongly agree. Anonymous questions via Mentimeter. 99 students answered (77%).

**Improving congruence of teaching environments**



## **Restructuring the PhD course in *Drug Delivery* for a better alignment and congruence**

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University of Copenhagen

### **Introduction**

The course alignment is important to establish the desired outcomes of teaching and learning in terms of contents as well students' understanding (Biggs & Tang, 2003). Therefore, any gaps and misalignments in a curriculum should be identified. A means to identify the gaps or misalignment in teaching, learning, and evaluation is to delineate the congruence of their purposes, processes and content. Hounsell and Hounsell (2007) recognized six dimensions of congruence within teaching-learning environments in higher education: (i) congruence of course organization and management, (ii) congruence of teaching-learning activities, (iii) congruence of learning support, (iv) congruence of assessment and feedback, (v) congruence with students' background and aspirations and (vi) congruence of curriculum, aims, scope and structure (Hounsell & Hounsell, 2007). Herein, the restructuring of alignment and congruence of *Drug Delivery* course is discussed in the context of students' background knowledge and assessment and feedback.

The *Drug Delivery* course offered to PhD students at the Department of Pharmacy is a popular course that receive good evaluations year to year. This course is available to all PhD students as well as non-PhD students from industry. Every year, the course also attracts students from universities outside Denmark and their background knowledge and skills vary widely. Although prior knowledge of pharmaceutical sciences is not a requirement for joining this course but a knowledge of basic drug delivery concepts is advantageous to complete the course. The perceived main challenge of this

course was that some students have pre-existing knowledge and skills in drug delivery while others have no prior knowledge and experience in drug delivery. To overcome this challenge, I developed tutorials on relevant concepts in drug delivery and evaluated students' learning of these concepts. In previous course evaluations, some students also asked for better explanation of written assignments and their evaluation. Thus, I introduced peer evaluation and feedback to support student learning. The overall aim of the project was to align congruence with students' background knowledge and assessment and feedback to teaching and learning activities.

## Methods

### The course

The *Drug Delivery* (PhD courses KU.dk, 2013) is a 4.2 ECTS course run in Block 4 (one week in May) for PhD students who have completed undergraduate courses in pharmaceuticals, chemistry or biology. The course is relevant for PhD students from the Graduate school of Pharmaceutical Sciences (Drug Research Academy) and all other graduate programmes at University of Copenhagen.

The course is an intense one-week course with lectures (25 hrs), group work (6 hrs) and exercises (group presentation) (2.5 hrs) followed by four weeks to write a report on a selected scientific paper discussing various drug delivery concepts learnt during the course. The lectures include theoretical concepts in drug delivery but are primarily based on examples from scientific literature and pharmaceutical industry. Course is usually in-person but was transformed into an online format over Zoom for the past two years (2020-21) due to COVID-19. The assessment of the course is based on the evaluation of the written report assessed with passed/not passed. The students additionally get feedback on their written reports to improve upon if not passed in their first attempt or in general to reflect upon the strength and weaknesses of the report.

The Intended learning outcomes (ILOs) for the course are:

1. To give participants an in-depth overview of important fundamental principles for drug delivery.
2. To present methodologies for optimizing delivery of different drug classes ranging from small molecules to complex biopharmaceuticals (peptides, proteins, nucleic acids and vaccines).

## The students

Thirty PhD students participated in the course held online from May 17-21, 2021. The class consisted of PhD students with a very diverse educational background (Figure 1A), counting students from universities in Denmark and outside Denmark. All students were enrolled in a PhD program at university except one participant that was employed in a biotech company in Denmark. The PhD students were involved in diverse research areas including pharmaceutical sciences, pharmacology, biotechnology, immunology, chemistry, biomedical science, neuropharmacology, nanotechnology, material science, and clinical medicine (Figure 1B).

## Student-centered exercises

Two interventions were tested during the course this year following discussion with a course co-organizer, who supported the idea of these new exercises.

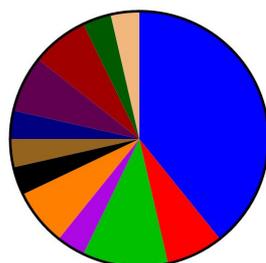
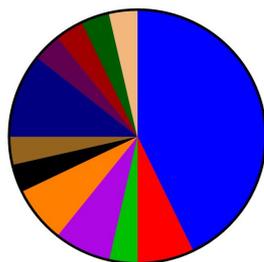
### *1. Congruence with students' background knowledge*

To align the student background knowledge in Pharmacy/Pharmaceutical Sciences with the ILOs, a list of important 'keywords or key concepts' in drug delivery were provided to the students (Appendix A). These keywords were uploaded in Absalon about 2 weeks before the start of the course. These keywords were available to students to work through in their own time before the start of the course. To verify, if the students have understood the basic terms or concepts in drug delivery, a self-evaluation quiz was prepared and launched on Absalon (Appendix B). This self-evaluation quiz consisted of 20 multiple-choice questions with one or two correct answers. Students' have to complete the self-evaluation quiz before the first day of the course. These keywords or concepts were reiterated during the first day of the course.

*Aim:* The overall aim of this intervention was to align students' background knowledge w.r.t. the keywords or drug delivery concepts used during the course or introduced by the teachers. Students' should familiarize themselves with these key concepts and evaluate their learning through a quiz. This tutorial could also be used as a reference during the course.

### *2. Congruence of learning support*

To support student learning in the form of access to guidance and feedback, peer evaluation and feedback for the written essay was included in the

**A****Master****B****Research area**

**Figure 1.** (A) Students' educational background *i.e.* field of their Master education and (B) current research area of their PhD program.

course. This exercise was briefly introduced on day 1 of the course and described in detail during the middle of the course. Following last day of the course, peer feedback (Peergrade) was launched in Absalon and students' were allowed around 2 weeks' time for the evaluation and feedback after the submission deadline for the written essay. Each student had to evaluate one peer essay. Criteria for feedback was also provided to the students (Appendix C), which was used by students and teachers for the feedback

on the written essay. These criteria also served as a guide for students when writing their essay.

*Aim:* The aim of this intervention was to align students' learning through a better explanation of written assignment and its assessment. Criteria laid for the peer evaluation and feedback could inform students' own writing.

### **Evaluation of the new format**

Evaluation of the new format of student exercises was based on (i) oral evaluation in plenum, (ii) an anonymous questionnaire sent to all participants on Absalon after the final day of the course, and (iii) an anonymous survey (Google Forms) circulated after the end of the peer evaluation and feedback. Questionnaire in Absalon included an overall evaluation of the course as well as focused on the new format of exercises.

## **Results**

All course participants took active part in the plenum evaluation of the course and 29 of the 30 course participants answered the online questionnaire (Absalon) after the course. After the peer feedback, 18 of the 30 course participants answered end of the peer feedback survey on Google Forms. The outcome from the questionnaire and survey is presented below for the two student-centered exercises.

### **Students find drug delivery keywords and self-evaluation quiz relevant**

To align student background knowledge with the ILOs in the *Drug Delivery* course, important drug delivery concepts and keywords were provided before the start of the course, which was followed by a quiz for students to self-evaluate their understanding of keywords.

Twenty-five of the 30 course participants attempted the self-evaluation quiz on Absalon (Figure 2). The average score of course participants in the quiz was 84%.

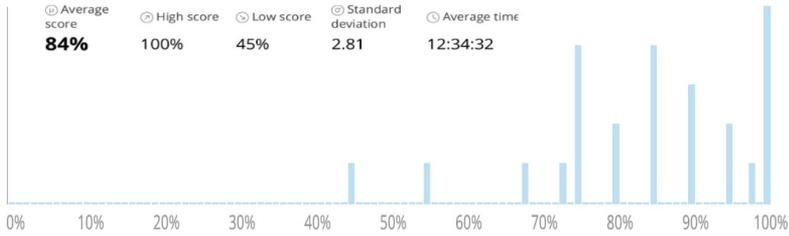


Figure 2. Summary of self-evaluation quiz.

Of the 29 students answering the online questionnaire on Absalon, 93% agree that the drug delivery keywords and the self-evaluation quiz were relevant and this student-centered exercise worked well (Figure 3). Additional information in the form of written feedback from students was also obtained. When analyzing the comments, it becomes apparent that overall, the students’ positively perceive the introduction of keywords and self-evaluation quiz. One student elaborated this by saying ‘*S1: The drug delivery keyword document is awesome! Such a good intro to the course.*’ While another student said ‘*S2: The keywords were generally really good, but there could have been a greater focus on the terminology on the first day.*’ There were no comments in the students’ course evaluation that reflected either non-familiarity with the drug delivery concepts or keywords used during the course or about a better introduction to the drug delivery concepts.

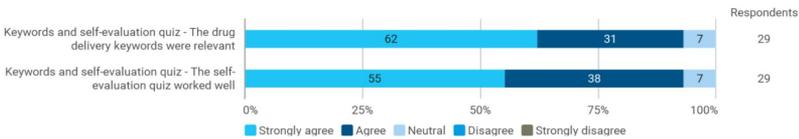
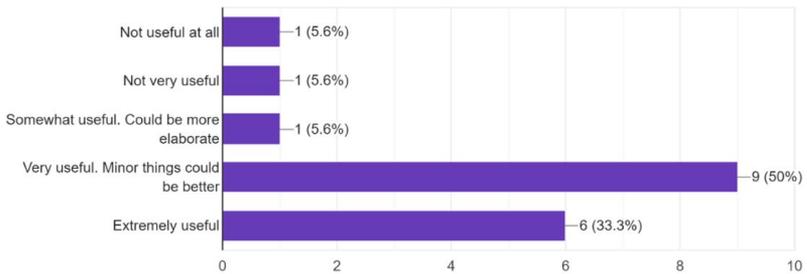


Figure 2. Evaluation of keywords and self-evaluation quiz.

### Majority of students find peer feedback to be useful

To support student learning, a peer evaluation and feedback was included and the criteria for peer feedback was also provided to the course participants. Eighteen of the 30 students answered the online survey via Google

Forms (Figure 4). Fifteen students (83.3%) find the peer feedback exercise either extremely useful or very useful while two students (11.2%) find it not that useful. When analyzing the aspects of the peer feedback that the students perceived as working well, positive words such as ‘good’, ‘useful’, ‘helpful’, ‘constructive’ appear frequently (Appendix D). On analyzing the comments in more detail, it becomes apparent that overall, students’ perceptions of this activity were positive with students seeing this exercise aligned with the teaching-learning activities. However, few students did not identify peer evaluation useful but reported it a time consuming exercise.



**Figure 4.** Evaluation of the peer feedback received.

## Discussion

Students enter the university with diverse skills and prior knowledge. This diversity causes heterogeneity that poses challenges for university education, as differences in prior knowledge have been shown to significantly influence the quality of learning and student achievement (Dochy, 1996). In order to achieve aligned teaching, there must be a maximum consistency throughout the system (Hounsell & Hounsell, 2007). The current *Drug Delivery* course uses appropriate teaching methods (*e.g.* lectures, group work, and exercises) that overall enable the ILOs to be met. Consequently, the course receives good evaluations year to year (Appendix E). However, the course has some congruence challenges that relate specifically to students’ background knowledge on basic concepts in drug delivery. Given that diversity, the extent of congruence with students’ background knowledge in this course was a dimension, which merited attention. Herein, I attempted to address this issue for a better course alignment and congruence.

Various strategies could be adopted to abridge knowledge gap and engaging with students' diverse needs and interests such as tutorial systems or group-based practical activities, self-test question banks and supplementary teaching-learning resources, as well as an approachable and supportive teaching staff (Hounsell et al., 2006). Herein, I adopted tutorial system and self-test question bank approach. While supplementary teaching-learning resources in the form of review articles covering important keywords used in the course are available to students on Absalon, however, one of the common feedback from students year to year was the non-familiarity and a better introduction to drug delivery concepts. Both tutorials and self-evaluation quiz were launched before the start of the course with the objective to familiarize students with non-pharmaceutical background to the most relevant concepts and keywords in drug delivery. As course organizer, I was aware of the challenges posed by these more diverse student intakes, but was also mindful of the practical constraints on the extent to which the students' needs could be appropriately met during the course duration. Overall, tutorials and self-evaluation quiz worked well and recognized as useful by students.

Peer evaluation and feedback provides a structured learning process for students to critique and provide feedback to each other on their work. It is supported by the conception that students' interaction can lead to enhanced understandings and improved learning experiences (Falchikov & Goldfinch, 2000; Moore & Teather, 2013). It enables students to take an active role in the management of their own learning based on the feedback (Carless et al., 2011). In this project, peer evaluation and feedback worked well as majority of students gave and receive useful feedback from their peers. However, few students did not find this exercise useful but rather time consuming and few others were unable to critically evaluate the written reports. These issues could be due to a lack of clarity regarding the feedback criteria, mid-course description of peer feedback, non-familiarity with feedback process, lack of anonymity, or cultural differences. It is important to provide training activities to teach novice students how to assess their peers' work and provide constructive feedback (Sluijsmans et al., 2002). Similarly, peer evaluation activities should be aligned with core learning goals so that it is clear to students how the activities benefit their learning and are not perceived as an add-on assignment with little value (Moore & Teather, 2013). The student-assisted course design approach (Birgbauer, 2016) as adopted in this project warrants continuous tracking of student

learning and collection of evaluation data on students' competencies and learning outcomes.

## Conclusions and future perspectives

The *Drug Delivery* course has some congruence issues most notably the students' background knowledge. Although the course is consistently positively evaluated and recommended by students, the decision to implement new student-centered exercises in the form of tutorials was based on the students' course evaluations from previous years. A new exercise in the form of peer evaluation and feedback was also tested. The ultimate goal is to offer students a coherent, connected and integrated learning experience irrespective of their prior knowledge. The students responded positively to the new format of course and appreciated tutorials in the form of keywords, and peer evaluation and feedback.

While majority of the students reported the peer evaluation and feedback to be useful, a few students did not see any additional benefit of peer feedback or identified it as a time consuming exercise. In the future, therefore, peer feedback exercise could be introduced along with the description of written examination in Absalon before the start of the course. This would ensure that students know what to expect from the overall course assessment. Most of the students gave constructive peer feedback based on the prescribed criteria. However, some students were unable to critically evaluate the written reports of their peers, which could be due to a lack of clarity regarding the feedback criteria, lack of anonymity, or cultural differences. Thus, in future, it could be useful to consider these aspects. Overall, the new format of teaching material and exercises tested in this project was a success and an improvement over the existing format, which offers promise to continually develop this course for a better alignment and congruence.

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## C

## Description of written examination and criteria for peer evaluation and feedback

### Description of Exam

The examination is an important and integral part of the course; without it, you cannot pass the course unless specific agreements have been made with the course organizers.

The evaluation is based on a written essay (or term paper) of at most 10 pages, in which you should discuss a relevant research paper that you choose (should address principles relevant to drug delivery) with respect to the various keywords we discussed at the start of the course.

The essay itself should be built up as follows:

- Title page, including your name
- A summary of the paper (max 2 pages)
- A discussion of the drug delivery concepts used in the paper, using the keywords discussed on Day 1 of the course (max 3 pages)
- A discussion of the relevant drug delivery topics discussed at the course, but not in the paper, in relationship to the paper (max 2 pages)
- A conclusion (max 1 page)
- References (max 1 page)

The essay should be uploaded on Absalon no later than Friday June 18<sup>th</sup>, 2021, at 12.00. We will have the essays evaluated before July 2<sup>nd</sup>, 2021.

### Peer Feedback

Please note that after the submission deadline on June 18<sup>th</sup>, 2021, you are required to provide peer review for the written essay (or term paper) of one other participant (deadline 30<sup>th</sup> June, 2021). In order for this to work, it is very important that you deliver the feedback on time.

### Criteria for feedback

We will be using the following criteria in the peer-feedback you will give and get from the other participants. You can also use these criteria as a guide when writing the essay:

- 1. Essay follows the prescribed format:** Does the essay includes an overall summary of the paper, discussion of drug delivery concepts, conclusion and references? Is the essay well structured or are there sections you would have liked to have more information about in the essay?
- 2. Essay includes discussion of drug delivery concepts in the research paper:** Does the essay includes drug delivery concepts used in the research paper, using the keywords provided before the course and discussed on Day 1 of the course? Are the used drug delivery concepts in the research paper clear? Are there alternative keywords that could be used? If so, what are they?
- 3. Essay includes discussion of drug delivery concepts discussed at the course but not in the research paper:** Does the essay discuss relevant drug delivery topics discussed at the course, but not in the research paper, in relationship to the research paper? Is it clear what the author thinks were the most relevant drug delivery concepts or keywords missing in the research paper? Does the author take drug delivery concepts from the course or keywords from the Day 1 of the course into consideration? Are there alternative keywords that could be used? If so, what are they?
- 4. Essay includes general reflections:** Does the author use the drug delivery concepts or keywords discussed during the course to highlight general points about the principles relevant to drug delivery in the research paper? Are there aspects of the essay that inform your learning of the drug delivery concepts? If so, what aspects do you find most relevant?

## D

### Anonymous end of peer evaluation and feedback survey using Google Forms

*S1: The feedback came with good examples and suggestions to what could have been elaborated. Very constructive and helpful.*

*S2: The peer feedback was good to give a general overview on the essay, and I found out what I missed in the essay. Since the concepts are broad, it is not easy to cover everything on the course, but a more detailed feedback is appreciated.*

*S3: The feedback was constructive and useful.*

*S4: It is nice to know what other students think about your report.*

*S5: It was nice to see another essay and get notes on my own. It was good that there was specific points to give feedback on. The feedback I got was very constructive, and good points were given on what I could have done better/included in my essay, which were very nice.*

*S6: It was both fun and useful to read another student's essay and have another student read your own. Knowing we would receive peer-feedback also made me think more about how I was writing my essay.*

*S7: As first my experience in peer review, I may comment that being able to analyze a work allows to have a deeper critical thinking in the concepts related to the course. Not only because you get more knowledge, you also understand how you could have complemented your own work, then in science two perspectives are better than one. In the same way, when you receive a feedback, a person with similar or different background may contribute in your analysis and help to find pros and cons. As Ph.D. students this is enriching for our careers. And very importantly, a feedback from the professors may help establish a more constructive opinion and evaluation of the feedback.*

*S8: The feedback came with good examples and suggestions to what could have been elaborated. Very constructive and helpful.*

*S9: It was helpful and I was able to see that the reviewer took some time and effort to read the essay.*

*S10: Feedback giver really read carefully.*

*S11: Personally, I got nice and fruitful comments with some good points. But since the feedback is very dependent on the individual student, I could imagine variations in quality.*

*S12: The student-student feedback was very helpful because it was much more thorough. However, I believe the ECTS points should be increased when this extra task (and therefore hours) are added to the course.*

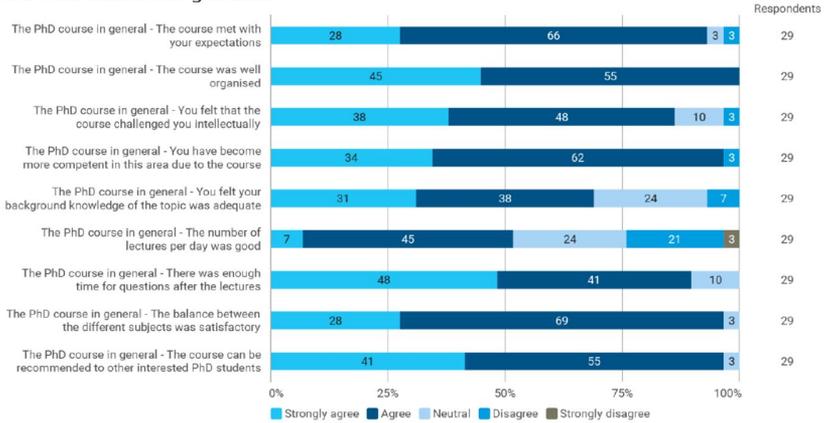
*S13: The feedback was not very elaborative it was more like only positive comments, without digging into anything specific.*

*S14: It does not give any extra value to the written essay.*

*S15: Although I see the benefits of the extra task of evaluation, I think it is a bit much to ask of us, since this course is already quite intensive in regards to workload. Furthermore, I am not sure I feel competent enough to evaluate another person's report.*

## E Anonymous end of PhD course evaluation 2021

### The PhD course in general:





## **Introducing and evaluating elements of alignment, congruence and feedback to a MSc programme**

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### **Introduction**

It is well-established that congruence and constructive alignment of teaching to university students is an appropriate tool to enhance engagement, motivation, learning processes and outcomes (Hounsell et al., 2005). Furthermore, formative feedback and self-regulated learning can be a means for the students to take control of their own learning (Nicol & Macfarlane-Dick, 2006). Using the case of the course ‘Global Health and Diseases’, this final project will explore how the introduction of congruence and constructive alignment as well as feedback can influence students’ perception of learning.

### **Background about the case**

The course ‘Global Health and Diseases’ for MSc Global Health students at University of Copenhagen, Denmark, is a nine week course in block 1 for up to 40 students (Health et al., 2021). The course has been a vital part of the MSc Global Health Programme from when the programme was first initiated nine years ago. While I was course coordinator for the first time in the fall of 2021, I have been responsible for a week on global mental health in the course for the previous five years. In conjunction with a methodology course, this is the first course the MSc Global Health students engage in. ‘Global Health and Diseases’ is an important starting point for the MSc

Global Health students in gaining a mutual understanding of what global health entails. During the course, the students are systematically introduced to a new disease or theme, for instance ‘non-communicable diseases’ or ‘mental health’. The format of learning is lectures as well as institutional visits in the Copenhagen area, such as to the UN City.

## Problem statement and rationale

While the evaluations of the course (2018, 2019, 2020) have overall been positive, the students bring up two areas of improvement: (i) lack of structure in the course and of individual lectures and (ii) lack of feedback in any form throughout the course (before the oral final exam). To ensure a red thread in the course, it has previously been the ambition to have an overall theme for each week. However, this has previously not always been possible to carry out. Since I was not the course coordinator of this course prior to block 1 2021, I am not entirely sure why. However, it is clear that it is a big task administratively putting the course together, with many busy calendars at play; in 2021 it amounted to 25 different internal and external lecturers, which is similar to previous years. The structure of each lecture has traditionally been reliant on the invited lecturers. There has not been a tradition of systematically making use of Intended Learning Outcomes (ILOs) for each lecture – neither on Absalon nor in class presentations. In 2020, the students highlighted in the final evaluation how:

*“( . . . ) By less structured the students mean that some lectures were difficult to follow. The well-structured lectures usually included a table of contents or a similar organizational slide in the beginning to set up the lecture properly, making it then easier to understand and follow. This is helpful so that students understand what the learning objectives are and can then leave the lecture knowing that it was covered.”*

*“These lectures left students confused about what the learning objectives were and didn’t feel as though they were properly informed about the topics.”*

The students thus called for a more transparent approach to the aim of each lecture and ultimately the entire course. Furthermore, this uncertainty possibly also feeds into their perceptions of how they are evaluated. The course is evaluated with an oral exam (summative feedback), of which

many of the students are quite nervous for – most are international students and have never been evaluated through an oral exam before. This has previously been the only type of feedback provided. In 2019, students highlighted how:

*“Some students mentioned that feedback during the course or even a graded assignment could be useful (also to take of pressure from the oral exam)”.*

Thus, though the students tend to overall appreciate the course in evaluations, they have over the years especially noted how alignment and congruence throughout the course and for individual lectures could be improved. Furthermore, students have asked for more feedback throughout the course and not only during the final oral exam. The question is thus whether an introduction of elements of alignment and congruence as well as feedback can influence students’ perceptions of own learning.

## **Aim**

The aim of this final project was to introduce and evaluate elements of alignment and congruence as well as feedback to the MSc Global Health course ‘Global Health and Diseases’.

## **Theoretical underpinnings**

An important part of the course ‘Global Health and Diseases’ is to find ‘common grounds’. As mentioned by Johannsen et al., many educations have a course similar to this (an introductory course) in the initial parts of programmes (Johannsen et al., 2013). Here students are explained about ‘basic’ knowledge and skills, which will be useful throughout the programme. However, while we, as course coordinators, see this as logic, the students are not necessarily aware of this (Johannsen et al., 2013). It is thus important to explain the rationale for a course as well as individual lectures in detail to the students. One way to do this is to introduce Intended Learning Outcomes (ILOs), using verbs to highlight what it is expected the student can do after the course (Brabrand & Dahl, 2009). As outlined by Brabrand and Dohn, ILOs can thus be a guiding frame for “what the student does and on what the students are supposed to learn (to do), i.e. what

competencies the students are expected to have by the end of the course” (Brabrand & Dahl, 2009).

In constructive alignment, learning is perceived as a result of the students’ activities, so what the students actually do in their learning (Mørcke & Rump, 2013). What has been a main concern in my new role as course coordinator is that this course is built around the students’ quite passively getting exposed to what they need to learn. The teaching components are to a large extent research-based, however in Mick Healey’s model, the students are much more the ‘audience’ than ‘participants’ (Bonderup & Dolin, 2013). Currently, the only assessment of the course is summative feedback, i.e. the final exam. There are no formative feedback or other types of assessment build into the course. While I can hope the students obtain the knowledge, skills and competencies spelled out in the intended learning outcomes, I actually do not know before the final exam. The students do not know either. Hounsell et al. outline how feedback should be included in all aspects of the student’s university experience and thus it has many aims and shapes (Bonderup & Dolin, 2013). ‘Formative feedback’ is one approach. Formative feedback is forward-looking, providing the students with the opportunity to change their approach. This can for example be in the form of lecturer-student feedback, peer feedback or quizzes. As previously mentioned, another way to make this clear is by introducing ILOs stating what the students is supposed to take away from the lecture(s) (Brabrand & Dahl, 2009).

## **Methodology**

The intervention for this final project consists of two components: increased alignment and congruence as well as feedback.

### **Increased alignment and congruence**

The ‘increased alignment and congruence’ component consisted of four different interventions.

- (i) Each week of the course was provided a headline and an overall theme, which was made visible on Absalon by making use of pictures illustrative of the theme.

- (ii) Each lecturer was asked to provide an ILO for their session, which was presented on Absalon as well as in their power point presentation.
- (iii) I initiated the course with an exercise situating the course in the degree programme and where the students and I aligned expectations. Specifically, each student was asked to fill out three post-its with their expectations to the course. After a class-room discussion of their expectations, I highlighted my expectations to them as students, i.e. active participation
- (iv) Finally, I used myself as the red thread, practicing 'being there and being seen' as a way of binding together the course and being available to questions the students had along the way

### **Providing feedback**

To introduce feedback throughout the course, I asked each lecturer to provide at least one question with one right and several wrong answers relating to the sessions they had taught. On the basis of this, three quizzes, placed on Absalon, was developed for the course. The quizzes could be taken whenever it was relevant to the students.

### **Evaluation**

The interventions were evaluated using the following approaches:

- Tracking of the number of ILOs obtained
- Comparing the post-its and notes from the 'alignment of expectations' exercise at the beginning of the course with feedback from the mandatory evaluation session at the end of the course as well as with the written evaluation report. I specifically asked about how the students felt the expectations they had in the beginning of the course were met.
- The quizzes were evaluated by tracking how many took the quiz and how they scored. Furthermore, the usefulness of the quiz was specifically asked about during the final evaluation.
- Finally, the evaluation included a discussion about the students' perceptions of alignment of the different course elements.

## Findings

The aim of this intervention was to introduce alignment and congruence as well as feedback in the course ‘Global Health and Diseases’. The findings are presented in the below.

### Increased alignment and congruence

After working on the new, coherent structure, each week was clearly labeled with an overall theme, which was presented on Absalon. A total of 24 of the 25 engaged lecturers during the course provided an ILO for their lecture(s), though the way they were constructed differed. The ILOs were clearly presented on Absalon for each session and in power-point presentation(s). In their evaluation, the students mentioned how:

*“Progression was very good. Students liked the week structure and the order of the weeks also made sense” (MSc Global Health students, 2021)*

*“As mentioned before, the structure and organisation of the course was experienced as very positive. Students appreciated the theme-per-week structure.” (MSc Global Health students, 2021)*

All students were engaged in the ‘leveling of expectations’ exercise and happily contributed, both to writing the post-its as well as discussing themes highlighted afterwards. We had a fruitful discussion of the issues they brought up. Their expectations ranged from them looking forward to focus on specific themes, such as an interest in a certain geographical location or disease, or more overall thoughts on looking forward to diving into at theme “that truly inspires me” (quote from one of the post-its). In my expectations to them, I highlighted that I expected them to show up prepared and ready to engage in discussions. This they truly lived up to. I have continuously discussed with colleagues how it has been a long time since we had a class this eager to discuss, engage with lecturers and ask questions. During the final evaluation, I specifically asked about how they felt the expectations they had noted down on the post-its had been met during the course. They responded to this in a positive manner:

*“Best parts were the organisation and structure of the course, the lecturers (their expertise, experiences in the field, their approachability and their different styles of teaching). The overall study environment was very great. Students felt challenged, enriched by the*

*study material and comfortable to ask questions.” (MSc Global Health students, 2021)*

The latter part of the quote can be seen as a way of describing a friendly study environment. Specifically, the students highlighted how it was great that I, as course responsible, was around and available.

### Providing feedback

In total, 3 quizzes with a total of 90 questions were produced. As indicated in Table 1, the highest number of respondents were 24, of whom several conducted the quiz numerous times.

**Table 1.** Overview of the quizzes developed, number of questions and respondents and scores.

	No. of questions	No. of respondents	Average score	High score	Low score
Quiz 1	26	24	76%	99%	21%
Quiz 2	24	19	75%	100%	27%
Quiz 3	40	18	58%	91%	0%

During the final evaluation it was highlighted how some students thought the quizzes were helpful in their preparations to the oral exam. They highlighted how it was *“nice to have an idea of what questions could entail”* (class-room evaluation). Other students were honest about not making use of the quizzes.

### Discussion and implications

In this final assignment I explored ways to increase congruence and alignment as well as student feedback in the MSc Global Health course ‘Global Health and Diseases’. Having just taken over the responsibility of this course, my aim was to keep the things that do work in the course, while intervening on the small things that could help make it better. My hope was

that these 'tweaks' would help create a good learning experience for the students.

The findings showed that students enjoyed the set-up of the course and directly articulated how they appreciated the structure of the course. The lecturers collaborated on providing ILOs, however, these ILOs differed somewhat in the way they were constructed. In a discussion with my colleague about this intervention, we discussed how it could be relevant to work with the invited lecturers to make their ILOs as precise and similar as possible, in terms of the expected learning outcome. That would help to create even more congruence and understanding about what is expected of the students.

For me as course coordinator, it made a lot of sense to start out the course with the leveling of expectations exercise. It was an appropriate way to get to know the students and vice versa. I believe it helped create a space where the students felt they could also share with me when and if the course was off track or if something else was needed. Me 'being around' throughout the course also helped in this matter. Next year, I will make an effort to follow-up on this exercise midway through the course, in order to make a formal space for the students to share suggestions for changes before the final evaluation.

In the evaluation, a number of students highlighted how they appreciated the quizzes. Both from the evaluation and the statistics of the quizzes, it was also clear how another part of the class, did not make use of them. Going forward, I believe several things could be improved. It was not mandatory for the students to do the quizzes. They were solely presented as a tool for the students to test themselves before the final oral exam. However, going forward, the quizzes could be better integrated into the course by for example setting aside time to discuss the questions and answers in class in order for the students to be able to truly learn from the experience. That was not the case this time around. After discussing this intervention with my colleague, I am also contemplating whether multiple-choice quizzes are the best approach to activate students and prepare them for the exam. We discussed how the ILOs could be much more used in the teaching. For example, a system could be set up in Absalon where students submit three take home messages after each lecture in response to the ILOs. This feedback could be anonymous, and once submitted, the students would see each other's responses. This would make the students reflect about their learning – which is also what is expected of them for the exam, which is very discussion-based. Five to ten minutes could be set aside at the end

of each lecture, where the students would have time to submit these reflections. Another type of formative feedback could be considered, such as handing in a smaller assignment several times during the course. By doing so, it would be possible to ask questions that would target a more complex understanding of the issues at play than what is possible through multiple choice. These smaller assignments could be evaluated through peer feedback, which would increase learning both for the person receiving and giving feedback (Rienecker & Bruun, 2013).

After writing the first draft of this paper, I discussed the intervention with a colleague from my department. This was a relevant exercise to continue my reflections on how the intervention could be further developed going forward. We discussed how it could be elaborated why the ILOs provided by lecturers needed more work as well as how the ILOs could be further integrated into the teaching. Specifically, she suggested to make use of the ILOs to make the students reflect about their learning, as previously explained. I believe this would be very relevant, and provide the feedback asked for in a way that a multiple choice quiz is not able to do. Furthermore, this way of reflection would be useful in the students' preparation to their exam.

## **Conclusion**

The aim of this final project was to introduce elements of alignment, congruence and feedback to the MSc Global Health course 'Global Health and Diseases' and explore how students perceived of these issues as influencing their learning. Based on the findings, the intervention elements were generally successful. Especially, the students appeared to experience congruence and alignment in the course and thus the red thread that I saw missing was successfully introduced. While the students performed well in the oral exams, I am, however, not in a position to conclude whether the intervention actually influenced their learning. Going forward, the quizzes could be further integrated into the course or changed into an exercise where they respond with their take home messages to each ILO. Furthermore, I will work with the lecturers to make their ILOs more stringent and coherent.

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## The perspective on congruence within a teaching-learning environment among 2nd and 3rd year Sports Science bachelor students

Nina Rica Wium Geiker & Thomas Petursson Gunnarsson

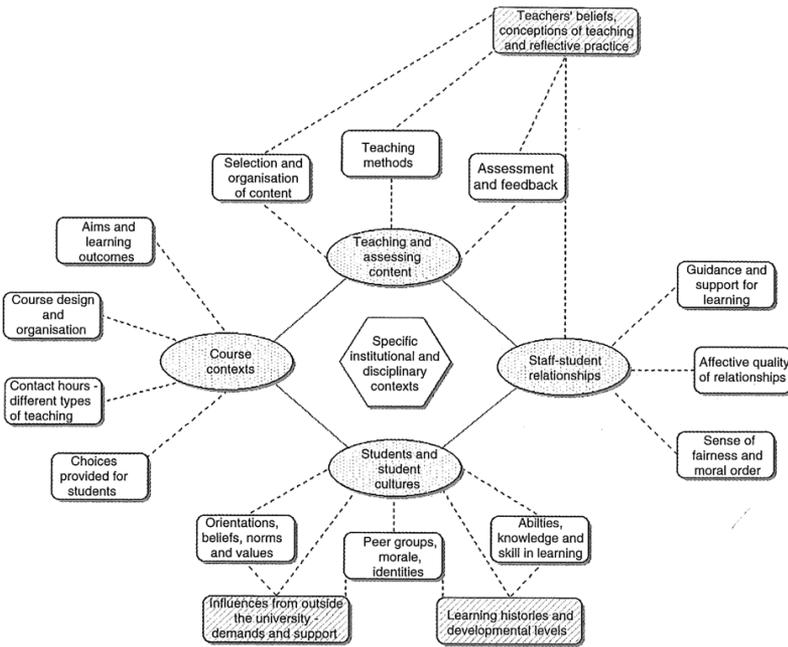
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### Introduction

A university course can be viewed upon as a “teaching-learning system” (Hounsell & Hounsell, 2007). That system functions optimally when intended learning outcomes (ILO’s) are of high-quality and matched in harmony with teaching styles and assessment, which was described as constructive alignment by Biggs (Biggs, 1996; Biggs & Tang, 2003). From a student perspective, a constructive alignment between learning outcomes, teaching and assessment styles is imperative in university courses, as inconsistencies may lead to student disappointment/frustration which in turn may lead to lack of motivation and learning outcomes that are diminished compared to those intended. From **Figure 1** it becomes evident that the “inner” teaching-learning environment is complex, and the term congruence builds on the constructive alignment theory, and has been adopted as a means of capturing interrelationships between high-quality learning outcomes and strategies deployed to pursue these outcomes, in a widened framework going beyond crude ILO’s and teaching-learning and assessment activities (Hounsell & Hounsell, 2007). Despite the complexity of the inner teaching-learning environment, all parts of the system should address the same agenda and be in support of connecting areas, hence be congruent.

An instructional approach proven successful in a university setting is the flipped classroom (Gilboy et al., 2015; Jinlei et al., 2012). In the traditional flipped classroom students prepare watching one or several topical out-of-class videos/slideshows and discuss the topic in class face-to-face

with the lecturer and fellow students. A high student preparation allows the teacher to engage with students in higher levels of Bloom’s taxonomy (Krathwohl, 2002) compared to the more traditional classroom introduction with reflection at home. Due to the covid-19 pandemic the flipped classroom will take yet another step into the virtual world as all teacher-student interactions will be online, hence there will be face-to-face meetings in the classroom. How this affects the student’s learning, their motivation, perspective and perception of the constructive alignment between ILO’s and the actual lecturing is yet unknown.



**Figure 1:** The ‘inner’ teaching-learning environment with focus on Teaching and assessing content and Course contexts (Modified from Hounsell and Hounsell, 2007).

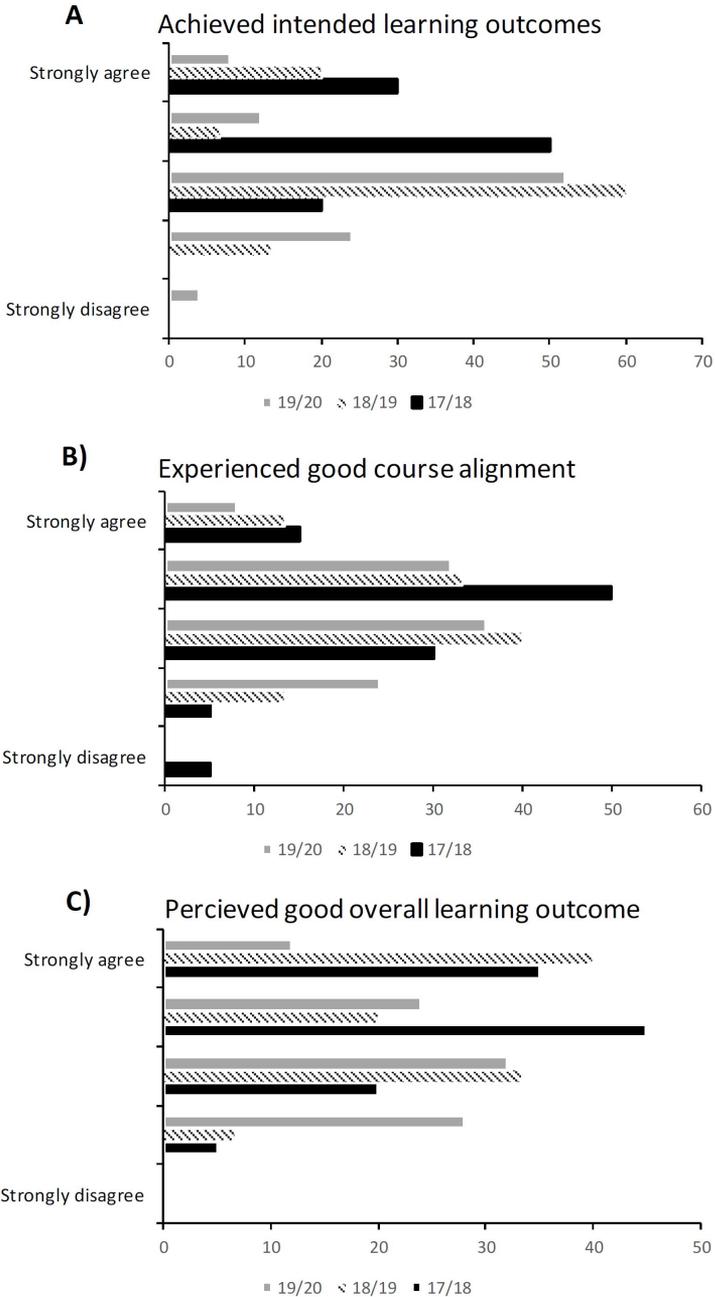
## Course setting

For this assignment, we have chosen to focus on the elective course “Planning of Sport and Exercise Training” (Træningsplanlægning) for 2<sup>nd</sup> and 3<sup>rd</sup> year bachelor students at the Department of Nutrition, Exercise and Sports Science (NEXS). The course was taught in block 4 (April to June 2020), and the structure of NEXS’ Sports Science bachelor program is that the students have mandatory teaching equivalent to 90 ECTS points for 6 blocks / 3 semesters, meaning that from block 3 in their 2<sup>nd</sup> year, students are free to choose elective courses. The course is popular, and usually enrolls 50-75 students (130 new bachelor students are enrolled each year).

From the course description, the students are able to assess ILO’s, means to obtain the described knowledge, skill and competency declarations and how these outcomes will be assessed. Based on respondents of course evaluations from 2017/2018 and 2018/2019, approximately half the students agreed to have achieved the competencies stated in the course description (**Figure 2A**), and experienced a good interrelationship between different elements of the course (**Figure 2B**).

Furthermore, in 2017/2018 and 2018/2019 60-80% of the students perceived having a good overall outcome i.e. it matched/fulfilled their expectations on beforehand (**Figure 2C**), suggesting a well-functioning and popular course. In the evaluations from 2019/2020, the students report a lesser agreement to all three questions.

The specific course description (<https://kurser.ku.dk/course/nidb11015u/2019-2020>) states, that the student will gain knowledge within analysis of a sports-discipline. Further, that the students will acquire skills and knowledge on valid testing and execution of relevant training programs. Lastly, the student gains the competencies to analyze the need for a specific type of training in a given sports-context, and to prioritize the usage of different training forms (aerobic, anaerobic, and strength training) over the course of a season with a specific sport-related performance outcome.



**Figure 2:** Results from student evaluation from the years 2017- 2018, 2018-2019 and 2019-2020, bachelor students attending the course “Planning of Sport and Exercise Training”.

For the students to obtain the knowledge, skills and competencies described, the course traditionally contains lectures (theoretical), practical sessions (hands-on testing) and instructor guided group work with presentations and assignments, including instructor- and peer-feedback. Due to covid-19, all lectures were conducted online via zoom and adhered to the flipped classroom-teaching model (Hew & Lo, 2018; Jinlei et al., 2012). In the course, there are two main teachers covering 90-95% of the course; the rest is covered by external lecturers (often national team coaches giving practical examples of how they apply the principles of training planning in their specific sport). From the start of the course (for some before) students choose a sports-discipline (in groups of 2-6 students), and work in-depth with this discipline throughout the course. Assessment was traditionally a 20 min case-presentation-discussion based on a 4-page synopsis, developed in groups throughout the course, but was this year changed to a 1.5 h individual written assignment, based on either a group or individual synopsis.

## Methods

Five students; four from their 2<sup>nd</sup> and one from his 3<sup>rd</sup> year, all studying the Sports Science Bachelors program at NEXS, UCPH voluntarily participated in both of the two online interviews via zoom. The interviews were semi-structured qualitative interviews following a pre-developed 'interview guide' in order to ensure that all main topics were covered. This approach allowed us to follow topical trajectories in the conversation that may stray from the interview guide (Cohen & Crabtree, 2006). The first interview was conducted the day after the first lecture of the course and the second prior the last lecture (21<sup>st</sup> of April and 3<sup>rd</sup> of June, 2020) and hence before the exam. The analysis of the respective course was based primarily on the student's perspective. Even though, other students may have responded differently to the questions the discussion will be based on responses from the five students who were interviewed.

## Aim

The aim of the present study was to assess the student's perspective and perception of the alignment of course contexts and their general perception of the teaching and learning environment within the course (see highlights in **Figure 1**). Secondly, we aimed to assess the student's perspective and perception on all lectures being online due to covid-19 on learning outcome and motivation and adhering to the flipped classroom model.

## Results and discussion

### Congruence of the bachelor program

The present course is placed in Blok 4, and students are expected to have acquired basic skills and competencies fulfilling the course requirements. The below questions were asked to assess how students perceived the placement of the course in relation to the overall bachelor program.

Q: “Do the students view the overall bachelor program as aligned, and do the students see the present course as a natural elongation on where to build former acquired knowledge?”

*“In order to take this course (and similar bachelor election courses, red.), one requires the build-up of a solid and basic physiological knowledge, in order to engage in more advanced (physiological, red.) discussions during classes.”*

Q<sub>follow</sub>: “Do you feel that the previous courses on the Bachelor program have prepared you for this course (Planning of Sport and Exercise Training, red.)?”

*“I think that the previous mandatory courses ”Physical training” and “Exercise physiology 1” gives a good foundation for this course, and has provided much needed basal knowledge. These acquired competencies can now be build-up upon in a specific direction of training planning. Further, that we have had statistics helps a lot when reading the background material (scientific papers, red.) for this course. Without the statistics course, I would be lost in the meaning of the different symbols and graphs . . . thus, it is really important and good that we have had statistics to provide a basic foundation (for interpretation of scientific papers, red.)”*

*“I agree. The courses in the Bachelor program have a good sense of order to them. . . Now I definitely start to feel, that without the knowledge acquired during those basic courses, it would be difficult to keep up with discussions (in the present course, red.) . . . (Without that basic knowledge, red.) it would be very difficult to read the things we are supposed to read. I can definitely see value to the things we were taught during the first 18 months (all of which is mandatory teaching, red.) of the study program, which has created a solid foundation to build on now.”*

These specific comments indicate acknowledgement of a red-thread in the Bachelor program and congruence on the dimension of overall course

alignment. The following comments further support the student's perception of congruence in the specific Bachelor program including perception on knowledge and competencies required when assessed during exams:

*"The thing that you can come across a question in an exam, where you really need to go to knowledge acquired in another course to be able to answer that question fully... An example is that basic theory acquired in "Exercise physiology 1 (mandatory 1<sup>st</sup> year course, red.)" was needed in order to make the required connection asked for in Physical training (mandatory 2<sup>nd</sup> year course, red.)"*

Q<sub>follow</sub>: "Is this a general notion; that you feel the need to use knowledge acquired during previous courses during exams?"

*"I primarily think the overlap was between "Exercise Physiology 1" and "Physical Training". It seems as if some of the teachers thought they were clever by adding double (repeated, red.) curriculum, without really doing so. However, I feel fine about this because we've all had both courses. Although this was not a problem to me personally, I know of other students that thought things got tangled up and were unclear."*

It becomes evident that the students have high expectations regarding the exam building on knowledge acquired during previous courses. Since the students feel they have an adequate acquisition of theoretical knowledge for this specific course, it is not addressed as a problem though. A clear red-thread is of importance in study programs in general as well as in the context of a single course. Biggs' constructive alignment theory (Biggs, 1996; Biggs & Tang, 2003) focuses on alignment between ILO's, teaching methods and assessment in a narrow course frame, and is a good starting point for any specific University teaching environment. From a student perspective, a constructive alignment between learning outcomes, teaching and assessment is imperative for learning outcomes, as inconsistencies may lead to student disappointment/frustration which in turn may lead to lack of motivation and diminished learning outcomes. However, the contextual influences that affects upon the students' learning outcomes are not confined within the establishment of teaching-learning and assessment activities implied by Biggs' model (Biggs, 1996; Biggs & Tang, 2003), why congruence, in the setting of this paper, is thought of as a widened framework-strategy to capture the interrelationships between high-quality learning

outcomes and strategies deployed to pursue these outcomes (Hounsell & Hounsell, 2007).

### Course design and organization

In the following section we investigate the student's perception and expectations to the alignment of the specific course context, and their general perception of the teaching and learning environment within the course. Further, by data from the second interview, we evaluate if their expectations to the course were fulfilled, and if they experienced the proposed red-threat in the course, and an alignment of course content.

The students had rather clear expectations to the course in general, especially in relation to ILO's, which is summed up by this commentary from interview #1

*“(I expect, red.)... to gain knowledge on how to design and plan training for different types of athletes and within different sports. Obtain knowledge to engage in relevant discussions on specific terms such as periodization of training and tapering (classical terms within planning and execution of training programs, red.)... In the real world, it is of importance to engage in discussions about which type of planning to use, and it is of importance to have an overview of macro- and micro-cycles and in general just have a good (theoretical, red.) overview to base decisions on.”*

This can be read from the online course description, and the students may have gotten that information from that description. However, the first interview was conducted after the 1<sup>st</sup> online lecture, which most likely helped spur the student clarity on course context. Especially since the first lesson included a general course overview to emphasize to the students what to expect from the duration of the course. Nevertheless, acquired one way or the other, the clarity of ILO's and course structure (as well as final assessment) is important for student motivation, and supported by Biggs constructive alignment theory (Biggs, 1996; Biggs & Tang, 2003). In the context of Knud Illeris' didactical triangle of learning (Rienecker et al., 2015) *i.e.* the interplay between psycho-dynamic and cognitive processes and social interaction (Rienecker et al., 2015), student motivation is an important part of the psycho-dynamic processes that is based on the individual, and of great important for student learning. To stimulate the cognitive processes of the students, it is mandatory to create a frame for learning, and

in the context of this course, it is extremely important, as each course part builds directly on the previous part. A clear course framework and clarity on the expected outcomes may improve student motivation and help the students to create a frame for learning, leading to a higher degree of assimilation over accommodation (according to Piaget, Rienecker et al., 2015). In this way the students will be able to build a solid foundation for their coming courses.

In respect to the course learning outcomes from the student perspective, the following quotation highlights a student expectation on obtaining a toolbox that is useful after the course can be carried out in to the real world, and to future courses in the study program.

*"I very much agree that you get this toolbox that I can use both on myself and on others, which can lead to good discussions (with peers and trainers, red.), even when planning training."*

To expect a relevant output of a given course raises student motivation, which may positively affect student learning outcomes. This could also be facilitated by a high degree of course clarity and a red-thread throughout the course, which the students reflected upon during the second interview.

Q: "Based on the first interview, you expressed a clear perception of what the course content was and where it was going to take you. Do you have that same sense of feeling now that you have taken the course?"

*"Yes I think so. I don't think there has been any doubt as to in which direction we were going, and what the end goal was. However, there has been some bumps along the road that has been difficult to overcome."*

*Q<sub>follow</sub>: "Like what?"*

*"For our group the biggest problem was definitely to make the year plan. We knew more or less what we were supposed to do, but it was difficult to do it, and we felt that we more often than not were guessing on solutions."*

*"It (the course setup, red.) has functioned very well, although we now are finishing the 2<sup>nd</sup> phase and putting everything that we learned together. The way the course has been structured has been good and tangible. It has been very clear, first we do this and then we progress to this, and in the end we put it together."*

Q<sub>follow</sub>: “How about the rest of you, do you agree that the course have lived up to your expectations?”

*“It fits very well with what I have gotten out of the course... I would though have liked to gain a little more knowledge on the aerobic part of the course, which I have not so much, as we have worked very specific on either or (an aerobic or anaerobic sport, red.). However, overall I have learned more or less what I expected, and now the relevant papers are available (on the aerobic part, red.) so I can just go back and study them.”*

Q<sub>follow</sub>: “What about the two main topics of the course (work demands and capacity analysis vs planning of training), was there a red-thread connecting them, or do you feel they were more two parallel topics?”

*“Yes. There has been a good and clear red-thread; as you first do the work- and capacity-analysis including testing before you do the training planning based on the outcomes of the former two. It has made good sense to me. It’s been very good.”*

These positive comments reflect very well the experience we as teachers had with the course over the years, and reflect the student evaluation from previous years (**Figure 2**). Nonetheless, one comment also highlight that although the overall course content is in alignment, and all students replied a clear red-thread throughout the course, one must not lose focus on the detail:

*“... the course in general worked well, especially the part where you get held up on what you do along the course (2x student presentations within the specific course topics, red.), and you get to do your own thoughts at the end. However, in relation to the description of specific assignments, my group had problems interpreting specific requirements and what we were expected to do. It was difficult for us to solve at least one specific assignment, albeit the structure around it was good, however I hope and believe that it will make perfect sense in the end when we have to formulate our final synopsis.”*

This is further backed by comments regarding a lack of higher applicability between sport specific practice and theory, which can lead to student frustration, especially because this was primarily related to the two guest lecturers during the course.

*“I can clearly see what he means (the external lecturer, red.) when he says that things should be done in rowing, but how do I translate it to 100m (the specific group discipline, red.)?”*

*“At times I have missed the link between theory and practice. General theory on how to do the planning of training, in combination with specific guest lecturers. I’ve missed the specific link to my sport. I would have liked the teachers to sum up on guest lecturers and general theory stating here are the important and missing links, that allows you (the students, red.) to do this in your sport. It could have helped us in our training planning making it more specific rather than guessing on how to do it.”*

This highlights a specific need from the teachers to use more time translating and guiding the students towards the bigger picture. It could be done by taking time to talk the students through the specificities from the lectures pending it on general theories. Admission of guest lecturers (most often highly qualified national team coaches, red.) in the course is not an option, which is also highlighted by the outcomes achieved from these guest-lecturer sessions

*“Guest lectures showed just how specialized each sport is. The theory is the foundation and is used to find practices that work.”*

Overall, students experienced a course with a clear red-thread (a high degree of constructive alignment), and had high expectations for the course outcomes. Further, students expected to use previous acquired knowledge for the exam (which was not assessed in this study, as the 2<sup>nd</sup> interview was conducted prior to the exam). In addition, students’ expected to develop a relevant toolbox that could be applied in their own sports / in the future working with athletes. This is expected to create a strong individual motivation. Another important dimension of congruence is the teaching-learning environment including specific teaching styles and organization in group discussions. The latter is of great importance in the specific course, as a great part of the course is based on group work, including feedback on assignments and student presentations. From a teacher’s perspective, the focus on group work, presentations and feedback sessions as well as on hands-on testing should motivate the students, and keep them on track in the progression of understanding their sport over time. The outcome is, that the students are able analyze the amount and type of physical training for each specific athlete to improve from their current state to the set goal. At

the exam, the students have to be able to present their acquired skills into writing (a 1.5 h written exam based on a 4-page synopsis). This form of examination has limitations, and does not allow the students to show their practical skills within the given sport. Although paramount in a real-life setting working with athletes, it is outside the scope of the course to give the students these skills. Mainly because it takes years to develop. However, the theoretical toolbox offered during this course should enable the ones working with a specific sport in practice to develop these skills, as they should better understand the whole of the sport from a physical perspective.

In the following sections, we discuss the students' perspective and perception of the teaching-learning activities within the course, with specific emphasis on group work and on all lectures being online adhering to the flipped classroom, an instructional approach proven successful in a university setting (Hew & Lo, 2018).

### Group work

Group work is a mandatory part of this course, as all assignments and the synopsis is based on a group effort. Further, the groups created on the first day of lecturing, was also the groups used for discussions in online break-out rooms during lectures.

At first we asked the students to reflect on composition of groups:

Q: "How were the groups put together?"

*"Our group was put together on the basis on who we knew who from previous classes and of interest in the specific sport. Someone you knew, not necessarily someone you had worked with a lot before. It (the group, red.) was super productive and nice (to be in, red.)"*

Then we asked the students to reflect on how the group discussions worked (break-out rooms in Zoom) during online classes (the answers during the first interview are based on the 1<sup>st</sup> lecture, red.)?

*"I think it worked really well (also the technical part, red.). I think we were more effective than previously during on-site lectures, as there was less time spent on "hygge" within the group."*

With this, the student indicate online classes facilitate more effective cognitive process but at the expense of psycho-dynamic thrive. Further,

when asked what the expectations to the teacher's role in the discussion based work was during interview #1 the students' replied:

*"I expect them to be those wise sparring partners that facilitate discussions rather than provide an immediate answer. In that context, I think that if our group manage to setup up a good framework for how to work and discuss, we will go down a more reflected path ensuring that we gain more knowledge than usually. I imagine that we discuss in the group, then comes back to the lecturers for more discussion, before we are send back in the group to reflect upon the theme."*

*"I expect them (the teachers, red.) to show us what the important part of the curriculum is, what it is that we are expected to gain knowledge on and help us to put our reading into perspective. Furthermore, just being available when needed (in general and during lectures, red.). I also expect everything to be somewhat of a struggle, maybe not a struggle, but I expect this online teaching (use of Zoom, red.) to be new to the teachers as well, and that the course will be different from what they expect. Therefore, within my group we had strengthened our patience prior to the first lecture, and (we, red.) felt it was okay if the teaching was not flawless (also in relation to technical issues, red.)."*

The students have high expectations for the groups to work well, and expect the discussions to strengthen their learning outcomes. In addition, the relation to guiding in the curriculum, slides with speak were available prior to lectures, containing specific questions related to the papers and a prioritizing of papers for that specific lecture, which should help the students prepare and focus for the group discussions. In addition, the group work can also motivate the students' to prepare for class, which is an ever-returning issue during teaching, which is highlighted in this comment:

*"It (the learning outcome from the online group discussions, red.) is very dependent on whether people have read the papers/prepared in general. In my group we are three people, and yesterday one did not prepare which excluded that one person from engaging in in-depth discussions. Hopefully that can serve as a wake-up call for all of us, that without preparation the learning outcome in this setting is diminished significantly. . . Although sometimes with a busy schedule, it is nice just to show op to on-site classes on just sit back and listen."*

This comment highlights the fact that the student often like to prepare, but sometimes miss it due to personal reasons. Nonetheless, the group work and discussion based approach is perceived as a motivational factor for preparation, as they now not only answer to themselves but also to the other group members. The key point here being that the student acknowledge that the specific learning outcome decreases with lack of preparation.

For the second interview the students' were asked how they experienced the online teaching in general in relation to the high amount of group work.

*“It has worked very well. My group was quite quick to set aside a day for a specific period of time ... It has really been very nice. (getting it scheduled - easier to shut down as people usually work, which can make it hard to meet, red.). We met both physically and online. Online worked best as it was more productive (less fun, red.)”*

*“In our group, we have not adjusted what each individual wants, what one would like. It may also have reflected somewhat in the work. Someone has done a lot and someone has done less. ... The thing about finding a common position in relation to where the task should be cut from the start.”*

The statements above clearly indicate that based on the interviewed students, group work is a productive way to go, especially in relation to online teaching, which will be discussed in the following section, albeit group motivation should be set straight before engaging in in-depth group work. Other students may have less positive experience with group work.

## **Flipped classroom**

The following section is based on student's expectations and reflections upon virtual flipped class room, *i.e.* where all preparation as well as teacher-student interaction is online through a virtual platform (Zoom). The following questions were asked:

Q: “How do you expect your learning outcome to be influenced by all lectures being virtual/online?”

*“I think it's really good, especially that you can read before the lecture and really get into things, and then you can go into depth during the lecture. So basically, you might get a little more out of it in the long run. You have a better foundation when you show*

*up and discuss it further. Usually when you just show up and have not read so much, you first have to set all the basics before you can start discussing. So there is a much better basis for the discussion”*

This was further supported by

*“That way (by the flipped classroom model, red.) you will also get some help to target the reading. . . . I have often experienced that I have spent a very long time reading, and yet not succeed in agreeing with what was relevant. The slides are just really good and visibly shows in advance what is to know and I can plan my preparation from what I don’t and do understand”*

Q<sub>follow</sub>: “So you view/listen to the slideshow first and then read the curriculum afterwards as a follow-up?”

*“Yes, and even though it may result in a higher level of preparation, it is acceptable as it supports the learning outcome of the present course.”*

After attending the first lecture as adhering to the flipped classroom approach, the students were very positive towards the structure. They acknowledged that preparation was likely to be a bit more time consuming but better and resulting in them better participating in discussions during the lecture. This was supported by the following comments:

*”If you read the curriculum and if all (students, red.) are prepared, the flipped classroom has a huge potential because we get more reflection, also from the lecturers”*

*“... But yesterday, when both Mogens and Thomas (the two teachers, red.) were there, it was insanely cool. If there was the slight uncertainty, then you just said ‘do you agree, Mogens?’ That ping pong between the teachers show that everything is not hell-bent (which was motivating to the students), as it underscores that there are more roads leading to Rome, red).”*

This describes, that the students see flipped classroom as having the potential of facilitating an environment where they are able to engage in discussions with peers and teachers and hence develop procedural knowledge and perhaps even metacognitive knowledge (Krathwohl, 2002). Engaging in discussions with peers facilitate learning and even more when teachers critically discuss openly during class, as this creates an environment where a high degree of reflection is encouraged. Since the product of the present

course is for the students to create an assignment by combining their knowledge to an original product, the flipped classroom could be ideal as the students during rounds of discussion analyze and evaluate within the given topic. But, as also highlighted by the students;

*“If you read and come prepared, this form of teaching can result in a huge advantage because we reflect more, and even our teachers do. . . .I would expect that, reaching a level where the curriculum is being read thoroughly, there will be a high level of reflection creating a better possibility for engaging in discussions with peers and the teachers”*

The success of the flipped classroom is very much dependent on the students actually preparing for class and with that it is difficult if not almost impossible to participate if not prepared.

*“We are three in my group, and one hadn’t read yesterday, and then it isn’t really possible to participate (in the group work, red.). Hopefully it will be a wakeup call that you actually need to prepare to get something out of the lecture”*

In relation to their exam, the students said:

*“Receiving power point slides ease preparing for the exam, or in case where you are not able to attend the whole class.”*

*“When I prep for exam, I find it difficult to judge what is important. . . it makes really good sense to review the videos/slideshows.”*

*“What is it my teacher thinks is important here? It is a nice tool for targeting reading.”*

Thereby the flipped classroom may in addition of facilitating higher learning during the lectures enhance preparation for exam. There is though a flipside to the current course being completed as 100% virtual; the students are not able to attend to any practical lectures otherwise planned to support the theoretical lectures.

*“Receiving power point slides ease preparing for the exam, or in case where you are not able to attend the whole class. It creates the possibility of being more prepared. You get more time to get the hang of things, but unfortunately we missed out on some of the practical parts (due to covid-19, red.).”*

Flipped classroom entails a blend of different teaching styles where students constantly are challenged in their cognitive processes creating disturbances (a disequilibrium according to Piaget's knowledge-formation, Rie-necker et al., 2015) facilitating a deep-learning approach. Research based learning, as practiced in the present course, is a type of learning that falls within problem- and inquiry-based learning approaches (Healey & Roberts, 2004). Even these processes have the possibility of facilitating deeper learning (Elton, 2001) and higher motivation leading to a higher learning outcome (Jenkins et al., 2003), the aspect of completing the course virtually creates a double edged sword.

*"Motivationally it can be difficult, just sitting at home, because I love being at the University... now you're just home, thinking "I have plenty of time, so I'll just do it later", and then all of a sudden, there's just no time. Then you have spent all day on nothing. So I totally agree that it offers some opportunities (online lecturing, red.), but it also creates some limitations in terms of being motivated"*

Other students found the higher degree of self-management aspect creating possibilities.

*"I have taken more actively part in this course than in others... it has been nice to plan my own time to a higher extent than regular..."*  
*"Nice to be able to decide for myself when to study."*

These closing remarks highlights that with a proper preparation flipped classroom may increase the learning outcome among students but in order to reach all students the value of physical attendance at the teaching facility must not be neglected.

## Conclusion

In conclusion, student's expectations and perception on the present course as a natural elongation of their Bachelor program were fulfilled. Further, they felt the acquired competencies from previous courses sufficient to obtain course related knowledge and skills to further develop their competencies necessary for successful completion of the present course, *i.e.* an alignment within the educational organization.

Within the course the students found the individual parts complementary and supportive to one another and expected to be able to acquire a practically and applicable toolbox. Introduction of the flipped classroom approach was well received by the students as they could see a potential for improved learning outcomes and a more reflective path during lectures. In addition, the provision of slides with speak (mimicking the teachers view on the specific topic) was discussed as very helpful for each lecture, but also for the exam preparation (which was yet to come following the 2<sup>nd</sup> interview).

Finally, the success, *i.e.* learning outcomes, of all lectures being online is highly dependent of the individual student's preparation and ability to uphold their inner motivation although not being physically confronted on-site at the University. The lesser social interaction during on-line teaching may influence the students requesting a higher inner motivation that with on-site lectures. Using the on-line available pre-class slides students found themselves able to engage in discussions creating opportunity for deeper learning. In addition, the in-depth discussions could serve as a wake-up call for the student's as they clearly see *"that without preparation the learning outcome in this setting is diminished significantly."*

## Perspectives

The two rounds of group interviews reveal an overall good alignment between the students' expectations to the course and what they actually observed completing the course. Nonetheless, in the light of the coming courses being completed on a virtual or partly virtual basis, there are some things to take into consideration.

A contract between students with focus on if not unifying, then at least clarifying expectations to preparation to and engagement in group work will create a more homogeneous environment where all can take active part in all processes. Such a contract may also include a decision of working structure and thereby assist the student in prioritizing the necessary time for preparation. Further, within the constructive alignment, assignments should be clear to the students. Finally, with the huge overlap between practice and theory in the present course, more effort could be put into "student translation", especially when introducing external lecturers. These should be motivating as they give the students a glimpse of how Olympic athletes work and prepare. Because each sport is different, it is of utmost importance, that

the students grasp the theoretical toolbox provided to them, as it is crucial to them when translating theory into practice across different sports.

Based on the written student evaluations, received after the completion of the present manuscript, only 25% felt the on-line teaching was comparable to traditional lecturing in preparing them for exam. In light of the expected future use of on-line teaching, either the lecturing or the exam should be modified to create a higher alignment between the two.

## **Pedagogical reflection process**

Originally we planned to evaluate student generated take home messages during a University course. Training planning builds on its own blocks; if the students lack understanding of the primary topics, they are unable to succeed in upcoming topics (tower structure). Thus, there may be a risk of misalignments between intended and actual learning outcomes.

We planned for the assignment to include an investigation of an assessment tool. To do this we were to develop an evaluation tool assessing if students grasp the intended learning outcomes of each lecture.

Since all lecturing was converted to on-line, as a consequence of covid-19, we discussed an amendment of the project to focus on the use of the Flipped-classroom approach, as a new teaching method. Since none of our departmental supervisors were available, we had this discussion with our pedagogical supervisor.

The amendment resulted in the project being as presented.

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## **Improving congruence: setting the stage for meaningful interactions with experts**

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### **Background**

Congruence between didactic elements in a course can foster deep learning in higher education (Mørcke & Rump, 2015). These didactic elements include aspects of learning support, student backgrounds and goals, and the framework of course management (Hounsell et al., 2005). The concept of constructive alignment is further woven into the fabric of congruence and includes didactic elements of teaching and learning activities (TLAs), aims stated in the curriculum, and approaches for assessment and feedback (Hounsell et al., 2005). One of the main duties of a teacher is to keep these ships pointed in the same direction, and to continuously communicate to students throughout the course about how each element is progressing or being sustained.

A central goal in my own teaching is to create a supportive classroom atmosphere where students gain the confidence and competence to engage with complex ideas. This student-centered approach emphasizes communication, learning processes, and teacher-student relationships. These elements also comprise the connections of the didactic triangle upon which increasingly sophisticated pedagogical elements and course content can be layered (Mørcke & Rump, 2015). A focus on congruence and constructive alignment can help balance the didactic triangle and ensure that the pedagogical focus is divided optimally between the teacher, the students, and the course content.

In the study described below, I discuss an initiative I designed and implemented in a Masters-level course to improve congruence between the

course description, the syllabus, and assessment. The goal was to capitalize on real-world expertise of guest lecturers to facilitate authentic interactions between these experts and students to help them understand connections between theory and practice and motivate the students to invest in deep learning.

## The case study

I have been course-responsible for a 7.5 ECTS MSc-level course with up to 25 students called Invasion Biology that has occurred during Block 4 in the years 2019, 2020, and 2021. The field of Invasion Biology is uniquely situated at the interface of theory in ecology and evolution and a broad range of applied issues. In the 2019 and 2020 iterations of the course, I was dissatisfied with the ability of students to bridge these two conceptual hemispheres in their final essays and in their oral exams. Students can usually discuss the details of the spread and impacts of specific invasive species, but they tend to provide rather ‘superficial’ answers to questions about the underlying ecological and evolutionary theory that do not convey deep learning. The course also has a large number of visiting lecturers during the block from the ranks of academia, civil servants in the Miljøstyrelsen, and the private sector. I previously felt that this wealth of professional expertise was not adequately integrated into the summative course assessment.

I inherited this course in 2019 and have not yet made official changes to the official course description, which is divided into the following sections: Content, Learning outcomes (knowledge, skills, competences), Teaching and learning methods, Workload, Feedback form, and Types of assessment. In the course description, a general statement of the main Intended Learning Outcome (ILO) is provided:

*“To provide the students with in-depth knowledge of the population ecology and evolution of exotic and invasive species of animals and plants, including theoretical aspects. To provide insight into methods for studying the mechanisms responsible for the ecological success of these species. To give the students competence in discussing and assessing strategies to counteract possible detrimental effects of exotic species on existing ecosystems and human societies. To train practical skills in oral and written dissemination of the knowledge acquired.”*

The final sentence about ‘practical skills in oral and written dissemination of the knowledge acquired’ also led me to think more carefully about

the idea of competence-oriented education set forth by the University of Copenhagen's educational paradigm, and more generally by Danish universities since entering into the 'Bologna Process' in 1999 (Christiansen et al., 2015). Specifically, I've come to more clearly understand that I could deepen the learning experience by trying to maximize congruence between pedagogical elements and the students' backgrounds, knowledge, and aspirations (Hounsell et al., 2005).

To do this, I devised a project that aimed to help students understand: 1) how research is done in practice (including in their upcoming MSc projects), 2) that the skills gained during the course can be applied to a broad range of fields beyond academic research, and 3) there are many ways to be an amazing and productive scientist. I expected that I could inspire students to achieve deep learning by highlighting authentic real-world applications of their knowledge. I further sought to maintain high learning motivations by clearly linking specific intended ILOs with these overarching course objectives (*i.e.* fulfilling the 'expectancy' criterion, Bomia et al., 1997).

Below, I describe the specific didactic elements I developed to meet these goals and maximize pedagogical congruence.

## Case Study Discussions

In March of 2020, I had just finalized my Invasion Biology syllabus. Then came news of the impending lockdown and the need to shift to online-only education. Like many other teachers, I was forced to quickly reconfigure the course while also retaining the connections of the didactic triangle. One of my key aims was to maximize in-class activation and minimize passive lectures. For instance, I asked guest speakers to deliver pre-recorded lectures that I put on Absalon so that students could watch and re-watch them at their leisure. These speakers came from across the Universities of Copenhagen and Aarhus, the Ministry of Environment, and private companies. Each speaker presented a different 'case study' showing the real-world challenges posed by a specific invasive species and how theoretical concepts from class lectures and seminar discussions about published papers could help mitigate these challenges.

I realized that these brief (ca. 20 minute) pre-recorded case-study lectures were an important resource for the course and I wanted to better align them with other TLAs in the syllabus and with course assessment. I also

wanted to involve the guest speakers in the current iteration of the course without asking them to invest too much time preparing. I thus devised a new ‘case study discussion’ TLA that I hoped would improve congruence while also setting the stage for meaningful and authentic conversations between the students and professional experts in the field of invasion biology.

Additionally, the general goal of ‘preparing students to perform MSc-thesis level research’ is not explicitly listed in the course description. Yet—I felt that such an emphasis could help achieve greater student ‘buy in’ to the other deep-learning goals of the course—especially within constraints of the Zoom format. It seems as though this basic research competence is more important to the students’ future success than specific details about Invasion Biology. I plan to make this goal more explicit when I revise the course description in the future. Below, I describe the specific pedagogical elements that I used to implement this project.

### **Pre-class assignments about pre-recorded case studies**

I assigned seven pre-recorded case study lectures at standard intervals throughout the block. I reorganized Absalon to highlight that these case studies had an equal weight relative to other course elements (e.g. course lecturers, and seminar discussions about invasion biology manuscripts). I made each video PowerPoint visible to the students on Absalon a week before the scheduled discussion with the guest lecturer. I also opened up an assignment for each case study lecture whereby the students submitted three questions about the scientific content in the presentation. These assignments automatically closed two days before the respective case study discussion. This deadline gave me time to read through the questions and curate a list of questions to pose to guest lecturers during each case study discussion. While I initially asked my own questions in a free-flowing way during case study discussions, I revised this approach in response to a student email suggesting that I more formally pose student questions. The student wrote:

*... Thank you for some interesting Invasion classes these last few weeks. In relation to these case studies, I have an idea for future discussions. In the future could you maybe pick 3 or 5 of the ‘best’ questions that students submitted for a walkthrough with the case expert? ... this would hopefully make the discussion most relevant to what we are currently looking at, as well as being an encouragement to write some good questions to begin with. Have a nice day! xxxxxx*

While I decided not to explicitly link individual questions to specific students, I would preface questions by saying “several students asked about X”. I further took the step of organizing the questions into the following topic headings: 1) practical aspects of the research, 2) details about the focal invasive species and its impacts, and 3) the specific research approaches used to understand these impacts. I told students that submission of these questions would not directly count towards the final grade—but I encouraged them to participate—given the usefulness of the discussions for the reasons I described above. Participation remained high throughout the block, across the seven case study discussions.

### **Communicating unconventional approach with guest lecturers**

I felt that it was important to reassure the guest lecturers that the discussion exercise was a bit unconventional, given that I was asking them to emphasize some of the ‘softer’ aspects of science. I drafted a standard email detailing that I would moderate the discussion to keep the dialogue flowing. I emphasized that their pre-recorded presentation from 2020 would be used to bring students up to speed on the scientific details of their research. I noted that we would spend the first 15 minutes talking about the softer scientific aspects. I prepared the lecturers that it may be difficult to elicit much activation over Zoom, that I would curate a list of student-provided questions to keep ask the lecturers. In other words, I would act as a student surrogate.

### **Encouraging meaningful dialogue with experts in the field**

After we finished discussing scientific aspects of the case study, I helped discussions transition to ‘softer’ aspects of the process of actually doing science or working with invasive species. I previously instructed lecturers that while they did not have to prepare anything concrete for the discussion event, they should think through the following three questions:

- **First**, *what are the important practical aspects of doing your research that are not covered in any textbook? (e.g. How do you actually do research? How do you spend your time?)*
- **Two**, *what are some specific issues about your study organism where you are most excited to see research increase or that challenge current assumptions in the field of invasive species biology?*

- **Three**, can you elaborate more generally on some of the most difficult and most exciting parts of your job (or doing research more generally)?

As discussions proceeded, I could sense a shift in the tone of the conversation when we transitioned to these questions. Each of the case study discussions organically took on its own focus and depth. One discussion with a professor nearing retirement focused on long-term changes in how science is done and perceived by the public. Other discussions focused on the pros and cons of practicing science as a civil servant at the ministry of environment (compared to doing academic research), the stresses of getting funding and dealing with stakeholders, the value of international networks, the challenges and opportunities of interdisciplinary collaboration, the value of fieldwork and working in different scientific/societal cultures, the practical aspects of publishing results of a Masters thesis, and alternative career paths in which skills from a MSc in biology can be applied. I received several positive feedback emails from students during the block. For example, one student wrote:

*“Dear Jonathan, I am currently following the course Invasion Biology and I just wanted to let you know that I think it is really, really nice how you encourage guest lecturers to talk about practicals like the ‘real life’ as a biologist, work, studies, and so forth. That is a subject that I personally think a lot of the other courses (and KU in general) lack, so that is very nice. Thank you! Best regards, xxxxx.*

I received similar feedback from guest lecturers. I was encouraged that despite their varied personalities, approaches to science, and cultural backgrounds, all guests approached the experience earnestly and were happy to share their personal experiences as a scientist. Time generally just flew by. While active participation by students varied, many kept their Zoom cameras on and I could tell they were engaged in the discussion.

### **Reflecting on successes and failures with pedagogical advisors**

One case study discussion was observed by my departmental and external pedagogical supervisors. We focused on active student participation (or lack thereof). While student questions were front and center in the discussions, most of the students ended up being rather passive observers during the event. We discussed several benefits of the question submission assignment, including that it: 1) enabled students to sit and ponder the lectures, 2) reduced the stress of having to ask questions live at the event, and 3)

enabled me to control the quality and moderate the flow and focus of the exchange between students and the expert. The main drawback was that this yielded a more passive dialogue between students and the guest expert. We also discussed whether I should enforce that the students turned on their cameras during the discussion, given that it may be perceived as impolite by the guest lecturer.

I have also noticed class-size thresholds beyond which student participation in plenum discussions over Zoom becomes concentrated in a few students. Some participation issues may thus have stemmed from the 'large' class size (capacity enrollment of 25 students). I considered using breakout rooms to encourage smaller group activation, but I ended up deciding against this as I thought it would interrupt the flow of the discussions and not make the best use of the time dedicated by guest lecturers. Instead, I used 'course management' to enhance congruence here by pairing each 45 minute case study discussion with other TLAs that maximized student activation (e.g. seminar discussions). Additionally, the pre-discussion assignment provided a 'flipped classroom' element where student activation occurred independently outside of class.

My pedagogical supervisors also brought up issues of constructive alignment between case study discussions and other TLAs occurring directly before and after the discussions. For instance, a given case study discussion on the invasion trajectory of the Japanese Rose in Denmark was not immediately related to a lecture on 'zoonotic disease transmission' that occurred immediately before, or a seminar discussion on a paper about an experimental approach to testing the Biotic resistance hypothesis that occurred immediately after. I was less concerned with this, as it would have been nearly impossible to achieve this alignment while walking the tightrope of avoiding scheduling conflicts with guest lecturers.

We also discussed whether I should more explicitly link questions to the specific students who posed the questions. I felt that I already had enough 'buy in' from students submitting questions, and that rewards from adding this extra element would not reflect the large amount of work this would require on my part. Another suggestion was that I could structure the discussions more like seminars, where a focal group of 4-5 students was selected for each case study discussion to be in charge of curating a list of questions and guiding the conversation. This was seen as risky from my end, given that the exercise was already unconventional, and a clean line had to be drawn between overly personal questions.

## Improving congruence through assessment

I used three main forms of assessment of the case study discussion TLA. I first provided implicit formative assessment regarding whether or not I selected student questions to pose to the visiting lecturer during the case study discussions. The other two forms of assessment were summative. I describe these briefly below.

### Essay assignment

Half of the grade in the course was determined by a final essay that was composed in the final three weeks of the course using fairly specific formatting guidelines (e.g. page limit, citation structure, text size and spacing, etc.). The main goal was to bridge theoretical aspects of invasive species biology and applied aspects related to case studies of specific invaders. The essay was also framed as a 'grant pre-proposal' designed to provide authentic practice of developing hypotheses and visualizing data that would be central to their own Masters thesis research projects. Students were given the following mandate: "*You are a scientist who wants to acquire funding to study the mechanisms of invasive success of a particular invasive species*".

Students were instructed to write essays with two sections. The first was a brief case study outlining why a specific invasive species is a problem and what is known about the species' distribution, impact, and management. For inspiration, I referred students to the pre-recorded case study lectures and the IUCN website database on the 'world's 100 worst invasive species' ([http://www.iucngisd.org/gisd/100\\_worst.php](http://www.iucngisd.org/gisd/100_worst.php)). Students could not select a focal species that was in this database. I also provided students with a list of theoretical topics that should be addressed in the case study (e.g. transport vectors, ecological and evolutionary mechanisms of invasive success, etc.), and recommended students review the textbook and course lectures available on Absalon. I additionally, guided students to the homepage of the scientific journal "Biological Invasions" where they could get inspiration on choosing focal invasive species.

The second part of the essay was to develop a hypothesis explaining the invasive success of their focal species, including a schematic figure. I helped students review a suite of hypotheses we discussed in the course and gave them some tips about thinking through temporal and spatial scale when developing their hypotheses. The final element of the essay was to devise an experiment to test their hypothesis. I told students they could

generate the figure in Excel, R, or other program using ‘dummy’ data to illustrate the expected result(s) if their experiment supported their hypothesis. Throughout the block, I had emphasized the importance of efficiently and deeply understanding what scientists communicate in figures, and how figures can be used to understand the logic of hypotheses. I was thus pleased that I could improve constructive alignment by integrating this course objective into the essay assignment. Before communicating this assessment plan with the students, I reviewed it with another course instructor from my section that was well-versed in invasion biology.

### **Formative and summative assessment on essay assignment**

I provided students with formative feedback on three occasions as they developed their essays. One week after receiving the assignment, I held a Zoom workshop where students gave brief (3 slides) PowerPoint presentations with their ‘title, idea/hypothesis, and figure’. While not graded, I told students that they would benefit from being prepared—as this would allow me (and another professor/guest observer) to provide them with more detailed feedback. After 2 weeks, I held two well-attended essay workshops where students could ask additional questions on Zoom. I and a guest professor met with individuals and groups in Breakout rooms with the stated goals of: 1) getting help with data/figures, 2) meeting with me and group members, 3) getting input from fellow students, and 4) opportunities to ask questions about general concepts from the course.

Summative assessment occurred during the final oral exam. Students prepared 6 minute PowerPoint presentations of their essay. These presentations were followed by a 6 minute discussion between the student, myself and an internal censor. Feedback was provided at the end of the students’ oral exam in the form of a final grade and our reflection on the details of their written essay and the oral PowerPoint presentation.

### **Conclusions**

I was generally pleased with the ways that a focus on congruence improved the quality of the essays and the integration of theory and practice demonstrated during the oral exams. When compared to previous years, students showed an enhanced ability to discuss specific hypotheses and to support their conclusions with specific case study examples. Student comments

were generally positive although, not surprisingly, this approach was not for everybody. And, while I believe that students are leaving this course better prepared for formalize their Masters thesis projects and place the scientific skills they gain in the bigger picture of ultimate career goals, other students would prefer that I stick to more theoretical aspects of Invasion Biology. I look forward to improving the case study discussion approach for next year's course.

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**Using problem based approaches**



## Hvordan kan planlægningen af et problemorienteret kursusforløb understøtte et sammenhængende læringsforløb?

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### Baggrund

Hjertecentrets (Rigshospitalet) 1-årige uddannelses- og træningsforløb er et projektorienteret kursusforløb for sygeplejersker, som har til formål at forbedre den faglige ydelse til patienterne, samtidig med at sygeplejersken opnår nye kompetencer (*Kursusbeskrivelse* appendix A). Kursisterne kommer fra forskellige afsnit og har varierende klinisk erfaring. Kursisterne vejledes af klinisk sygeplejespecialist fra eget afsnit under udarbejdelse af projektbeskrivelse og gennemførelse af projektet. Flere gange under forløbet præsenterer kursisterne status for projektet, for en vejleder og medkursister, i forud aftalte grupper (2 - 3) med 4-6 kursister. Parallelt hermed er der kursusdage gennem hele kursusforløbet, hvor der undervises i teorier og metoder indenfor sygeplejefaget. Projektbeskrivelse og gennemførelse af projektet bliver tidligt i forløbet det altdominerende fokus hos kursisterne. Nogle kliniske problemstillinger er rettet mod specifikke patientpopulationer, mens andre har mere generisk karakter. Visse problemstillinger er udsprunget af eksisterende projekter og andre er helt nye, og derfor er projektprocessen på forskellige stadier allerede ved kursusforløbets begyndelse. En konsekvens heraf er, at deltagerne oplever utakt mellem timeline i projektet og undervisningen på kursusdagene, som udmønter sig ved at undervisningen ofte ikke opleves meningsfuld i relationen til projekt og det samlede kursusforløb. Kursisterne oplever ikke kongruens mellem undervisning og den projektorienterede form, hvilket viser sig som frustration og bekymring, hvilket ikke er befordrende for undervisnings- og lærings-

miljø. Desuden er der hos nogle undervisere bekymring over kursisternes noget kritiske tilgang til deres undervisning, som ikke tolkes specifikt at omhandle underviserne, men fremstår som en mere overordnet frustration. Derfor vil det primære pædagogiske fokus i være at understøtte et sammenhængende kursusforløb som i den aktuelle form opleves som to parallelle forløb; projekt med udarbejdelse af projektbeskrivelse og gennemførelse af kursusdagene, hvor der burde være en oplevelse af kongruens.

## Mål

Målet for dette projekt er derfor at integrere de to dele til en helhed som er tydelig eksplicit for at opnå et sammenhængende kursusforløb, som understøtter måden som stoffet og undervisningen ønskes tilgået for at fremme læring. Derfor ønskes følgende undersøgelsesspørgsmål undersøgt i dette projekt: *Hvordan kan planlægningen af et problemorienteret kursusforløb understøtte et sammenhængende læringsforløb?*

## Problemorienteret projektarbejde

Det problemorienterede projektarbejde har siden 1970'erne været en dominerende studieform ved Universitetscenterne i Roskilde og Aalborg som et kritisk modstykke til de eksisterende undervisnings- og studieformer. Knud Illeris' definition af akkomodative og assimilative læreprocesser er blandt andet noget af den forskning som udviklede sig til det didaktiske koncept; det problemorienterede projekt arbejdet. Med henvisning til Piagets teorier om læring definerede Knud Illeris akkomodative læreprocesser (omstrukturering af kognitive strukturer), som en forudsætning for at kreative læreprocesser kan finde sted. I hans perspektiv sker hensigtsmæssige læreprocesser, når de studerende tilegner sig færdigheder, tilpasningsevner og kreativitet i en vekselvirkning mellem akkomodative processer og assimilative processer (indlemmelse af ny viden i eksisterende kognitive strukturer) (Illeris, 1999). Det problemorienterede projektarbejde er kendetegnet af principperne: gruppearbejde, projektorganisering og deltagerstyring, problemorientering, kobling af teori og praksis, det eksemplariske princip og tværfaglighed (Kolmos, 1996; Krogh & Wiberg, 2013). Elementer som i et eller andet omfang indgår i dette projektarbejde. Karakteristisk ved projektorienteret projektarbejde er en høj grad af studenterinvolvering og praksisnære som

teoretiske problemstillinger. Et væsentligt princip i det at arbejde projektorienteret, er for de studerende at lære kunsten selv at identificere, definere og formulere, problemformuleringer, der er relevante at arbejde med i forhold til et givet fagligt område. Derigennem skulle den studerende lære at agere professionelt i en praksis, idet problemstillinger ofte ikke er veldefinerede og afgrænsede. Forud for og sideløbende med, undervises den studerende i fagets teorier, teknikker og metoder, hvor disse ses som redskaber til såvel problemindkredsning som problembearbejdning. En gennemgående ide i problemorienteret projektarbejde er, at der skabes en forbindelse mellem teori og praksis. Vejlederen i denne kontekst vil være både fag- og procesorienteret og agere som fagperson, proceskonsulent og bedømmer, hvilket fordrer opmærksomhed.

## **Intervention**

Interventionen som ønskes afprøvet i projektet består af tre dele; introduktionsmøder, refleksionsdagbog og peer-feedback, som enkeltvis beskrives nedenfor.

### **Introduktionsmøder**

For at kunne agere i et kursusforløb som kursist og underviser, er kendskab til rammerne essentielle, og argumentet for den første del af interventionen består af introduktionsmøder. Disse afholdes før kursusforløbet starter med opfølgning under forløbet. Der er tre møder med følgende mødedeltagere: i) undervisere og kursusleder; ii) vejledere, præsentationsvejledere og kursusleder og iii) kursister, kliniske sygeplejespecialister, afdelingssygeplejersker og kursusleder (beskrivelse Appendix B). Fælles for alle tre møder er at give indsigt i problemorienteret projektarbejde. Formålet med det første møde er at give indsigt i undervisningsemner og at underviserne mødes samt at sikre en sammenhæng mellem de enkelte undervisningssessioners læringsmål i forhold til overordnede læringsmål. I det andet møde er formålet at italesætte vejledning og peer-feedback (beskrivelse nedenfor). Det sidste møde skal være med til at give aktørerne et samlet overblik over kursusforløbet, at forventningerne til de enkelte grupper af aktører er tydelige og at der er mulighed for at stille opklarende spørgsmål.

## Refleksionslogbog

Sammenhængen mellem projekt og undervisningsemner er ofte utydelig for kursisterne og kan medføre at kursisterne ikke kan se, hvad de skal bruge undervisningen til. Det skulle gerne blive mere eksplicit, når læringsmålene for de enkelte undervisningssessioner målrettes de overordnede læringsmål. Som supplement hertil er en logbog et redskab til at skabe refleksion hos kursisterne, hvor hensigten er at understøtte kursisters læringsforløb (læringsmål se Appendix B). Refleksionslogbogen er inspireret af Deweys begreb refleksiv tænkning som beskrives som; ”den form for tænkning, der består i at vende et tema i hovedet og underkaste det en alvorlig og sammenhængende overvejelser.” (Dewey, 2009) Derfor introduceres kursisterne til refleksionslogbogen i begyndelsen af forløbet. Det pointeres at refleksionslogbogen ikke indgår i nogen bedømmelse af den enkelte kursists præstation. Refleksionslogbogen skal understøtte læring, og afleveres sammen med den endelige projektbesvarelse.

## Peer-feedback

Peer-feedback er tænkt som en fast del, når deltagerne flere gange gennem kursusforløbet har præsentation af deres individuelle projekter (læringsmål se Appendix B). Aktuelt foregår feedbacken i mindre grupper med 4 studerende, hvilket fastholdes. Peer-feedback introduceres tidligt i kursusforløbet. Der er læringspotentiale i at inddrage og modtage feedback, og i at modtage og give peer-feedback. Et perspektiv som blev bekræftet jævnfør UP-for-projekt (Johansen m.fl., 2021). For at understøtte læringspotentialet tildeles kursisterne en makker, og makkerparrene er indbyrdes forpligtet til at samle den givne peer-feedback under præsentationerne. Der planlægges undervisning i peer-feedback herunder hvilke kriterier der gælder for peer-feedback. Her italesættes det også, at det kræver træning at give konstruktiv peer-feedback, og at det derfor skal finde sted i et trygt læringsmiljø. I og med at projektet vil progrediere, vil en tilretning af evalueringskriterierne være nødvendig i løbet af forløbet.

## Gennemførelse af intervention og evaluering

Idet interventionen i dette projekt grundlæggende omhandler flere forslag til ændringer i det samlede kursusforløb, har det ikke været muligt at afprøve den indenfor projektperioden, da det kommende kursusforløb først

påbegyndes april/maj 2022. Derfor er interventionen evalueret gennem fire individuelle semi-strukturerede interview af to kursusedtagere (K1 + K2) og to undervisere (U1 + U2). Interviewenes længde var 16 til 26 minutter og relevante dele af interviewene er transskriberede. Væsentlige pointer fra interviewene fremstilles med brug af citater i resultatafsnittet og diskuteres i en pædagogisk kontekst i diskussionsafsnittet. Se Appendix C for interviewguide.

## Resultater

Resultaterne præsenteres relateret til de tre interventionsdele.

### Introduktionsmøder

Introduktionsmøderne ses af kursister og undervisere som en måde at give en fælles forståelse for kursusforløbet. Underviserne fremhæver, at støtte til udarbejdelse af læringsmål og mulighed for et større kendskab til den resterende gruppe af undervisere og emner for undervisningen vil være gavnligt og få indflydelse på kontinuiteten i kursusforløbet.

*"For det første bliver der ikke nogen rigtig sammenhæng for kursisterne. Jeg ved ikke, hvad de andre underviser i og der bliver heller ikke nogen sammenhæng til det overordnede mål nødvendigvis. Man kunne godt have en anden planlægning i forhold til underviserne, så vi også var klædt bedre på til at gå ind og støtte om projekterne og målrette undervisningen i forhold til det. Så kunne man sige til kursisterne, at når der kommer den undervisning, skal du være opmærksom på eller man kunne referere til hinanden. Så det bliver mere sammenhængende for kursisterne. Det har stor betydning at få målrettet læringsmålene. (U1)*

*"... jeg fik at vide af kursisterne, at der var uoverensstemmelse mellem mine læringsmål og underviseren som har den anden del af emnet. Det var tydeligt, at det var svært for kursisterne at relatere undervisningen" (U2)*

*"... Der er uoverensstemmelse mellem målene for undervisningen og de overordnede mål."(K2)*

### Refleksionslogbog

Angående undervisningen, så tilkendegiver informanterne at den har været relevant, men det kan være vanskeligt at se og forstå i den konkrete undervisningssituation:

*"Jeg kan jo godt se at al undervisning har givet mening, men den indsigt har jeg først fået bagefter. Det er frustrerende at være i, men det giver mening bagefter". (K1)*

*". . . . Der er ikke noget af den undervisning som vi har haft, som har været dårlig." (K2)*

*I forlængelse heraf ser informanterne logbogen som et kærkomment støttende læringsredskab:*

*"Hvis man ikke lige står og skal bruge undervisningen ryger den lidt i baggrunden. Så er det måske bare viden, som kommer ind og forsvinder igen, fordi den ikke bliver brugt. Man skal bruge det og arbejde med det. Til det med logbog tænker jeg, at hvis det lige er en halv side om hvad er det egentlig jeg er blevet undervist om, og hvad har jeg lært; hvad kan jeg bruge det til? Så lyder det fornuftigt og det er jo forholdsvis konkret. Det skal være brugbart og ikke noget med at føles efter. Det tror jeg nemlig er rigtig godt, fordi jeg kan høre, når de fremlægger, at de har glemte det (tidligere undervisning) hele fra tidligere". (UV1)*

*"Det synes jeg lyder rigtig spændende. Man kan sige, at der er en forventning om, at de sygeplejersker, der har været på træningsforløb, har fået en anden indsigt i organisationen og en anden analytisk indsigt. Du har lært noget metode, så er der jo også en forventning om at du kan gå tilbage og se mere refleksiv på din egen praksis. Så jeg tænker faktisk, at det kunne være en rigtig god øvelse som led i det. Så der er helt klart flere formål." (U2)*

*"Hvad er det for en tanke jeg havde lige her? jeg synes også selv, at det er svært når man i slutningen af undervisningen skal sætte sig og tænke: Godt hvad har jeg lært i dag? Og hvad skal jeg tage med mig? For jeg skal bruge længere tid på det. Jeg skal nogle gange ud at være i en anden situation før det kommer . . . . Gud, ja det giver mening. . . . For undervisningen handler jo ikke kun om dette projekt, for lige pludselig er der mange andre sammenhænge, hvor det er relevant." (K1)*

## **Peer-feedback**

Kursisterne ser peer-feedback som en oplagt ramme ved projektpresentationerne. En ramme som faktisk efterlyses: *"feedback-delen kunne man helt sikkert sætte i system, så der var en ramme hver gang"* (K2). Samtidig kunne feedback-delen bruges til at målrette præsentationerne:

*”Det kunne også gøre, at præsentationerne blev mere målrettet. Som det er nu, så kommer de bare og præsenterer og så sidder man der og synes at man skal finde på noget og det kan godt blive lidt tilfældigt.”(U1).*

Det har stor betydning at vide, hvad ens opgave er som medkursist og her er rammerne er ikke uvæsentlige:

*”Jeg har været i tvivl om, hvad er min rolle ud over at være et ansigt, som min medkursist skal tale til, men hvad skal jeg ellers? For man får jo mange ideer fra hinanden, som man kunne have brugt mere tid på, hvis det blev sagt at nu er planen følgende ... ”(K2)*

En anden vinkel som positivt fremhæves, er med fokus på peer-feedback, når den er fremadrettet. Informanterne mener, at det er vigtigt at viderebringe feedbacken, men det er ikke altid let:

*”Man fremlægger og man tager det hele ind og også skrive noter. Det er overvældende og samtidig er det jo næsten den vigtigste feedback der er. Det er hardcore at få feedback og jeg er ikke sikker på, om man lige er parat til det. Så en makker kunne være en god ide på mange måder.” (K1)*

*”Jeg har udfordringer med, at der ikke bliver skrevet noget ned af kursisten. Så skriv nu noget ned! For så starter vi lidt forfra igen og så kan det godt være lidt svært. Jeg synes, at der er skabt et trygt miljø for både at give og modtage feedback, så mere formaliseret peer-feedback er oplagt ” (U2).*

## Diskussion

I det følgende diskuteres resultaterne i en i en pædagogisk kontekst.

Introduktionsmøderne ses som en måde at få fælles forståelse og viden om kursusforløbets overordnede ramme og herunder hvad der forventes af de enkelte aktører. Det at vide hvad man skal og hvad der forlanges, kan være et fundament for et trygt undervisnings- og læringmiljø (Horst & Ingerslev, 2013). I den overordnede ramme indgår læringsmålene og det viser sig netop at uoverensstemmelse mellem læringsmålene eller manglende, ikke er befordrende for et sammenhængende forløb. Væsentligt er det også, at der ikke ses en sammenhæng på tværs mellem de enkeltstående undervisningsseancer og her kan de foreslåede mødefora mellem underviser/kursusleder og vejledere/kursusleder være med til at initiere det. Vil-kårene for at denne sammenhæng kan opstå vil være, at man i underviser- og vejledergruppen har en høj grad af fokus på at understøtte kursisters læring og som de målrettede læringsmål kan være en naturlig del af (Dolin,

2013; Jørgensen, 2013a, 2013b). Der er også fokus på læring ved at indtænke refleksion som et aktivt i kursusforløbet. Trods kursisternes ”fortvivelse” over undervisningen, så viser undervisningen sig at være brugbar. At denne erkendelse først har vist sig nogen tid efter den aktuelle undervisning, viser meget tydeligt at undervisning er en proces som er tilrettelagt, så kursisten lærer noget. Undervisningen skal være med til at fremme læring, men det er ikke givet at det sker i selve undervisningssituationen (Dolin, 2013). Refleksionslogbogen er et understøttende læringsredskab som kan bruges tidsmæssigt væk fra den reflekterende aktivitet, og derfor er der ingen tidspres og handletvang. Det foregår i et i et ”præstationsfrit refleksionsrum”, idet der ikke er nogen underviser involvering, hvilket kan være med til at minimere kursisternes præstationsangst. Det kan opleves som en krævende proces, fordi der tænkes ud af selvfølgeligheder (Dewey, 2009).

Udover at give kursisten en mulighed for refleksion over egen læring, kan refleksionslogbogen også bruges til at vise kursistens udvikling over tid. Her bør fokus være refleksionen over undervisning for at guide kursisten til meget konkret, at tænke over den konkrete undervisning og hvad det har givet af viden/overvejelser. Som en af informanterne giver udtryk for, kom læringen ikke i undervisningssituationen, men i en anden sammenhæng. Det henfører til Deweys udfoldelse af begrebet refleksiv tænkning og dens betydning for uddannelsesprocessen førende til, at studerende skal få lyst til at undersøge og reflektere over det, de har lært (Dewey, 2009). Et perspektiv som er interessant og brugbart, set i lyset af de to dele i et problemorienteret projektarbejde som er svært for kursisterne at være i, men som i et eller omfang er en præmis for det problemorienterede projektarbejde (Krogh & Wiberg, 2013). Den sidste interventionsdel, peer-feedback, er også en undervisningsaktivitet som retter sig mod læring for både den der giver, og den der modtager. Desuden får de ikke præsenterende kursister en aktiv rolle og det viste sig, at der faktisk var en stor interesse for peer-feedback fra kursisternes side, i forhold til at blive bragt i spil ved projektpresentationerne. Ved alle former for feedback er det essentielt som kursist eller studerende fremadrettet at bruge feedback. På trods af det så tilkendegiver både studerende og undervisere i studier som her, at feedback ikke bruges fremadrettet og i værste fald slet ikke (Rienecker og Bruun, 2013, 259).

## Konklusion

Dette projekt har undersøgt hvordan planlægningen kan understøtte et sammenhængende problemorienteret projektarbejde. For at få svar på undersøgelsesspørgsmålet blev der taget udgangspunkt i et konkrete kursusforløb og dets anvendte didaktiske koncept og de bagvedliggende tanker og overvejelser ved at bruge dette. Disse overvejelser blev sammenholdt med de udfordringer, kursister og undervisere har givet udtryk for. Overvejelserne førte til udarbejdelse af en intervention, rettet mod nogle centrale udfordringer og under hensyntagen til det anvendte didaktiske koncept. Resultaterne fra dette projekt bygger ikke på en praktisk afprøvning, men en ”teoretisk” afprøvning. Konklusionen må være at de forslåede interventioner potentielt vil give et mere sammenhængende projektorienteret kursusforløb og forhåbentligt et styrket læringsforløb. Trods den positive feedback fra informanterne, så skal interventionen afprøves og evalueres før der kan drages større og endelige konklusioner.

## Feedback og perspektiver

Dette pædagogiske projekt er i flere omgange diskuteret med uddannelsesansvarlig Camilla Bernild, Hjertecentret, Rigshospitalet, som har været min kliniske vejleder i UP-forløbet. Her fremhæves nogle centrale diskussioner i projektførløbet. En af de indledende drøftelser var om refleksion, både brug og betydning af begrebet, som jeg var optaget af i kobling til læring i relation til kursusforløbet. Det gjorde mig mere bevidst om at anvende refleksion (refleksionslogbog) som en interventionsdel. Da det blev besluttet ikke at starte et nyt kursusforløb under mit UP forløb, drøftede vi om strategien skulle ændres og i stedet for en samlet intervention, så kun at afprøve én eller to dele. Denne strategi fravalgtes, da den samlede intervention var designet til at understøtte et mere sammenhængende kursusforløb. Konsekvensen heraf var det bevidste valg, at evalueringsprocessen blev anderledes. Ved sidste feedback på det afsluttede projekt, fremhævede Camilla, at de tre interventionsdele retter sig mod pædagogiske begreber som; undervisere og vejlederes rolle og opgaver, feedback til at fremme deltageraktivitet og refleksion som en tilgang til at understøtte læringsforløb. Informanternes positive reaktion giver forhåbning om at de teoretiske overvejelser fungerer i praksis. Camilla ser frem til at følge inkorporeringen af interventionen i det kommende kursusforløb i foråret 2022, hvor de første introduktionsmøder er planlagt til begyndelsen af februar. Hertil følger at beslutte en

evalueringemetode til interventionen når den inkorporeres i det kommende kursusforløb.

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## A

### Kursusbeskrivelse

#### Beskrivelse af Hjertecentrets 1-årige uddannelses- og træningsforløb

#### Formål og mål for uddannelses- og træningsforløbet

Det overordnede formål for uddannelses- og træningsforløbet er at forbedre den faglige ydelse til patienterne, samtidig med at sygeplejersken opnår nye og ønskede kompetencer. Det forløber i to spor, hvor det ene spor retter sig mod et klinisk projekt, og det andet spor retter sig mod at styrke sygeplejerskernes organisatoriske kompetencer til at lede mindre forandringsprocesser og implementere den viden, projektet frembringer. I begge spor er der fokus på at styrke kompetenceelementer som: evnen til at forholde sig kritisk til egen praksis, faglig og videnskabelig argumentation, kompetence til refleksion, evne og vilje til handling samt analytiske og praktiske kompetencer til at gøre dét, de lærer. Dette sker i tæt samarbejde med den kliniske sygeplejespecialist eller ph.d.-studerende, som er projektansvarlig

Målet er, at deltagerne:

- videreudvikler deres analytiske kompetencer til at identificere kliniske problemstillinger og indhente og kritisk vurdere den nyeste viden inden for det pågældende felt.
- udvikler kompetencer til at formulere undersøgelsesformål, indsamle og opgøre data om egen patientgruppe.
- udvikler kompetencer til at anvende denne viden i eget afsnit og formidle viden til patienter og kollegaer.
- styrker deres evne til at reflektere over egen praksis og argumentere fagligt og videnskabeligt for valg af kliniske beslutninger.
- kender og anvender metode til forskning og kvalitetsudvikling.
- får øget indsigt i metoder til at evaluere projektets effekt for patienten.
- får øget viden om begreber og teorier i sygeplejen - og deres betydning for kvaliteten for patienterne.
- får viden om begreber og teorier til analyse, forandringsstrategier, læreprocesser og pædagogiske aktiviteter, der fremmer forankring af den viden og de resultater projektet frembringer.
- etablerer netværk med mulighed for at diskutere, udveksle og drage nytte af hinandens personlige og faglige viden, erfaringer og ressourcer under træningsforløbet.

#### Deltagere

Deltagerne er sygeplejersker, som afdelingssygeplejersken og de(n) kliniske specialist(er) ønsker at kvalificere til at kunne indgå i udviklingsarbejde og fx varetage ansvaret for kvaliteten af sygeplejen inden for et specifikt område eller deltage i klinisk udviklings- og forskningsarbejde ledet af den kliniske sygeplejespecialist

#### Indhold

- Patientperspektiv og patientinddragelse
- Udvalgte sygeplejeteorier, begreber og betydningen af teoretiske perspektiver for kvaliteten i pleje og behandling
- Vidensformer i de kliniske beslutningsprocesser – den pædagogiske refleksionsmodel
- Kvalitetsudvikling – anvendelse af eksisterende forskning
  - Metode til kvalitetsudvikling
  - Evidensbaseret sundhedsvæsen
  - Baseline
  - Litteratursøgning
  - Udarbejdelse af abstract, poster og PowerPoint
- Forskningstyper og metoder
  - Videnskabelighed og videnskabsteoretiske overvejelser
  - Teoretisk referenceramme
  - Kvalitative og kvantitative metoder
  - Etik

- Problemstillingen bestemmer metoden – valg af metode
  - Dataindsamling, analyser, resultater/fortolkning, validitet, reliabilitet, fejlkilder, statistiske grundbegreber, populationsstørrelser, måleskalaer og spørgeteknikker
- Læring, læreprocesser og forankring af viden
  - Teori og begreber til analyse som afsæt for en ændringsproces
  - Forandringsstrategier, aktiviteter og metoder

#### **Metode**

- Projektmetoden: Udgangspunkt i den kliniske problemstilling med udarbejdelse af projektplan. Undervisning med efterfølgende grupperefleksioner og øvelser.
- Analyse og vurdering af forskningsartikler i forhold til forskningsresultaternes anvendelighed for klinisk praksis.
- Vejledning.
- Præsentation i plenum af eget projekt i grupper af 4-5 kursister med henblik på feedback.

#### **Bedømmelse**

Projektet præsenteres ved afslutningen, og projektopgaven afleveres til kursusleder, som godkender denne.

# B

## Intervention

### Introduktionsmøder

#### Introduktionsmøde I

Deltagere: Undervisere og kursusedler  
 Tidspunkt for møde: Minimum fire måneder før kursusstart med opfølgning 1-2 gange under forløbet

#### Formål

- At underviserne introduceres til kursusforløbet og undervisningsform(metode)

#### Mål

- At underviserne får indsigt i metoden og får en forståelse for hvordan de skal agere i forløbet.
- At underviserne kan udarbejde læringsmål for egen undervisning med baggrund i de overordnede læringsmål
- At udarbejde arbejdsproces for udarbejdelse af læringsmål for de enkelte undervisningssessioner

#### Væsentlige oplægsemner

- Problemorienteret projektarbejde

#### Introduktionsmøde II

Deltagere: Vejledere, præsentationsvejledere og kursusedler  
 Tidspunkt for møde: Minimum to måneder før kursusstart med opfølgning 1-2 gang under forløbet

#### Formål

- At vejledere og præsentationsvejledere introduceres til problemorienteret projektarbejde

- At vejledere og præsentationsvejledere får viden om hvad vejledningens form og udførelse i problemorienteret projektarbejde

#### Mål

- At vejledere og præsentationsvejledere ved hvori deres opgave består og håndteringen af denne
- At udarbejde aftale for vejledning af vejledere

#### Væsentlige oplægsemner:

- Problemorienteret projektarbejde
- Vejleders rolle?
- Peer feedback; vejledere og præsentationsvejledere – roller og opgaver

#### Introduktionsmøde III

Deltagere: Kursusdeltagere, kliniske specialister (vejledere), afdelingssygeplejersker og kursusedler

Tidspunkt for møde: En måned før kursusstart

#### Formål

- At tydeliggøre formålet med uddannelses- og træningsforløbet
- At introducere deltagere, kliniske sygeplejespecialister og afdelingsygeplejersker til kursusforløbet
- At klarlægge forventninger til deltagere, kliniske sygeplejespecialister og afdelingsygeplejersker

#### Mål

- At give mulighed for give svar på spørgsmål vedrørende kursusforløbet

#### Væsentlige oplægsemner

- Problemorienteret projektarbejde (undervisningsform)
- Opbygning af kursusforløbet
- Forventninger er der til de forskellige grupper af aktør

## Refleksion - refleksionslogbog

Indhold	Læringsmål
Refleksion – hvad er det og hvad er det ikke? hvordan kan refleksion bruges i læring?	Forklare hvad refleksion er og hvordan det kan være et læringsredskab  Forklare hvordan refleksionslogbogen er tænkt anvendt  Reflekter over hvordan refleksionsbogen vil blive anvendt refleksionsbogen

## Peer-feedback

Indhold	Læringsmål
Peer-feedback hvad betyder det? Hvad er rammerne? Hvad er spillereglerne? Hvilke roller og opgaver er der ved peer-feedback?	Forklare hvad peer-feedback er  Forklare hvordan peer-feedback skal være en del af kursusforløbet
Introduktion til feed-back-indhold og -skema.	Reflekter hvad det betyder at skulle give og modtage peer-feedback

## C

*Temaguide final UP-projekt: Hvordan kan planlægningen af et problemorienteret kursusforløb understøtte et sammenhængende læringsforløb?*

Spørgsmål	Hvad vil vi gerne vide?
<b>Tema 1: Projektorienteret kursusforløb</b>	
<ul style="list-style-type: none"> <li>Hvad tænker du på , når du hører ordet (begrebet) projektorienteret kursusforløb?               <ul style="list-style-type: none"> <li>Ved du hvad det indebærer?</li> <li>Ved du hvilke forventninger der er til dig som underviser/kursusdeltager?</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>At få informantens umiddelbare viden om begrebet</li> <li>Spore informanten ind på emnet</li> </ul>
<b>Tema 2: Sammenhæng mellem undervisning og projektarbejde</b>	
<ul style="list-style-type: none"> <li>Hvordan oplever du at kunne bruge undervisningen i dit projektarbejde?               <ul style="list-style-type: none"> <li>Hvad har du kunne bruge og hvordan?</li> <li>Hvorfor har du ikke kunne bruge det?</li> <li>Hvad kunne have understøttet brugen af undervisningen?</li> </ul> </li> <li>Hvilke overvejelser har du gjort i planlægningen af din undervisning i forhold til kursusdeltagernes projektarbejde?</li> </ul>	<ul style="list-style-type: none"> <li>Forstå om og hvordan informanten oplever sammenhæng i kursusforløbet</li> <li>Undersøge hvilke dele af undervisningen som informanterne hæfter sig ved</li> <li>Undersøge om underviserne indtænker egen undervisning som en del af en større sammenhæng</li> </ul>
<b>Tema 3: Intervention som tydeliggør og skal være understøttende for sammenhængen i kursusforløbet (før kursusstart)</b>	
<ul style="list-style-type: none"> <li>Hvilken betydning kan introduktionsmøderne få?</li> <li>Hvilke fordele giver de?</li> <li>Hvilke ulemper kan der være?</li> <li>Hvad er dine erfaringer med før-møder inden kursusstart?</li> <li>Kan der være andre fordele end det de er målrettet her?</li> <li>Hvad tænker du kursuslederen får en mere tydelig gennemgående rolle?</li> </ul>	<ul style="list-style-type: none"> <li>Få informantens umiddelbare input til understøttende intervention</li> <li>Få underviserens reaktion på at skulle udarbejde læringsmål med fokus på de overordnede læringsmål</li> </ul>
<b>Tema 4: oplevelse og tanker om peer feedback</b>	
<ul style="list-style-type: none"> <li>Hvilke erfaringer har du med feedback generelt?</li> <li>Hvilke erfaringer har du med peer feedback?               <ul style="list-style-type: none"> <li>I hvilken sammenhæng?</li> </ul> </li> <li>Hvilke bekymringer har du for at give/modtage fra med-kursusdeltager?</li> </ul>	<ul style="list-style-type: none"> <li>At få kursusdeltagernes præferencer i forhold til peer feedback</li> <li>At få kursusdeltagernes præferencer til at kursusdeltagerne skal give hinanden</li> </ul>

# **Improving the learning outcome for students in Human Physiology by a problem-based learning approach**

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## **Preface**

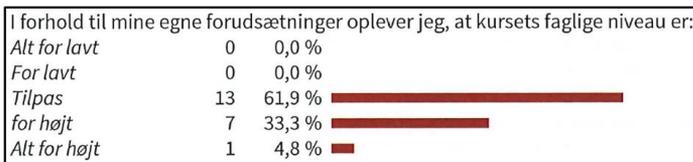
A problem-based learning (PBL) approach can be defined as teacher-constructed problems presented to a small group of students whose mission it is to discuss, describe and produce tentative explanations for the given problem or case study (Norman & Schmidt, 1992). Although PBL does not seem to improve general problem-solving skills, evidence suggests that PBL enhances retention of knowledge, intrinsic interest in the subject matter as well as self-directed learning skills (Norman & Schmidt, 1992). In this project report I will therefore investigate how PBL is adapted and perceived in classroom teaching of university students studying human physiology for the purpose of accommodating learning and specific intended learning outcomes (ILOs).

## **Background**

“Human Physiology I” is a mandatory course introduced to all students enrolled in the Human Physiology masters programme provided by the Department of Nutrition, Exercise and Sports, University of Copenhagen (course description can be found at [kurser.ku.dk](http://kurser.ku.dk)). The course includes approximately 60 students primarily derived from the bachelor programme in “Exercise and Sport Sciences” held by the same department. Personally, I

have been responsible for teaching the students how physical activity affects insulin sensitivity during a 3-h lecture in addition to a 30-min session with follow-up questions. The course has been running for >20 years and is made up of classical lectures (~3/4 of the time), a few practical exercises, teacher-led discussions (~1/4 of the time) and three written assignments.

Prior to the start of the course this academic year (2021/2022), I examined the course evaluation from the past two years (2019/2020 and 2020/2021) in order to uncover possible educational elements that needed to be prioritized to further accommodate learning. Interestingly, I discovered that 30-40% of the students found the academic level of the course too high in relation to their own proficiencies (**Figure 1**). This may pose a challenge for some students in regards to achieving the ILOs of the course, which is an important issue to meet as the students must apply these ILOs later on in their education to critically and analytically address general issues in physiology particularly in relation to physical activity.



**Figure 1.** Extract of the course evaluation in ‘Human Physiology I’ from the academic year 2020/2021.

The course evaluations also indicated that the students found it difficult to keep up and concentrate when the lectures took place for several consecutive hours. One student mentioned: “*It was much easier to concentrate during shorter screencasts than the 3-hour long Zoom lectures*”. Another student wrote: “...it can be tough to follow a lecture for 2-3 hours online” and a third student argued “...that the distribution of lectures and group work ought to be altered”. These comments should not come to a surprise as it has been documented that students are (to a large extent) only able to concentrate for up to 20 minutes at a time (Rienecker et al., 2013, p. 182). It is therefore important to introduce breaks and variation during teaching activities as this has been shown to make the students cognitively active and sharpen their attention for the purpose of accommodating the ILOs (Rienecker et al., 2013, p. 183). From this it can be deduced that

a series of "classic" lectures over a period of consecutive hours are not preferable for student learning. In contrast and as mentioned above, PBL seems to promote student learning as it is typically characterized by increased involvement of the students who need to perform a number of various cognitive processes including identification, definition, and formulation of the problem-based work (Rienecker et al., 2013, p. 215-217). Based on the student course evaluations, the theory behind PBL and the principle of 'constructive alignment' between teaching and test forms described in the course description, I have chosen to reconstruct a 3-h lecture series so it accommodates student learning and lecture ILOs to a greater extent (Appendix A).

## **Purpose**

The overall purpose of this educational experiment is to provide the students with the ability to gain new knowledge and skills on a highly specific physiological matter using PBL with the intention of accommodating the intended learning outcomes.

## **Problem-based teaching in Human Physiology I**

The educational experiment was sought implemented by a six-step teaching practice that took place in the period before as well as during the actual reconstructed 3-h lecture (3x 45 min). The following describes the six steps in chronological order:

1. The students are introduced to the lecture via a ~15 min webcast, which they have to watch before the day of lecture. The webcast is uploaded to Absalon two days prior to the lecture.
2. During the first hour on the day of lecture, the students are re-introduced to the ILOs by the teacher followed by a short recap of the webcast with Q&A. In the end of the first hour, students are introduced to the problem-based work.
3. Following a 10-15 min break, the students are placed in groups for a period of 30-40 min to discuss and prepare presentations based on the problem-based work (hand outs/downloads). A minimum of 2 individual groups is working on the same problem. During this step the teacher visits all groups to facilitate the problem-based work.

4. All groups are gathered in plenary to present solutions to the problem-based work. One group presents a solution to a problem while another group, which has been working with the same problem, provides critic/feedback to the presenting group. A break of 10-15 min are provided to the students during the ~1-hour session.
5. The teacher makes a joint summary when all solutions to the problem-based work have been presented (10-15 min)
6. During the last 10 min of the lecture, the students are asked to evaluate the today's teaching via an online questionnaire (menti.com).

### **Reflections on teaching and evaluation**

Problem-based work is often performed in groups due to learning-related reasons. Thus, group work provides students with the ability to give and receive feedback as well as get further and deeper into the problem-based work (Rienecker et al., 2013, p. 218). However, problem-based group work may also be time consuming due to the great number of cognitive processes the students need time to fulfill. One way to secure enough time for problem-based work during teaching is by taking advantage of concepts from the 'flipped classroom'. Here, the students are placed in the center of learning with the teacher as a facilitator that (typically) takes place on the basis of a prior watched video presentation/webcast (Schunk, 2016). In my teaching, I wanted to combine the "flipped classroom" concept with problem-based work for a number of reasons. Initially to reduce time spent doing "classical" lecturing but also because students find webcasts rewarding and helpful when they study. In the course evaluation from the past two years one student mentioned: "... *I think the webcast videos have been really rewarding*" Another student wrote: "... *webcasts as means to prepare for classes and lectures that are recorded and uploaded have been very helpful*". Secondly, to introduce the ILOs at two different occasions (webcast and lecture) and thirdly, to provide the students with the possibility to give and get feedback on presentations - a key element in problem-based work (Rienecker et al., 2013, p. 217-218). The latter I also prioritized in order to increase the "constructive alignment" between the teaching activities and the test form as described in the course description.

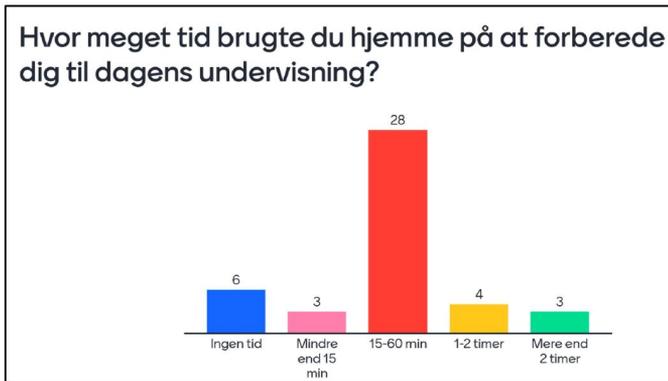
In regards to documentation and evaluation of my teaching, I sought to reflect on my own teaching in real time while noting any topics I wanted to discuss with my respective UP supervisors. In addition, my academic

supervisor was present during most of my 3-h lecture, which allowed us to evaluate my teaching in the following days. I also recorded my lecture (video), which provided my pedagogical supervisor the opportunity to offer constructive feedback on my performance as a teacher. As previously mentioned, I also wanted to evaluate my teaching at the end of the 3-h lecture using an online quantitative and qualitative questionnaire that the students had to complete before leaving the class. Lastly, I briefly asked the students in plenum what they had found positive and negative about the 3-h lecture and my teaching. Altogether, these initiatives were meant to provide me with the best possible evaluation of my teaching.

## Results and discussion of teaching outcomes

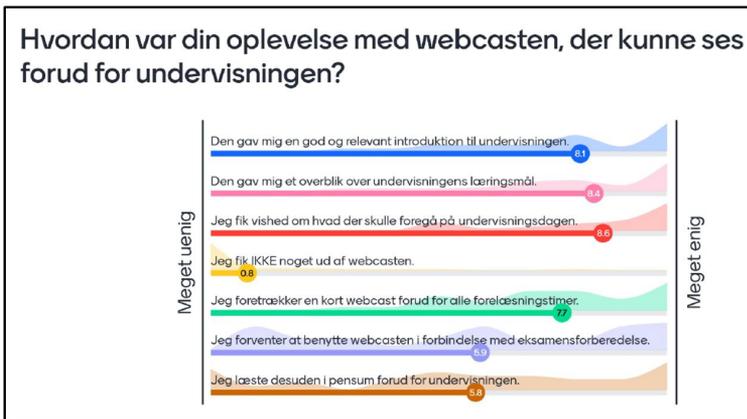
### Online questionnaire

A prerequisite for my lecture to become successful was that the students had spent preparation time on watching the webcast prior to attending my lecture. Since the webcast lasted ~15 min, my hope was that all students had used >15 min in their preparation for my lecture. Based on the online questionnaire, I observed that ~75% of the students had used >15 min and thus, likely watched and used the webcast to prepare for my lecture (**Figure 2**).



**Figure 2.** How much time did you spend preparing for today's lecture? (derived from the online questionnaire)

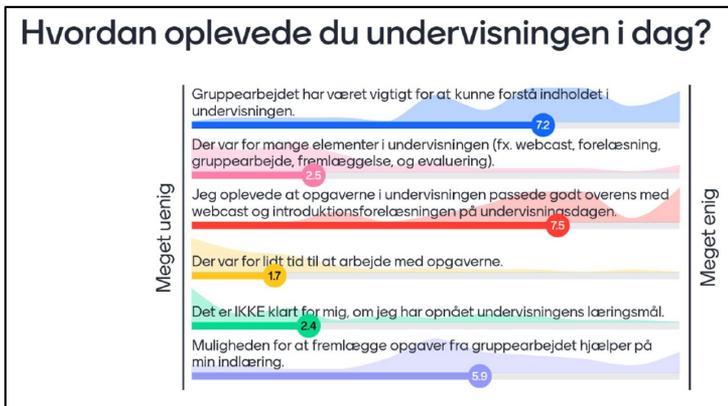
Looking at how the students actually experienced the webcast, it seemed clear that the webcast provided the students a relevant introduction to the lecture, overview of the ILOs as well as an assurance of what was going to happen on the day of lecture (**Figure 3**). Webcasts may therefore be used to accommodate learning by providing a possibility to shift the attention from the two lower taxonomic levels (i.e. remember and understand) to the upper more demanding taxonomic levels during the actual lecture (Schunk, 2016). Interestingly, most students seem to prefer webcasts prior to all lectures (**Figure 3**), which may indicate that webcasts impart the students with a greater and better understanding of the taught subject that in the end stimulates the students. General use of webcast may therefore constitute an excellent tool to improve student learning. On the other hand, webcasts do not allow the students to ask questions and test their understanding of the subject nor provide an opportunity to disseminate the information (Mathiasen, 2019). For this reason, I deliberately included time in my lecture (step 2) during which the students could ask questions about the webcast.



**Figure 3.** How did you experience the webcast prior to the lecture? Agree or disagree answer (derived from the online questionnaire)

Following the webcast evaluation, the students were asked to evaluate the 3-h reconstructed lecture. Importantly and to a large extent anticipated, the problem-based group work had been important for the students to fully

understand the content of the lecture (**Figure 4**). This may in part be related to my efforts in trying to align the content of the webcast (step 1) and introduction lecture (step 2) to the group work (step 3) (cf. **Figure 4**). In addition, the students seemed to have understood the ILOs of my teaching, which may increase student motivation to commit themselves to learn the intended (Andersen, 2010). However, it is important to bear in mind that highly detailed ILOs yields less freedom for personal approaches and innovation and thus less room for teachers' and students' own reflections and solutions to problems. In the end, this may compromise teaching if the purpose of the university pedagogical effort is to help create reflection and awareness of the complexity that any teaching situation consists of (Andersen, 2010).



**Figure 4.** How did you experience the today's lecture? Agree or disagree answer (derived from the online questionnaire)

It was important for me to include breaks and variation in my teaching (see step 1-6) due to the documented drop in concentration observed in students shortly into lecturing (Rienecker et al., 2013, p. 182). On the other hand, I also feared that implementing a high degree of variation in my teaching could distract the students and thus, compromise learning. Yet, most students seem to endorse implementation of several teaching elements during a lecture (**Figure 4**), which I interpret as if the students found my teaching both motivating and rewarding. Extracts from the online qualita-

tive questionnaire (Appendix B) seem to support my belief. One student wrote: “*Nice varied teaching – good with a break from lecturing.*” A second student wrote: “*I think the teaching was enlightening and a great variation from the classical lectures*”. On the other hand, a third student wrote: “*I would have preferred more actual lecturing. . .*”. To me this clearly shows that every student is different and prefers his/her own way of being taught. This also implies that one must remember that it is likely impossible to implement university teaching that embraces individual needs of all students at the same time – which may actually not be a desired didactic goal in itself either.

### **Reflections with academic supervisor**

A topic discussed between my academic supervisor and me relates to the use of (problem-based) group work in my teaching. We agreed on that group work holds significant opportunities for student learning. Thus, not only are students able to improve learning via group discussions but students also learn more by explaining themselves to others while misunderstandings are straightened out more often (Rienecker et al., 2013, p. 192). Group work also makes it possible to conduct differentiated teaching. Accordingly, I spent more time guiding “weaker” students while the “stronger” students were offered extra tasks that were meant to test them at higher taxonomic levels. This way it seemed that no one got bored during the problem-based group work.

Another topic we discussed was the principle behind ‘constructive alignment’ in relation to my idea of adding in student presentations during my lecture. In my case, the students had to present and conclude on original scientific data in front of an audience, which constitutes a large part of the work performed in academic research environments as well as in the life science industry. From my observations during the lecture, I believe the students found these presentations challenging but also rewarding. In the online questionnaire one student wrote: “*Great having oral presentations – it provides a good learning opportunity having to communicate orally - just as it will also take place during the examination in Human Physiology.*” Therefore, in teaching I strongly advocate for a closer association between the Teaching Learning Activities (TLAs) and the test forms as such didactic strategy is meant to promote the development of educational skills that students are expected to apply and use after they graduate (Biggs & Tang, 2007).

## A perspective conclusion

From my own perspective as well as the student evaluation, I believe that this educational experimental has been successful in promoting student learning by taking advantage of a problem-based learning approach in a group work setting. However, there are still matters to consider. One relates to the fact that only one or two students in each working group were responsible for presenting the group's findings. As a teacher, one must therefore ensure that everyone in a working group is offered the opportunity to present during the whole course, so that it is not only the academically strong or loud and eloquent students who stand as "winners" in the end. A second matter relates to overall student motivation, which in my opinion is one of the most significant driving forces that have a positive impact on learning outcomes. Through fruitful discussions with my academic supervisor, I realized that as a teacher one could stimulate student curiosity and motivation simply by linking the ILOs to relevant everyday events. This is indeed one highly valuable concept that I will strive to implement in my future teaching.

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## Læringsmålene

- Have kendskab til de specifikke definitioner der gør sig gældende i forbindelse med diagnosticering af type 2 diabetes mellitus (T2DM)
- Identificere forskellige behandlingsstrategier for T2DM baseret på de organ-specifikke defekter der fremtræder i sygdommen.
- Reflektere over og præsentere mulige molekulære mekanismer i muskulaturen, der kan forklare hvorledes fysisk aktivitet forbedrer sukkerstofsiftet i blandt andet patienter med T2DM.

## B

# Har du ét forslag til forbedring af undervisningen?



Fedt med mundtlige fremlæggelser - det giver god indlæring selv at skulle formidle mundtlig - ligesom det også vil foregå til eksamen af Humanfysiologi 1.

Tak for god undervisning

ndæ

ikke

Fin varierende undervisning - godt afbræk fra forelæsning

Ingen bemærkninger. Rigtig god undervisning

Strukturen i dag var virkelig god!!!

Jeg kunne godt have tænkt mig mere reel forelæsning/gennemgang af mekanismer

Bare vær mere lige på, du behøver ikke spørge om vi har spørgsmå. Dem skal vi nok stille, ellers godt gået

Læng din webcast direkte på kursus hjemmeside, istedet for inde i filer. Bk mig

God undervisning

Beskeder i announcements er rigtig lette at overse, så jeg tror mange ikke så den, fordi de ikke vidste den var der

Nøj, det var fedt

Der gik lidt meget tid med presentation af læringsmål/agenda. Det er rart med en introduktion, men hold den kort, og så lad os gå direkte på det svære stof. Jeg tror bachelordstuderende vil have større glæde af agenda/intro, men på kand. vil vi igang.

Niksen biksen Karen Blixen

Jeg synes det kunne være fedt lige at opsummere læringsmålene sammen til sidst, så man kunne sikre sig at man havde forstået dem rigtigt og fået det rigtige ud af undervisningen

Lidt længere intro/forelæsning før gruppearbejde. Ellers en god undervisning

Mere intro til figurer mm før gruppearbejde

Tag lidt mere styring på dannelse af grupper/gruppeinddeling. Ellers super godt

Ville være godt med lidt mere powerpoint tekst, så det er lidt lettere at huske efter timen.

Jeg synes undervisningen var lærerig og en god afveksling fra de klassiske forelæsninger.



**Improving feedback practices**



## Improving Peer Feedback on Arguments

Mads Goddixsen

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### Introduction

Peer feedback can increase learning for both the person receiving feedback and, especially, the person providing (Nicol et al., 2013). Providing feedback on results of higher level cognition including evaluations and creative processes is what participants often find most challenging (UNSW, 2018). Clear and concrete guidelines should therefore be provided, if the peer feedback session is to be successful (Winstone and Carless, 2019, Ch 8).

Among the higher level cognition processes that are challenging to provide useful peer feedback on are evaluations of complex arguments and the creative construction of new arguments. The challenge is enhanced if the topic of the arguments or the practice of constructing and evaluating arguments itself is foreign to the participants. Despite the challenge, being able to construct and evaluate evidence-based arguments is one of the core skills of being an academic, and one that must be nurtured in university education.

The aim of this study was therefore to test an intervention – in the form of guidelines - designed to improve the learning outcome of peer feedback sessions where participants had to provide feedback on complex arguments.

## Materials and methods

### The intervention

The study took place over the course of four peer feedback sessions in two different iterations of the same course (described in Sec 2.2, 'Participants and course setting'). In the first two sessions, students were given a guideline with general advice on how to provide feedback on discussions and arguments. In the final two sessions, the general guidelines were supplemented with specific questions about the discussion they had read. All guidelines are presented in the Appendix.

The aim of the intervention was to get the person providing peer feedback to pay more attention to, and provide better feedback on, the arguments presented by their peer. Specifically, the aim was to aid the participants in providing feedback on the clarity and depth of the argumentation.

Following Toulmin's model of argumentation (Toulmin, 2003), a good argument is characterized by a clear conclusion supported by a general warrant and established particular facts. To increase the strength of the argument, the author may include a backing to support the warrant and counter potential rebuttals, e.g. by adding a modifier to the conclusion. Prior to the intervention, lack of clear conclusions was identified by the author as one common weakness in the argumentation by participants in the particular course, as well as lack of attention to potential rebuttals resulting in weaker arguments. The specific questions included in the revised guidelines therefore focused especially on these two areas.

The existing guidelines were supplemented with a number of specific questions to different parts of the assignments (see Appendix). For the discussion parts, which is where the author is expected to present his or her evaluation of existing arguments and construct their own, four specific questions were added to the existing guideline (see Appendix):

1. Summarise in your own words, the author's answer to [the specific discussion question].
2. Summarise in your own words, the author's argument for the answer to the question above.
3. Is the argument convincing?
4. In what ways could the argument be improved?

The first question aims to focus the participant's attention to the conclusion of the main argument, and the clarity with which this is presented. Similarly, the second question asks the participant to reconstruct the argument, potentially leading to the realization that this is difficult, either because (parts of) the argument is missing, or because it is unclear.

The two remaining questions focus on the constructive assessment of the arguments, encouraging the participant to propose objections and suggest improvements, thus addressing one of the common weaknesses identified prior to the intervention: Lack of attention to potential rebuttals.

### **Participants and course setting**

The intervention took place in the 2021 iteration of a master course on risk assessment of chemicals (7,5 ECTS) at the University of Copenhagen (UCPH). The experiences from the 2020 iteration served as a reference for comparison. 26 students completed the 2021 version of the course, whereas 22 completed the 2020 version. With a few exceptions, all course participants were enrolled in the master program Environmental Science at UCPH. Around half of the participants had earned their BSc outside Denmark. Both iterations were conducted fully online, with lectures, theoretical exercises and peer feedback sessions taking place via Zoom.

#### Two written assignments:

During the course, participants hand in two mandatory individual assignments (3-4 pages). In both assignments, the participants discuss the decision regulate one or more chemicals in a specific way. As such, the core quality criteria for the assignments are very similar. In particular, both assignments require participants to analyse the regulation of a specific chemical, and

- *formulate a clear personal, but scientifically based, opinion about the regulation of said chemical, and*
- *argue for their opinion.*

Both assignments are handed in in two different versions. First, participants hand in a "beta-version". The instruction for this version is that it should be a complete and finished assignment, which will serve as the basis for the peer feedback session. After the peer feedback session, participants revise their assignments and hand in their final version for assessment. The

teacher (the author) also provides personal written feedback as well as general oral feedback on the final version of both assignments.

#### Peer feedback sessions:

Peer feedback has long been part of the course, in the form of in-class sessions (90 min), where students read and provide written and oral feedback on an assignment by a randomly selected classmate, and receive feedback from one classmate - usually the one they provide feedback. A guideline on how to provide feedback and what to focus on is provided before the class, and explained by the teacher before the session begins. The guidelines from the 2021 and 2020 versions of the course are shown in the Appendix.

Course evaluations show that the peer feedback sessions conducted prior to the intervention were rather well received. Most participants found the feedback they got at least somewhat helpful, and found that they learned something about their own assignment when providing peer feedback. Furthermore, the guidelines helped them understand what was expected of them, not only for the specific assignments, but also for the final exam. However, two problems were identified by the author:

1: Some participants felt that they gained very little from the sessions.

2: The quality of the discussion sections in the assignments was in many cases rather low.

Two causes for 1) were identified from the evaluations: first, some of these participants felt that their peer was unable to provide much useful feedback and, secondly, some did not perceive learning much from providing feedback.

## **Data**

The data for the study consisted of:

- The assignments handed in the 2021 iteration of the course, both the beta and final versions (104 assignments in total).
- The written feedback provided by the teacher (the author) to the final versions of the assignments handed in the 2021.
- The teacher's summary of the feedback provided to the assignments in the 2020 iteration of the course.
- Qualitative and quantitative data from the oral and written course evaluations of the 2021 and 2020 iterations of the course.

A complete analysis of all 104 assignments was beyond the scope of this paper. Therefore, five participants were randomly drawn, and their assignments included in the analysis (10 assignments in total). No assignments from the 2020 iteration were included in the study, as they are no longer available to the author. However, the written feedback to all 52 final assignments submitted in the 2021 iteration of the course as well as the teacher's summary of the feedback provided to the assignments in 2020 were included in the study.

The data drawn from the evaluations were qualitative data from an oral evaluation conducted immediately after the first peer feedback session in 2021, supplemented with written comments from the general course evaluation, and answers to the standard evaluation question 2.6: "In my opinion, I have received relevant academic feedback on my oral and written work on the course".

### **Data analysis**

A qualitative analysis of the argumentation in each of the ten included assignments broadly followed the Toulmin model of argumentation. After analysing each assignment individually, beta- and final versions were compared to identify potential improvements in the argumentation between the two versions. Finally, a comparison was made between the final versions of the first and second assignment of each student to assess progress across assignments.

The remaining data was included more or less in their raw form.

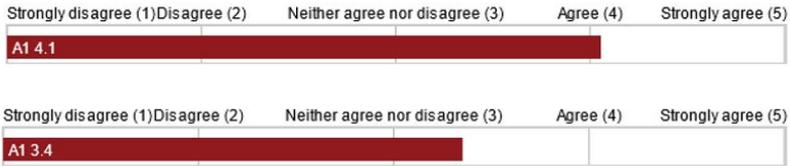
## **Results**

### **Reception and perceived learning outcome**

As shown in Fig 1, course participants were generally happy with the feedback they got on their oral and written work in the 2021 version the course - more so than in the 2020 version. In 2021, the average score for question 2.6 ("In my opinion, I have received relevant academic feedback on my oral and written work on the course") was 4,1, with 15 of 18 participants in the evaluation indicating that they agreed (N=8) or strongly agreed (N=6). One participant disagreed. In comparison, the average score in 2020 was 3.4 with only 8 of 18 participants in the evaluation indicating that they to

some extent agreed. No test for statistical significance of this comparison was performed.

2.6 In my opinion, I have received relevant academic feedback on my oral and written work on the course



**Figure 1:** Participants’ perception of the quality of the feedback received. Answers for 2021 are shown on top, the answers from 2020 are at the bottom.

In the oral evaluation following the first peer feedback session in 2021, the participants indicated that the allocated time was appropriate, and that reading an assignment by a peer had been interesting and beneficial for them. A majority indicated an intention to modify their own assignment based on thoughts they had had while providing feedback to their peer. In a more confidential discussion later, one student indicated that she had not gained much from the session. In her opinion, this was because her peer had not been able to provide any useful feedback, and because the quality of the peer’s assignment had been so low that she had not gained anything from reading it. This indicates that although participants were generally satisfied with the feedback they got, the issue with some students feeling that they gained very little from the session identified in Sec. 2.2.2 (‘Peer feedback sessions’) had not been eliminated by the intervention.

In the qualitative part of the final course evaluation of the 2021 iteration, the peer feedback sessions were mentioned twice. One participant described them as “very useful” another wrote: “The ‘peer review’ feedback on assignments was really nice, as it gave us practice in reading and giving constructive feedback.” (Anonymous course participant, 2021).

## The assignments

### Progress from beta to final version:

Of the ten pairs of beta and final assignments included in the study, five showed improvement from beta to final version that could reasonably be at least partly associated with the peer feedback. Most commonly, the author had added additional facts or backing to the argument and improved the language to make the conclusions and arguments more clear. In two cases, an explicit consideration of a potential rebuttal had been added to the final version compared to the beta.

Of the remaining five pairs, two did not include a discussion section at all in the beta, whereas the final version did include a (very well argued) discussion. In two other cases, the beta and the final versions were nearly identical. In one of these cases, the author of the assignment made a comment upon submitting the final version, that she had only received positive feedback from her peer, and had therefore not changed much (although the teacher did find room for improvement). In the final case, the author drew more conclusions in the final version than in the beta, but the quality of the arguments did not improve.

### Progress from first to second assignment:

The analysis of the assignments and written feedback showed that in both 2020 and 2021, the quality of the argumentation in the final versions of the second assignment was higher than in the final versions of the first assignment. Particularly, the clarity with which the participants presented their conclusions had improved, and fewer unjustified claims were made.

### Progress 2020 to 2021:

Since the assignments from the 2020 iteration of the course were not available to this study, the progress in the quality of the argumentation from 2020 to 2021 had to be based the summary of the teacher feedback provided in 2020 to the assignments. This obviously introduces substantial uncertainty, and no meaningful conclusions could be drawn.

## Discussion

The present study does not provide sufficient evidence to show that the intervention had an effect on the impact the peer feedback sessions had on the quality of the arguments in the participants' assignments. However, the

analysis did show that there was improvement in the argumentation from beta and final version in half of the assignment pairs included in the study.

Furthermore, the results presented above indicate that the intervention was successful in the sense that it contributed to improving the participants' experience in participating in the peer feedback session. Fewer students felt that they gained little or nothing from the sessions. However, there were still students who felt that they did not gain much from the peer feedback session, which was to be expected, as the perception of major differences in academic level in the peer feedback groups was previously identified a partial cause of this experience (Sec. 2.2.2, 'Peer feedback sessions'), and this was not addressed in the intervention. The intervention described in this study should therefore be combined with further interventions on e.g. the size or composition of the peer feedback groups.

## Acknowledgements

The author wishes to thank Jan Sølberg, Anders Dahl and Morten Misfeldt for constructive discussions.

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## A The feedback guidelines

Below are the guidelines used in the study.

### 2021 versions

#### Peer review of the first report

Here are some things to look for when giving feed back to your peer on the first report. I will be looking for similar things when assessing the final version. Remember that the point of peer feedback is to help your peer improve her or his report, and for you to have a constructive discussion that you can both benefit from. So be constructive, and hopefully your peer will be equally constructive when providing feedback to you.

Specific questions to consider are provided in the table below, but consider some general things first.

#### *Overall*

In the report, the author should demonstrate the following:

#### Knowledge

- of the Precautionary Principle (PP) and some challenges related to applying it
- of Neonicotinoids and Glyphosate and the controversies that surrounded their approval/ban in the EU

#### Skills

- In analysing relevant sources

#### Competences

- In discussing the use of the PP
- In constructing clear and concise arguments in writing

A report that ticks all of the above is a very good report.

Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all three sub-questions should be answered somewhere in the report.

#### *Part 1*

The answer to this question is a *description* (as opposed to an analysis or discussion). Descriptions should be *correct*, *relevant* and *concise*.

In this case, you are describing the Precautionary Principle (PP) and challenges related to applying it in an EU setting. This is a complex, difficult and very broad topic. Therefore, consider whether your peer provides *enough information* (i.e. all the information needed for the subsequent analysis and discussion) and whether this information is *correct*. There is also a real danger that your peer is providing *too much information*. In a short report like this (and in a scientific paper), this is a problem because your peer then has less space for the subsequent analysis and discussion.

In an exam situation, a good description is a good start. If the descriptive part fails, the whole assignment fails, but a good description does not on its own get you a good grade. At most, it gets you from 00 to 02

#### *Part 2*

The answer to this question is an *analysis*. In general, analyses should be *methodical, clear and true to the data/sources that it is based on*.

In this case, it will be important that the analysis is true to the sources it is based on – do you agree with the way your peer has read the main text? The analysis should also be connected to the description, and clearly presented and argued. It should be clear to you what the author believes the most important differences between the two cases are, and *why* the author thinks these are the most important. If it is not, help your peer by pointing out what you think is unclear and suggesting ways to clarify.

In an exam situation, a good analysis is key to getting a good grade. But a good description and analysis on their own do not get you a very good grade. At most, they get you from 02 to a high 7.

#### *Part 3*

The answer to this question is a *discussion*. In general, a discussion should have a *clear message* backed by a *strong argument*. This argument should to a very large extent be based on the foregoing analysis.

In this case, the author should discuss whether it was justified to use the PP to ban the neonicotinoids, but not glyphosate. This is a yes/no question, and the author's opinion should be clearly stated. More importantly, it should be *clearly argued*. It should be clear to you why the author believes what s/he does. If you do not agree, state your objections. Then the author can improve his or her argument by countering your objections. If you do agree, try to think of possible objections and discuss with your peer how you would counter them.

In an exam situation, a good discussion is key to getting a top grade. If combined with a good description and analysis, a good discussion is what gets you from a high 7 to 12.

#### *Style and grammar*

When providing feedback, focus mainly on the content. However, if there are obvious problems with language, grammar or punctuation, it would be kind of you to point it out. Also, consider whether the text is appropriately divided into sections.

#### *References and sources*

*The report should have clear and consistent references as well as a reference list.* If external sources have been used, these should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.

*Specific questions to consider*

	<b>My feedback</b>
<b>Description</b>	
Has the author presented all relevant information on the PP and the challenges related to applying it?	
Does the description contain information that is <i>unnecessary</i> for the analysis and discussion?	
<b>Analysis</b>	
Has the author, in your opinion, identified the most important differences between the two cases?	
Does the author explain <i>why</i> these differences are the most important differences?	
Is the explanation provided clear?	
Do you agree with the explanation?	
<b>Discussion</b>	
Summarise in your own words, the author's answer to whether it was justified to use the PP to ban the neonicotinoids, but not glyphosate.	
Summarise in your own words, the author's argument for the answer to the question above.	
Is the argument convincing?	
What parts of the argumentation would a person who disagree with the author's conclusion object to, and how?	
It what ways could the argument be improved?	
<b>Spelling, grammar and references</b>	

### Peer review of the second report

Here are some things to look for when giving feed back to your peer on the first report. I will be looking for similar things when assessing the final version. Remember that the point of peer feedback is to help your peer improve her or his report, and for you to have a constructive discussion that you can both benefit from. So be constructive, and hopefully your peer will be equally constructive when providing feedback to you.

Specific questions to consider are provided in the table below, but consider some general things first.

#### *Overall*

In the report, the author should demonstrate the following:

Knowledge:

- Of relevant EU law

Skills:

- In identifying and analysing relevant sources

- In classifying chemicals according to their hazards to humans and the environment

Competences:

- In discussing data requirements for human health and environmental risk assessments of chemicals within various risk assessment frameworks
- In discussing potential solutions to emerging challenges for risk assessment and risk management.
- In constructing clear and concise arguments in writing

A report that ticks all of the above is a very good report.

Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all four sub-questions should be answered somewhere in the report.

#### *Part 1*

The answer to this question is a *description* (as opposed to an analysis or discussion). As always, descriptions should be *correct, relevant* and *concise*.

In this case, you are describing the selected chemical and its use (or some of its uses). For any chemical, there is a lot of information to present and many ways to present it. Therefore, consider whether your peer provides *enough information* (i.e. all the information needed for the subsequent analysis and discussion) and whether this information is *correct*. Sometimes, a picture says more than a thousand words, so also consider whether illustrations could help the presentation. There is also a real danger that your peer is providing *too much information*. In a short report like this (and in a scientific paper), this is a problem because you peer then has less space for the subsequent analysis and discussion.

When it comes to describing use, again consider whether the amount of information is appropriate, and if your peer has chosen to focus on only a part of the use, check whether this is clearly stated.

#### *Part 2*

The answer to this part is also a description, a description of the regulation covering the chemical under consideration. The above applies to this part as well.

In an exam situation, a good description is a good start. If the descriptive part fails, the whole assignment fails, but a good description does not on its own get you a good grade. At most it gets you from 00 to 02

#### *Part 3*

The answer to this question is an *analysis*. In general, analyses should be *methodical, clear* and *true to the data/sources that it is based on*.

In this case, the analysis consists of an analysis of why the regulation described part 2 is the way it is. It will be important that the analysis is true to the sources it is based on, that it is connected to the description in part 1, and that it is clearly presented and argued. In this case,

you might not know the sources that you peer is drawing on, but that makes you even more capable of providing feedback on clarity.

It should be clear to you:

- what the author considers the most important issues with the chemical,
- what your peer sees as the main reasons for why the regulation is the way it is.

If this is not clear, point out what you think is unclear and try to suggest ways to clarify.

In an exam situation, a good analysis is key to getting a good grade. But a good description and analysis on their own do not get you a very good grade. At most they get you from 02 to a high 7.

#### Part 4

The answer to this question is a *discussion*. In general, a discussion should have a *clear message* backed by a *strong argument*. This argument should to a very large extent be based on the foregoing analysis.

In this case, the author should discuss whether the current regulation on the selected chemical is appropriate. This is a yes/no question, and the author's opinion should be clearly stated. More importantly: it should be *clearly argued*. It should be clear to you why the author believes what s/he does. And if you do not agree, state your objections. Then the author can improve his or her argument by countering your objections.

In an exam situation, a good discussion is key to getting a top grade. If combined with a good description and analysis, a good discussion is what gets you from a high 7 to 12.

#### Style and grammar

When providing feedback, focus mainly on the content. However, if there are obvious problems with language, grammar or punctuation, it would be kind of you to point it out. Also, consider whether the text is appropriately divided into sections.

#### References and sources

*The report should have clear and consistent references as well as a reference list.* A tricky issue in this report could be citing legal texts, check whether it has been done appropriately.

Sources should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.

#### Specific questions to consider

	My feedback
<b>Description</b>	
Which chemical(s) is the assignment about?	
Which use(s) of the chemical(s) are considered?	

Has the author presented all relevant information on the chemical(s), use(s) and risk(s) related to?	
Has the author included all relevant information on the relevant regulation?	
Does the description contain information that is <i>unnecessary</i> for the analysis and discussion?	
<b>Analysis</b>	
Summarise in your own words, the author's answer to why the current regulation is the way it is?	
Is the explanation provided clear? If not, what could be improved?	
Is the explanation drawing on relevant and reliable sources?	
Do you find the explanation plausible?	
<b>Discussion</b>	
Summarise in your own words, the author's answer to whether existing regulation is appropriate.	
Summarise in your own words, the author's argument for the answer to the question above.	
Is the argument convincing?	
What parts of the argumentation would a person who disagree with the author's conclusion object to, and how?	
It what ways could the argument be improved?	
<b>Language, spelling, grammar and references</b>	

## 2020 Versions

Below are the guidelines 2020 sessions. The main difference is the absence of a detailed scheme with questions, particularly questions to the discussion sections.

### Peer review of the first report

Here are some things to look for when giving feed back to your peer on the first report. I will be looking for similar things when assessing the final version. Remember that the point of peer feedback is to help your peer improve her or his report. So be constructive, and hopefully your peer will be equally constructive when providing feedback to you.

#### *Overall*

In the report, the author should demonstrate the following:

#### Knowledge

- of the Precautionary Principle (PP) and some challenges related to applying it
- of Neonicotinoids and Glyphosate and the controversies that surrounded their approval/ban in the EU

#### Skills

- In analysing relevant sources

## Competences

- In discussing the use of the PP
- In constructing clear and concise arguments in writing

A report that ticks all of the above is a very good report.

Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all three sub-questions should be answered somewhere in the report.

### *Part 1*

The answer to this question is a *description* (as opposed to an analysis or discussion). Descriptions should be *correct, relevant* and *concise*.

In this case, you are describing the Precautionary Principle (PP) and challenges related to applying it in an EU setting. This is a complex, difficult and very broad topic. Therefore, consider whether your peer provides *enough information* (i.e. all the information needed for the subsequent analysis and discussion) and whether this information is *correct*. There is also a real danger that your peer is providing *too much information*. In a short report like this (and in a scientific paper), this is a problem because you peer then has less space for the subsequent analysis and discussion.

In an exam situation, a good description is a good start. If the descriptive part fails, the whole assignment fails, but a good description does not on its own get you a good grade. At most it gets you from 00 to 02

### *Part 2*

The answer to this question is an *analysis*. In general, analyses should be *methodical, clear* and *true to the data/sources that it is based on*.

In this case, it will be important that the analysis is true to the sources it is based on – do you agree with the way you peer has read the main text? – that it is connected to the description, and that it is clearly presented and argued. It should be clear to you what the author believes the most important differences between the two cases are, and *why* the author thinks these are the most important. If it is not, help you peer by pointing out what you think is unclear and suggesting ways to clarify.

In an exam situation, a good analysis is key to getting a good grade. But a good description and analysis on their own do not get you a very good grade. At most they get you from 02 to a high 7.

### *Part 3*

The answer to this question is a *discussion*. In general, a discussion should have a *clear message* backed by a *strong argument*. This argument should to a very large extent be based on the foregoing analysis.

In this case, the author should discuss whether it was justified to use the PP to ban the neonicotinoids, but not glyphosate. This is a yes/no question, and the author's opinion should

be clearly stated. More importantly it should be *clearly argued*. It should be clear to you why the author believes what s/he does. And if you do not agree, state your objections. Then the author can improve his or her argument by countering your objections.

In an exam situation, a good discussion is key to getting a top grade. If combined with a good description and analysis, a good discussion is what gets you from a high 7 to 12.

#### *Style and grammar*

When providing feedback, focus mainly on the content. However, if there are obvious problems with grammar or punctuation, it would be kind of you to point it out. Also, consider whether the text is appropriately divided into sections.

#### *References and sources*

*The report should have clear and consistent references as well as a reference list.* If external sources have been used, these should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.

#### Peer review of the second report

Here are some things to look for when giving feedback to your peer on the second report. I will be looking for similar things when assessing the final version. Remember that the point of peer feedback is to help your peer improve her or his report. So be constructive, and hopefully your peer will be equally constructive when providing feedback to you.

#### *Overall*

In the report, the author should demonstrate the following:

##### Knowledge

- Of relevant EU law

##### Skills

- In identifying and analysing relevant sources
- In classifying chemicals according to their hazards to humans and the environment

##### Competences

- In discussing data requirements for human health and environmental risk assessments of chemicals within various risk assessment frameworks
- In discussing potential solutions to emerging challenges for risk assessment and risk management.
- In constructing clear and concise arguments in writing

A report that ticks all of the above is a very good report.

Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all four sub-questions should be answered somewhere in the report.

#### *Part 1*

The answer to this question is a *description* (as opposed to an analysis or discussion). As always, descriptions should be *correct, relevant and concise*.

In this case, you are describing the selected chemical and its use (or some of its uses). For any chemical, there is a lot of information to present and many ways to present it. Therefore, consider whether your peer provides *enough information* (i.e. all the information needed for the subsequent analysis and discussion) and whether this information is *correct*. Sometimes, a picture says more than a thousand words, so also consider whether illustrations could help the presentation. There is also a real danger that your peer is providing *too much information*. In a short report like this (and in a scientific paper), this is a problem because you peer then has less space for the subsequent analysis and discussion.

When it comes to describing use, again consider whether the amount of information is appropriate, and if your peer has chosen to focus on only a part of the use, check whether this is clearly stated.

#### *Part 2*

The answer to this part is also a description, a description of the regulation covering the chemical under consideration. The above applies to this part as well.

In an exam situation, a good description is a good start. If the descriptive part fails, the whole assignment fails, but a good description does not on its own get you a good grade. At most it gets you from 00 to 02

#### *Part 3*

The answer to this question is an *analysis*. In general, analyses should be *methodical, clear and true to the data/sources that it is based on*.

In this case, the analysis consists of an analysis of why the regulation described part 2 is the way it is. It will be important that the analysis is true to the sources it is based on, that it is connected to the description in part 1, and that it is clearly presented and argued. In this case, you might not know the sources that your peer is drawing on, but that makes you even more capable of providing feedback on clarity.

It should be clear to you what the author believes the most important issues with the chemical is. It should also be clear to you what your peer believes are the main reasons for why the regulation is the way it is. If this is not clear, help your peer by pointing out what you think is unclear and suggesting ways to clarify.

In an exam situation, a good analysis is key to getting a good grade. But a good description and analysis on their own do not get you a very good grade. At most they get you from 02 to a high 7.

#### *Part 4*

The answer to this question is a *discussion*. In general, a discussion should have a *clear message* backed by a *strong argument*. This argument should to a very large extent be based on the foregoing analysis.

In this case, the author should discuss whether the current regulation on the selected chemical is appropriate. This is a yes/no question, and the author's opinion should be clearly stated. More importantly it should be *clearly argued*. It should be clear to you why the author believes what s/he does. And if you do not agree, state your objections. Then the author can improve his or her argument by countering your objections.

In an exam situation, a good discussion is key to getting a top grade. If combined with a good description and analysis, a good discussion is what gets you from a high 7 to 12.

#### *Style and grammar*

When providing feedback, focus mainly on the content. However, if there are obvious problems with grammar or punctuation, it would be kind of you to point it out. Also, consider whether the text is appropriately divided into sections.

#### *References and sources*

*The report should have clear and consistent references as well as a reference list.* A tricky issue in this report could be citing legal texts, check whether it has been done appropriately.

Sources should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.

## Improving the learning outcome of peer-feedback sessions

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### Background

This work is based on an elective course at master level qualifying for 7.5 ETCS. It comprises 32 lectures, 64 hours of class instruction, and 110 hours allocated to preparation *e.g.* group work. Here, the students work in groups of three to prepare three deliverables throughout the course *e.g.* 1) oral presentation of a case-study, 2) 2-3 written laboratory journals including presentation hereof, and 3) poster presentation on their case. The students give and receive formative peer-feedback on each deliverable *e.g.* oral feedback on deliverable 1 and 3, whereas they receive both oral and written peer-feedback on deliverable 2. In addition to the peer feedback, the students also receive feedback in plenum from the course responsible. Course capacity is 60 students, with an average of 20 students enrolled per course. The exam is based on a continuous assessment by the course directors. This year, only 9 students participated in the course due to unforeseen circumstances. I share the role as course director with a colleague, with whom I designed and planned this course in 2018. Each year, student feedback is used to further develop the course striving at increased learning outcome.

Peer-feedback is seen as one of the most powerful influences on learning and achievements, and results in a positive learning outcome for 50-83% of the students (Hattie & Timperley, 2007), thus enforcing the learning outcome (Nottingham & Nottingham, 2017). By supporting student centered learning, peer-feedback allows students to share thoughts and decisions, believe in their capacity to lead and allows them to learn from each other (Nicol et al., 2014; Nottingham & Nottingham, 2017). However, for

peer-feedback to be effectful the conceptualization hereof is key (Hattie & Timperley, 2007). Nicol and Macfarlane-Dicks have described seven principles for good feedback practice (Nicol & Macfarlane-Dick, 2006). The principles highlights, among other things, the importance of well-defined feedback criteria's for the feedback to be successful. Moreover, the principals addresses that a dialogue between teacher and students on learning including student self-assessment in learning is crucial. The principles described have successfully been included in a restructuring process of a course in Econometrics II by Tabor and von Müllen (Tabor & Von Müllen, 2020), where the students showed a higher work effort, increased learning outcome, higher grades at the final exam and increased total number of students passing the exam. *Thus, the aim of this project was to evaluate how I as a teacher facilitate the peer student feedback sessions to maximize student learning outcome.*

## **Interventions**

In spring 2021, I gave class lectures before and after laboratory experiments in the compulsory bachelor course, while receiving supervision on my teaching as a part of my enrollment in the course on teaching and learning in higher education. During those lectures, the students were asked to provide and receive oral peer-feedback on their written laboratory reports prior to handing them in to me for pass/not pass assessment. Together with my supervisors, we identified a clear gap between potential and actual learning outcome from the peer-supervision sessions. To further understand why this was the case, I created an integrated questionnaire in the following lecture. I learned to my own surprise, that the students had a very diverse perspective on why to provide student peer feedback, hence a highly varied learning outcome. From the poll it was clear, that a high number of students saw the purpose of providing student peer feedback as to "find the highest number of errors in the laboratory reports provided by fellow students" and "to figure out who was the most right". Based on the poll, I had a discussion with the students on how to provide peer feedback, which subsequently sparked a peer feedback session with highly motivated students.

## **Understanding the student's motivation for peer-feedback**

Based on experiences from the bachelor course, I found it highly interesting to further explore how and why peer-feedback deliberately affects the

student motivation to engage in the feedback process. Thus, to specifically target this gap I defined three overall themes to be addressed by interviewing the three student groups from the elective MSc level course described in the background section above. The three themes were 1) peer-feedback in general, 2) students' perspective on teaching outcome of peer feedback, and 3) how does students perceive peer feedback.

### **Conceptualization and translation of peer-feedback into classroom practice**

With inputs from the focus group interviews, a lecture was prepared. The primary goal of this lecture was to increase student motivation hence learning outcome from the peer-feedback by addressing the following learning outcomes 1) what is peer feedback? 2) why is peer-feedback important? 3) what can you learn from peer-feedback? 4) framing how to do peer-feedback in this context, and 5) what peer-feedback can be used to outside the classroom (Appendix A).

### **Evaluation**

To evaluate whether the teaching intervention improved student learning outcome from the peer-feedback session, the students were asked to reflect on whether the peer-feedback received and especially provided helped them to further improve their case work, if it was useful, which criteria they find the most useful and if the criteria could be adjusted to improve learning outcome. The reflections were shared and discussed in plenum on the following course day *e.g.* 5 days after the peer-feedback session, followed up by group interviews. In addition to this, this intervention was supervised and evaluated by my department supervisor and co-course director.

## **Results and discussion**

### **Understanding the student's motivation for peer-feedback**

The interviewees all had previous experiences with peer-feedback, yet no one perceived it as either motivating or as a tool to increase own learning. Instead, they experienced it as time consuming, demotivating and without any learning outcome. The interviewees were enrolled in different study

programs, hence with varied experience on which format of peer-feedback they have experienced. In study program “A”, previous experience was based on peer-feedback on oral presentations, where they were asked to read a paper on forehand. From study program “B”, previous experience was based on giving and receiving peer-feedback on written laboratory reports, written scientific reports together with oral presentations. When asked about previous experiences, the interviewees said, that “*people are often asking simple questions when forced to ask something*” and explained further “*it would be better with questions that keep the discussion going. The teacher has a broader overview, ask better questions and can go into more details*”. Common for all interviewees was, that they put more effort and work into products delivered to a scientific staff member. Simply, if the product did not count in the final assessment, it was not prioritized. As for the group composition and size, all interviewees preferred a group size of 3-4 and to choose group members themselves. The misbelief amongst students regarding the qualification of peers to provide valuable feedback is further discussed by Tabor and von Müllen (Tabor & Von Müllen, 2020), and related to one of Nicol and Macfarlane-Dicks seven principles e.g. feedback must deliver high quality information to students about their learning (Nicol & Macfarlane-Dick, 2006). Yet, relating critically to received feedback is in itself a source of learning, as it requires the students to take a critical stance and reflect upon the feedback in relation to own stance (Nicol et al., 2014). In other words, students must plan an active role in peer-feedback processes by connecting the feedback received with prior knowledge, hence constructing a meaning by analysis, discussion and clarifying questions (Nicol et al., 2014).

Another interviewee added “*it is demotivating when you are not opponent or presenter. The opponent groups always take up all the time, leaving no time left for others to ask questions. . . the workload is often too high, when there are many groups to prepare for*”. Regarding initiatives to improve teaching outcome, the interviewees mentioned “*explaining the exact purpose would be a benefit, not just that it is compulsory*”. Interviewees from study program “B” similarly stated, that “*the feedback is very different from group to group. Often, people do more a grammar check than scientific content*” and “*people are focused on finding mistakes, not constructive criticism on what could be improved*”. Clarifying what a good performance is, is listed as principle number one according to Nicol and Macfarlane-Dicks (Nicol & Macfarlane-Dick, 2006). In the context of course setting, assessing a good performance is directly linked to learning outcomes from

the course description (AarhusUniversity, n.d.; Dolin, 2017). Thus, the assessment criteria must be clearly defined to the students prior to providing peer-feedback, preferable conceptualized via dialogue with the students rather than one-way information (Nicol et al., 2014).

From study program “B”, the interviewees additionally had experience with formative peer-feedback on written laboratory reports including summative decision making on whether the reports were accepted or not. In this context, the interviewees said *“I would never ask my friends to hand in a report a second time. We approve each other’s reports, and then we just use the time to talk and drink coffee”*. For peer-feedback on scientific reports, they have used a rubric structure. From the rubrics, a certain number of points were required for the report to pass. But *“if the report did not have enough points to pass, we just went through it again and found somewhere where we could add a bit more. We will not fail our friends”*. Statements suggesting that peer-assessment is a vulnerable topic, from where it might prove difficult to obtain a high learning outcome. This is further supported by the literature, where a previous study have reported that students do not feel comfortable and are reluctant to give marks to peers due to lack of expertise and the fact that their assessment can highly affect the non-contributing students. Thus, summative peer-feedback should be avoided as it is not likely to be accurate and fair in the assessment (Nicol et al., 2014; Sridharan et al., 2019).

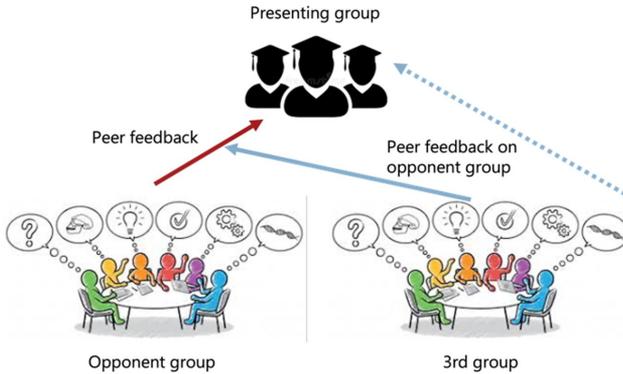
No interviewees used the feedback received to revisit their written reports or reflected upon the feedback received. Not even, if the opponent group disagreed with the results and scientific content in general due to *“lack of time, I will look at it when I am studying for my exam. I am already engaged in a new laboratory exercise, so I don’t care about the ones completed”*. From a lecturer’s perspective, it appears as a wonder that the interviewees did not utilize the opportunity to reflect upon and learn from peers. Yet, being a student myself, enrolled in the pharmaceutical science program in 2004, I clearly remember the busy schedule with several overlapping courses hence deliverables. Thus, when barely having sufficient time to complete the reports, prepare for new classes etc., it is relatable why the interviewees did not prioritize to revisit the reports after receiving feedback, when not obliged to hand in.

## **Conceptualization and translation of peer-feedback into classroom practice**

From the interviews it was clear, that the students did not see the purpose nor learning perspective in peer-feedback. Also, it was unclear how to provide peer-feedback. To address this, five learning outcomes for the lecture on peer-feedback were identified (as described above), and a 45-minute lecture prepared (Appendix A). The content was centered around and an adapted version of the seven principles as described by Nicol and Macfarlane-Dicks (Nicol & Macfarlane-Dick, 2006). To further emphasize the relevance of peer-feedback not only in academic settings but also in future jobs, a job description from a current relevant job opening was included. It was further highlighted in the presentation, where the learning outcome from peer-feedback feeds directly into this job position. After the lecture on peer-feedback, the students were given 45 minutes to prepare for the peer-feedback session and 45 min to prepare for feedback on feedback. The idea was to give the peer-feedback group time to reflect on the assessment criteria and in groups discuss the paper provided on forehand from the presenting group. The time allocated to prepare feedback on feedback group was used to reflect on this role, and what good peer-feedback is.

To guide the students on the peer-feedback, a template listing peer-feedback criteria was developed (Appendix A) and introduced to the students during the lecture. According to Race (Race, 2001), applying assessment criteria in the feedback process results in a much deeper learning experience in itself compared to just being informed about assessment artefacts. Moreover, it has shown to be valuable to include students when defining the assessment criteria (Tabor & Von Müllen, 2020), and the rubrics structure might be a useful in this context (Dolin, 2017). Thus, the developed peer-feedback scheme included feedback criteria directly related to learning outcome and pass/non-pass criteria as described in the course description. Additionally, some boxes were left open with a question mark, where students were encouraged to reflect on new assessment criteria for their feedback. Moreover, it allows students to appropriately challenge the pre-defined goals, hence being involved in establishing the ongoing learning process (Hattie & Timperley, 2007). Besides receiving and providing peer-feedback on the scientific content, the students were also asked to provide peer-feedback on presentation techniques. To prepare the students for this, a lecture was given on presentation techniques, including selected videos of various speakers focusing on this particular (Duarte, n.d.; Forbes,

n.d.). Showing examples of a good performance helps to illustrate, iterate and highlight the criteria towards the students (Tabor & Von Müllen, 2020). *E.g.* the second principle on good feedback practice according to Nicol and Macfarlane-Dick (Nicol & Macfarlane-Dick, 2006), to facilitate development of self-assessment in learning.



**Figure 1.** Feedback structure.

Some interviewees identified lack of motivation during peer-feedback sessions, when they were not actively engaged as presenters or opponent group. Therefore, the third group was asked to provide peer-feedback on the opponent group according to Figure 1. An additional column was added in the review sheet for the observer group (3<sup>rd</sup> group).

## Evaluation

The students found the teaching intervention *e.g.* lecture on peer-feedback to improve their learning outcome. The interviewees stated, that “it is important to know the criteria and why to do peer-feedback. It has a huge impact on the learning outcome”, “it makes more sense now”, “I was skeptical before, but there were good questions and it was more engaging”, “a much better session” and “now I understood what I was expected to do, when relating the peer-feedback to the learning outcomes of the course”. And in relation to the peer-feedback template, the interviewees said, “good with specific points to address”, “worked well” and “it gave me a structure on

how to do it, it was nice". Addressing the seven principles on peer-feedback by Nicol and Macfarlane-Dicks (Nicol & Macfarlane-Dick, 2006) promote student metacognition in regards to the peer-feedback process (Tanner et al., 2012), hence student motivation (Molin et al., 2020).

When asked about specific learning outcome(s) of the peer-feedback session, the interviewees mentioned "discussion with peers on how to focus the scope of our case work for next deliverable", "it was interesting to discuss with peers from different study programs, as we all had diverse perspectives" and "giving peer-feedback allows me to relate to and reflect on my own work". Additionally, all interviewees mentioned specific feedback received on presentation techniques that they intend to implement for future presentations. Those findings further support the work by Nicol and Macfarlane-Dicks (Nicol & Macfarlane-Dick, 2006), as the interviewees found the peer-feedback to facilitate reflection on own learning, providing an opportunity to close the identified gap between current and desired learning outcome.

As for further improvements on the teaching intervention, some students found it stressful to be obliged to ask questions to peers and suggested "It would be nice if we could have 5 minutes in the opponent group after the presentation to discuss our peer-feedback before delivering it". Interestingly, the highly motivated students said, "it helps to relieve the burden on my shoulders as to always being the one to ask questions, when this responsibility is shared with my peers" and "peer-feedback serves the basis of a better discussion, as everyone is actively engaged". Only limited studies focuses on the effect of peer-feedback on student stress levels (Nicol & Macfarlane-Dick, 2006). Yet, a correlation was found between peer-feedback inducing a higher stress level particularly amongst female students, while at the same time improving summative performance tasks (Nicol & Macfarlane-Dick, 2006). Some interviewees did not like the feedback-on-feedback format, as they did not see the learning potential hereof. Thus, this is object for further improvement. As a last remark, the interviewees unitedly found the template to be objective for further improvements, as should be converted into bullet point format with clear-cut criterions. Only one new assessment criteria was suggested by an interviewee, being "time-management and prioritization during presentations".

## Conclusion

The overarching aim of this study was successfully achieved, as the teaching intervention on conceptualization and translation of peer-feedback into classroom practice improved student learning outcome. Obviously, there is room for improvements. First aspect is to further develop the feedback template, and continuously work on a metacognitive level to help the students reflect on and understand the learning potential of peer-feedback. Especially, the feedback-on-feedback aspect could be further developed. Number of students attending the course significantly impacts a feasibility of the described format. Having said that, the students highlighted, that the small class size was highly motivating. Thus, the format of the peer-feedback session needs to be carefully considered in relation to number of students participating.

## Perspective

This project has addressed the importance of understanding the learning outcome of a giving teaching activity on student motivation. The knowledge derived could be utilized in other courses using the peer-feedback. In particular, it could be relevant to consider a red thread throughout the pharmaceutical educational program, where the students continuously use peer-feedback in different contexts, always subsequent to introduction and carefully described peer-feedback criterions.

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### Today's program (and Monday)

8.15-9.00 How to provide peer feedback  
 9.00-9.15 Break  
 9.15-10.00 Prepare peer feedback  
 10.00-10.45 Prepare feedback on feedback  
 10.45-11.00 Break  
 11.00-14.00 Deliverable 1  
 14.15-15.00 Introduction to Deliverable 2  
 15.45-17.00 Quiz and reflection on peer feedback (in groups)

Monday  
 13.15-13.45 Recap and reflection on peer feedback (in plenum)  
 13.45-15.00 Nanogels for enhancing drug delivery of antimicrobials  
 15.00-15.15 Break  
 15.15-17.00 Group work on deliverable 2 (and interviews)

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### Introduction to peer feedback

Stine Harloff-Helleberg  
 Drug Delivery and Biophysics of  
 Biopharmaceuticals group

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### Learning outcome: peer feedback

- What is peer feedback?
- Why is it important?
- What can **YOU** learn?
- How do you provide peer feedback in today's context?
- What should you use the feedback to?

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### What is peer feedback?

Modified from <http://www.biopharmaceutics.com/2012/04/24/peer-to-peer-feedback-why-give-it/>

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### What is peer feedback?

Where am I going?  
 - What is expected from the students  
 - Learning outcome and evaluation

Modified from <http://www.biopharmaceutics.com/2012/04/24/peer-to-peer-feedback-why-give-it/>

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### What is peer feedback?

Learning Outcome

At the end of the course, students are expected to be able to:

Knowledge

Skills

Modified from <http://www.biopharmaceutics.com/2012/04/24/peer-to-peer-feedback-why-give-it/>

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### What is peer feedback?

Exam (SFAK20003E - Continuous assessment)

Credit: 7.5 ECTS

Type of assessment: [Redacted]

performance, meet the overall performance exam

Modified from old.sas.dk/Module/View/2222/View/22 peer-Feedback - an.godt@ - ucdmstrigener - ucd20000

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### What is peer feedback?

Where am I going?  
- What is expected from the students  
- Learning outcome and evaluation

How am I going?  
**Summative feedback**  
- To assess student performance, have you met the overall performance criteria? Eg. exam

**Formative feedback**  
- To improve the process or product e.g. identify strengths and weaknesses  
- To continually improve learning e.g. looking forward  
- Moving from actual performance to desired performance e.g. to target learning

Modified from old.sas.dk/Module/View/2222/View/22 peer-Feedback - an.godt@ - ucdmstrigener - ucd20000

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### What is peer feedback?

Where am I going?  
- What is expected from the students  
- Learning outcome and evaluation

How am I going?  
**Summative feedback**  
- To assess student performance, have you met the overall performance criteria? Eg. exam

Where to next?  
- Reinforcement  
- Redirection

**Formative feedback**  
- To improve the process or product e.g. identify strengths and weaknesses  
- To continually improve learning e.g. looking forward  
- Moving from actual performance to desired performance e.g. to target learning

Modified from old.sas.dk/Module/View/2222/View/22 peer-Feedback - an.godt@ - ucdmstrigener - ucd20000

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### Good feedback practise

- Includes self-evaluation and peer-feedback
- Must be related to pre-defined criteria(s)
- Grading (e.g. summative feedback) must be avoided
- Must be adjusted according to the need of the receiver
- Must be feed-forward
- Have to be prioritized (otherwise to overwhelming, blocks learning)
- Must be concrete and explicit
- Must be constructive and praising, not negative

Your task is not done after receiving peer feedback, but after reflecting on and adapting the feedback into your product... (this afternoon + Monday)

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### The substance of feedback

Figure from course on PhD supervision, INE, KU

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### Peer feedback in "the real world?"

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### When preparing peer feedback

- What is the most significant weakness(es) to address?
- What is the most reasonable explanation for the weakness to occur?
- How can I help to prevent this weakness in the future?
- Which "well done" aspects should be highlighted?

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### Today's peer feedback

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### Feedback template opponent group

PEER FEEDBACK DELIVERABLE 1

SCIENTIFIC CONTENT

Criteria	Where to react?	Level	Excellent
Scientific communication			
Learning outcome			
Scientific communication			
Student defined criteria			

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### Feedback template opponent group

#### Presentation techniques

Criteria	Rating	Goals	Excellent
English			
Event Language			
Content			
Support material			
Visual			
Other			

Student defined criteria

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### Feedback on feedback

- Dialogue focusing on reflection, exploration, generating ideas
- Report on aspects participants may be too involved in to recognise
- How do you experience the session?
- How is dialogue initiated?
- Relationship between presenting group and opponent group?
- What types of questions does the opponent group pose? What reactions do the questions bring about with the presenting group?
- Was the feedback prioritized?

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### Feedback on feedback

- Dialogue focusing on reflection, exploration, generating ideas
- Report on aspects participants may be too involved in to recognise
- How do you experience the session?
- How is dialogue initiated?
- Relationship between presenting group and opponent group?
- What types of questions does the opponent group pose? What reactions do the questions bring about with the presenting group?
- Was the feedback prioritized?

Criteria	Rating	Where to react?	Level	Excellent	Observer
Criteria					Observer
Content					Reflection
Visual					Writing
Other					Clarification

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### Reflections on feedback

- Did it help you to understand how your deliverable should be improved?
- Could you use the peer feedback?
- Did the peer feedback improve your learning outcome?
- Which feedback criteria(s) were the most useful?
- Could the criterias be adjusted to improve your learning outcome?
- Other thoughts?

*Consider those points in your groups this afternoon for further discussion in plenum next Monday*

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### Learning outcome: peer feedback

- What is peer feedback?
- Why is it important?
- What can **YOU** learn?
- How do you provide peer feedback in todays context?
- What should you use the feedback to?

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## Peer-feedback som formativ feedbackform på studerendes skriftlige øvelsesarbejde

Stine Frydendal

Institut for idræt og ernæring  
Københavns Universitet

### Introduktion

Dette projekt omhandler et eksempel på, hvordan peer-feedback er forsøgt implementeret som gennemgående formativ feedbackform gennem et helt kursusforløb på et valgfag på kandidatniveau. Mere specifikt undersøges det, *hvordan peer-feedback som formativ feedbackform på løbende skriftligt arbejde under kurset kan bidrage til øget læring frem mod en skriftlig eksamen?* Undersøgelsen fokuserer på én af kursets øvelsesgange, hvor de studerende giver hinanden feedback på et mindre skriftligt produkt.

### Peer-feedback som læringsredskab på videregående uddannelser

Feedback er et centralt element i den studerendes løbende læreproces og er gennem de senere år blevet udråbt til en af de mest afgørende kilder til læring overhovedet (Rienecker & Bruun, 2013). Til trods for dette, udtrykker studerende ofte, at de kan have svært ved at håndtere feedback eller gennemskue formålet med denne (Hounsell m.fl., 2008). Derfor er det i undervisningsøjemed essentielt at fremhæve, hvad formålet med feedback er (Rienecker & Bruun, 2013). Formativ feedback er et vigtigt læringsredskab i undervisningen på universitet, og anvendes til at få indsigt i og videreudvikle den studerendes udbytte af undervisningen (forståelse og præstation) for derigennem at øge læringen fremadrettet (Nicol & Macfarlane-Dick, 2006). Peer-feedback kan, hvis den struktureres hensigtsmæssigt dæmme op for nogle af de udfordringer, som findes i forbindelse med feedback på videregående uddannelser. Studier af undervisning, hvor der både indgår

peer-feedback samt underviser-feedback, men hvor de studerende ikke har været bevidst om, hvilken feedback, der er givet af hvem, viser, at studerende kan opnå samme læringsudbytte af peer-feedback, som underviser-feedback (K. Cho m.fl., 2006). Samtidig sikres det også, at underviserfeedbacken i sådanne tilfælde ikke underminerer peer-feedbacken, som det ofte ses, når den studerede er bevidst om, at peer-feedback suppleres af underviserfeedback (Rienecker & Bruun, 2013). Derudover er studerende ofte bedre til at også at rose i deres feedback, hvorimod feedback fra underviser ofte er mere fokuseret på fejlfinding, og derfor kan have en negativ effekt på de studerendes selvværd. K. Cho m.fl., 2006 har netop vist, at de studerende bedre kan tage kritik ind, hvis denne følges af ros, og de er dermed mere tilbøjelige til at internaliserer peer-feedback. I forlængelse heraf viser flere studier, at den største læring faktisk sker hos feedbackgiveren og ikke hos modtageren (Y. Cho & Cho, 2010; Lundstrom & Baker, 2009; Nicol m.fl., 2013). Dette er dog forudsat af, at underviseren rammer sætter peer-feedbacken og opsætter kriterier for, hvordan feedbacken skal gives (van Gennip m.fl., 2009). Peer-feedback er desuden en feedbackform, som kan tilgodese et tidsperspektiv fra underviserens side, da de studerende selv indgår i feedbackprocessen, og dermed tillader mere og grundigere feedback til de studerende end underviseren nødvendigvis har resurser til at give (Rienecker & Bruun, 2013). Ligeledes fremmer den reflektive proces, som ligger i at skulle forholde sig kritisk til andres arbejde, evnen til at se sit eget arbejde i et kritisk lys, og derfor sker der i feedbackgiverprocessen også en øget læring vedrørende eget arbejde (Y. Cho & Cho, 2010; Lundstrom & Baker, 2009). Undersøgelser har vist, at mange studerende ønsker større grad af feedback i undervisningen. Mange undervisere på danske universiteter beskriver dog, at der ikke er afsat tilstrækkelig tid til at give feedback i den udstrækning, det ønskes. Yderligere tilkendegiver undervisere og vejledere, at de oplever, at de studerende ikke bruger undervisernes feedback (Rienecker & Bruun, 2013, side 260-61). Dette taler for at opkvalificere og udforske brugen af peer-feedback i undervisningen frem for andre feedbackformer. For mit eget virke som underviser, ønsker jeg især at blive dygtigere til at gøre peer-feedback anvendeligt og lærerigt for de studerende, da det åbner muligheder, som underviser-feedback ikke har resurser til. Potentialet for at udvikle de studerendes egen evne til at tænke kritisk udvikles ligeledes, og muligheden for dybere læring kan således opnås ved at indarbejde kvalitetsfyldt peer-feedback i undervisningen.

## Beskrivelse af kontekst og intervention

Jeg vil herunder beskrive selve interventionen. Denne er overordnet tilrettelagt på baggrund af den viden, som er gennemgået ovenfor. Undersøgelsen tog udgangspunkt i et valgkursus på kandidatuddannelsen Humanistisk-samfundsvidenskabelig idrætsvidenskab; *Idræt og Ungdomskultur* i blok 2. Jeg er modulansvarlig, og det er et sociologisk forankret kursus. Kurset er bygget op omkring 2 undervisningsgange pr uge. Hver uge behandles et nyt tema. Den ene undervisningsgang er bygget op omkring forelæsning, gæsteoplæg, gruppearbejde. Den anden er konkrete øvelsestimer indenfor ugens tema, hvor de studerende skal aflevere et enten skriftligt eller mundtligt produkt, hvortil der gives peer-feedback som i nogle tilfælde suppleres af underviserfeedback. Biggs og Tang (Biggs & Tang, 2007) argumenterer for, hvordan overensstemmelsen mellem mål, læringsaktiviteter og prøver betinger den studerendes dybere læring, og der skal således være sammenhæng mellem kursets overordnede mål, hvilke aktiviteter i løbet af kurset, som sikrer læring indenfor disse mål, og at den studerende også prøves og bedømmes med udgangspunkt heri. På dette kursus, skal de studerende aflevere en skriftlig eksamensopgave om et selvvalgt emne inden for kursets ramme, og flere af øvelserne vil derfor fokusere på forskellige stadier i udformningen af en sådan opgave for dermed at skabe sammenhæng mellem læringselementer i øvelserne og eksamensformen, således at de studerende klædes bedst muligt på til dette. Jeg har bevidst valgt at bygge øvelserne op omkring peerfeedback – både for at dygtiggøre mig indenfor denne feedbackform, og udforske dens muligheder og begrænsninger dybdegående. Dette knytter jeg især an til den mængde forskning som viser, hvordan peer-feedback som formativ feedbackmetode især kan fremme den studerendes evne til at tænke kritisk, både vedrørende andres arbejde, men især hvordan denne kritiske refleksion skaber en bedre evne til at anskue sit eget arbejde fra et kritisk perspektiv og lære af dette (K. Cho m.fl., 2006; Y. Cho & Cho, 2010; Lundstrom & Baker, 2009; Nicol & Macfarlane-Dick, 2006). Samtidig tilgodeser peer-feedbackmetoden muligheden for mere og grundigere feedback (Rienecker & Bruun, 2013), og dermed en af de udfordringer, som ligger i et sådan kursus, hvor jeg varetager det meste af undervisningen selv, og derfor ikke har den fornødne tid til at give de studerende feedback på alle deres øvelser undervejs i kurset. De mundtlige øvelser var dog suppleret af underviser-feedback, mens de skriftlige øvelser udelukkende var baseret på peer-feedback. En refleksionsproces for mig omhandlede derfor også, hvorvidt og om underviserfeedback skal in-

korporeres mere i de skriftlige øvelser i kurset fremadrettet. Nærværende opgave tager udgangspunkt i kursets første øvelse, hvor de studerende individuelt skulle forberede et kort skriftligt arbejde på 1-2 sider, som fokuserer på ungdomssociologiens relevans for at forstå unges perspektiver på idræt, krop og sundhed (se øvelsesbeskrivelsen, bilag A). De studerende fik øvelsen udleveret en uge før peer-feedbacksessionen. Jeg havde på forhånd udformet en vejledning til, hvordan de skulle give hinanden feedback, som var vedhæftet øvelsesbeskrivelsen, og de studerende kunne derfor også i arbejdet med det skriftlige produkt bruge feedbackvejledningen som rettesnor for deres eget skriftlige arbejde. Dette var for at kvalificere feedbacken og skabe rød tråd gennem hele øvelsen, så det hele vejen fra det skriftlige arbejde til peer-feedbackdelen var tydeligt, hvad der forventedes af dem, og forberedte dem på, hvordan de skulle læse de andres opgaver på et tidligt tidspunkt i forløbet (K. Cho m.fl., 2006). Figur 1 viser kontekst, mål og plan for den pågældende undervisning, som nærværende opgaver tager udgangspunkt i.

## **Evaluerings**

De studerende blev efter undervisningen bedt om at udfylde en mindre open-ended spørgeskema i programmet SurveyXact. Desværre satte jeg ikke tid af i selve undervisningen til, at de skulle udfylde evalueringen, hvilket har betydet at kun 7 ud af 13 deltagende studerende har udfyldt den skriftlige evaluering. Derudover lavede vi en mundtlig evaluering af øvelsen. Den skriftlige og mundtlige evaluering vil blive anvendt til at understøtte diskussionen af undervisningens forløb. Slutteligt skulle de studerende udfylde et refleksionsark centreret omkring, hvad de havde lært af hhv. at give og modtage feedback. Dette var udelukkende til egen brug, men for at sikre en dybere refleksion over, hvad de havde fået ud af øvelsen (Hounsell m.fl., 2008).

**Kontekst**

Kursus: <i>Idræt og ungdomskultur</i>	Formål: Indblik i unges idrætsvaner med henblik på at kunne identificere, analysere og fortolke ungdomskulturelle problemstillinger i forhold til idræt og fysisk aktivitet i et sociologisk perspektiv, både i en dansk og international kontekst. Sociologisk funderet: anvende sociologisk teori til at analysere og skabe forståelse for relevante problemstillinger i relation til unges idrætsvaner.
Uddannelse:	Kandidatuddannelsen <i>Humanistisk-samfundsvidenskabelig idrætsvidenskab</i>
Undervisningstype	Øvelsestime med peerfeedback
Tid:	150 min
Antal studerende tildelt:	13
Min rolle på kurset:	Modulansvarlig. Varetager al undervisning

**Mål for undervisningen**

Tema for øvelse:	Første øvelse på kurset: Skriftlig opgave om Ungdomssociologiens relevans for at forstå unges perspektiver på idræt, krop og sundhed. Se bilag 1 for beskrivelse af øvelsen
Læringsmål:	Det ønskes at styrke den studerendes evne til kort og præcis skriftlig formidling, som knytter sig til kursets eksamensform, som er en 15 siders skriftlig aflevering om et selvvalgt tema. Øvelsen kan repræsentere en indledning til eller rammesætning af en potentiel eksamensopgave. Det skriftlige arbejde evalueres med peer-feedback, som skal styrke de studerendes færdigheder i at give og modtage feedback, og forbedre evnen til at forstå og anvende kriterier til at vurdere andres og egen præstation.
Pædagogisk mål	Ved hjælp af peer-feedback er det målet at styrke den faglige forståelse, fordi man, når man giver feedback, må forklare og begrunde sin vurdering, og ved at læse og vurdere andres arbejde opnås større forståelse for, hvad der gør en præstation god og hvorfor.

**Plan for undervisningen**

1. Introduktion til øvelsen	Rammen for dagen sættes.
2. Gennemlæsning af opgaver ca. 45 min	De studerende inddeles i grupper af 3 og skal hver læse to opgaver, og give feedback ud fra vejledningen
3. Peer-feedback Ca. 45-60 min	De studerende skiftes til at give hinanden feedback. Den der modtager er lyttende og lader to øvrige i gruppen tale på skift. Det vægtes, at man holder en god og konstruktiv tone, men samtidig fokuserer på, at vi er her for at lære og blive dygtige, og man må derfor gerne være kritisk, så længe man også er konstruktiv. Man skal afslutningsvis opsummere to ting, som fungerer særligt godt, og to ting som der kan arbejdes videre med.
4. Opsamling Ca 15-20 min	Vi samler op på feedbackøvelsen i plenum og evaluerer. De studerende udfylder et refleksionsark til egen brug.
5. Igangsættelse af øvelse 2	Intro til næste øvelse

**Figur 1: Oversigt over intervention****Diskussion**

Ifølge Hounsell et al (Hounsell m.fl., 2008) er det vigtigt at afklare de *studerendes tidligere oplevelser* med feedback for at kunne engagere sig i feedbacken. De studerende kan være mere eller mindre afhængige af vejled-

ning og støtte til at sætte sig ind i, hvad der kræves af dem, alt efter hvor familiære de er med øvelsens form (p. 60). Netop dette element blev jeg på baggrund af denne undervisningsgang meget opmærksom på. Det viste sig, at de studerende ikke var særlig vant til at læse hinandens skriftlige arbejde kritisk. De fleste havde hovedsageligt erfaring med peer-feedback på mundtlige præsentationer, men havde ikke særlig meget erfaring med kritisk læsning af hinandens arbejde ud fra fastsatte kriterier. De to udsagn nedenfor omhandler både en usikkerhed omkring arbejdsformen, samt en vis skepsis over, hvorvidt det kan fungere lige så godt som underviserfeedback.

*Øvelsen var udfordrende, da vi ikke på den måde har prøvet at give peerfeedback til hinanden på skriftlige produkter før. Det udfordrende ved øvelsen var også, at man ikke måtte kommentere på den feedback, man selv fik. Det var svært kun at være lyttende.*

*Det der fungerede mindre godt var, at der manglede det ekstra lag af kvalitet i feedbacken. Altså et kritisk perspektiv til indholdet af det skrevne, hvilket klart er det sværeste at gøre. Det er her jeg ofte oplever, at underviseren er dygtig til den del og til at have overblik. At kunne se hvad der mangler i det man skriver/siger.*

Flere af de studerende arbejdede rigtig fint med øvelsen og havde ingen problemer med at udfylde den afsatte tid, mens andre kom meget hurtigt igennem de forskellige dele af øvelsen, hvilket vidner om, at de måske har haft svært ved at anvende de kriterier, der var sat op for feedbacken eller en tvivl på egne evner i forhold til at udpege kritikpunkter i andres arbejde (Hounsell m.fl., 2008, p. 61). Dette kom også til udtryk i nogle af de studerendes refleksioner over *den løbende præcisering* op til aflevering af den skriftlige del af øvelsen, hvilket Hounsell et al (Hounsell m.fl., 2008, p. 61) mener er betydningsfuldt for, om de studerende føler sig klædt på til at udforme opgaven. Flere udtrykte at øvelsesbeskrivelsen til den skriftlige del havde været god og anvendelig, men også at det virkede meget voldsomt ved første øjekast, og måske kunne føles overvældende at skulle kaste sig ud et skriftligt produkt så tidligt i forløbet, som andre oveni købet skulle se.

*Først lidt omfangsrig, men da det blev klart at det jo ikke skulle være et færdigt produkt som en eksamensopgave og at det ikke skulle afleveres og godkendes af læren, blev det rigtig fint. Det var godt at gøre sig nogle tanker og bruge pensum helt konkret til noget og have en god vejledning i form af opgavebeskrivelsen til hvordan.*

*Den var mere tidskrævende end jeg først havde antaget, men det var godt at man blev tvunget til at arbejde med teorien allerede fra starten af modulet.*

Ovenstående fortæller, at de studerende ikke har stor erfaring med at skulle lave skriftlige øvelser undervejs i kurser, og fandt det udfordrende, men samtidig også lærerigt. Især blev sammenhængen mellem øvelsesformen og eksamensformen fremhævet som positivt af de studerende og bidrager således til sammenhængen mellem kursusindhold, og prøveform (Biggs & Tang, 2007). Jeg har efterfølgende overvejet, om jeg kan præcisere vejledningen til feedbackdelen mere, og måske fokusere på, at de skal kunne give hinanden en skriftlig udgave af feedbacken efterfølgende. Dette kunne fungere godt i en rubric, i stedet for kun at lægge op til en mundtlig peer-feedback. Denne overvejelse underbygges også af, at der var et stort spænd i, hvordan de studerende arbejdede med selve peer-feedback delen, efter de have lavet den skriftlige del af øvelsen. Nogle grupper kunne godt have brugt længere tid, mens andre kom til at sidde og vente, fordi de var hurtigt færdige:

*Det tog alt for lang tid - at bruge 3 timer på det, kunne sagtens være gjort hurtigere og mere effektivt.*

*Der var afsat for meget tid. Vi var hurtigt færdige selvom jeg synes, vi var grundige nok.*

*Øvelsen fungerede rigtig godt. Min umiddelbare tanke var, at der var afsat alt for meget tid til øvelsen. Men da vi var i gang, kunne jeg nærmest godt have brugt mere tid. Det satte en masse refleksioner i gang, som var spændende at fordybe sig i.*

Denne dimension af peer-feedback, hvor man som underviser skal sætte rammer op, som favner alle de studerende, uanset deres tidligere erfaringer samt evne til at forstå og bruge kriterierne for feedbacken, fandt jeg særligt udfordrende. Efterfølgende har jeg overvejet, hvordan man kan støtte de grupper, som kommer meget hurtigt gennem opgaven, og måske overlade de grupper, som arbejder godt mere til sig selv. Denne balance er svær, fordi faren bliver, at min indblanding i deres feedback kommer til at underminere deres egne refleksioner og overvejelser (K. Cho m.fl., 2006). En studerende udtrykte på et senere tidspunkt i kurset, at hun var bange for, at hun var virkelig dårlig til feedback, for hun syntes virkelig, hun forsøgte at være grundig, men det gik bare altid meget hurtigt. Således kan peer-feedback også have den bagside, at de studerende kan føle sig utilstrækkelige på grund af deres udfordringer som feedbackgiver. Dog var den gennemgående oplevelse blandt de studerende, at de have fået rigtig meget ud af peer-feedbacken:

*Jeg fik konkret nogle forslag til mit skriftlige arbejde, altså at jeg kaster nogle påstande ud uden videre belæg, udfoldning, teoretiske begrundelse, som gør læseren nysgerrig, men der mangler lidt opfølgning. At jeg skal øve mig i at gå meta; hvorfor vælger jeg den teori, og hvad kan den og hvor står den i modsætning til den teori artiklen bruger. Men også, at jeg har god struktur, grammatik og sprog, og selvom det er en 'hurtig' opgave, er den skriftlig stærk.*

De studerende har gennem kurset overordnet været positive omkring peer-feedback som overvejende metode til feedback på deres produkter og som supplerende støtte i deres læringsproces (Hounsell m.fl., 2008, pp. 62-63). Mit indtryk har, både gennem snakke under kurset, men også i evalueringerne, været, at de har lært rigtig meget både ved at skulle anvende pensum skriftligt i forhold til konkret stillede spørgsmål, og at de efterfølgende skulle forholde sig kritisk til hinandens produkter:

*Jeg blev mindet om hvor vigtig ens kropssprog er, når man modtager og giver det. Jeg læste de andres opgaver, så jeg fik indsigt i andre måder at gribe en opgave an på. Jeg gik meget tekstnær til værks, hvilket jeg kunne fornemme både havde gode og mindre gode elementer i. De gode lå i at det var meget konkret og håndgribeligt. Jeg fornemmede at det mindre gode lå i at det kunne opfattes personligt eller i hvert fald kom tæt på dem. Så måden ting siges på, kan være mere sårbart for nogle end andre selvom det blot er inputs og overvejelser.*

*Jeg fik måske mere ud af at give feedback end at modtage feedback i denne omgang. Jeg kommer meget til at hive mig selv med i den feedback, jeg giver til andre. Eksempelvis ved at sige, at det har jeg jo også selv gjort i min opgave. For ligesom at retfærdiggøre den kritik, jeg giver, hvis man er bange for at det lyder for negativt. Det er rarest at starte med at sige noget positivt, så noget kritik og til sidst noget positivt igen.*

Dette understøtter megen af den eksisterende forskning om peerfeedback (Y. Cho & Cho, 2010; Lundstrom & Baker, 2009). Samtidig var der flere studerende, som efterspurgte mere feedback fra mig som underviser, og at jeg også gik mere ned at noget af det arbejde, de havde lavet. Det var især nogle af dem, som synes det var svært at være kritisk på fakta og faglighed, hvilket også er en af udfordringerne ved peer-feedback – at de studerende af gode grunde ikke har den samme baggrundsviden som underviser, og derfor og kan komme til at overse faktuelle fejl, eller misforståelser (Rienecker & Bruun, 2013). Jeg har derfor efterfølgende overvejet, at jeg måske skal indgå i feedbacken enkelte gange, men som blinded feedback i stedet for åben feedback, sådan at min feedback ikke kommer til at underminerer

deres egne feedback (K. Cho m.fl., 2006). Jeg tænker at denne tilgang har mange positive egenskaber til forskel fra at lægge en skriftlig øvelse ind kun med underviserfeedback. Her kunne faren være, at de studerende ser denne feedback som mere tungtvejende, end den de selv giver hinanden i de øvrige øvelser, og derfor ikke vælger at prioritere peer-feedbackøvelserne. På den anden side, var en væsentlig læring for mig som underviser, at de studerende var meget begejstrede for, at de skriftlige øvelser ikke behøvede at være perfekte eller skulle afleveres og godkendes af underviser.

*Måske kunne man skabe en kultur, hvor det er ok at komme med noget der ikke er færdigt. Det var lidt pinligt at teksten ikke var færdig, men det godt at det var ok.*

*Jeg fik faktisk et mere positivt syn på min opgave i stedet for at synes, det var pinligt, at jeg havde brugt så lidt tid. Jeg fik et mere konkret overblik over muligheder for forbedringer i stedet for bare at se min opgave som et stykke pinligt*

*andenhåndsarbejde.*

De studerende var positive over, at de kunne komme med noget, som de ikke følte skulle bedømmes af underviser, eller som kunne være en slags work-in-progress. Det blev de dog først rigtig klar over, da de sad til selve peer-feedback-delen, og det kunne jeg derfor godt have præciseret for dem, og understrege, at de hellere måtte komme med noget, som måske ikke var perfekt, i stedet for at blive væk.

## Handlingsanvisninger

På baggrund af ovenstående diskussion følger her 4 punkter, som repræsenterer de handlingsanvisninger, jeg vurderer er væsentlige at tage med videre i mit eget arbejde med peer-feedback som læringsform i undervisningen:

- At bruge endnu mere tid på at rammesætte øvelsen og være tydelig omkring, hvad de studerende skal lære. F.eks. bruge tid på understrege, at det er work-in-progress, og hvad man kan bruge det til; at det er ok at lægge noget frem, som ikke er færdigt.
- Overveje tidsperspektivet og hvordan det er muligt at favne både de studerende, som sagtens kan fylde tiden ud, og de som har svært ved det. Hvordan kan man støtte begge grupper på en god måde? Et skriftligt element i peer-feedbacken kunne måske gøre det lettere for de studerende, som har svært ved at bruge al tiden mundtligt.

- Antallet af fokuspunkter skal afstemmes i forhold til, hvor omfangsrig opgaven er. For nogle var det svært at tale om alle elementerne i feedbackvejledningen på baggrund af 1-2 sider. I den forbindelse er det således vigtigt at understrege for de studerende, at det er opmærksomhedspunkter, og at mange af tingene er noget, som skal være til stede i alle skriftlige produkter.
- Det giver det god mening at prioritere skriftligt arbejde løbende under et kursus med skriftlig eksamen, men feedback på dette kan være tidskrævende for underviser, og de studerende kan derfor drage nytte af peer-feedback og samtidig også arbejde med aktiviteter, som knytter sig til kursets prøveform.

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## A Øvelsesbeskrivelse samt vejledning til peer-feedback

### Øvelse 1:

Skriftlig øvelse om sociologiens relevans for at forstå unges perspektiver på idræt, krop og sundhed.

Du ska l skrive 1-2 sider, hvori du skal forholde dig de 2 nedenstående spørgsmål. Du skal underbygge dine pointer og argumenter ved brug af mandagens pensum. Brug halvanden linjeafstand og skriftstørrelse 12.

1. Med udgangspunkt i kapitel 1+10, skal du argumentere for sociologiens relevans for at studere ungdom i relation til idræt krop og sundhed. Eksemplificer gerne med brug af de tre videnskabelige artikler fra mandagens pensum.
2. Udvalg 1 idrætsrelateret problemstilling fra rapporten *Ungdomsprofil 2020 - Gentofte Kommune*
  - a. Gør kort rede for problemstillingen
  - b. Hvordan kan denne problemstilling studeres sociologisk?
  - c. Hvordan bidrager et sociologisk perspektiv til at kunne forstå og forandre denne problemstilling?

Husk litteraturliste

### **Feedback:**

Feedback på øvelserne foregår mandag d. 29.11 som peer-feedback.

**Mandag d. 29.11.21**

**Vejledning til feedback:**

I skal give feedback i grupper af 3, så i hver giver feedback på 2 opgaver. Husk at give feedback i en god og konstruktiv ånd. Formålet er at blive dygtigere, så man skal både give ros og pointere, hvad der kunne forbedres. Fremhæv det positive først: Hvad er det bedste ved besvarelsen, og hvad er det, der virker godt? Husk at være lyttende, når du selv modtager feedback. Du skal ikke forsvare dig selv og din tekst, men lytte til den konstruktive kritik, så du kan forbedre dig.

Struktur:

- Svares der på spørgsmålene (underspørgsmålene)?
- Har teksten faktuelle fejl?
- Er teksten interessant læsning?
- Er besvarelsen sammenhængende – har den en rød tråd?
- Fremstår besvarelsen velstruktureret og præsenteres informationer i en logisk rækkefølge?
- Er opgaven disponeret på en god måde (indhold og struktur)?

Sprog:

- Er besvarelsen beskrivende og/eller kritisk vurderende (taksonomi)?
- Er besvarelsen skrevet i et præcist og akademisk sprog?
- Er der variation i sproget?
- Hvordan er besvarelsen ift. stavefejl, grammatik og sætningskonstruktion?

Faglig ramme:

- Knytter teksten an til fagets begreber og teorier?
- Er teksten velunderbygget med tilpas mange henvisninger og er de korrekt placeret ift. indhold?
- Er referencerne i teksten konsekvente og korrekt udført?
- Har forfatteren anvendt relevante kilder?
- Er litteraturlisten udført korrekt?

Opsamling:

- Du skal opsummerende fremhæve to elementer, som fungerede godt i opgaven, og to elementer, som skal ændres/arbejdes videre med for at gøre besvarelsen endnu bedre?



## Fokus på læringsrum og feedback for at opnå læringsmål på kandidatkurset i almen medicin

Anne Møller

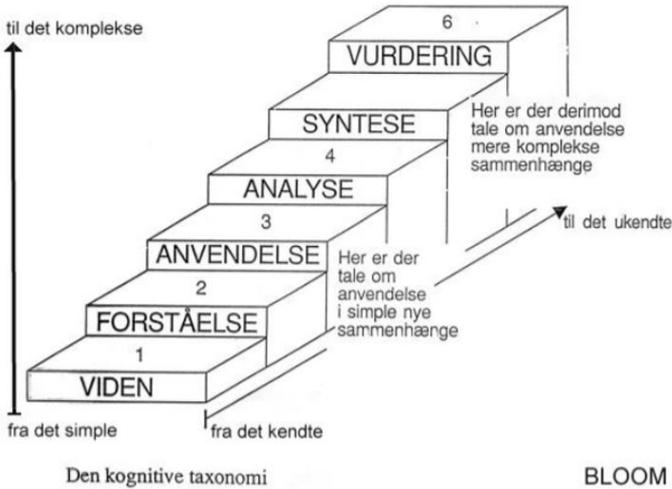
Institut for Folkesundhedsvidenskab  
Københavns Universitet

### Baggrund

I mål- og indholdsbeskrivelse fra Studienævnet for medicin fremgår det, at målsætningen for kandidatkurset i almen medicin er, at ”den studerende skal kunne diagnosticere og behandle almindeligt forekommende tilstande i almen praksis. Den studerende skal desuden lære at bruge ’konsultationsprocessen’ som et kommunikativt redskab til diagnostik og behandling” (se <https://kurser.ku.dk/course/smea15062u/2021-2022>). Fagbeskrivelsen (afsnit 5.1 i målbeskrivelsen) udspecificerer målsætningens læringsmål og bruger Blooms taksonomi til at beskrive videns- og færdighedsniveau for hvert læringsmål (se figur 1).

### Læringsmålet: Konsultationsprocessen

Når det drejer sig om konsultationsprocessen som redskab, skal de studerende tilegne sig viden på alle niveauer i Blooms udviklingstrappe. Dvs. der skal både være viden og forståelse af konsultationsprocessen, og den studerende skal kunne anvende viden om konsultationsprocessen i konsultationer med patienter i klinikken. Den studerende forventes desuden at kunne integrere viden omkring konsultationsprocessen i egne konsultationer og derefter være i stand til at analysere egen performance i konsultationen. Slutteligt skal den studerende kunne reflektere over egne konsultationer og kunne evaluere egen performance og på den måde arbejde videre med konsultationsprocessen i fremtidige konsultationer både på kurset og senere i arbejdet som læge.



**Figur 1.** Fra målbeskrivelsens side 10 efter: Taxonomy of educational objectives. Vol. 1: Cognitive domain BS Bloom - New York: McKay, 1956.

Læringsmålet omkring konsultationsprocessen er således helt essentielt for den studerendes fremtidige virke som læge i en klinisk sammenhæng. Vi oplever imidlertid ved eksamen i almen medicin, som afslutter kandidat-kurset på 6. semester, at ikke alle studerende opnår de forventede niveauer af dette læringsmål. Alle opnår de første trin i Blooms udviklingstrappe, nemlig viden og forståelse af processen. Det, der kan være udfordrende for en del studerende, er at integrere denne viden i egen praksis, men også at være i stand til at analysere egen performance og på den måde arbejde videre med konsultationsprocessen. De studerende, der ikke opnår denne færdighed, kan ofte ikke selv se manglerne i deres præstation, og bliver ved karaktergivningen og mundtlig feedback efter eksamen ofte overraskede over disse evalueringer af deres færdigheder.

Jeg har i tidligere opgaver under universitetspædagogikum beskæftiget mig med kongruens og alignment på kurset i forhold til læringsmål og læringsmetoder og den endelige vurdering af de studerendes kunnen (ved eksamen). Gennem det arbejde har jeg set et oplagt indsatsområde i forhold til at bedre de studerendes evner indenfor integrering af konsultationsprocessen og muligheden for senere analyse og evaluering af egen performance (de sidste trin i Blooms udviklingstrappe). Jeg har som underviser og eksa-

minator vurderet, at et af indsatsområderne er at fokusere på den formative feedback til de studerende på holdundervisningsdelen af kurset. Samtidig har forståelsen af læringsrummets vigtighed givet ideer til udvikling af dette.

Spørgsmålet, som skal besvares i opgaven, er således:

**Kan fokus på læringsrum og feedback til den studerende på kurset i almen medicin være et redskab, der kan sikre at flere studerende opfylder læringsmålet omkring konsultationsprocessen?**

### **Teoretisk baggrund**

Hvis vi tager udgangspunkt i kurset i almen medicin, så har de studerende på sidste semester af kandidatdelen en stor faktisk viden fra lærebøgerne. Imidlertid er den viden, der primært kræves/efterspørges i mødet med patienten, en viden om, hvordan man i konsultationen er i stand til at kunne bruge den viden. Inden man når så langt, foregår der i konsultationen en stort relationel og kommunikativ opgave i samarbejde med patienten. Den første dag på kurset i almen medicin på 6. semester af kandidatuddannelsen deltager de studerende i en kommunikationsworkshop, som danner basis for de næste 8 ugers kliniske kursus. Dernæst introduceres de studerende til en videnskabeligt funderet struktur for konsultationen (konsultationsprocessen), som de opfordres til at øve sig i at bruge, når de har patienter ude i almen praksis. Kurset består således af 8 dages ophold hos en praktiserende læge, hvor de har selvstændige superviserede konsultationer med patienter samt af 5 gange med holdundervisning med praktiserende læger med forskningsbaggrund. De studerende optager under opholdet ude i almen praksis en række af deres konsultationer, som de medbringer til holdundervisningen. I holdundervisningen modtager den studerende formativ feedback fra medstuderende (peers) og fra underviser i forhold til konsultationsprocessen.

Denne måde at tilegne sig konsultationsprocessen på bygger på pædagogiske erfaringer og evidens. Et review (Hammoud m.fl., 2012) over netop brugen af video-optagede konsultationer blandt medicinstuderende konkluderer:

*It was evident that video review with self-assessment alone was not effective because learners do not necessarily know what they don't know. Guidance of some kind is necessary, whether it be feedback from peers and/or faculty (including standardized patients), a checklist of expected behaviors,*

*or a “gold standard” performance against which students could measure their own performance*

De nævnte elementer er således allerede en del af holdundervisningen på kurset i almen medicin, nemlig feedback fra medstuderende og underviser/tutorlæge, når den studerende viser en video med en patientkonsultation, et skema over konsultationsprocessen og oplagte indholdselementer, der kan afkrydses ved gennemgangen af videoen samt en række videoer til fælles afbenyttelse, der viser typiske konsultationer med fiktive patienter. Når det drejer sig om feedback og refleksion, så viste både reviewet (Hammoud m.fl., 2012) og et andet studie af brugen af video-baseret feedback (Dohms m.fl., 2020), at det accepteres godt af de studerende. Det viser sig også i studierne at være svært at måle, hvor stor og hvordan effekten er, men man så en øgning i selvvurderet empati i studiet af Dohms et al (Dohms m.fl., 2020). Det er et interessant fund, da det stemmer godt overens med vores observationer blandt studerende under eksaminationen, hvor det er nogle af de samme dele af læringsmålet de ikke opnår. Det handler netop om en manglende evne til at sætte sig i patientens sted, og vi arbejder derfor i den indledende kommunikationsworkshop netop med mentalisering som begreb (Skårderud & Sommerfeldt, 2008). Her er mentalisering forstået som evnen til at kunne forstå andre menneskers ageren ud fra mentale tilstande.

Baseret på viden fra litteraturen og kursus i universitetspædagogikum vil jeg derfor arbejde med en kortvarig intervention bestående af fokus på to elementer i undervisningen med formålet at flere studerende opfylder målbeskrivelsens krav ved kursets afslutning. De to elementer er at øge trygheden i undervisningsrummet og at arbejde mere fokuseret med formativ feedback.

## Metode

I forbindelse med min undervisning på et hold af kandidatstuderende på 6. semester vil jeg afprøve interventionen. Vi har 5 kursusgange a 4 timer på kurset. Jeg underviser på en speciel linje på kurset, (”Køge-sporet”), hvor studenterne er tilknyttet Region Sjælland, og undervisningen foregår fysisk på Køge Sygehus. Holdet på ”Køge-sporet” har typisk kun 8 studerende<sup>1</sup>,

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<sup>1</sup> ”Køge-sporet” er en mulighed for de studerende at tilvælge klinisk ophold/dele af kandidatuddannelsen på Køge Sygehus. Der er nogle privilegier forbundet

som er cirka halvdelen af den almindelige holdstørrelse på de øvrige hold på kurset.

### Undervisningsmiljøet

Undervisningsmiljøet påvirkes af både fysiske, kulturelle og affektive faktorer. I denne intervention vil jeg fokusere lidt på de fysiske og mere på de affektive faktorer. I forhold til de fysiske faktorer er placeringen på Køge Sygehus en præmis for undervisningen. Det er lækre nye undervisningslokaler med runde borde, der faciliterer den holdundervisning i mindre grupper med problembaseret læring, som er omdrejningspunkt i kurset i almen medicin. Imidlertid ligger undervisningslokalerne i en mennesketom bygning uden konneks til klinisk hverdag eller forskningsaktiviteter inden for området. Som underviser kan jeg bidrage til at gøre det fysiske undervisningsmiljø mere attraktivt ved at sørge for, at der er hyggeligt i lokalet, og jeg sørger altid for at bage kage/boller til første undervisningsseance, så vi kan starte en god tradition til resten af kursusforløbet og arbejde for at skabe tryghed i læringsrummet. Trygheden forsøges ligeledes øget med fokus på min egen tilstedeværelse under holdundervisningen. Jeg lægger vægt på at være ærlig, personlig, empatisk og indlevende i de studerendes hverdag under kurset. Jeg lærer de studerendes navne hurtigt og interesserer mig for deres hverdag uden for holdundervisningen (Rienecker m.fl., 2013, kapitel 2.3) Samtidig lægger jeg en linje fra starten, hvor spilleregler omkring feedback og gruppedynamik præsenteres på den første kursusgang. Fra tidligere kurser er min erfaring, at det til en start kan være grænseoverskridende for de studerende at være ”på” i plenum, især når det handler om ens egen præstation, der skal analyseres som ved videofremvisning. De studerende kender ikke nødvendigvis hinanden på forhånd. Trygheden vil jeg sikre ved

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med dette. Holdet følger de fælles forelæsninger men har fysisk holdundervisning på Køge Sygehus og ikke på CSS, som de øvrige studerende på årgangen. Køge-sporet er således en selekteret gruppe af studerende, men der er ikke tegn på at de har specielle kompetencer ift det aktuelle kursus. De vælger ”Køge-sporet” fordi det passer dem godt logistisk (bor i Region Sjælland) eller fordi de vil undgå at få KBU i Jylland/Fyn (da Køge-sporet garanterer KBU i Region Sjælland). Det andet specielle rent undervisningsmæssigt for disse studerende er, at de kommer til eksamen hos deres underviser. Det gør de øvrige studerende på samme kursus ikke.

selv at optræde åben, imødekommende og inddrage mine egne oplevelser fra den kliniske dagligdag i undervisningen.

## **Feedback**

Feedback forstås her som en reaktion fra enten underviser eller medstuderende på den studerendes præstation, hvor formålet er at fremme indlæringen omkring konsultationsprocessen. I det aktuelle handler det om formativ feedback, som er tilpasset den enkelte studerende. Der gives både feedback fra underviser og medstuderende i holdundervisningen på kurset. Vi sætter rammerne for feedback fra kursets begyndelse. Under aktuelle intervention fokuseres på to elementer i feedbacken. En teoretisk evidensbaseret introduktion til feedback (Rienecker m.fl., 2013, kapitel 4.6.1.) og dens betydning for læring samt en feedback metode, hvor den studerende på forhånd skal forberede tre ting i videoen, som vedkommende vil have feedback på. Disse tre ting præsenteres for de øvrige studerende og underviseren inden videoen vises. Dette gøres også for at øge læringen af feedbacken. Derudover lægges der vægt på, at der fra medstuderende og underviser skal gives konstruktiv feedback: Man starter altid med noget, der gik godt, noget positivt, men man kan efterfølgende godt supplere med ting, der kan forbedres/sættes fokus på i fremtidige konsultationer. Tidsrammen for feedbacken er ikke givet på forhånd men vil variere afhængig af den studerendes præstation og de medstuderendes kommentarer. Desuden er der også faglige diskussioner knyttet til gennemgangen af den studerendes video, men det er ikke i fokus i denne opgave.

## **Evaluering**

Evaluering af effekten af fokus på undervisningsmiljøet og feedback-sessionerne kommer gennem mundtlig evaluering fra de studerende, fra observationer fra faglig og pædagogisk vejleder, fra LEARN-skemaer (evalueringsskemaer som de studerende udfylder efter hver kursusgang) og desuden skriftlig evaluering tre måneder efter kursets afslutning (alle data haves af underviser og kan fremlægges anonymiseret ved interesse).

## Resultater

### Undervisningsmiljø

Jeg startede første undervisning med at bage kage til de studerende, og de tog stafetten med videre og fik lavet en kage/morgenmadsordning. De fik selv styr på at lave kaffe (der er desværre ikke let adgang til kaffe/the i bygningen, hvor undervisningen foregår). Hele holdet støttede op om ”hyggedelen” af kurset, som var relevant for at gøre læringsrummet trygt. For at mindske utrygheden lod jeg dem de første kursusgange blot tale to og to sammen og krævede ikke, at de talte i plenum, men hurtigt stod det klart, at på det aktuelle hold turde alle melde sig og besvare/kommentere/give og modtage feedback.

De studerende, der deltog i den skriftlige evaluering tre måneder efter kurset, lagde vægt på, at læringsrummet havde være trygt, og stemningen beskrives både som ”rolig” og ”god”. Stemningen på holdet beskrives mere specifikt af student 2:

*Vores hold havde i øvrigt en rigtig god stemning og med åbenhed for fejl, og det gør, at man også er mere tilbøjelig til at deltage aktivt i lektionerne. (Student 2)*

Læringsrummet blev vurderet som meget trygt af både faglig og pædagogisk vejleder.

### Feedback

Næsten alle forberedte sig på tre ting i videoen, som de gerne ville have feedback på. En studerende havde imidlertid ikke klaret at forberede dette. Hun var lidt usikker og måske også fagligt svag, og jeg fornemmede, at det var usikkerheden, der var baggrunden for den manglende forberedelse og påtalte ikke manglen yderligere. Bagefter diskuterede jeg med den pædagogiske vejleder, om jeg havde taget over for tidligt, men hun vurderede tværtimod, at jeg havde reddet den studerende fra et nederlag i plenum og ført hende gennem processen med en mere underviserstyret feedback, så hun kom styrket ud af situationen. Det gav refleksion hos underviser omkring den sårbarhed hos de studerende, som man skal have fornemmelse for og ikke blot fokusere på manglende forberedelse. Når det drejer sig om den feedback de fik, var de glade for selv at skulle lægge ud med noget, der gik godt i videoen, men også de kommentarer, de fik fra både underviser og

medstuderende. Det blev opfattet som brugbart og anvendeligt feedback. Vi diskuterede undervejs, hvad de fik mest ud af, og flere mente, at de fik mest ud af at give de andre feedback, for så var de ikke så hæmmet af følelser, som når de selv sad og fik feedback. De vurderede selv, at de fik meget ud af at høre og se de andres præstationer undervejs i kurset.

Det kan ikke i det aktuelle datasæt vurderes, om vi har nået målet ift. Blooms taksonomi omkring erkendelsen, men to af de tre studerende, der har svaret på de opfølgende spørgsmål har reflekteret over deres udbytte af kurset:

*Jeg synes jeg lærte nogle værktøjer til at tilpasse mig. Alle mennesker er forskellige både hvad angår sygdomsopfattelse, humor og mængde af info mm. (Student 1)*

*Jeg lærte at læne mig tilbage og reflektere over patientens situation, uden at glemme hvad jeg egentlig skulle spørge om (Student 2)*

Den pædagogiske og den faglige vejleder gav en god tilbagemelding på feedback. Jeg havde planlagt, at jeg ville supplere den mundtlige feedback men en time-out efter hver feedbacksession, hvor den studerende, der havde vist video kunne få lov til at skrive egne noter omkring de tilbagemeldinger, der var givet. Samtidig kunne de andre medstuderende gøre det samme, men på baggrund af, hvad de havde observeret udefra. Imidlertid glemte jeg flere gange denne aktivitet i undervisningen.

## Diskussion

Interventionen omkring undervisningsmiljø/læringsrum og feedback var lærerigt for både de studerende og underviseren. De studerende var begejstrede for formen og udfyldte velvilligt LEARN-skemaer, og flere tog sig tid til at svare på opfølgende mail tre måneder efter kursets afslutning.

Jeg har ingen kvantitativ evaluering af, om interventionen har haft effekt. De studerende klarede sig imidlertid meget godt til eksamen og fik et gennemsnit på 10. Jeg oplevede ikke, at nogle af disse studerende manglede at opnå nogle niveauer i Blooms udviklingstrappe, da de alle kunne reflektere over egen praksis, men det er et meget lille selektivt sample uden kontrolgruppe, og vi kan derfor ikke drage konklusioner på den baggrund.

## **Forslag til det videre arbejde med undervisningsmiljø og feedback på kurset i almen medicin**

Gennem forløbet med den pædagogiske vejleder blev jeg gjort opmærksom på, at jeg kunne optimere min italesættelse overfor de studerende af vigtigheden af et trykt læringsrum, gensidige forpligtelser og den evidens, der ligger til grund for kursets opbygning og indhold. Det har jeg ikke tidligere været særlig fokuseret på, men i de hold, jeg har haft efterfølgende, har denne rammesætning haft god effekt.

Jeg er gennem arbejdet med feedback også blevet inspireret af min faglige vejleder til at variere feedbackformen i undervisningen, således at vi f.eks. bruger en fish bowl teknik, hvor den, der har vist video blot lytter til de øvrige studerendes feedback til en start, og derefter reflekterer over, hvad hun har hørt. Det giver mere ro til at lytte, når man ikke med det samme skal "forsvare" sig i plenum. Jeg er også blevet inspireret til at forsøge mig med studenterstyret feedback-session, som kan afprøves de sidste gange på kurset, hvor de studerende har mere erfaring i formatet.

Hvad angår det videre arbejde med feedback som vej til at opnå opfyldelse af læringsmål, har jeg gennem pædagogikumkurset stiftet bekendtskab med Rubrics (kriteriebaseret feedback), som er en anden metode til at evaluere de studerendes tilegnelse af læringsmål (Orrell, 2003). Jeg vil på et undervisermøde tage ideen med brug af Rubrics på kurset op, da det kræver et forarbejde at få beskrevet hvilke dele af læringsmålene, vi ønsker at de studerende opfylder. Det kræver også en enighed blandt underviserne, en enighed, som vi hele tiden arbejder på, men som også kan være svær, og som jeg har beskæftiget mig med i tidligere opgaver under pædagogikum.

I forbindelse med mere kvantitativ feedback fra de studerende, findes der en central indsamling af kursusevaluering på Københavns Universitet. Jeg har imidlertid aldrig modtaget sådan feedback i mine mange år som underviser. Det kunne være interessant at forsøge at skaffe denne evaluering, og undersøge hvorfor den ikke bruges systematisk på dette kursus.

På baggrund af peer-feedback på min opgave gennem pædagogikum, vil jeg arbejde med at præsentere de studerende for udsagn/data (i anonymiseret form) fra denne opgave. Det vil ske ved første kursusgang for endnu bedre at give de studerende en fornemmelse af, hvor de skal bevæge sig hen i løbet af de kommende uger på kurset. Jeg er blevet inspireret til i endnu højere grad at beskrive på første kursusgang, hvor vi fører dem hen, i løbet af kurset. De starter et sted og bevæger sig hen et andet sted. Ligeledes sandsynliggøre for dem, at det kan være let at vurdere præsta-

tionen på de nederste trin i Blooms taksonomi, men at når vi nærmer os de øverste trin, så er det ikke objektive forskelle men mere subjektive og fornemmelser/følelser, der kan spille ind. Det er mindre entydigt, hvad der er vigtigt.

## Afrunding

Målet med dette projekt var at udvikle mine kompetencer som underviser, således at jeg i højere grad kan facilitere, at de studerende på kurset opnår læringsmålene. Interventionen var simpel med fokus på undervisningsmiljø og feedback. De umiddelbare vurderinger fra både studerende og vejledere på UP var positive, og studenterne klarede ligeledes eksamen utroligt godt. Imidlertid er det vigtigste resultat en øget faglighed i min tilgang til kurset generelt og mere specifik på læringsprocesser hos de studerende og mit mål er, at vi som undervisere på kurset i almen medicin vil arbejde videre med feedback. Jeg vil selv tage erfaringen med videre over i andre kurser og arbejde videre med at optimere feedbacksessionerne med de studerende i kommende kursusforløb. Resultaterne af forløbet på pædagogikum er i øvrigt delt med kursusleder, og der bliver afholdt et undervisermøde, hvor jeg præsenterer resultaterne til de øvrige undervisere mhp. vidensdeling.

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## A

### Målbeskrivelse:

Følgende lægeroller anvendes på kurset: lægefaglig ekspert, sundhedsfremmer, professionel, kommunikator og samarbejder.

Efter endt kursus forventes den studerende at kunne:

#### Viden

- Redegøre for de problemer af fysisk, psykisk og social art, som befolkningen søger den praktiserende læge for.
- Redegøre for den praktiserende læges rolle som primær, personlig, kontinuerlig og koordinerende (tovholder) fagperson for den enkelte patient og dennes familie
- Beskrive gensvarsmodeller og andre kommunikative redskaber i konsultationsprocessen
- Beskrive generelle sundhedspsykologiske teorier
- Redegøre for betydning og anvendelse af evidensbaseret medicin i patientbehandlingen.
- Analysere og bedømme tilgængelige forebyggende sundhedstiltag i forhold til den enkelte patient.

#### Færdigheder

- Modtage patienten, analysere, vurdere og foreslå behandling af akutte tilstande
- Modtage patienten, analysere, vurdere og foreslå eventuelt kontrolforløb for patienter med kroniske sygdomme i almen praksis
- Analysere og vurdere behovet for kontakt til andre kliniske og parakliniske specialer, til sekundærsektor og til sociale myndigheder
- Analysere og diskutere anvendeligheden af "konsultationsprocessen" som kommunikationsværktøj i mødet med patienten i en patientcentreret konsultation
- Anvende den patientcentrede model i læge-patientsamtalen
- Anvende konsultationsprocessen og gensvarsmodellen i læge-patientsamtalen
  - Analysere konsultationen ud fra ovenstående principper
- Diagnosticere patienten ud fra almen-medicinske diagnostiske strategier
- Anvende diagnostiske test og parakliniske undersøgelser og foretage medicinordinationer ud fra rationelle principper
- Analysere og bedømme tilgængelige, forebyggende sundhedstiltag i forhold til den enkelte patient
- Varetage "gate-keeper" funktionen, dvs. at analysere og bedømme patientens behov for behandling i primærsektoren eller i sekundærsektoren.
- Udfærdige et problemorienteret journalnotat efter PSOAP modellen, dvs. i forhold til Problemer, Subjektive symptomer, Objektive fund, Analyse og Plan
  - journalnotatet skal ICPK-kodes.
- Ved holdundervisningen analysere mindst en af sine egne videoer i forhold til konsultationsprocessen og det faglige indhold og i den forbindelse kunne anvende den patientcentrede konsultation i almen praksis og kunne se patienten i et helhedsperspektiv.

#### Kompetencer

- Foretage sikker patientbehandling, herunder selvstændigt vurdere om patienten kan viderebehandles i almen praksis eller skal henvises til akut eller elektiv behandling.

<https://kurser.ku.dk/course/smea15062u/2020-2021>



## **Will using blended learning, peer instruction, pair programming and live coding better facilitate teaching programming and data manipulation?**

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### **Background**

Programming can be challenging to teach, as learning how to program is often perceived as difficult by students (Sharma et al., 2020). Programming is a relatively new discipline and the learning curve is rather steep causing some people to give up before they gain a working understanding on how to code. Teachers of computer programming are faced with a difficult challenge, as there are no perfect and finite guidelines for how to best teach computer programming (Brown & Wilson, 2018; Sharma et al., 2020). However, as learning to code is a very hands-on process, a hands-on approach may be more effective than a more passive approach (Wilson, 2019).

Blended learning can be defined as “learning which combines online and face-to-face approaches” (Heinze & Procter, 2004), and this method has become more widespread in higher education over the last decade (Alammary et al., 2014). Both Wang et al. (Wang et al., 2005) and Sharma et al. (Sharma et al., 2020) found that a blended learning environment, combining lectures and on-line learning platforms, provides flexibility to both teaching and learning computer programming, as the students can take control of their own learning pace. Sharma et al. (Sharma et al., 2020) included live coding and peer instruction in their in-class lectures, which are both forms of active learning.

Active learning is generally defined as “any instructional method that engages students in the learning process” (Prince, 2004), and has become popular in university teaching (Prince, 2004; Rossi et al., 2021), where traditional lectures and teacher-centred pedagogy is being replaced, and students play an active part in their own learning process (Rossi et al., 2021). When students are allowed to dynamically use what they are taught, they often learn better than by simply watching and listening (Wilson, 2019). Active learning can be implemented using in-lecture quizzes, group discussions, peer instruction and other methods. Peer instruction is generally defined as “an opportunity for peers to discuss ideas or to share answers to questions in an in-class environment” and can improve the students’ problem solving skills and understanding (Knight & Brame, 2018). Brown and Wilson (Brown & Wilson, 2018) suggest using peer instruction and in particular pair programming when teaching computer programming. Pair programming is when two programmers, one being a more experienced programmer, share one computer and take turns being the one who types the code and being the one to offer comments and suggestions (Brown & Wilson, 2018). This way partners can help each other and clarify any misconceptions. The less experienced student learns by getting instructions from the more experienced student while the latter learns by explaining and having to think about the concepts (Brown & Wilson, 2018). Research suggests that pair programming can lead to improvement in learning outcomes as well as increased retention (Hanks et al., 2011). Live-coding, where the teacher writes code in front of their learners and encourage them to code along is another way of activating the students (Brown & Wilson, 2018). This method enables a learning-by-doing environment and slows the teacher down for the students to follow along and furthermore encourages questioning along the way (Brown & Wilson, 2018).

The vast diversity in students and their knowledge background and experience can make it difficult to simply adhere to one way of teaching computer programming. Adaptive teaching is a way to change and adapt the teaching to match the students’ abilities, thus achieving a learner-centric environment (Haddad & Kalaani, 2014). Adaptive teaching may prevent discouraging students from learning computer programming and may aid in getting them interested and encourage them to continue their learning even after the course is finished (Settle et al., 2014). Adaptive teaching can however be hard to implement, when trying to accommodate the individual students’ learning style as well as working with the entire class and still following the syllabus.

In this study, I applied methods to facilitate teaching computer programming in an online course. I applied blended learning, active learning in the form of live coding, quizzes and pair programming and adaptive teaching in order to facilitate a good learning environment both for the students and for me as a teacher.

## **Materials and methods**

### **The course**

I was one of the teachers in the 2021 PhD course “Epidemiology 1: Planning a study” at the Faculty of Health and Medical Sciences at the University of Copenhagen (<https://phdcourses.ku.dk/detailkursus.aspx?id=108081&sitepath=SUND>). One of the course objectives is to use the program R to manage epidemiological data. The course usually fits 15-18 students, and lasts 2 months, with mostly self-studies as well as 4 campus-based days with lectures and exercises. The “campus-based” sessions are not mandatory and due to COVID-19, the campus-based sessions have been conducted online on Zoom for all of 2021. I taught the R-programming sessions, and as R is both a programming language and a statistical software program, teaching R can be compared to teaching computer programming.

### **Blended learning and live coding**

I was provided lecture material from previous versions of the course. I changed the lectures slightly to accommodate my teaching style and created pre-recorded videos of three lectures teaching the basics of data handling and the program we would be using for this – R. The pre-recorded lectures were uploaded to Absalon (<https://absalon.instructure.com/>) and the lecture slides were made available as pdf’s along with R files with the discussed code. I created a mandatory assignment on Absalon, ensuring that the students had watched the lectures before start of the online R and data management sessions. At each online session start, I gave a short summary of the online lectures and asked for feedback on any difficulties the students had regarding understanding the topic. I followed up on the feedback to make sure that the topic at hand was understood. This blended learning approach allowed me to be more hands-on during the actual sessions and

engage the students, and avoided long-winded lectures on a very practical subject.

After the summary of the online lectures and feedback, I systematically went through the R code used in the online lectures, thus the first 3 days, I showed the student codes taught in each of the three online lectures respectively. I started out by showing the students how to open R and what the different functionalities were before moving on to the actual coding. Then I asked the students to code along with me, so they could experience first-hand what the code did and how to use it. I asked the students to make predictions of possible outcomes of some of the coding, and encouraged the students to ask questions along the way. The questions and responses from the students allowed me to use adaptive teaching, as I could chose to change the course of action or slow down my teaching depending on student feedback. I furthermore prepared topic-relevant quizzes for them to activate and motivate them during the live coding sessions. The quizzes were also used as a form of adaptive teaching, as I could gauge how much of the material the students understood and if I should change my teaching accordingly. The very last day, I asked the students to evaluate and give feedback regarding the structure of the course using Padlet.

### **Peer instruction/pair programming**

Before course start, I again created a mandatory assignment on Absalon where the students had to write a summary of their data handling experience and experience with programs and computer programming. The goal was to use this information to divide the students into pairs, where at least one of them had some experience with programming and statistical programs; a goal that was communicated to the students. The goal was furthermore to gauge, where the students were at knowledge-wise so I could adjust my teaching according to their level (adaptive teaching). On each day, after the live coding, the students would go into Zoom break-out-rooms and do exercises in their pair-programming groups where their newly found R skills could be put to practise on epidemiological data. I made sure to give instructions on the pair programming process to avoid that the more experienced students took over the entire coding exercise. I would continuously oversee these break-out-rooms and join a group, if the students had questions or needed help. These exercises were from previous versions of the course, and were specifically created to fit the teachings for that particular session. The exercises are highly relevant to the topic and are case-based to

simulate real-life examples of what the students may encounter when handling epidemiological data. Each following day, I would review the exercises with the students, answer questions, and address potential problems or difficulties to ensure that all students have understood the exercises and the solutions. This review allowed me to use adaptive teaching by changing the pace or structure depending on feedback from the students. The solutions to the exercises along with the associated R-scripts were freely available on Absalon for the students to download. The final and 4th day was spent reviewing what they had learned and doing exercises. After each session, I asked the students to evaluate the pair programming sessions using Padlet (<https://padlet.com>).

## **Results**

### **Blended learning and live coding**

All students viewed the online pre-recorded lectures before course start, and the feedback received indicated that the students found the pre-recorded lectures and the structure of the sessions useful (Appendix A). There were a few problems with some students not having two screens or not being able to split screens in order to follow the live coding and coding themselves at the same time. I realized that this is something we may want to specify for future versions of the course – particularly if the course is held online instead of on-campus. As previously mentioned, I encouraged the students to ask questions during the live coding sessions, which they embraced. I realized that they had many questions, and that I had to slow down the live coding and explanations immensely. This resulted in me not being able to use all the quizzes prepared, but I found it was better to thoroughly make sure, that all the coding was understood by the students.

### **Peer instruction/pair programming**

Having divided the students into pairs, based on the answers to their assignment, I learned that some of the student answers were not entirely realistic. Some students, who wrote that they had worked with the program R before, had very limited skills and some of these students even ended up being the ones who needed the most help. The first day of teaching and pair programming was therefore quite chaotic, with negative feedback (Appendix

B, comments in the first column) and I realized that I needed to change the course of action. This also meant that I did not have enough experienced students to continue the planned pair programming; instead, I had to convert my approach to group programming, where groups consisted of up to four people including at least one experienced coder. Furthermore, as the online lectures and exercises were not mandatory, I had to manage students regularly dropping in and out of the sessions. This meant that I could not do what I had originally envisioned with the pair programming – I could not have the same people in a group throughout the course, and every day, I had to reconfigure the groups, to have at least one experienced coder among them. This demanded a lot of time and organisation skills.

Three of the students, were very experienced coders and users of the program R. I therefore emailed them before course start to ask if they preferred to work on their own or join the pair programming process. I did this to accommodate their needs and expectations for the course, as the level of programming taught in this course was fairly low and I wanted to avoid them feeling that they were wasting their time. Two of these students preferred to work on their own while one of them did not mind joining the pair programming (later becoming group programming) process. Originally, I let all three of them work on their own, but due to lack of experienced coders for the pair/group programming sessions, I drew on this one experienced student to manage a group of inexperienced coders. Despite starting difficulties and having to change pair programming to group programming, the feedback indicated that these sessions were helpful for the students in learning R (Appendix A and B).

## Discussion

I attempted to better facilitate teaching computer programming by implementing blended learning, active learning, peer instruction in the form of pair programming and adaptive teaching by adjusting the teaching to the students and their abilities.

Despite the relatively positive feedback from the students, there were considerable problems regarding both the live coding and the pair programming sessions. Live coding on an online platform, requires the students to either have two monitors or to know how to split the screen in order to both follow the live coding and coding along with the teacher. Some of the students in my class were unable to do so, thus rendering the live coding less

useful. This may not be a problem in physical teaching as the live coding can be viewed using a projector while the students code on their own laptops. Problems with the pair programming were mostly due to not having enough experienced programmers in the class as well as the class not being mandatory, resulting in students dropping in and out of the sessions. This interfered with the planned pairs (and subsequently groups), and required me to reconfigure groups on every new day of the course. The learning outcome of the course in regards to R programming may have been further impacted by the short duration of the on-campus (online) sessions. Learning computer programming can be hard and require a lot of practise, thus four online instructional sessions may not be enough for learning. However, the short R-sessions may have inspired the students, shown them the utility of the program, and hopefully opened their eyes to pursue further learning. It should be noted that the student programming summaries may have been truthful in the students' own eyes and that they may have overestimated their own abilities. Objectively quantifying programming ability may not be straightforward and we may often measure student confidence rather than ability, which is important to acknowledge and take into account.

The students responded well to the blended learning approach, with pre-recorded lectures to be viewed before course start. This agrees well with the findings of Wang et al. (Wang et al., 2005) and Sharma et al. (Sharma et al., 2020) that blended learning proved to be a more effective approach when teaching computer programming. The blended approach allowed me to implement active learning during the face-to-face online sessions, where instead of lectures, I asked the students to live code with me, all the while answering whatever questions they had. This way the session consisted of dialogues between the students and I, and the students took an active role in their learning experience. This approach, however, was time consuming and I had to adapt by limiting the extent of the live coding, as more time than expected was used explaining the code. Furthermore, I was not able to use all the quizzes I had prepared for the students due to time restraints. This taught me that using active teaching the way I did, is a trade-off between the planned program (and potentially syllabus) and the methods used to teach. I found it more important to ensure that the teaching material was understood, than sticking strictly to the planned program, however, this is something that needs to be recognized when planning a teaching session.

The live coding sessions along with doing exercises, allowed the students to dynamically use what they were taught, creating a learning-by-doing environment that has been known to strengthen the learning of com-

puter programming (Brown & Wilson, 2018; Wilson, 2019). According to the student feedback, the students found the exercises very useful, particularly that the solutions to the exercises were provided for them to go through at their own pace. Using adaptive teaching by including student abilities in the pair/group programming process, posed a didactic challenge and was harder than expected as trying to meet all the students' needs was very time consuming and logistically difficult. I tried using adaptive teaching at the individual level through pair programming, carefully dividing the students into compatible pairs (learning wise). However, when the pair programming did not work, due to the limited number of experienced coders, I tried to apply adaptive teaching through a group programming approach, where at least one experienced coder was assigned to each group. This seemed to work really well, and the student feedback was mostly positive – some of the students even commented that they liked the group structure better than working in pairs, as they had input from more people when solving the exercises. One of the very experienced coders that took part in the group programming exercises conveyed, that they also benefitted from teaching and explaining the code to other students, which was exactly the reasoning behind this approach (Brown & Wilson, 2018). The group programming experience, however, showed me how this method relies heavily on the availability of experienced students, and thus the learning process of the students can be highly dependent on their colleagues. This dependence may be more pronounced regarding hands-on topics such as computer programming, where the students have to actively use their knowledge oftentimes directly following or during teaching sessions. The availability of experienced students may also become more important for short-term courses, where the teacher cannot follow the students progression over a longer time period and thereby recognize more skilled students that could be drawn on to help other students. This dependence on experienced students seems more pronounced for an online setting. Since this first experiment, I have taught the same course in 2022 with the same setup as described here, but where the on-campus days were actually physical. In a physical setting, I could continuously gauge the students and their learning, listen in on their in-group conversations and answer group questions in plenum, which is difficult to do online when the students are isolated into breakout rooms. Thus, in a physical setting, there may be less need for experienced coders due to more student-teacher interaction.

The results from this project has inspired me to continue using blended learning and active learning in the form of live coding and pair/group pro-

programming to teach computer programming, which I have done in the physical 2022 course. Overall, the students provided mostly positive feedback for the session structure, so I was happy to see, that this way of teaching was helpful for the students. If this course is taught online again, I need to make it clearer to the students that they need two screens or split screens to follow the live coding. I also need to think of ways to correctly gauge the students' programming abilities to avoid relying on their own, sometimes overconfident, assessments. I would start out using group programming instead of pair programming. I used group programming for the 2022 physical course, and it seemed to work really well for the students as I only received positive feedback regarding the group work. Furthermore, if possible, I would like the on-campus (online) sessions to be mandatory, so that the students can stay in the same groups throughout the week.

## Conclusion

The applied approaches - blended learning, live coding and pair/group programming – garnered positive feedback from most of the students, and seemed to encourage the students to learn the program R, thereby making the students take an active part in their own learning process. However, it is important to note that incorporating dialogue and activation of the students may create a trade-off between teaching the syllabus and time spent incorporating the different approaches and activities. Computer programming is a difficult topic to teach, and despite the availability of numerous different approaches, teachers of computer programming are still faced with difficult challenges.

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## A Overall feedback to programming session structure

padlet  
Lene Jung Kjaer + 5 • 3mo  
**Overall feedback for Data Handling in R**  
Lene Jung Kjaer

**Feedback questions**  
Remember this feedback is only for the data handling in R part of the course:

What did you think of the structure of the data handling sessions (online prerecorded lectures/live coding/pair or group programming)?

Regarding pair/group programming, were you the more experienced or the less experienced coder?

How did the pair/group programming work for you?

Did you all contribute equally to the coding of exercises?

Do you understand the purpose of pair/group programming and do you think that purpose was fulfilled?

Were you able to follow the exercises?

Is there anything else you can think of that you would like the lecturer to know?  
Positive/negative comments, suggestions for improvement?

Add comment

**I thought the structure was excellent. I appreciate the effort, the links to resources.**

Add comment

**I like the R exercises, especially that you had the solutions, that allowed us self paced time to play with it**

Add comment

**good opportunity to get into R, had been planning to learn it for a while.**

Add comment

**I really like the R-part of this course. The background introduction made it possible to follow the lectures and participate in the exercises. I was the less experienced coder in the groups, but I learned a lot by following the experienced coders. Also I really appreciate there being solutions to the tasks, that way I can explore the codings myself**

Add comment

**I like that you give us the solution to go through on our own time**

Add comment

**R exercises**  
I really like the exercises although was difficult to grasp because I was completely new to R. I am glad I was paired with someone more experienced in R and the groups were quite helpful to learn more and practice after lectures.

Add comment

**pair group worked well for us, as the experienced coder paired with me, was very patient, but I felt a little guilty asking her all the questions, wondering if she felt it was a waste of her time, but she seemed very kind**

Add comment

**I thought that you did a good job with pairing us. I was the less experienced R-coder and it was nice to have a good experienced coder to help. I found it hard to follow the live coding and I think it would be a good idea for you to ask us to divide the screen (and maybe have to) prior to the session.**

Also it might be a good idea to specify from the beginning that the R-part is not relevant to the rapport. So that the students has the option of prioritizing their time.

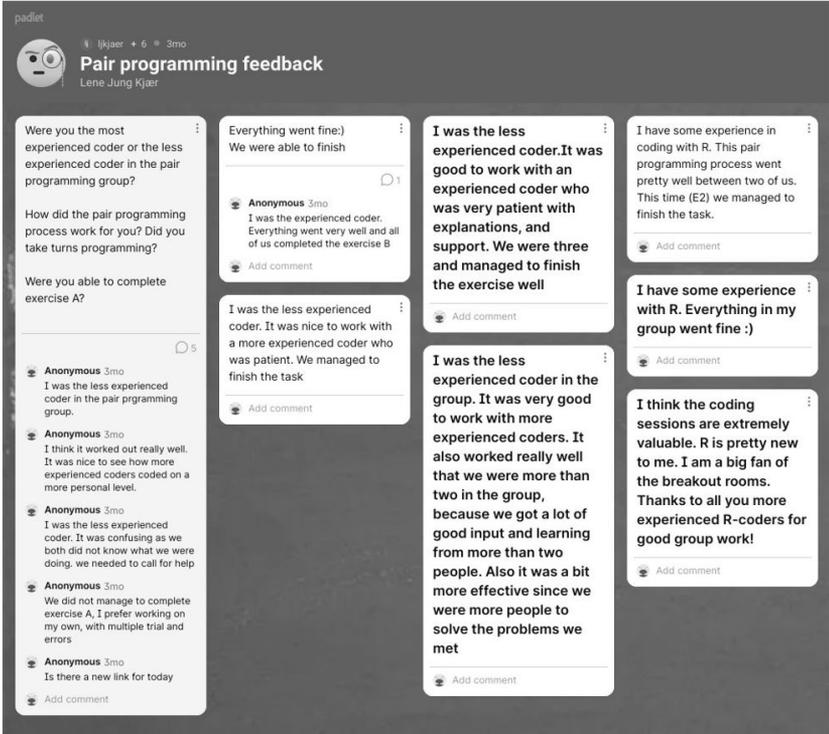
Add comment

**I really liked the lectures and the R part. I was the more experienced coder in my group and it was a great experience to try to explain the codes to others.**

Add comment

Picture exported from Padlet

## B Feedback on the pair programming



Picture exported from Padlet

## ***Can we talk about the report now? Rethinking Learning-Teaching Activities in the TPK course***

Alexandra Brandt Ryborg Jønsson

Department of Public Health  
University of Copenhagen

### **Introduction**

Despite the vast body of literature confirming the positive correlation between physicians' communication skills and patients' treatment adherence (Zolnierek & Dimatteo, 2009), medical students have only limited training in communicating with patients. One example of such training is the Tidlig Patient Kontakt (TPK) course. The course intends to make students familiar with two of the established seven roles of physicians; namely the communicator and the academic. The overall aim of the course reads "students obtaining the ability to use the presented theories and [communication] techniques to describe and analyze the patient's life circumstances in written and oral form" ("Course Description", 2022, my translation). Notwithstanding a particular focus on the report during the course students repeatedly find the requirements unclear: *"It's is not until long into the course that the teaching starts focusing on the written report and examination. We could have used this info at an earlier stage"* ("Course Evaluation TPK fall 2019", 2019). This leads to a large number of specific questions regarding the report and how to get started on it, which takes away time from teaching the curriculum, as shown by Willadsen in her pedagogical project (Willadsen, 2020). I have been discussing the discrepancy in intended learning outcomes (ILO)s and students' ability to transfer acquired knowledge to the report with fellow teachers and my departmental supervisor. Learning is said to encompass three overall dimensions; what is being learned, the driving force for learning, and the interaction with others (Illeris, 2015). Adding to that, students anticipating that they can master a task

helps motivation for learning (Skaalvik & Skaalvik, 2015). TPK teachers agree that the teaching-learning activities (TLA)s of the course could be revised to better facilitate learning the academic role of physicians by a more student-activating approach in which the students will realize that they can master writing an academic report. This project aims to investigate whether rethinking TLAs with an intervention to facilitate writing during SAU classes can improve students' transfer of acquired knowledge in the field into an academic report and hence strengthen the alignment of the course TLAs and its ILOs. Empirically, I draw on the course material, course evaluations, and questionnaires for students on the intervention together with individual interviews with students, teachers, and external assessors (see methods section).

### **TPK-course: rethinking TLAs**

*“It doesn't matter what I tell them about learning outcomes of the SAU, no matter what someone is always going to ask “is this going to be in the report” (Interview with TPK teacher, Jan 4, 2021)*

TPK is a mandatory 2.5 ECTS course on first term BA medicine. The course consists of six lectures, six three-hour classes (SAU) taught in smaller groups by a default teacher, small-group supervision by an assigned General Practitioner (GP), and three individual at-home visits with an assigned patient. Each SAU has its own ILO, not necessarily linking directly to the overall learning (“Kompendium TPK. Revideret Januar 2020 af Andersen, J.S. og T, Willadesen og Jønsson, A.B.R.” 2019). Attendance is only mandatory on the first SAU class, yet supervision and patient interviews need to be completed to pass the course. At-home visits focus on life-story interviews with the assigned patient, which are audio recorded and partly transcribed verbatim by the student herself. The patient interviews also lay the ground for the student's individually written report in which the patient's experience of living with an illness is analyzed through the curriculum theory presented at the SAUs and in the textbook. Finally, the course is assessed in an individual oral examination based on the written report. The assessment is meant to assess the students learning outcome as a whole but the nature of the assessment leads the focus primarily to students' ability to write a report and use theoretical concepts. Evaluation is passed/not-passed (“Course Description”, 2022).

In general, TPK students focus on the report and this drives their attention in terms of learning. It is a standing joke among TPK teachers that in every class, at least one student will raise their hand asking *can we talk about the report now?* Acceptance at the medical school at UCPH requires a very high graduation score from high school, which means that the students have been high achieving in all of their assessments from high school. Throughout their past three years in high school, students have adapted to attending to learning with a particular focus on examinations, because that has been what mattered, in the end, to get into university. Such cultural habitus is not easily unlearned, as we know from social science research (see for instance Bourdieu, 1977).

TLAs that hold students active and engaged in their learning processes may promote a feeling of better mastering the tasks presented to them, and I wanted to try to rethink the TLAs to better encompass the more practical aspects of the course and thus create more confidence in the students that they are capable of writing the report. I suggest an intervention with practical writing exercises to strengthen medical students' academic proficiency, as a direct continuation of the pedagogical project of Willadsen (Willadsen, 2020) focusing on student peer feedback, where a shorter version of a writing exercise was offered to interested students. Willadsen's project showed that students felt insecure about their ability to write the report and that writing exercises have the potentiality to be adapted as an integrated TLA on the last two SAU classes (Willadsen, 2020).

## The TLA intervention

The report upon which the student is orally assessed is written individually and contains two separate parts; the patient part and the communication part. The first part is telling the patient's life story and disease trajectory and then analyzing it with theories discussed both in the lectures and at the SAUs. The second part describes the communication between the student and the assigned patient. Both parts need to have a description section, an analysis section, and a reflection section.

To get the students confident that they can write the report and subsequently getting the students started with the writing process I have made an intervention to the SAU class consisting of three parts:

1. Description: 20 min of SAU 5. First, students are allocated to their default group where they will be taking turns presenting their patient

in an anonymized form (15 min). This will make students tune in to how and what to present, and they may gain inspiration from listening to each other. Then they will individually write for 5 minutes in silence timed by the teacher (me).

2. Analysis: 20 min in SAU 6. Same procedure as with part 1 only that I will have been going through the most common theoretical terms and how to use them before this exercise.
3. Reflection: 60 min of SAU 6. First, we will have a general discussion in plenum on what kinds of reflections that the students have made upon meeting their patient and developing new communication skills. Second, students are assigned to default groups to name three things they might use in the reflection section. Last, we will finish with the five minutes of writing in silence.

## Methods

In this project, I wanted to investigate whether the intervention had any effect and if students found the intervention to be meaningful. Regarding the latter, I asked my students to fill out an online open-ended questionnaire and held individual interviews to get more in-depth knowledge. To see if the intervention had any effect on the outcome, namely the written report, I interviewed one external assessor following his examination of my students.

Within individual interviews, there is an asymmetric power relation (Kvale and Brinkmann, 2015: 56). The power relation is usually not intentional, but the structural positions in the interview situation may result in the participants, consciously or unconsciously, distorting the information they give to the interviewer. In this particular situation, both students and assessors may have felt urged to be positive about the intervention when talking to me, which is why I decided to add the anonymous open-ended questionnaire<sup>1</sup>. In total, six individual interviews with students were held, and 49 out of 52 students completed the questionnaire. Two assessors examined my students, but I only gained access to one, whom I interviewed. This assessor is a retired GP and has been examining the TPK course for more than 5 years.

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<sup>1</sup> The questionnaires are too long to attach to this paper (49 pages). They can be forwarded upon request.

## What did the students learn?

Interviews and questionnaires with students show that students perceive the writing exercise as both meaningful and helpful. Particularly two themes were brought up; that writing exercises made the task of report-writing more manageable and that beginning writing earlier during the course was a skill that they would carry on forward. The external assessor pointed out that there may have been a slightly more broad reflection in the reports, though this is a subjective perception and cannot be used as an objective outcome.

## Report writing made manageably

Students reported all but one (N=46/47) that writing exercises made the task of report writing more manageable. As one student said in an interview: *“I was unsure of what we had to do, so I think maybe I just had been postponing it. But when \*Ida\* and \*Mie\* and I spoke of our patients it made it so much more easy to put it into writing, and I felt like ‘ooohhh so it’s ‘just’ this, I can easily do this”*. Several students pointed out that they felt more secure in their abilities to write the report after this initial exercise. One wrote in the open-ended questionnaire: *“It was great, because I feel like talking about it is easy, and it helps a lot writing it down immediately after speaking. It seems hard to write the report but the exercise opened it”*

## Usable lessons for studying

What I had not asked in the open-ended questionnaire but kept coming up during interviews was that students felt the exercises had prepared them for how to study. One said: *“Getting started, dividing the task into smaller parts that I can actually do, I think that’s something that I’ll try to use onwards”*. In particular, working with the more vague term of ‘reflections’ in the report resonated with the students’ perception that they could use this in their future studies. Another student puts it like this: *“Reflections, I mean, what is that? But having actually worked with it, not just trying on my own, I think I’ll much easier make reflections in the future now”*.

## Reflections broadened

Reading the reports and discussing them with the external assessor in the interview showed that what is usually the most unprocessed part of the reports, namely the reflection sections, had what the assessor and I perceived to be more ‘depth’. Instead of merely writing something like *I gained from meeting a patient and learned a lot* students had provided more details. Observing GDPR and informed consent rules, I am not allowed to publish any parts of the reports. But generally, students would be reflective on how this course had given them tools to understand and communicate with patients and give examples of such tools, like “realizing that even though they both have diabetes, two people will always have individual experiences of that disease” as a student mentioned in the interview when recalling what he had written about. The assessor said, “*I’m not sure if it’s because we’re [he and I] talking about it but I think that this batch of students have really made great reports, and they’ve been really reflective about how they can use it when it comes to practice medicine in the future*”.

## Concluding remarks

I believe, that to offer students a coherent, connected and integrated learning experience any course should regularly be assessed and new TLAs should be integrated. This small-scale investigation may not function as a white paper for revising the TPK course, however, building on existing knowledge about this particular course, I have shown that my intervention improves students learning by helping them anticipate that they can master the task of writing the exam report (Skaalvik & Skaalvik, 2015). Thus, my departmental supervisor and co-teachers have discussed the possibility of making writing exercises an integrated part of the course to the teachers who express interest, not least based on this report and the very positive oral evaluations of my classes. In the coming semester, I will present these results at the TPK teacher conference and discuss the findings with the course leader.

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**Using ICT to promote learning**



## Computer-assisted activations during physical classroom teaching

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### Introduction

The field of Natural Language Processing (NLP) in Computer Science is growing rapidly. Educators in NLP struggle to keep up, needing to make decisions about what to teach and how with every iteration of a course, sometimes even as a course is being offered. The fast-paced nature of NLP brings unique challenges for curriculum design. We also have an increasing number of students interested in NLP, bringing with them a wide range of backgrounds and experiences.

I teach a course on NLP at the University of Copenhagen. It is a Master-level course given in English, amounting to 7.5 ECTS and stretching over one block. The usual attendance is 30-40 students. In 2021, about a third of the students came from a Social Science background and had limited Computer Science experience. This proved challenging for catering for the needs of all students, while maintaining the goal of targeting the indented learning outcomes without boring the Computer Science students and without leaving the Social Science students behind. To facilitate this, I chose to activate the students in class with exercises that are focused in scope but aim for a high level of engagement with the material, with the goal that each student should gain what they can from the exercise according to their background.

Instead of traditional student activations, I chose to use online tools that have become popular during the massive turn to online teaching during the COVID-19 pandemic, relying on the students bringing their laptops or smart devices to class, which turned out to be a valid assumption.

## Related Work on Student Activation

The teaching paradigm has been moving from a teacher-centered view to a more student-centered perspective (Kaymakamoglu, 2018), meaning that instead of focusing on the role of the teacher, the focus is increasingly on what the student should do, that is, process the material through deliberate practice, collaboration, and active reflection. To effectively support this process, teaching is planned and conducted with the student's disposition in mind, considering their prior knowledge, expectations, study skills, and other conditions. With the proper planning, design, and implementation of the course, active learning can then be achieved (Cook & Babon, 2017) when students are going into lectures and tutorials prepared to engage in the learning process, and they are not just passively trying to absorb information. Active learning encourages active cognitive processing of information, and the concept is not a new one (Saini et al., 2021).

Many pedagogical theories and frameworks have been developed to facilitate effective teaching covering different aspects of teaching (Chi & Wylie, 2014; Cook & Babon, 2017; Kandlbinder, 2014). However, with the advancement of technology and globalization, the traditional pedagogical models evolved to make distance learning possible. Students can sit anywhere and learn online through the internet and connect with other students in the physical classroom or online.

Flipped Classroom (Brame, 2013; Lage et al., 2000) is a teaching approach in which students get first exposure to the material of a lecture outside of class, and the in-class activities involve applying the learned content. Provision of lecture material can be done in several ways, such as reading material, video lectures as slideshows, podcasts, and so on. Students are expected to do the homework, and most of the in-class activities fully depend on that. Because of that, the teacher should make sure that students do their homework, because even though we name it in various ways, watching lectures or reading articles is still homework (Nielsen, 2012), and the challenge of making students accomplish with that is still there. A possible idea for making sure that students do the reading homework could be to ask them to do a quiz or reward them somehow. Apart from challenges regarding students, we must not forget that all the activities, homework, readings, and so on must be retrieved, selected or produced. Furthermore, as the content covered in class is more complex, the teacher will have to be more prepared. All this results in a larger workload in the preparation of the class and its activities (Agirrezabal, 2021).

## Intentions

The format of the NLP course while I have been teaching it (two years, since 2019) consists of a weekly two-hour lecture, as well as a weekly two-hour TA session (exercise). Each lecture introduces a new topic, and the TAs revisit that topic and assist students with technical issues and questions about the hand-in assignments.

Both in 2019 (when I was giving in-class physical lectures) and in 2020 (when I was giving online lectures on Zoom, which were recorded and posted on Absalon subsequently), I felt like student engagement was very low and I was talking to blank faces (in 2019) or black screens (in 2020). As a result, I often felt that I had no grasp of the students' understanding and that I was simply going through the material with no indication of whether it was absorbed. In the course evaluation, students had no strong opinion on whether I communicated the content in a clear and precise manner; were somewhat ambivalent about whether I showed interest in the learning outcomes; and indicated that I was good at expressing myself in the language of instruction, but often went too quickly over complicated topics without giving enough explanations and examples.

I wanted to change this situation this year, introducing more interaction into the lectures themselves to both increase student engagement and to gauge their understanding of the content to better organize the lectures. This should already be easier than, for example, a course where all lectures are pre-recorded, since the overall format can stay the same this way. Of course, the main goal of the lectures is still to teach the content of the course to the students, while the TA sessions complement the lectures by providing an opportunity for more interaction and letting the students express themselves. That said, I believe the lectures should be less authoritative and more dialogue-based to a high degree.

While I acknowledge the importance of lectures, as opposed to reading material, for communicating content to students in a synchronous and colloquial manner, I intended to shift some of the burden of teaching from the lectures to the reading material provided to students before each lecture. Additionally, the students could watch the recorded lectures from the 2020 iteration of the course. This way I could implement a "flipped classroom" style of teaching. This would free up the time during class to focus on the points that were difficult for the students (perhaps by giving short lectures on them) and to activate them.

To activate the students, I intended to use in-class exercises with Gather.Town, Padlet, Socrative, and Google Docs as the means of interaction with the students. I intended to open each lecture with immediate activation relating the content to students' personal experience with some application domain, e.g., sharing their own business reviews for sentiment analysis, to create a dialogue among the students about possible solutions before presenting them to them, or asking students what languages they speak and simply listing them before talking about cross-lingual NLP. I intended to implement the TDS framework (Theory of Didactic Situations; Brousseau, 1997) with the activation phase being assisted by digital tools, as these had been vastly improved and made widely available when all teaching became online in 2020 due to the COVID-19 pandemic and had been shown to be beneficial for online teaching (Saini et al., 2021).

My research question in this project is whether digital tools for student activation can also benefit in-class teaching.

## Format

I decided to experiment with digitally assisted activations during my three lectures in the course, respectively on (1) Information Extraction and Question Answering, (2) Machine Translation and Cross-Lingual Transfer Learning, and (3) Dependency Parsing.

I started each lecture by asking the students if they had read the reading material and watched the pre-recorded lectures, which they answered by filling in a Google Form.

In the Information Extraction and Question Answering lecture, I gave the students a 20-minute Padlet exercise at the end about Reading Comprehension vs. Knowledge-based Question answering (Figure 1). Padlet is a flexible digital tool, which in my case served as an online canvas where students could type in answers to the different "question cards" by commenting on them. The students performed the exercise individually, answering as many questions as they could and reflecting on the method they used for answering the questions, which used online resources as well. Subsequently, I spent the end of the lecture (20 minutes more) going through the answers and reflecting on the advantages and disadvantages of each of the methods the students used.

In the Machine Translation and Cross-lingual Transfer Learning lecture, I started with a 2-minute Mentimeter questionnaire about which languages



**Figure 1:** Padlet exercise on Question Answering.

the students speak. This served to “break the ice”, relating to the students’ personal experience, but also to learn more about the students, since the subsequent exercise on Machine Translation uses examples in multiple languages, which the students should be able to understand. I considered using Socrative for this questionnaire, but decided to use Mentimeter since it presents the responses as a world cloud, which was appropriate for my needs.

In the responses to the questionnaire (Figure 2), I confirmed that the students are multilingual and that the distribution of languages I chose for the Machine Translation exercise is appropriate.

Subsequently, after an introductory lecture to Machine Translation, I allocated 20 minutes for a Google Docs exercise on Machine Translation (Figure 1), which I prepared in advance. In it, students needed to determine failures of hypothetical Machine Translation systems as reflected in their outputs in multiple languages. The exercise was completed in groups of 2-3 students based on the seating arrangement. I dedicated 20 more minutes to going over the answers to this exercise, which served to teach much of the material I would usually teach in a lecture.

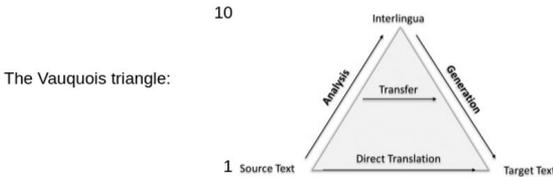


**Figure 2:** Student responses to the Mentimeter questionnaire about which languages the students speak.

After concluding with institutionalization about Machine Translation and presenting an overview of Cross-Lingual Transfer Learning, I finished this part of the lecture with a follow-up Google Form about Cross-Lingual Transfer Learning for Machine Translation (Figure 2), which immediately related to the Google Docs exercise from earlier in the lesson.

Below there are examples of machine translation system outputs.

1. Make a group of 2-3 people
2. Choose one unclaimed example
3. Write your names under it (before someone else does!)
4. Answer the questions under your names (5-10 lines in total):
  - a. What is the correct translation? (Try your best!)
  - b. Where is the system on the Vauquois triangle [1-10]? Why?
  - c. Which "component" did not work properly? Explain.



Spanish to English  
Source: *María no daba una bofetada a la bruja verde*  
Output: *Mary not gave a slap to the witch green*

**Figure 3:** Google Docs exercise on Machine Translation.

In the Dependency Parsing lecture, I started with an overview lecture of Dependency Syntax, and continued with a 20-minute Draw.Chat exercise on it (Figure 5). Draw.Chat is a free online tool for sharing a whiteboard with other users, which proved useful for this exercise, where the students worked in groups again, annotating dependency trees of given sentences in multiple languages. I spent another 20 minutes going through the trees that the students drew, and using the opportunity to teach important distinctions in Dependency Syntax. Subsequently, after a lecture about Transition-based Parsing (Figure 6), I concluded with a 5-minute Quizalize exercise on it, where students were presented with a series of parser states and had to apply their knowledge from the lecture to determine what an arc-hybrid transition-based parser would need to select as the next transition each time. Quizalize is a free online tool for “gamification” of multiple-choice quizzes, giving points and optionally even ranking participants based on their scores.

Multilingual Pre-trained Models for MT

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Consider a machine translation system using a multilingual pre-trained encoder and decoder.

---

Vauquois triangle

The diagram is a triangle with five horizontal levels. From bottom to top, the levels are: Lexical/surface level, Morphology, Syntax, Semantics, and Pragmatics. Above the top level is the text 'Interlingua?'. A dashed arrow on the left side points upwards and is labeled 'Analysis'. A dashed arrow on the right side points downwards and is labeled 'Generation'. Horizontal arrows point from left to right across each level.

---

Where is the system on the Vauquois triangle?

1   2   3   4   5   6   7   8   9   10

**Figure 4:** Google Forms quiz on Cross-Lingual Transfer Learning for Machine Translation.

1. Make a group of 2-3 people
2. Choose one unclaimed sentence
3. Write your names under it
4. Draw a syntactic dependency tree above it (try your best!)

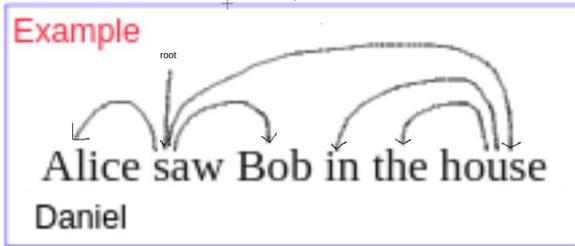


Figure 5: Draw.Chat exercise on Dependency Syntax.

What is the next transition?

! love parsing ! \*\*root\*\*

! love parsing ! \*\*root\*\*

SHIFT

RIGHT-ARC

LEFT-ARC

57

Right-arc

Left-arc

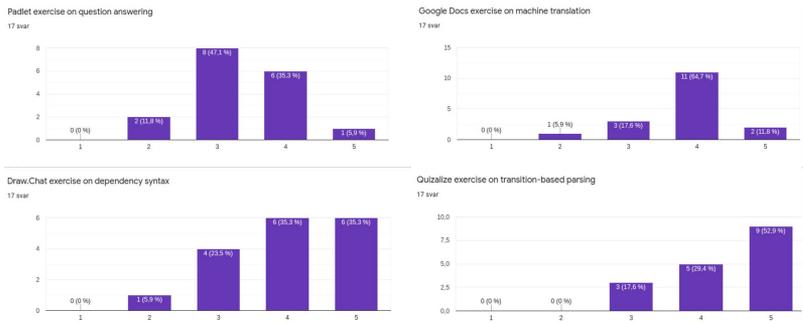
Shift

Figure 6: Quizalize exercise on Transition-based Parsing.

At the end of the last lecture, I asked the students to fill in an anonymous Google Form survey on the benefit of in-class activations, asking them to rate how much it contributed to their learning outcomes compared to a hypothetical "normal" lecture on the same subject.

## Results

In the responses to the anonymous survey on the benefit of in-class activations (Figure 7), I observed that some exercises were more beneficial than others. Specifically, the Quizalize exercise turned out to be the most beneficial, although it was also the shortest in terms of time. Based on the students' free text responses to this survey, as well as to the teaching evaluation survey (see Appendix), they appreciated the material taught in the lectures more than the more indirect teaching through the exercises, although they found them engaging and the format and tools used were appropriate.



**Figure 7:** Student responses to the anonymous survey on the benefit of in-class activations.

## Discussion

Based on the experience in my teaching, I realized it is important to set expectations with the students before class: are they expected to watch the online recorded lectures that are available from last year? Are they expected to

read the reading material thoroughly? Furthermore, it is important to check with the students at the beginning of class if they have watched the lectures and/or read the material. To my surprise, I found that although I tried to set the expectations appropriately, most students had no more than a brief look at the material. Accordingly, I had to make the exercises more superficial than intended, to avoid having to teach the material comprehensively in a lecture format (which is what I was trying to avoid).

The decision to use Padlet as a tool for in-class exercise had both positive and negative aspects, as there may not be enough time to go through all answers, even if work is done in groups. I had to either prepare efficient validation methodology (e.g., grouping the examples by “type of error” and then simply categorizing them) or announce that I will process them during the break (and thus will not be available for questions etc.). I chose to use the former approach, but students still found the validation phase tedious.

In the more free-form exercise using Google Docs for group work, it was important to clarify how elaborate students’ answers should be – describing *how* the solutions would work or simply listing *what* methods they would rely on? Additionally, I had to plan carefully when to go over the answers and when to provide feedback.

## Conclusion

Overall, I was satisfied with the students’ engagement, as expressed by asking questions during the lecture and participating in exercises. I was also satisfied with the timing, as I did not have to skip almost anything. However, students did not read the reading material almost at all, so the exercises had to be superficial. Nevertheless, students were overall satisfied with the exercises and thought that they contributed to their learning outcomes more than a “normal” lecture would. While there was much more interaction in the Machine Translation lecture than the Dependency Parsing one, (at least some) students were overall more satisfied with the latter, as it covered more material due to more lecturing and less dialog. A good balance between the two must be found to provide the best learning experience.

If I were to repeat this experiment, I would focus on what reading material is necessary, and cut down on non-essential material. This would make sure that the students come prepared to class and can engage with the exercises fully. I would also add a quiz before class that must be solved based on reading material, to clarify to the students what level of preparedness is

expected. This will also serve for assessing their knowledge and interest. This will also be an opportunity to source questions from students about the content, which they are interested in hearing further explanations for during class. To be able to complete the quiz, the students will have to go over the main points in the reading material, providing a kind of motivation that is lacking when simply asking them to read it.

While many of these conclusions could apply to non-digital in-class activations as well, the ultimate conclusion I reached was that indeed, digital activations are beneficial in physical teaching as well, if done right.

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## A

### Free-text responses to the anonymous survey on the benefit of in-class activations Padlet exercise on question answering

- A bit too many examples
- I think it may have been more usefull to look more at the query language
- A bit long
- Although I enjoyed it very much, we probably didn't need to go through all the questions as thoroughly.
- It was a good exercise, but it was too long. We don't need to go through all the answers
- After a few reviews of questions it became repetitive. I found that I learned the most from the comparison between information gathering methods, both when shown in the lecture and as a task done in groups.

### Google Docs exercise on machine translation

- A bit long walkthrough afterwards - we got the point
- I found it very useful when learning the different components of a sentence in translation.

### Quizalize exercise on transition-based parsing

- good - also took an appropriate time
- The interactive quiz with this was great! Really helped ☺
- This worked very well

### General comments

- Doing short exercises helps understand the topic explained during the lecture
- Because the lectures we so intense and information heavy (too much) in the beginning these last lectures has seemed almost to light, and a few of us are nervous that because we have spend a lot of time on thouroughly going through these interactive lectures that we are missing out on important stuff that we should have learned for the multiple choice test.

### Free-text responses to the teaching evaluation

- The interactive examples were good and engaging.
- The tempo was a bit slow at times, it was good too do some interactive learning, but it took a lot of time at much, and we only had 2 hours lectures a week, so it felt a bit "weak".
- Some of the exercises you made are a bit trivial. The one about the varquous triangle did not have to take a whole lecture, a few example would have been enough. The same with the wikipedia articles



## Revised teaching and learning approaches in PC-based exercise

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### Introduction

This project report has been carried out in relation to the teaching course (Universitetspædagogikum JAN 2021) conducted from January 2021 to January 2022. The project suggest new teaching methods to SFAB20021U Molecular Pharmacology course which I have been involved as a teacher for the past 3 years. This Molecular Pharmacology course offers once a year in spring for the bachelor students. According to the course description they will learn basic theories, methodologies used in molecular pharmacology and how to integrate molecular biology, pharmacology techniques to elucidate the key role that plays in drug discovery process.

This course offers students the opportunity to learn about Molecular Pharmacology in theory and practice. The course is divided into three parts:

- 1) Workshops covering theory (3 weeks)
- 2) Laboratory exercises including planning and data analysis (4 weeks)
- 3) Oral Exam

Until 2019 the course was class room based physical teaching, but in 2021 due to COVID it was online (zoom) teaching. During the course time, I support and conduct Molecular Pharmacology course and assess Mol-Pharm reports submitted by the students as a part of final oral exam (2020). This course has been running for several years, which I think does helped to revise the course material several times to achieve ILOs as mentioned in the course web page (Appendix A).

Some of the key aspects in for improving the course is the need of continued development/revision with an emphasis on current research ideas/work/achievements pursued in the teaching materials for the course. This will help the students to enlighten their goals on their future academic prospects. One other important factor which has been neglected in the early time of 21st century at least to some extend in certain field of higher education is student engagement. Engaging students could be facilitated through a dynamic learning process in the course to make sure that students play a key role as interactively as possible so that the teaching process is non-linear. Nowadays there are various ways to engage students like using pre-recorded videos, flipped class room, discussions/chat forum etc (Dumulescu et al., 2021; Eaton, 2017). The course coordinator who closely monitoring the process, could provide the necessary instructions so that the discussions should be related to the course, while sometimes the chat could evolve into rather unrelated subject. These discussions could later be made public/sharing (only after the permission from the students) so that these discussions could be useful for new students in the following years.

Students also play a key role in the improvement of course curriculum, where they could get a chance to provide online feedback about the course. This doesn't have to be detailed one, it could be an instant summary of what does student like/dislike about the course, ideas to improve the course from their perspectives (Rienecker et al., 2015).

## **Aim**

I would like to improve and re-evaluate a PC-based tutorial (Workshop 2: Genetic engineering) which is a part of the SFAB20021U Molecular Pharmacology course. I will approach this task by explaining the problem associated with it, further describing step-by-step actions required to solve the issue followed by a revised teaching plan. I want to implement these changes in the coming spring 2022: SFAB20021U Molecular Pharmacology course. At the end of the course, we are planning to make a questionnaire for the students asking if they achieve the learning goals through these different teaching practices. While phrasing we choose the question in such a way that's the information is quantitative which could use later for conclusions.

## Investigating the problem

The course curriculum spans 7 weeks of extensive workload (200 hours) covering basic to advanced molecular pharmacology techniques. Therefore, it is extremely time demanding and challenging for both students and teachers, where students might end up spending less time learning the topic deeply. While teachers must stay within the teaching program providing new information every day in such a pace that students might not keep up with it. This restricts students to acquire hands-on experience in the field of molecular pharmacology, which is one of the competences students shall obtain at the end of the course. It is always demanding for the teachers to engage students constructively irrespective of the type of curriculum. Therefore, it is mostly overwhelming for the teacher to decide how deep or shallow teaching is required to meet the curriculum.

Despite of teachers' great efforts on creatively transferring knowledge for students using existing illustrative tools (power point slides) to make the lectures more interesting, students still left laid-back as the role of an audience. Even though sometimes there seems to be some active student participation through the lecture, such actions quickly decline resulting in a one-way lecture activity. This will eventually end up students acquiring flat surface learning which is a serious problem in teaching and since 2019 it has been a limitation for one of the topics in the Molecular Pharmacology course (Workshop #2: PC-based tutorial)

I want to address the problem by acknowledging three major factors associated with best teaching practice to engage students for achieving the intended learning outcomes (L. Rienecker & Ingerslev, 2015).

- 1) Good interaction
- 2) Positive teaching atmosphere
- 3) Within the allocated time, engage students to carry out the exercise efficiently

Before illustrating PCR in the PC-based tutorial, I will introduce the topic and provide essential background covering the technique (Appendix B). Even though students might remember PCR from their previous courses.

## **ILO's and evaluation criteria**

At the end of the PCR tutorial, I want students to accomplish intended learning outcome not limited to:

- How to analyze DNA using PCR method?
- How to describe all essential steps of PCR technique?
- How to design forward and reverse primers for a specific PCR from target gene?
- How to clone the amplified target gene to the vector of interest?
- How to insert/delete tags in the N-terminus or C-terminus of the target gene

Hopefully soon in their near future projects they could apply this knowledge they have acquired during the lecture.

Even though the final exam of the course will not be used to evaluate the ILOs of this lecture, I will interact with the students through chat, questions and dialogues to understand how far I succeeded in teaching the topic per se. Through these efforts I assume that the assessment is aligned with the ILOs.

## **Previous years reflections after the tutorial**

In 2019, 2020 the tutorial was offline while 2021 the whole course was online (Zoom). We (2 teachers) were involved in the tutorial (Appendix B). A short 10-minute introduction to the workshop (Power Point) followed by 30 minutes introduction to Molecular Cloning Tool (SnapGene). The rest 1 hour 20 minutes students worked in breakout rooms of 4 students each (12 break out rooms). We visited each breakout room in succession to examine students' participation in the tutorials. In all 3 years irrespective of changing the time schedule for introducing workshop and programs by using different timelines, it was still not sufficient to finish the tutorial in 2-hour time constrain. Despite of time issue we got good feedback from students who attend the workshop. Some of the feedback comments were as mentioned below

- Good interaction with the students in the breakout room.
- Assisted students to perform the exercise.

- i. By explaining the answer right away if necessary, or
- ii. Guiding them to figure out the solution themselves

- Provided a relaxed environment for students to ask questions/chat during the exercise for some groups not to every groups.
- Managed to keep students more vocal through constructive dialogue. Engaged students to get more studious in the exercise.
- I was playing a passive role to the students while helping in the break-out rooms
- Finally showed the excitement to be a good tutor

Even though there were some good feedbacks, we had some issue with the whole set up as mentioned below

- During online (Zoom) sessions not all students were willing to turn on their camera and microphones which makes it difficult to interact with all of them.
- There was very little time for individual discussion with all 12 group of students.
- The first breakout group had technical difficulties to share screen and sound quality was not the best to communicate with them.
- The second breakout group also had other challenges. Even though I had good interaction with the students, unfortunately the students did not understand how to proceed. However, I could guide the students to a certain extent, but it was therefore difficult to get an impression that the students could follow the tutorial. Probably here also time was a big constrain.
- The third breakout group misunderstood which exercise to work on. In the interest of time, I encouraged the students to continue with the workshop that they had started working on. Here, more than one student interacted with me. There was some good discussion between the students, and it was clear that the students did understand how to proceed further with the tutorial.
- Due to the time pressure, it was difficult to provide a relaxed environment for students in all groups to ask questions/chat during the exercise.

Therefore, I came up with this new plan from previous year's feedback from the students.

## The new teaching plan

As discussed above being in the past years, we did not manage to finish the exercise completely in the allotted time schedule (2 hours). Even though we used different timelines for the below 3 steps, students couldn't manage to finish the tutorial. So, I am proposing a new teaching strategy as mentioned below which involves new teaching and learning activities to accomplish the result.

1. Pre-recorded videos, explaining step by step to an introduction to the Molecular Cloning Tool (SnapGene): 15 minutes.
2. Software demo with a worked example (Step by step guidance in the material provided before the exercise): 30 minutes (should be watched by students before the exercise).
3. We ask the students to perform it by their own using another example in the class: 105 minutes.

Both point 1 and 2 will be analyzed and rated by 1 master student (took molecular pharmacology course in 2021) and 1 research associate (didn't took the course). They will evaluate and provide their feedback about the whole new setup. This will be a good opportunity for me to make any necessary changes and later in spring 2022, I will introduce this to bachelor students at the course.

## Discussion and conclusion

In 2021 due to COVID-19 restrictions being molecular pharmacology course is laboratory based exercise, students couldn't able to learn the techniques by hand, while teachers prepared video tutorials displaying how to carry on practical exercises in the lab referring to the molecular pharmacology techniques that is described as ILOs. Here students were just watching the video and no interaction between the student-teacher and lab was carried out. One of the solution we used in the pre-project of Universitetspædagogikum is to introduce virtual lab work, using SmartBuilder application. We provided "Testing for COVID-19 using RT PCR" an interactive application where students need to follow steps as how to at least virtually perform COVID-19 test using RT-PCR. These kinds of interactive oriented activities were helpful for the students to be confident to perform experiments

in the lab, which makes them less nervous to handle equipment's that are mostly very costly. Additionally, due to COVID pandemic PCR technology prevails in diagnosing people infected with SARS-CoV-2.

All these above-mentioned formats chat, active forums, podcasts, videos and virtual labwork could be integrated to the course in such a way that students felt more engaged in the course, rather than assuming that students are following 45 minutes lectures. At last students, teachers and content should provide a dynamic character to engage and responsibly delegate and share the knowledge while respecting and partially building on user knowledge with focus on the core ILOs (Schmidt et al., 2011). In the end, there should be a space to focus on research based and research integration using tools available from lab, collaborators, journal clubs, peer discussions and concept to prepare students for their carrier path.

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## A Course description

<https://kurser.ku.dk/course/SFAB20021U>

### SFAB20021U Molecular Pharmacology

Volume 2021/2022

EXPAND ALL ▾

#### Education

BSc Programme in Medicinal Chemistry (BA i medicinskemi - SCIENCE) - compulsory  
BSc Programme in Pharmacy - elective

#### Content

Through an integrated approach of lectures, project work and laboratory exercises, the students will learn about central topics in molecular pharmacology, such as ligand-receptor interactions, recombinant techniques (cloning of drug targets, mutagenesis), expression systems (mammalian cell culturing), transgenic techniques, pharmacological assays (binding/functional assays), molecular probes, structure-activity relationships, gene-expression studies (mRNA/protein), data analysis and interpretation (GraphPad Prism etc).  
During the course the students will work together in groups of 3-6. They will cover 4 themes and write up material used for both the practical work and examination.

#### Learning Outcome

##### Overall course objective

Molecular pharmacology is an important research field integrating molecular biology and pharmacology. The field is central to the drug discovery process. The objectives of this course are to provide a theoretical foundation of central molecular pharmacology terms and methodologies through theoretical and practical experience.

##### After completing the course the student is expected to be able to:

###### Knowledge

- understand central molecular pharmacology principles, methodologies and terminology
- obtain research-based knowledge of theory, methodology and practice within the field of molecular pharmacology
- describe molecular mechanisms of important drug targets, understand the use of cloned targets in research, and obtain knowledge about cell-based pharmacological assays
- explain how these principles and methods can be exploited in practical experiments aimed at reaching distinct research goals
- reflect on the subject molecular pharmacology in relation to the drug discovery process

###### Skill

- identify critical steps and describe technical details in relation to planning a pharmacological assay
- carry out experiments using common methods in molecular pharmacology
- calculate and interpret pharmacological data
- formulate 1-3 in a short report (technology and data sheets)
- present and discuss results in a relevant drug discovery/pharmaceutical context

###### Competence

- argue for choice of pharmacological assay in a specific research situation
- transfer theories and principles to other areas of drug discovery
- translate theoretical knowledge into practice (assay design)
- collaborate and communicate effectively with other professionals with expertise in molecular pharmacology and related subjects
- comprehend molecular pharmacology in relation to drug discovery

#### Course information

Language	English
Course code	SFAB20021U
Credit	See exam description
Level	Bachelor
Duration	1 block
Placement	Block 3
Schedule	B
Course capacity	48 students: 24 seats reserved Students of BSc Programme in Medicinal Chemistry and 4 seats reserved for international students.

[Course is also available as continuing and professional education](#)

Study board  
Study Board of Pharmaceutical Sciences

Contracting department  
Department of Drug Design and Pharmacology

## **B Workshop 2 (Genetic engineering) plan – theoretical and practical parts**

Time	Activity	Title
45 minutes	Lecture	Recombinant DNA technology
45 minutes	Lecture	Expression systems
105 minutes	Tutorial	Analysis of m1 plasmid and cell line, demo and hands-on



## **Optagelse af patient-konsultationer via en mobiltelefon-app og videoundervisningssekvenser, en forbedring af kursus i almen medicin og konsultationstræning**

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### **Indledning og problemformulering**

På medicinstudiets sidste semester på Københavns Universitet indgår faget Almen medicin. Kursus i almen medicin kombinerer uddannelse i klinisk og teoretiske indhold med træning i konsultationsprocessen og analyse af konsultation med en patient ved refleksion og supervision.

Kurset består af forelæsninger, klinisk ophold hos en praktiserende læge og holdundervisning med cirka 7-12 studerende. Hovedvægten på kurset ligger på konsultations analyse og patient kommunikation. Den studerende gennemfører selvstændige patientkonsultationer i en lægepraksis han/hun er tilknyttet. Disse konsultationer superviseres umiddelbart efter af tutor lægen (den praktiserende læge i klinikken). Derudover optages konsultationerne på videokamera, disse optagelser arbejder den studerende med ved selvrefleksion derhjemme, ud fra teorien de læser og undervises i, ved forelæsninger og ved holdundervisning. Optagelserne danner baggrund for feedback sessioner ved holdundervisning, hvor der arbejdes sammen med medstuderende og underviser i analyse af konsultationsprocessen. Ved holdundervisningen ses konsultationsvideoer igennem med underviser samt medstuderende som i feedback-sessioner udgør en reflekterende baggrundsgruppe med den studerende. Her øves den studerende i konsultationsprocessen, analyse af denne, selvrefleksion samt i at give og modtage feedback fra andre. I holdundervisningen tages der afsæt i de studerendes

konsultationer også i den teoretiske og kliniske undervisning og søges inddraget som eksempler. Derudover vælger studenten også én af sine konsultationer ud som den studerende analyserer ved eksamen og udgør en del af den endelige summative vurdering af studenten. ("Kursushæfte for almen medicin på Københavns Universitet forår 2021", n.d.). Konsultationsundervisning med selvrefleksion og feedback i kombinationen med mesterlære i almen praksis - studenteraktiverede undervisning - er hjørnestenen af det almen medicinske kursus og i den *situerede læring* (Rienecker m.fl., 2013, kap 2.1), som anvendes på medicinstudiet. Denne læringsform, med supervision, feedback og refleksion er også med til at danne baggrund for den videre udvikling af den studerende i at indgå i mesterlærer sessioner som er kendetegnet ved også den post-graduate læring som yngre læge. Denne supervisions-proces bliver også et "startskud" i læringsprocessen til at give feedback til kollegaer og personale i arbejdet som vejleder/tutor for andre.

Den studerendes forberedelse derhjemme med gennemsyn og gennemgang af egne konsultationer, herunder kommunikationen i disse kræver gode optagelser som kan bruges i læringen for den studerende. Det er endvidere vigtigt at optagelserne kan vises til holdundervisningen og til eksamen og ikke teknisk er for svære at optage eller fremvise så det tager for meget tid fra undervisningen, det kliniske ophold eller forberedelsen. Optagelserne skal være i en høj billedmæssig og lyd mæssig kvalitet som kan danne baggrund for den efterfølgende analyse af kommunikationen og konsultationsprocessen i videoen.

For at understøtte de studerendes læring, refleksion og udvikling har jeg med udgangspunkt i egne og kollegaers erfaringer tænkt på om fagets rammer kunne udnyttes bedre. Herved forstås brug af nye tekniske løsninger for optagelse af patientkonsultationer og brug af nye undervisnings-platforme: E-læring med korte videosekvenser på Absalon (Københavns Universitets virtuelle studieplatform). En sådan intervention skal medvirke til at frigøre mere *undervisningstid* til feedback af de studerende til undervisningssessioner og give de studerende nemmere adgang til forberedelse og sparring hinanden imellem (peer-feedback).

I analysen vil der dels være fokus på, hvorvidt den studerende og underviser ser problemer ved den nuværende og den foreslåede optagelsesmetode, herunder kvaliteten af optagelse, tidsforbrug, bekymring for tekniske problemer og oplevelsen af at skulle optage på eget medie (egen telefon), gør det noget ved konsultationen og for udbyttet af undervisningen? Giver det ex. bekymringer hos den studerende -- og patienten -- at personfølsomme data optages (om end krypteret) på egen telefon? Hvordan ser studeren-

de på E-læring som et tilbud i undervisningen? Kan det frigøre mere tid til feedback af studerende? hvilke elementer egner sig til E-læring?

Derfor har dette projekt følgende problemformulering:

*Hvilke fordele og problemer er der ved, at anvende en app-baseret optagelse af patient konsultationer i stedet for klassisk videokamera optagelser og kan korte videosekvenser (E-læring) give mere tid til feedback, supervision og studenter aktiverende undervisning?*

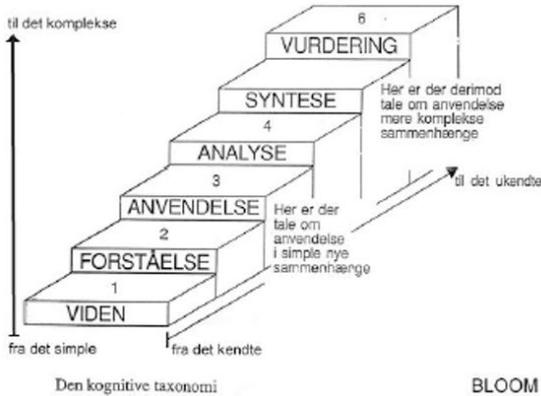
## Resume af udvalgt litteratur

Analysen vil tage afsæt i nuværende evidens afklaring ud fra pædagogisk litteratur på området og i diskussionen vil resultater sættes i forhold til tidligere, lignende interventioner og problemer i læring oplevet af andre brugere af denne optagelses teknologi og brug af E-læring.

Nedenfor er en kort redegørelse af nogle teoretiske forklaringsmodeller, der er valgt til at belyse, hvad som påvirker studerendes læring, og som kan begrunde og forklare interventionen og de opnåede resultater.

I holdundervisningen arbejdes i konsultationstræning (Bilag E) på et højt og komplekst læringsniveau i henhold til Blooms taksonomi (Figur 1, Bloom, 1956). Det komplekse læringsniveau som den studerende bevæger sig ind i på dette kursus med analyse og selvrefleksion kræver tid og rum for den studerende, samt et fokus på at skabe en tryk ramme, hvor at dette kan foregå.

Læring kan ud fra nogle betragtninger siges at indeholde tre overordnede dimensioner; det der læres, drivkraften til at lære og samspillet med andre (Illeris, 2015). I den konstruktivistiske læringsteori som udspringer fra Piaget (Piaget, 1971) taler man om forskellige læringsformer, assimilativ og akkommodativ læring, som konstant er i en aktiv tilpasningsproces (Illeris, 2015). Ved assimilation inddrager man ny viden i den videns ramme man allerede har – det den studerende allerede kan. Det er derfor vigtigt i undervisningen, at man tager afsæt i, og har fokus på, hvad de studerende har af forkundskaber, for at kunne lære dem nyt. Ved akkommodation omstrukturerer man det man allerede ved, for at bruge det lærte i andre både ukendte og kendte situationer, hvilket er mere krævende, men skaber forudsætning for anvendelse af det lærte (Illeris, 2015). Denne proces er på et højere stadi i den kognitive taksonomi (Bloom, 1956) som beskrevet kursus beskrivelsen i almen medicin (“Kursushæfte for almen medicin på

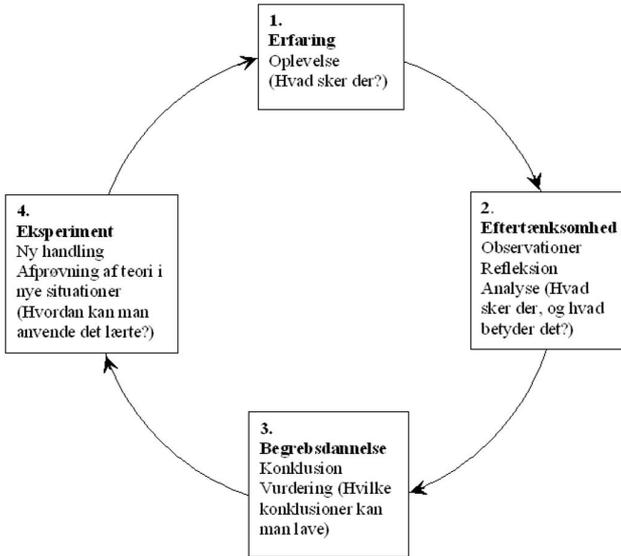


**Figure 1.** Bloom 1956 (fra kursus beskrivelsen).

Københavns Universitet forår 2021”, n.d.). Den læring som den medicin-studerende har på kursus i almen medicin kan beskrives godt ud fra Kolbs lærings cyklus (Kolb, 1984, (Figur 2)). Den studerende er i praksis og gør sig erfaringer som er udgangspunkt for refleksion der danner grundlag for begrebsdannelse, hvorefter at den studerende vender tilbage til praksis og laver ny handling i en cirkulær proces – læringscyklus - dette understøttet af feedback og undervisning ved holdundervisningen som en art dynamo for processen.

Jensen et al, beskriver i en stor undersøgelse af studieforholdene på AAU, at mange studerende efterlyser mere feedback. Jensen foreslår endvidere øget brug af peer-feedback og E-læringsaktiviteter som muligvis kan frigive ressourcer til feedback (Jensen, 2011). Hvis man i undervisningen i øget omfang bruger peer feedback og e-læringsaktiviteter, for dermed at frigøre mere undervisningstid til supervision og feedback, er det vigtigt at man som underviser instruerer og også overværer feedback-sessioner (Rienecker m.fl., 2013, kap 4.6.1). Det er velbeskrevet at man ved E-læring har andre rammebetingelser og det betyder, at undervisere kan (eller bør) tage højde for dette i planlægningen af sådan og hvilke undervisningselementer der kan fungere i denne ramme (Rienecker m.fl., 2013, kap 4.8).

Didaktik omfatter, hvordan undervisningen planlægges og gennemføres, så læring kan finde sted, modsat pædagogik der omfatter den mere opdragende undervisning. For at man skal tale om undervisning, skal der, som



**Figure 2.** Kolbs læringscyklus 1984 (modereret udgave).

bekrevet i den didaktiske trekant mindst være et *indhold*, en *studerende* og en *underviser*. De tre aspekter er afgørende for kvaliteten og planlægningen af undervisningen. Der findes også teorier om andre faktorer, der kan påvirke, hvordan undervisningen understøtter mere dyb læring. En af dem er John Biggs teori om ”constructive alignment”, der peger på, at et læringsudbytte fremmes af sammenhæng og genkendelighed i undervisningen. Det vil sige, at evalueringen skal afspejle både de opstillede læringsmål og de brugte læringsaktiviteter (Rienecker m.fl., 2013). Det er også nævnt, at selve formatet på evalueringen kan være svært at forstå for de studerende, hvis ikke det er koblet til de læringsaktiviteter der er på kurset (Hounsell & Hounsell, 2007). I planlægning og udførsel af et undervisningsforløb er det vigtigt at forstå den indbyrdes relation mellem forskellige elementer i et undervisningsforløb (ex: læringsforudsætninger, rammefaktorer, mål, mfl.) – at man ved at påvirke et område af denne også vil have effekt på de andre elementer (Figure 3, Hiim og Hippe, 2007).

Interview (i gruppe) er egnet til at skabe eller indhente viden om menneskers livsverden, via holdninger, forståelser og meninger. I denne opgave bruges interview som empiri. Det kvalitative forskningsinterview kan ha-

ve forskellige tilgange, og er et håndværk, som kræver både teoretisk viden og megen øvelse at tilegne sig. Ved en fænomenologisk tilgang tager man udgangspunkt i interviewsubjekters oplevelse af en situation (Brinkman S, 2015; Halkier, 2016). Med dette udgangspunkt kan der forberedes interviewspørgsmål, men hvor der er en åbenhed for de fænomener, som interviewet afslører. Eftersom feedback er en interpersonel proces, hvor den sociale dimension er central, er det vigtigt, hvordan de studerende udtrykker sine holdninger i forhold til hinanden og indgår i meningsdannelse. Ved interview i gruppe kan flere aspekter desuden belyses på kortere tid. På den anden side kan der også forekomme selvcensur, det vil sige, hvor eksempelvis de studerende kan begrænse hvad de deler med hinanden (Halkier, 2016).

## **Intervention og dokumentation**

Interventionen er inspireret af litteraturen, kursus i Universitetspædagogikum, diskussion med mine undervisningskollegaer og studerende på kursus og ved faglig sparring med kollegaer som faglig vejleder for medundervisere. Intervention bestod i nye optagelses teknologier og bruge nye virtuelle muligheder til at understøtte undervisningen i almen medicin for at få mere tid til feedback af de studerende til holdundervisningen. I interventionen skal en ny app-baseret konsultations-optagelse, på de studerendes egen telefon/device eller udlånt device, gøre det nemmere for den studerende at optage samt fremvise videoer uden at gå på kompromis med beskyttelse af personfølsomme data som en lægekonsultation udgør. Interventionen bygger på en teknisk løsning som er udviklet til og bruges af læger (post-graduat) – (Supervisionsportalen, n.d.), der lever op til lægeforeningens etiske regler (Bilag C). Formålet var at undersøge behovet for en sådan og hvilke problemer og fordele der kunne være i en sådan set fra studerende, undervisere og fra instituttet. På grund af manglende databehandler aftale mellem Københavns Universitet og udbyder af appen har appen ikke kunne implementeres nu, men forventes implementeret i løbet af 2022. Undersøgelsen i denne rapport skal være medvirkende til at danne, baggrund for Institutet og kursusledelsens videre implementering af denne app på kursus i Almen medicin

2. del af interventionen var den understøttende del, med korte e-lærings moduler som skal bruges til at understøtte undervisningen, ex. introduktion til videooptagelse på app, samt studieelementer der egner sig til denne

undervisning og dermed frigøre undervisningstid til feedback og studenter aktiverende undervisning. Der blev lavet korte videosekvenser med underviser, som den studerende selv kunne se på Absalon (eksempel på de tilgængelige optagede videosekvenser der blev prøvet af i denne opgave: ”Instruktion og hjælp til konsultationsoptagelse”, ”Information om eksamen”, ”Undervisning i praksisformer”). Interventionen (appen) og E-læring vil løbende skulle udvikles og evalueres. Dette projekt vil være et pilotprojekt og foregå i forår og efterår 2021 og vil understøtte den videre implementering.

Den empiriske dokumentation består af en kvalitativ tilgang med semi-strukturerede fokusgruppeinterviews af 3 hold af studerende (henholdsvis 8, 8 og 7 studerende) (ca. 15 minutter, se bilag B). For at afdække så mange forskellige aspekter af denne undervisnings-intervention var et af holdene et ”virtuelt hold” som pga. ”Corona LOCKDOWN”, alene havde holdundervisning og forelæsninger online og 2 almindelige hold med fremmøde undervisning. Ét af de to hold der indgik var en kollegas hold for at undersøge evt. forskelle mellem forskellige undervisere og hold.

Der indgik også observationer af holdundervisning med anden underviser og fra egne hold som del af empirien.

Endvidere er der anvendt observationer og pointer fra et temamøde blandt underviser på almen medicin omhandlende e-læring/brug af videosekvenser og små interview med enkelte undervisere (se bilag B)

## Analyse og diskussion

### Videokamera optagelse vs app-baseret optagelser

Almen medicin kurset har indtil nu anvendt klassiske videokameraer med optagelse på hukommelseskort som så er blevet set igennem af den studerende på hjemme computer (eller på den lille skærm på selve optageren) og brugt i undervisningen til fremvisning på stor skærm og til undervisningen. Det har i undervisningen givet mange problemer.

Fra de studerendes perspektiv beskriver flere ved interview, at det har givet dårlige forberedelsesmulighed AS: ”Jeg har ikke kunne få det til at fungere på min computer og har været nødt til at se på den lille skærm med skodlyd på videokameraet”. Majoriteten af de studerende beskriver dog at hvis først, at videokameraet er tilsluttet en god skærm og højtaler er optagelserne af god kvalitet selvom udstyret er gammelt. Ud af 8 studerende på det ene hold havde kun 1 brugt at få optagelser over på egne skærme med bedre billede og lyd ved forberedelse på det andet hold var det 7 ud af 7 der

havde brugt computerskærm og lyd. De studerende beskrev at videokamera eller andet device ikke fyldte i konsultationen xx: "...kameraet stjæler ikke fokus" men at det var problematisk at placere videokamera ordentlig. Flere af de studerende nævnte også at, hvis nyt device, at man skulle have adgang til stativ til denne, for ordentlig optagelse. Flere af de studerende havde haft svært ved at vise deres videoer til undervisningen virtuelt samt at arbejde med disse med medstuderende som forberedelse beskrev flere af de studerende. Flere af de studerende mente at en app-baseret optagelse ville være nemmere at bruge, nemmere at se og mere kompatibel med moderne computere, ipads m.fl. og vil derfor fremme refleksion og læring for de studerende.

I interviewet med det "virtuelle-" og de to fremmøde-hold beskrev samstemmende, at instruktionen og undervisningen i videokamera optagelse som den er nu, var meget mangelfuld. De studerende beskrev selve udlevering og indsamling af videokameraer og hukommelseskort samt servicering af disse og instruktion af de studerende i de enkelte kameraer som meget besværlig og tidskonsumerende. Studie tid der kunne have været anvendt i klinikken, forberedelse eller til undervisning som de studerende beskriver som der de lærer mest.

Flere af de studerende var utrygge ved at have kameraet liggende xx: "Faktisk var jeg nervøs for at gå med kameraet". De studerende beskrev samstemmende, at hvis man skulle bruge et videokamera så de bedst, at det var i praksis og var låst inde her så ingen kunne få adgang til kameraet og optagelserne (de studerende er ansvarlige, hvis de mister kameraet og skal betale for et nyt). Flere af de studerende beskriver at det giver uro og "unødvendigt" fjernelse af fokus fra selve undervisningen eller eksamen med de mange tekniske problemer.

Brug af eget device til at lave app-baseret optagelse beskriver de studerende med flere problemer AP: "jeg vil være bange for at optagelsen gik tabt hvis en ringede til mig mens jeg optog", JC: "Man skal stole fuldstændig på at data er sikker". Flere af de studerende var også usikre på om der kunne være problemer med optagelse på eget device i form af for lidt datahastighed/datakapacitet og at det derfor var vigtigt med låneapparater til de studerende, der måtte have behov for et sådan. Det blev også beskrevet fra nogen af de studerende, at de mente at patienterne kunne være mere utrygge ved at blive optaget på den anden type af device PL: "Jeg ved ikke om jeg vil bryde mig om at blive optaget på den måde..." Mens flertallet af studerende beskrev, at ved ordentlig introduktion af patienten vil det ikke være problematisk med optagelse på andet device i deres optik.

Fra et underviserperspektiv blev der beskrevet flere problemer i brug af videokameraer. Håndtering af kameraer er en meget ressource tung for instituttet både økonomisk og tidsmæssigt (hente, aflevere kameraer, servicering samt introduktion til kameraet som for de studerende ikke er kendt). Der bruges derudover også meget tid og energi på kurset på tekniske problemer med videokameraer og kompatibilitetsproblemer både til undervisningen og til eksamen. Det beskrives af flere af undervisere ved interview (Bilag B), AM: ”det kan være svært af få kameraret til at spille, derfor bruger jeg pauserne til at få det til at fungere”. Ved de observerede undervisningssessioner blev der brugt meget tid på kompatibilitets-problemer mellem fremviser og kamera ved fremvisning af optagelse. Denne tid tages fra undervisning, som i stedet kunne bruges på at arbejde med teorien og feedback af de studerende og dermed fremme de studerendes læring og pause til underviser. Det beskrives af undervisere enkelte gange, om end sjældent, har det betydet at eksamen eller supervisionen mislykkedes, da de forskellige systemer, videokameraer og fremviser ikke har fungeret (TD, AM). Kursus ledelsen og undervisere har set sig nødsaget til at lave ”back up” videoer af en læge/patient konsultationer, hvis ikke den studerende kunne få videoen til at spille til eksamen. Særligt har fremvisning af optagelse været en udfordring ved de virtuelle eksaminer (JS, TD). Det aldrende udstyr af videoer har også haft store problemer med lyd og billede kvalitet. De studerende og undervisere kan til tider dårligt høre hvad der bliver sagt på nogen af optagelserne og lyden er ofte noget forvrænget så at vigtige konsultations-elementer kan gå tabt i undervisningen til følge (ASH, ML).

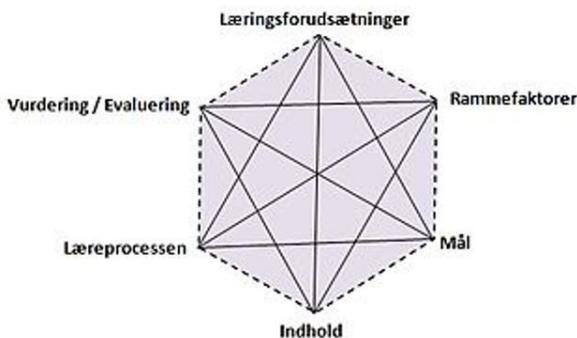
Underviser TD beskrev, at der på kurset desværre også er sket flere gange at kameraer er bortkommet eller stjålet fra praksis som har betydet, at meget personlig information om patienter potentielt er blevet tilgængelig for uvedkommende, et alvorligt brud på læge patienttavshedspligten, som både kan have konsekvenser for den enkelte patient, og også for om patienter i fremtiden vil indgå i de meget vigtige læringssituationer for kommende læger. Disse vil således muligvis være mindre klar til at lade sig optage hvis deres personlige oplysninger ikke er sikre og kun vil blive brugt til undervisning. I lægeforeningens etiske regler står der: At konsultationerne skal optages på video hvis muligt, at der skal udfyldes en patienttilladelse og Lægeforeningens etiske regler mht. lyd- og billedgengivelser skal overholdes se bilag (Bilag E).

Supervisionsportalen, som bruges post-graduat af yngre læger og speciallæger i almen medicin, ligner i opbygning den planlagte app der foreslås implementeret på kursus i Almen medicin. Supervisionsportalen beskrives

i en rapport fra 2020, som ”god og velfungerende” af testpersoner af appen (praktiserende læger) samt ved vurdering af pædagogisk/faglige vejleder i speciallæge uddannelsen i almen medicin (AMU) og yngre læge speciallæge uddannelse-vejledere (DYNAMU) (Årsrapport for 2020 KEU).

E-læring, brug af videosekvenser på Absalon.

Underviser perspektiv: Til temamødet med undervisere og studieleder af kursus i almen medicin om E-læring (24/8 2021), beskrev flere undervisere gode elementer til E-læring, som supplement til undervisningen, og flere af underviserne er i gang med at producere disse. Der var dog en stor enighed om, at *ikke* alle undervisningselementer - dele af pensum - kunne foregå virtuelt og, at noget af kontakten med de studerende gik tabt. Flere af underviserne udtrykte også at det var vigtigt at elementerne blev revideret ofte og at underviser skulle have ”retten” over optagelserne (JB).



**Figure 3.** Hiim og Hippe 2007 (modereret udgave, lærebog).

Videosekvenser/E-læring blev afprøvet med optagelser af oplysning om eksamen, generel introduktion til undervisning og hvordan en praksis er bygget op og praksisformer på mine egne hold i forår og efterår 2021. Det resulterede i fra underviser perspektiv mindre tids forbrug på disse emner til undervisningen og større læringsudbytte, da vi til undervisningen kunne prioritere mere tid til andet. Her brugte vi mere undervisningstid på de af de studerende prioriterede vigtige emner eller ved tvivls områder i pensum. Det var mit indtryk, at de studerende skal have nem adgang til at stille spørgsmål til elementer i den virtuelle undervisning både mellem undervisningsgange og til undervisningen direkte, det fremgik ligeledes af flere af

de studerendes udsagn ved interview. Vi arbejdede med en formaliseret procesevaluering som supplement. Her anvendte jeg ”Learn skemaer” (Bilag D), for at give de studerende rum til at spørge til områder af pensum/E-læring de ikke havde forstået, samt dele med medstuderende nogen forståelse pointer.

De studerende mente overordnet set at de korte videosekvenser på Absalon fungerede godt og var nemme at gå til. De studerende beskrev at mediet, kun kunne bruges indenfor nogen afgrænsede emner, særligt den teoretiske del af pensum. De beskrev, at det var vigtigt at man kunne spørge til indholdet i timen og evt. per mail-besked mellem undervisningsgangene. Tilgængeligheden på Absalon ”on demand” synes de studerende var godt, xx: ”... hvis der er noget jeg var i tvivl om kunne jeg se det igen”. Der var opbakning til at instruktion i den nye optagelse facon og brug af app kunne foregå på et E-modul på Absalon, men mulighed for backup til tekniske problemer var vigtigt, der var dog ikke nogen af de studerende der havde haft problemer med at se sekvenserne. De studerende på det virtuelle hold beskrev, at meget af undervisningen havde fungeret udmærket online, ligesom forelæsninger, men beskrev at selve konsultationsanalyse undervisning og undervisning i kommunikation havde fungeret mindre godt ved de virtuelle holdundervisningssessioner og kunne under ingen omstændigheder være optaget. De studerende beskrev i interview at learnskemaer fungerede godt som procesevaluering og grundlag for vidensdeling mellem de studerende.

For god læring er det centralt, at den studerende tilegner sig noget, ved at være i samspil med andre (Rienecker m.fl., 2013, kap 2.1; Illeris, 2015), som fx der sker i feedback/refleksionssessionerne til holdundervisningen i kursus i Almen medicin. Det kan bekræftes med nærværende undersøgelse og denne undervisningsdel er relevant at udbygge. Det er ligeledes fremmende for læring at undervisningen, forgår i et studenteraktiverende miljø, hvor de inddrages i egen læringsproces. Disse elementer er fremmende for forståelsen af sammenhænge (Rienecker m.fl., 2013, kap 2.1 og 3.1) og muligvis endnu mere vigtigt når der undervises i komplekse fag og med høj taksonomi som Almen Medicin og i den situerede læringsform som bruges her. På kursus i almen medicin er det særligt tilfældet med konsultationsanalyse af de studerendes egne videooptagelser og feedback-processen omhandlede de andre studerendes videooptagelser. Men også rammerne (fx E-læring og fysiske forhold som arten af videooptagelser der er tilgængelig) og sammenhængskraften i det fag, indenfor hvilken denne læring skal finde sted, kan have betydning for læringsudbyttet (Biggs og Tang, 2007;

Rienecker m.fl., 2013, kap 4.8). I denne analyse kunne konstateres, hvorledes elementerne med: *rammefaktorer, læringsforudsætninger, indhold* m.fl. i høj grad er relationelle og dynamiske og at ændringer med øget E-læring skal gennemtænkes i hele den didaktiske relations model (se Figur 2, Him og Hippe, 2007). Der er særlige udfordringer når læring skal foregå i et for nogen studerende uvant læringsmiljø, en virtuel platform. Her er brug for en virtuel socialisering, hvori informationsudveksling og videns konstruktion og udvikling skal foregå både i nyt stof og i læringsramme. E-læring og egen læringsdisposition kan blive ensomt og uforpligtende for den studerende (Rienecker m.fl., 2013, kap 4.8). Det er vigtigt at forstå som underviser og studerende, at det *ikke bare at sætte strøm til tilstedeværelses undervisning*, som beskrevet i interview fra det virtuelle hold. Det kræver øget evaluering af undervisningen både fra den studerende og underviser for at undgå misforståelser, god teknisk support og ”E-moderation” af underviser (Salomon 2011) at ændre undervisningsmedie. Noget af undervisningen egner sig ikke til hverken virtuel undervisning eller som E-læring. Evalueringen skal foregå løbende og både på selve undervisnings processen og af de studerendes læring og kræver øget fokus og formalisering fx ved learnskemaer, virtuel feedback af underviser m.fl. Learnskemaer er i min optik godt instrument til støtte i E-læring.

Det vil være vigtigt i en kommende større undersøgelse og evaluering af en sådan intervention, at overveje at bruge også skrevne evalueringer som supplement for at flere kan komme til orde og undgå selvcensur. Det vil også være relevant ved en sådan at inddrage tutorlæge perspektiv og patient perspektiv i en sådan undersøgelse.

## Konklusion

Interventionen med App-baseret optagelse kunne ikke implementeres fuldt pga. et problem omhandlende manglende, DATA-behandler aftale på Institut niveau som endnu afventer afklaring arbejdet er fortsat i gang og denne rapport er med til at danne baggrund for implementering som forventes i løbet af 2022. Denne undersøgelse giver dog en afdækning af nogen af de udfordringer og fordele af et sådant læringselement og dermed hjælpe med den senere implementering. Appen er ved at blive afprøvet, herunder af under tegnede, for små tekniske fejl er blevet rettet til. E-læringsformatet med videospots som støtte til brug af appen samt understøttelse af den almindelige holdundervisning kunne afprøves efter planen.

De studerende og undervisere bruger i dag meget spildtid på optagelser i det nuværende format. De har sværere ved at forberede sig og det tager undervisningstid fra den egentlige undervisning og feedback og dyr at ”drifte” for instituttet. En App-baseret optagelse af patientkonsultationer, kan muligvis være læringsfremmende og tidsbesparende element i udviklingen af kursus i almen medicin. De studerende og underviserer kan potentielt nemmere tilgå den nye app, da den bygger på moderne teknologi som bedre fungerer med computere og andre devices tilgængelig for de studerende idag og bygger på en allerede fungerende teknologi (Supervisionsportalen, n.d.).

De studerende pointerer i interview, at det kan være problematisk med brug af studerendes egne devices, da disses kvalitet eller adgang til data kan være limiterende for brugen af denne teknologi. Ressource- og tidsbesparelsen for den studerende og for instituttet ved brug af egen device, kræver at de studerende har adgang til stativ og for de studerende der ikke har et device der teknisk (fx data-forbrug) kan leve op til krav for studieapp skal der være adgang til lån af disse. Det kan altså begrænse gevinsten i undervisningen ved at skifte til dette medie da nogen af disse problemstillinger vil kræve en del kræfter for instituttet og nogen af de studerende vil have sværere ved at anvende denne teknologi.

Det er vigtigt med en grundig instruktion af patienter, når man anvender en app-baseret optagelse, om at mediet er sikkert at lave optagelser på og at data er beskyttet. Inddragelse af tutorlægers oplevelse og input til et sådan skift af optagelsesteknologi i deres praksis allerede tidligt i processen er meget vigtig. Rekrutteringen af tutorlæger, er allerede nu meget svært for instituttet, og inklusion er derfor alfa og omega. Muligvis vil nogen af de problemstillinger som de studerende beskriver i denne rapport også kunne afhjælpes ved at integrere tutor-praksisser yderligere. Tutorpraksisser kunne eksempelvis have devices klar til de studerende, så at problemet omhandlende tilstrækkeligt dataforbrug, stativ og devices kvalitet kunne løses på den måde, og imødegå nogen af de bekymringer som de studerende havde ved at bruge egne devices. Yderligere undersøgelse (ex: pilotundersøgelse) af patienters oplevelser af at blive optaget på andet device, de studerendes oplevelse af påvirkningen af lægepatient-relationen mm. og tutorpraksis tiltag vil være relevant før implementering.

Interventionen med små videospots ved underviser fungerede – som oplevet af studerende og underviser – godt til introduktion af videooptagelser samt indenfor nogen emner af pensum. Øget e-læring i form af digitale videooptagelser, kræver at man giver de studerende rum til at kommunikere

om tvivlspørgsmål. LEARN skemaer (bilag C) virkede som et godt format til denne formative procesevaluering. Undersøgelsen viste at der er elementer der egner sig godt til E-læring og nogen elementer som *ikke* egner sig til denne undervisningsform og en udvikling af denne platform kræver tæt samarbejde og evaluering mellem undervisere og studerende – studentercentreret undervisning og undervisningsudvikling. Både studerende og undervisere mente at E-lærings moduler kunne frigøre mere tid til den egentlige feedback baserede undersøgelse hvor de studerende sammen og med underviser kunne arbejde studentercentreret.

## Perspektivering

Projektet, og det at diskutere det med kollegaer, har været lærerigt for mig samt indgået i arbejdet med min udvikling af undervisningen og af mig som underviser. Inddragelse af de studerende tidligt i denne proces med udviklingen af faget med nye former for optagelse og læringsplatforme, viste sig at give vigtige og også - overraskende - både positive indspark, men også u-erkendte problemer som skal løses ved en fortsat udvikling af kursus. Et sådant projekt understreger, at man i fremtiden med udvikling af studier skal have fokus på alle perspektiver tidligt og inddrage disse i skabelsen af et effektivt, godt læringsmiljø – ”*samskabelse*” med en student centreret tilgang. Jeg vil sammen med min kollegaer fortsat udvikle kursus. Der er planlægges et senere større studie af og fortsat udvikling af de virtuelle platforme for læring og fortsættelsen af implementering af App-baseret optagelse. Her foreslås også inklusion af vigtige aspekter som patientoplevelse og tutorlæge-perspektiv som også er vigtige interessenter i faget og er vigtige i udviklingen af kursus i almen medicin og som ikke er undersøgt tilstrækkeligt

Jeg vil bruge resultaterne fra denne opgave til, at arbejde videre med implementering af nye platforme for undervisningen og med udvikling af kursus i samarbejde med mine kollegaer, kursus ledelse og på institut niveau, men også konkret i udviklingen af min egen undervisning. Denne undersøgelse har medvirket til en begrebsdannelse af min udvikling som underviser. Jeg indgå som underviser, ligesom de studerende i *Kolbs læringscyklus* (Figur 2) med at udvikle og forbedre undervisningen ud fra erfaringer, refleksion, begrebsdannelse og planlægning og udførsel af nyt eksperiment/ny handling. Endvidere har undersøgelsen vist i, hvor høj grad undervisningsforløbs elementer er dynamiske og interagerende og at man

som underviser og udvikler skal have øje for disse relationer og deres interaktion (Hiim & Hippe, 2007).

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**A****Nøglebegreber konsultationstræning  
Kursus i almen medicin 12. semester**

Konsultationsprocessen som værktøj

- a. Beskrive konsultationsprocessens elementer og baggrunden for anvendelsen af denne model (2).
- b. Kunne integrere den patientcentrerede metode i egne konsultationer (5).
- c. Anvende konsultationsprocessen i egne konsultationer (3).
- d. Kunne analysere konsultationer med baggrund i konsultationsprocessen (4).
- e. Kunne reflektere over og evaluere konsultationens forløb, herunder egen indsats (6).

Kommunikationsteori og færdigheder

- a. Beskrive de forskellige gensvarstyper (2).
- b. Kunne anvende disse i egne konsultationer (3).
- c. Beskrive grundlæggende kommunikationsredskaber (papegøjemetoden, aktiv lytning, parafrasering, non-verbal) (2).

## B

Temaer	Forskningsspørgsmål	Interviewspørgsmål
<b>Del 1 Introduktion og baggrund</b>		<b>Semistrukereret interview af de studerende på hold hold 12 forår (virtuelt) 11,12,2021 efterår</b>
Kort om formålet med interviewet, og brug af lydoptagelse. Før interviewet.		Tak fordi I vil deltage. I vil blive anonymiseret. I behøver ikke at svare, hvis ikke I har lyst. Er det ok at jeg optager interviewet? Har I nogen spørgsmål før vi begynder?
Generel information		<ul style="list-style-type: none"> <li>• Har I arbejdet med videooptagelse af jer selv som læringsinstrument tidligere</li> <li>• Hvor mange er jer arbejder eller har arbejdet i almen praksis ved siden af studiet?</li> <li>• Har I tidligere arbejdet med optagede konsultationer?</li> </ul>
<b>Del 2 Analyseafsnit</b>		
	<p>Afdække de problemer den studerende ser i brugen af video apparat.</p> <p>Undersøge også tekniske problemer for den studerende om hvor meget det har påvirket deres forberedelse. Og refleksioner over hvorledes det har påvirket deres læring</p> <p>Hvilke fordele og ulemper ser den studerende i brug af en app som evt. kan foregå på eget device.</p> <p>Hvilke etiske overvejelser har de studerende om beskyttelse af lægepatient tavshedspligten.</p> <p>Beder de studerende om at reflektere over hvorledes patienter vil opleve at blive optaget med det andet medie, hvor patienter potentielt kunne frygte at disse optagelser ved et uheld kunne blive mere bredt tilgængeligt på internettet? Vil det gøre noget for relationen mellem den studerende og patienten? Vil det påvirke patienternes velvillighed til at deltage i denne centrale læringsituation for de studerende?</p> <p>Kan videooptagelser dække noget af pensum vurderet fra de studerende – hvad kræver det? Vil det være tilstrækkelig opbakning til at lave optagelser på</p>	<ul style="list-style-type: none"> <li>• Hvordan har det fungeret for jer med optagelse og gennemsyn af video på kameraet?</li> <li>• Hvad synes du har været svært?</li> <li>• Har du kunnet se optagelsen inden holdundervisningen, Hvordan har lyden og billede kvaliteten været?</li> <li>• Har du fået set nogen optagelser inden undervisningen</li> <li>• Har det påvirket din læring og hvordan?</li> <li>• Tænker du at det vil være ok at optagelser af video med patienter skete på eget device, mobil telefon, krypteret og med beskyttelse af personlig data?</li> <li>• Hvordan ville du have det med at optage på dit eget device, med lagring i skyen og sletning af data efter kurset?</li> <li>• Hvordan tror du patienten vil have det med optagelse på mobiltelefon?</li> <li>• Vil en adgang til at se videoer direkte på dit eget device gøre at du bedre kunne forberede dig og vil den bedre lyd og billede optagelse betyde noget for din læring?</li> <li>• Ville en video optagelse med relevant instruktion om brug af dit eget device som optager være tilstrækkelig til, at du ville kunne foretage optagelse, med adgang til support ved problemer? Det vil betyde at</li> </ul>

	eget device med videospots? Så man kunne undgå udlevering tilbageleverings-sessioner af videokameraer/devices og forelæsning om optagelse?	<p>man ikke behøver at komme ind på instituttet for at introduceres mm til optagelse.</p> <ul style="list-style-type: none"> <li>• For at få mere tid til feedback og undervisning i konsultationsanalyse ved holdundervisningen har vi forsøgt med små videosekvenser med E-læring/video optagelser. Hvordan har de små videosekvenser på Absalon fungeret, synes i det vil være et relevant supplement?</li> <li>• Hvordan har learskemaer og adgang til spørgsmål til E-læringen fungeret?</li> </ul>
<b>Del 3</b>		
<b>Del 4</b> <b>Afslutning</b>		
Afrunding af interviewet.		
<b>Del 5</b> <b>Debriefing</b>	(Foregik uden brug af lydoptagelse)	
Efter interviewet.		<ul style="list-style-type: none"> <li>• Hvordan har det været at være med i interviewet?</li> <li>• Er det noget der underer jer?</li> <li>• Tak for hjælpen/deltagelsen.</li> </ul>
<b>INTERVIEW 2</b>		
<b>Del 1</b> <b>Introduktion og baggrund</b>		<b>Interview af undervisere på almen medicin samt elementer/pointer fra temamøde om virtuel undervisning: TS, ML, JS, ASH og AM , efterår 2021</b>
	Kort om formålet med interviewet, blev ikke optaget	
<b>Del 2</b> <b>Analyseafsnit</b>	<p>Hvilke udfordringer er der set fra undervisere ved brug af videokamera?</p> <p>Hvilke fordele og ulemper er der ved at skifte til andet medie?</p> <p>Ser undervisere E-læring som en mulighed i nogle dele af curriculum og kunne det evt give tid til anden undervisning ved holdundervisningen?</p>	<ul style="list-style-type: none"> <li>• Hvilke problemer oplever du med video optaget konsultationer, ved undervisningen, forberedelsen hos de studerende og til eksamen?</li> <li>• Vil en anden "APP-baseret" optagelse være en fordel i forhold hertil?</li> <li>• Vil E-lærings videosekvenser til nogen specifikke undervisnings-elementer være et godt supplement som kan frigøre undervisningstid til holdundervisningen?</li> </ul>

## C

### Lægeforeningens etiske regler om lyd- og billedgengivelser

#### § 15. Lyd- og billedgengivelser. *Kilde: Lægeforeningens etiske regler*

Stk 1 Lyd- og billedgengivelser af identificerbare patienter og personalegrupper må kun finde sted til undervisnings- og forskningsformål og i oplysningsvirksomhed med de pågældendes tilladelse. Lægen er ansvarlig for, at anvendelse sker i overensstemmelse med god lægeskik.

Stk 2 Patienter og ansatte bør have tid til at overveje deres deltagelse, inden tilladelsen gives.

## D

### LEARN-skema, Klinisk Kursus i Almen Medicin

1. Hvad er det vigtigste jeg har lært i dag?
2. Hvad står stadig uklart?
3. Hvad vil jeg gerne blive bedre til?
4. Hvad kommer jeg til at bruge i fremtiden?
5. Hvordan har jeg haft det med undervisningen i dag?

Andre kommentarer

## E

### 5.1. Fagbeskrivelsen

Parenteserne udtrykker placeringen i Blooms taksonomi. Desuden er listen sorteret i kronologisk rækkefølge i forhold til forelæsningserne.

#### 1) Konsultationsprocessen som værktøj

- a. Beskrive konsultationsprocessens elementer og baggrunden for anvendelsen af denne model (2).
- b. Kunne integrere den patientcentrerede metode i egne konsultationer (5).
- c. Anvende konsultationsprocessen i egne konsultationer (3).
- d. Kunne analysere konsultationer med baggrund i konsultationsprocessen (4).
- e. Kunne reflektere over og evaluere konsultationens forløb, herunder egen indsats (6).



## **Forøger videooptaget undervisning de studerendes opfattelse af egen indlæring?**

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### **Introduktion**

Denne opgave tilsigter at undersøge om videooptagelse af undervisning samt tilgængeliggørelse af optagelserne online, bidrager til de studerendes egen opfattelse af bedre indlæring.

Opgaven omhandler studerende på 5. semester på medicin-studiet, der undervises i faget ”immunologi”. Opgaven starter med en rammesætning af de studerendes læringsmæssige situation samt en præsentation af den overordnede pædagogiske intervention jeg har udført og evalueret. Dernæst gennemgås videnskabelige litteratur der er på området, som ligger til grund for min valgte intervention. Herefter følger indsigter fra kvantitative og kvalitative interviews med studerende, som har gjort brug af den optagede undervisning. Slutteligt vil jeg evaluere og konkludere på denne intervention samt diskutere fordele og ulemper ved at optage sin undervisning og gøre den tilgængelig for de studerende online.

### **Rammesætningen af de studerendes opfattede virkelighed**

På 5. semester på medicin-uddannelsen ligger kurset ”Immunologi”. Kurset består af en forelæsningsrække samt SAU undervisning (ca. 20 studerende pr. hold). Sideløbende følger de studerende også kurserne ”Farmakologi” og ”Patofysiologi”, og eksamen er integreret, hvorfor alle 3 del-fag skal bestås. SAU undervisningen løber over 6 uger med 3 timers undervisning

pr. uge (1x1 time i starten af uge og 1x2 timer i slutningen af ugen)<sup>1</sup>. Inden jeg startede som underviser fulgte jeg en anden undervisers forløb, hvilket gav mig mulighed for at tale de studerende omkring deres opfattelse af kurset og semesteret som helhed. Denne opfattelse af har jeg efterfølgende kunne bekræfte på de nu 6 semestre jeg har undervist på kurset:

- De studerende føler sig overordnede meget pressede, da det er et meget indlæringstungt semester, hvor man ikke kan prioritere nogle kurser over andre, idét eksamen er integreret.
- De studerende synes immunologi er meget svært pga. den store kompleksitet samt mængden af viden der skal indlæres på relativt kort tid.
- Denne kompleksitet kombineret med hastigheden hvormed immunologien skal læres bevirker derfor, at mange studerende ikke kommer til undervisningen, og i stedet laver selvstudium.

Det er med udgangspunkt i denne opfattelse af at være meget stressede på dette semester, at min hovedopgave tager sit udgangspunkt. Som så meget anden digitalisering af undervisning, udspringer mine observationer og refleksioner af erfaringerne fra online-undervisning ifm. COVID-19 lockdown. Her foregik al undervisningen online, og jeg kunne derfor nemt optage min undervisning og gøre den tilgængelig for de studerende. Dette tiltag blev modtaget meget positivt. Dog var denne feedback ustruktureret, hvilket til dels også gjaldt den optagede undervisning. Og det er med afsæt i denne rammesætning af de studerende virkelighed, samt deres positive feedback på optaget undervisning, at jeg har valgt at undersøge dette emne. Hvad er det videnskabelige grundlag for at videooptage sin undervisning og gøre den tilgængelig online? Og hjælper dette pædagogiske og didaktiske tiltag til at højne de studerendes egen opfattelse af deres indlæring?

## Videnskabelig baggrund for videooptaget undervisning

Videnskabeligt er der lavet flere undersøgelser af emnet omkring videooptagelse af undervisning. Her peger flere erfaringer på, at studerende har meget gavn af videooptaget undervisning (Boster m.fl., 2007; Rattleff & Holm, 2009; Woolfitt, 2015). Sågar har et randomiseret kontrolleret forsøg fundet, at tilføjelsen af video-materiale til klassisk undervisning i et

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<sup>1</sup> <https://kurser.ku.dk/course/smeb12020u#:~:text=Kurset%20skal%20give%20den%20studerende,%2C%20parasitter%2C%20og%20kr%C3%A6ftceller>

naturvidenskabeligt fag var fordelagtigt. I dette forsøg blev der blandt de studerende observeret en forøget deltagelse, bedre tilfredshed med kurset samt bedre test-resultater (Stockwell m.fl., 2015). I disse undersøgelser giver de studerende til kende, at der er flere parametre, der er fordelagtige, men samtidig påpeges der også nogle ulemper:

- Positivt: Studerende kan se optaget undervisning i sit eget tempo og det antal gange det kræves for at forstå stoffet. Muligheden for at se og gense undervisningen kan give ophav til nye og mere dybdegående refleksioner
- Negativt: Der er ikke mulighed for at kommunikere med en optaget undervisning og samtidig kan man ikke kommunikere med studiekammerater, da man oftest ser undervisningen forskudt i både tid og sted.

Læringsteoretisk ved vi, at interaktionen mellem de studerende i undervisningen samt interaktionen med underviseren højner indlæringen (Rienecker m.fl., 2013). Dette er ud fra et konstruktivistisk verdensbillede, hvor interaktionen hjælper de studerende til selv at konstruere deres viden og indsigter, og når dette sker er der potentiale for læring på et mere komplekst niveau (Woolfitt, 2015). Denne konstruktivistiske tilgang til indlæring observeres bl.a. når studerende skal diskutere faglige problemstillinger med hinanden, hvilket er et centralt element i studenter-aktiverende undervisning. Derfor skal man nøje tilrettelægge hvordan videooptaget undervisning evt. skal tages i brug, således at det ikke bliver på bekostning af disse pædagogiske og didaktiske tilgange. Ifølge denne konstruktivistiske tilgang, vil det derfor ikke være en fordel fx at præ-optage sin undervisning, da det vil fjerne det studenter-aktiverende element.

Inden jeg beskriver den pædagogiske intervention i form af videooptagelser, vil jeg dog lige knytte et par kommentarer til min personlige opfattelse af den generelle hensigt med universitetsundervisning”. Jeg mener, at undervisningen bør handle om, at så mange studerende som muligt lærer så meget om immunforsvaret som muligt. Derfor mener jeg, at hvis jeg har et virkemiddel til rådighed (fx videooptagelse), som virker til at højne de studerendes opfattelse af egen indlæring, så føler jeg mig til en hvis grad forpligtet til at bruge dette virkemiddel. Men virkemidlet skal selvfølgelig kun skal bruges, såfremt det benyttes af de studerende på en hensigtsmæssig måde, og såfremt at det ikke forringer undervisningens kvalitet.

Ovenstående aspekter vedrører de studerendes opfattelse af optaget undervisning. På den anden side er underviseren og dennes tilgang til og overbevisning af videooptagelser. I litteraturen er der beskrevet flere forskellige

kritiske aspekter fra underviserens perspektiv på videooptaget undervisning (Rattleff & Holm, 2009), og nogle af disse aspekter er:

- Optagelserne kan bruges utilsigtet til at evaluere underviserne
- Undervisningen bliver en-dimensionel
- Meget undervisning skal modificeres, så det kan optimeres til det digitale format
- Undervisere kan blive mere nervøse for at sige noget forkert, som herved foreviges

Videooptagelse af undervisning blev også debatteret heftigt for nyligt. Studerende argumenterer for, at den optagede undervisning var det eneste positive ved COVID-19 lockdown<sup>2,3,4</sup>. Specielt det fleksible aspekt af den optagede undervisning bliver nævnt igen og igen, hvilket også er beskrevet i litteraturen (Woolfitt, 2015). Omvendt argumenterer undervisere i debatindlæg for hvorfor de ikke længere vil eller bør optage undervisning<sup>5,6</sup>. Her peges der hovedsageligt på at 1) undervisningen vil blive ensformig, 2) underviserne bliver stressede over at skulle styre teknikken og bliver bange for at sige noget forkert, og 3) der er store tidsmæssige krav til at omlægge sin undervisning, hvilket underviserne ikke har tid til at gøre uden at det tidforbrug lønmæssigt bliver dækket. Lignende aspekter er også gennemgået i litteraturen (Woolfitt, 2015), hvor også de teknologiske udfordringer for underviserne er noget man skal tage højde for.

Videooptagelse af undervisningen er derfor langt fra et afklaret emne, og nok heller ikke et emne, som der findes et entydigt svar på. Der er dog gode eksempler på succesfuld implementering af videooptagelse på 3. semester på medicin-studiet, som har en klar positiv effekt for både undervisere og studerende<sup>7</sup>.

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<sup>2</sup> <https://uniavisen.dk/hvorfor-er-universitetet-stoppet-med-at-optage-undervisningen/>

<sup>3</sup> <https://uniavisen.dk/dtu-har-optaget-forelaesninger-i-10-aar-hvorfor-kan-ku-saa-ikke/>

<sup>4</sup> <https://uniavisen.dk/lad-os-optage-alle-forelaesninger/>

<sup>5</sup> <https://uniavisen.dk/lektor-3-grunde-til-at-det-er-en-daarlig-ide-at-optage-undervisningen/>

<sup>6</sup> <https://uniavisen.dk/kameraerne-kommer-vist-ikke-lige-nu/>

<sup>7</sup> <https://uniavisen.dk/onlineundervisning-storhitter-paa-anatomi/>

## Den pædagogiske intervention – videooptagelse af undervisningen

Min pædagogiske intervention ift. at optage min undervisning tager derfor udgangspunkt i 1) ovenstående litteratur på området, samt 2) den positive feedback jeg har fået fra studerende på tidligere semestre.

Jeg har derfor på det sidste semester optaget al min undervisning. Både de første 3 uger, der foregik fysisk, samt de sidste 3 uger, der foregik online. Umiddelbart efter endt undervisning, er optagelserne blevet lagt på Absalon, hvorved det er tilgængelige primært for mit eget SAU hold. Optagelserne var dog også tilgængelige for andre studerende på semestret, som derfor ligeledes havde mulighed for at se min undervisning. Selve optagelsen af undervisningen er en blanding af 1) voice-over på slide præsentation, 2) picture-in-picture og 3) reel whiteboard undervisning (Woolfitt, 2015) (se også opgavens forside, der er et screenshot af en reel undervisningsgang). Ydermere er der ingen video af studerende, sådan at GDPR regler overholdes.

Det var et bevidst valg, at undervisningen ikke var præ-optaget jf. den tidligere beskrivelse af konstruktivismens betydning for dybdegående indlæring. Derfor var det vigtigt, *ikke* at fjerne det studenter-aktiverende element af undervisningen fra optagelserne, da videoer (specielt præ-optagede) oftest vil resultere i en passiv indlæring. De studerende skulle gerne komme til undervisningen og deltage aktivt i denne, og det blev faciliteret ved bl.a. at stille åbne spørgsmål i løbet af undervisningen. Ydermere blev der benyttet online instant quizzet i undervisningen, der har vist sig at være gavnligt for de studerende (jf. vores universitetspædagogikum forprojekt om ”brugen af online instant quizzet i undervisningen”), og disse fremgår derfor også af optagelserne. Denne interaktive del er i litteraturen også beskrevet som værende fordelagtigt at inkludere i bl.a. video-optagelser (Brame, 2016). Samtidig blev optagelserne gjort tilgængelig umiddelbar efter endt undervisning. På den måde ville jeg kunne undersøge, om optagelserne blev brugt i løbet af kurset, eller om de mest ville blive brugt eksamensforberedende.

## Evaluering af den pædagogiske intervention

Efter endt undervisning har jeg evalueret min pædagogiske intervention igennem kvantitative spørgeskemaer (15 respondenter) samt kvalitative in-

terviews med 6 studerende. I den kvantitative del af analysen blev der undersøgt hvilke parametre af ”optaget undervisning”, der var værdsat af de studerende. Ydermere undersøgte jeg om optagelserne substituerede andre indlæringskanaler. I de kvalitative interviews har jeg forsøgt at afdække, om optagelserne bidrager til at højne de studerendes (opfattelse af egen) indlæring, og i så tilfælde hvorfor. Ydermere havde jeg mulighed for at interviewe to grupper af studerende:

1. Gruppe 1 er studerende, som var med til ”live” undervisning (både fysisk og online)
2. Gruppe 2 er studerende, der har fundet min optagede undervisning og benyttet sig af denne, men som dog ikke har været til ”live” undervisning.

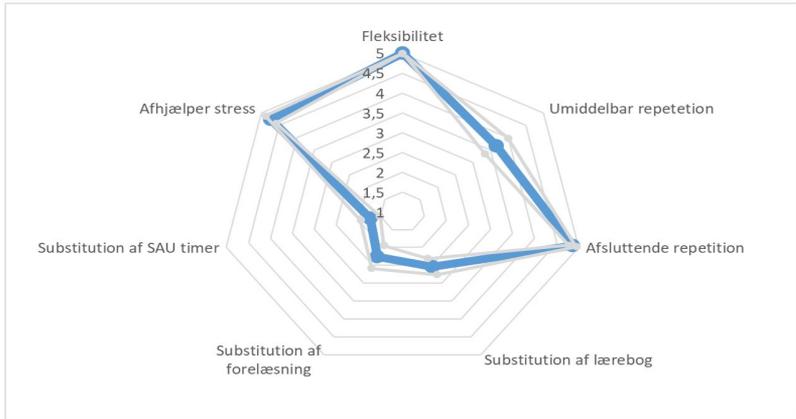
Og hermed kunne jeg undersøge, om der er forskel i opfattelsen af den pædagogiske intervention er afhængig af om man var med til undervisningen ”live” (gruppe 1) eller ej (gruppe 2).

## Indsigter fra kvantitative og kvalitative interviews

I alt responderede 15 studerende på spørgeskemaet omkring optagelse af undervisning, og efterfølgende deltog hhv. 4 og 2 studerende fra gruppe 1 og gruppe 2 i kvalitative interviews. Nedenfor repræsenteres først data fra spørgeskemaet i form af et radar-diagram, og efterfølgende konkluderes der med baggrund i disse data samt udsagn fra de kvalitative interviews (både spørgeskema, samt anonymiserede interview guide med interview transkripter haves af opgavens forfatter, og kan fremsendes ved forespørgsel).

*De studerende er meget tilfredse med, at undervisningen optages:* Til en start, blev de studerende spurgt, på en skala fra 1-5 (1=meget utilfreds, 5=meget tilfreds), om hvorvidt de var tilfredse med, at undervisningen blev optaget og lagt på Absalon efterfølgende. Her svarede alle respondenter ”5”, og jeg konkluderer derfor, at alle var meget tilfredse med den pædagogiske intervention.

Efterfølgende blev de studerende spurgt ind til 7 parametre omkring den optagede undervisning, for nærmere at kunne afdække, hvilke aspekter af den optagede undervisning, de studerende var tilfredse med (bilag 1), hvilket resulterede i data repræsenteret i figur 1.



**Figur 1:** Radar-diagram der viser gennemsnittet af 15 studerendes besvarelser på spørgsmål relateret til de indikerede parameter omkring optagelsen af SAU undervisningen. De grå kurver indikerer standard-afgivelserne på svarene.

Ud fra de kvantitative data samt de kvalitative interviews er jeg kommet frem til følgende indsigter omkring, hvorfor optagelse af undervisningen opfattes meget positivt for de studerende:

**Fleksibilitet:** Hvis man er syg eller skal arbejde, kan man stadig følge godt med. Samtidig kan man gense svært stof i sit eget tempo. Sætte på pause, tage noter, diskutere med læsemakkeren. Alt sammen noget der øver fleksibiliteten og hermed kan de studerende ”skræddersy” undervisningen til deres egen indlæring

**Afsluttende repetition:** Enstemmigt mener de studerende, at optagelserne er virkelig brugbare som ressource til at læse op til eksamen.

**Afhjælper stress:** Det faktum, at de studerende ved, at undervisningen optages gør, at de kan fokusere mere i selve undervisningen. De er ikke ”bange for” at misse noget, da de ved, at de kan gense undervisningen.

**Substitution af anden indlæringskanal:** Ift. om optagelserne af undervisningen vil blive brugt som en substitution af anden indlæringskanal (fx at de studerende ved at bruge optagelserne ikke vil læse i lærebogen, gå til forelæsninger eller udeblive fra SAU undervisningen), så indikerer data fra denne analyse, at dette ikke er tilfældet. Den generelle opfattelse er,

at optagelserne ses som et supplement til og ikke substitution af de andre tilbudte indlæringskanaler.

**Umiddelbar vs. afsluttende repetition:** Her er der ikke konsensus de studerende imellem. Nogle rapporterer, at de bruger optagelserne i løbet af kurset. Specielt til svære emner, som de kan gense umiddelbart efter undervisningen. Andre rapporterer derimod, at de udelukkende bruger optagelserne til eksamensforberedelse. Dette understreger dog vigtigheden af fleksibiliteten ift. at studerende indlærer forskelligt. Optagelserne kan derfor med fordel gøres tilgængelige umiddelbart efter endt undervisning.

*Studerende foretrækker optagelser af den reelle undervisning.* Derudover havde jeg også mulighed for at interviewe studerende, som ikke har fulgt min undervisning "live". Disse studerende har dog set alle videoerne, jeg har lagt op i løbet af kurset. Både disse studerende, samt de studerende der fulgte undervisningen "live", blev spurgt ind til om formatet af den optagede undervisning var den bedste. Ville de have foretrukket en mere skarp præ-optaget undervisning, eller ville de helst have optaget den reelle undervisning. Interessant er det, at der var enighed grupperne imellem om, at optagelsen af den reelle undervisning var klart at foretrække. For studerende, der havde fulgt undervisningen "live" blev der rapporteret, at det var fordelagtigt med det genkendelige aspekt ved, at man kan gense den samme undervisning efterfølgende. Det gjorde det mere nærværende, og det repetitive aspekt blev opfattet positivt. Og overraskende nok, var det samme holdning hos de studerende, som ikke havde været til den reelle undervisning. De foretrak ligeledes optagelser af den reelle undervisning frem for en mere skarp præ-produktion. Der blev understreget, at det gjorde det mere oprigtigt og nærværende.

*Ikke al undervisning har gavn af at blive optaget:* I interviewsne blev der også nævnt, at det ikke er al undervisning, der har gavn af at blive optaget. Såfremt undervisningsforløbet ikke havde været tilfredsstillende for de studerende, ville det være ligegyldigt med optagelser. Ud fra disse interviews kan man derfor konkludere, at den primære faktor er, at selve undervisningen er god og godt tilrettelagt. Hvis dét er tilfældet, er det en klar fordel for de studerende, at undervisningen bliver optaget.

*Optagelserne forøger de studerendes (opfattelse af egen) indlæring:* De studerende rapporterer enstemmigt, at denne pædagogiske intervention har hjulpet på deres opfattelse af deres egen indlæring af immunologi. Jeg vil derfor konkludere, at optagelserne fa SAU undervisningen er en reel fordel for de studerende ift. at højne deres indlæring af immunologi.

## Konklusion

Ud fra ovenstående indsigter fra mine kvantitative og kvalitative analyser mener jeg at der er klare fordele ved at videooptage sin reelle undervisning og gøre den tilgængelig for de studerende umiddelbart efter endt undervisning. De studerende er meget positive over for dette didaktiske redskab. Specielt værdsætter de fleksibiliteten som optagelserne bibringer, samt at optagelserne er en virkelig god ressource ifm. eksamensforberedelse og til dels også til umiddelbar repetition i løbet af kurset. Ifølge mine analyser ser optagelserne ikke ud til at opfattes substituerende af andre indlæringskanaler men derimod som en ekstra indlæringskanal. Det blev dog understreget, at dette tiltag kun hjælper, såfremt at undervisningen i første omgang opfattes til at være af høj kvalitet.

Fra mit synspunkt som underviser, ser jeg det som en relativt lille byrde at skulle optage og uploade undervisningen. Jeg oplever heller ikke den nervøsitet, det efter sigende skulle medføre, at undervisningen bliver optaget. Ydermere rapporterer de studerende, at de gerne vil have optagelser af min reelle undervisning, hvorfor jeg kun i mindre grad har set mig nødsaget til at modificere noget af undervisningen, så den blev optimeret til at kunne blive optaget. og

Slutteligt, rapporterer de studerende enstemmigt, at denne pædagogiske intervention har hjulpet på at højne de studerendes opfattelse af egen indlæring. Dette er for mig den vigtigste parameter, og specielt med denne indsigter vil jeg forsætte med at optage min undervisning.

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