”Teaching-based research” as a triple-win

Student learning, partner benefits and research advancements

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Volume 9, Number 1-2

Frederik Voetmann Christiansen
Lars Ulriksen
Idunn Prestholm

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

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

University of Copenhagen

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Pedagogical Projects 2017

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Preface

Frederik Voetmann Christiansen

Department of Science Education, University of Copenhagen

This is the ninth volume of the Department of Science Education's series of pedagogical projects made in relation to the Higher Education Teaching and Learning programme at the University of Copenhagen.

The series is published both in hard-copy versions and electronically, and can be downloaded from the webpage of the Department of Science Education.

This volume contains the pedagogical projects written by participant in the English and Danish spoken courses given in August 2015 and January 2016.

The projects concern a long range of topics – course design and re-design, the limits of constructive alignment thinking, developing research based teaching and teaching based research, and how to improve formative and summative feedback to students (to name a few). However, these subjects are not discussed in general, but in relation to the specific teaching situations in which the topics are explored. The projects show how individual teachers have managed specific problems in their teaching practice, and their reflections on how their practice can be developed.

The University of Copenhagen is currently implementing a teaching portfolio format to be used by all teaching staff – not only in relation to job appointments, but also in a range of other situations, notably in the personal development reviews. The format encourages teaching staff to reflect continually on the development of their teaching practice. But what does it mean "to reflect on ones teaching"? Well, this antology – and the eight volumes before it – provides many good answers to that question. Does such "reflection" lead to actual improvements of teaching? I will let the readers judge for themselves – but I am personally not in doubt that they do.

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

Part I

Student activation and active learninng

1

”Flipped classroom” – tidsforbrug, barrierer og præferencer

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Introduktion

Læring er en aktiv proces, hvor den studerende selv skal gøre noget for at tilegne sig viden og færdigheder. Dette kan foregå som en del af en tydelig aktiv dialog eller som en tilsyneladende passiv tilbagelænet proces. Ens for disse er dog at de studerendes forudsætninger, erfaringer og drivkraften i den aktuelle læringssituation er afgørende for udbyttet (Ulriksen, 2014, pp. 23-70; Illeris, 2003). Der er dog mindst tre problemer forbundet med den passive tilbagelænede fremgangsmåde - typisk eksemplificeret med traditionelle forelæsninger. 1) Man lærer bedst når man bruger indholdet aktivt og læreren får mulighed for at justere undervisningen efter de studerendes feedback. 2) Aktiv deltagelse betyder en anden form for opmærksomhed og involvering i undervisningen. 3) Opmærksomheden flyttes fra underviseren til de studerende således at læringen i højere grad bliver et fælles ansvar mellem underviser og de studerende (Ulriksen, 2014, pp. 303-341). Forelæsninger er på mange bacheloruddannelser den dominerende undervisningsform og de studerende har vænnet sig til denne undervisningsform som de generelt sætter pris på, men som ofte har et problem med at aktivere de studerende. Hertil kommer at mange studerende på bachelorniveau (som lige er kommet fra gymnasieskolens strukturerede pensumlister) har svært ved at finde fokus indenfor den foreslåede læsning (pensum) til de enkelte undervisningsgange. Dette kan være en medvirkende årsag til at en stor del af de studerende ikke forbereder sig inden undervisningen, men i stedet betragter undervisningen (forelæsningerne) som det sted hvor de bliver præsenteret for de vigtigste elementer i et stort undervisningsmateriale (pensum). Disse omstændigheder kan dermed være en medvirkende årsag til de studerendes passivitet i undervisningen. De studerende har altså i visse tilfælde vænnet sig til forelæsninger og læner sig bogstaveligt tilbage uden at deltage aktivt – en passivitet der udgør et potentielt problem for de studerendes læring og dermed også for underviserne, uddannelsen og erhvervslivet. Hovedperspektivet er dog her på de studerende og deres læring. Denne passivitet kalder på studenteraktiverende tiltag, der ”tvinger” til forberedelse under guidede forhold. Den såkaldte ”flipped classroom” undervisning kunne være en ideel undervisningsform til at gøre noget ved dette problem. Denne undervisning ligger nemlig op til at de studerende ser videoer og besvarer online tests før undervisningen og herefter bruger størstedelen af tiden i undervisningen til aktivt at diskutere med hinanden og underviseren blandt andet med brugen af Shakespeak (eller anden form for klikers) (EDUCAUSE, 2012). Formålet med dette projekt er derfor at undersøge hvordan bachelorstuderende modtager ”flipped classroom” i forhold til traditionelle forelæsninger mht. bl.a. tidsforbrug, præferencer og bariærer, der placere et større ansvar for læring hos de studerende. Herunder desuden om der er forskel afhængig af de studerendes niveau og tidligere erfaringer med denne undervisningstype.

Metode

Dette projekt bygger på undervisningen på ”Menneskets Fysiologi” hvilket er et 2. års bachelorkursus udbudt af Institut for Idræt og Ernæring (Københavns Universitet) på uddannelsesretningen ”Fødevare og Ernæring”. Det var første gang kurset blev udbudt. Kurset var groft sagt inddelt i 6 forskellige undervisningstemaer af én uges varighed (med 8 forskellige undervisere) indenfor fysiologien (Kredsløb, Fordøjelsessystemet, Respiration/Stofskifte/Temperaturregulering, Væskebalance/Nyre-fysiologi, Nervesystemet og Endokrinologi) hvoraf 2 af disse blev undervist efter ”flipped classroom” princippet og de resterende 4 temaer blev undervist som mere traditionelle forelæsninger. Ved egen undervisning som byggede på 2x3 konfrontationstimer blev de studerende inden undervisningen bedt om at se 7 små videoer af en samlet varighed på 1 time samt at besvare 2 quizzer i Absalon. Herunder skulle de orientere sig i lærebogen og bruge lærebogen som opslagsværk til besvarelse af quizzer. Til undervisningen skulle de studerende diskutere og svare på mere dybdegående opgaver, hvorved der ikke var nogen traditionel stofgennemgang. Se vejledningen til de studerende inden undervisningen i appendix A. Følgende dokumentation bliver benyttet til at belyse projektets formål:

- Spørgeskema om forberedelse og total tidsforbrug mm. til hver af de 6 overordnede temaer og opfattelsen af de forskellige undervisningsformer på kurset.
- Absalon quiz-besvarelser relateret til ”flipped-classroom” undervisningen (sammenflettet med ovenstående spørgeskema i dataanalysen).
- Uddrag fra kursusevalueringen/underviserevalueringen samt observationer på kurset og fra dialogen med de studerende.

Statistik

Fordelingen i de enkelte svarkategorier er præsenteret som procent af besvarelserne. Chi-Square-test og 2-sidet uparret t-tests blev brugt til at teste om der var forskel mellem subgrupper af studerende henholdsvis for kategoriske og kontinuerte variable. De kategoriske tidsforbrug-variable fra spørgeskemaet blev desuden omregnet til kontinuerte variable ved at tage midten af svarintervallet (f.eks. 15 min ved svarkategorien ”0-30 min”). Kategorien ”mere end 4 timer” blev scoret som 4 timer. Efterfølgende blev en 2-sidet parret t-test brugt til at teste om der var forskel i tidsforbrug mellem undervisning med ”flipped classroom” og traditionel undervisning. En lineær regressionsmodel blev anvendt til at sammenholde karakter med henholdsvis antallet af Absalon quizzer som den studerende tog og tidsforbrug ved de forskellige undervisningsformer. Signifikansniveauet blev for alle tests sat til $P < 0,05$.

Resultater

Generelt om undervisning

I alt 36 ud af de 61 (59 %) studerende som besøgte Absalon under kurset besvarede spørgeskemaet. Som forberedelse til en klassisk forelæsning vil 40% af de adspurgte studerende ”altid” eller ”for det meste” skimme pensum, mens 28% ”altid” eller ”for det meste” vil gennemlæse pensum grundigt. Størstedelen vil altså ”jævnligt”, ”nogle gange” eller ”aldrig” forberede sig til undervisningen (se tabel 1). Manglende tid pga. andre fag rapporteres som værende ”vigtig” og særdeles vigtig” for 67,6% af de studerende som årsag til ikke at forberede sig mens det er 21,9% som betegner det som en vigtig årsag at det hele alligevel bliver gennemgået til undervisningen. Kun 6% betegner at en ”vigtig” eller ”særdeles vigtig” årsag til ikke at forberede sig er at de ikke får noget ud af at forberede sig. Årsagerne der vurderes ”vigtig” eller ”særdeles vigtig” af mindst 97% af de studerende for at komme til en klassisk undervisning er for at ”få et overblik over stoffet”, ”Få alt relevant stof gennemgået”, ”Få en god eksamen og at ”Lære noget” (se tabel 2).

Tabel 1) Spg 1: Hvor tit gør du følgende når du forbereder dig før en klassisk/normal forelæsning

	Altid	For det meste	Jævnligt	Nogle gange	Aldrig
Skimmer pensum	11,4 %	28,6 %	22,9 %	34,3 %	2,9 %
Gennemlæser grundigt pensum	5,6 %	22,2 %	22,2 %	33,3 %	16,7 %
Diskuterer pensum i læsegruppe	0,0 %	3,0 %	0,0 %	15,2 %	81,8 %

Tabel 2) Spg 2-3: Årsager til at komme til en klassisk forelæsning og årsager til ikke at forberede sig til en sådan

	Absolut ikke vigtigt	Ikke vigtigt	Hverken/ eller	Vigtig	Særdeles vigtig	Ved ikke
Få et overblik over stoffet	0,0 %	0,0 %	0,0 %	34,3 %	65,7 %	0,0 %
Få alt relevant stof gennemgået	0,0 %	0,0 %	0,0 %	17,1 %	82,9 %	0,0 %
Møde mine medstuderende	0,0 %	5,7 %	37,1 %	37,1 %	20,0 %	0,0 %
Få en god eksamen	0,0 %	2,9 %	0,0 %	42,9 %	54,3 %	0,0 %
Lære noget	0,0 %	0,0 %	2,9 %	25,7 %	71,4 %	0,0 %
Manglende tid pga. Andre fag	2,9 %	8,8 %	8,8 %	44,1 %	23,5 %	11,8 %
Kedeligt hvis man har læst	63,6 %	21,2 %	3,0 %	0,0 %	3,0 %	9,1 %
Får ikke noget ud af at forberede sig	57,6 %	12,1 %	9,1 %	3,0 %	3,0 %	15,2 %
Det hele bliver alligevel gennemgået	28,1 %	18,8 %	21,9 %	21,9 %	0,0 %	9,4 %
Manglende forberedelse med andre	45,5 %	15,2 %	18,2 %	0,0 %	3,0 %	18,2 %

Tabel 3) Spg 10-12: Foretrukken undervisningsform og undervisningsform med størst udbytte

	Traditional	Flip classroom	Ingen forskel	P-værdi[1]
Foretrukken undervisningsform (n=36)	55,6 %	27,8 %	16,7 %	
Første gang (n=11)	27,3 %	36,4 %	36,4 %	P=0.041
Prøvet før (n=25)	68,0 %	24,0 %	8,0 %	
Undervisningsform med størst udbytte (n=36)	55,6 %	33,3 %	11,1 %	
Første gang (n=11)	36,4 %	36,4 %	27,3 %	P=0.090
Prøvet før (n=25)	64,0 %	32,0 %	4,0 %	

[1]Chi-Square-test

Tabel 4) Spg 6: Antallet af de foreslåede videoer som blev set inden undervisningen i ”flipped classroom”

Ingen	1	2	3	Alle (4-7)
9,8 %	1,4 %	12,5 %	15,2 %	61.1 %

Tabel 5) Spg 7: Blev de obligatoriske quizzer taget

Nej	Ja, en enkelt gang	Ja, flere gange	Ja, men først efter undervisningen
16.7 %	36.1 %	19,4 %	27,8 %

Forskellige undervisningstyper

Overordnet var den foretrukne undervisningsform (55,6 vs. 27,8%) samt undervisningsformen med størst vurderet udbytte (55,6 vs. 33,3%) de traditionelle forelæsninger i forhold til ”flipped classroom” (se tabel 3). I alt så ca. 60% af de studerende alt det forslåede videomateriale (svarende til ca. 1 time) og ca. 50-60% af de studerende tog quizzerne enten 1 eller flere gange inden undervisningen (se tabel 4 & 5). I alt 88,9% af de studerende følte (i høj eller mindre grad) at videoer inden undervisningen hjalp til at forberede sig mere fokuseret til undervisningen. Tilsvarende følte 61,1% (i høj eller mindre grad) at quizzer inden undervisningen gav en fornemmelse for om man havde forstået hovedpunkterne (se tabel 6). Der var ingen forskel i forberedelse (n=28; P=0,26) eller tid brugt efter undervisningen (n=31; P=0,33) afhængig af undervisningstype, men samlet set var der en tendens til et 20 min højere tidsforbrug ved ”flipped classroom” sammenlignet med traditionel undervisning (n=27; P=0,051) (se tabel 7).

Tabel 6) Spg 8-9 og 12: Hjalp videoer og quiz inden undervisningen til bedre forberedelse og fornemmelse for hovedpunkter

	Ja, i høj grad	Ja, i mindre grad	Nej, kun i meget ringe omfang	Nej, overhovedet ikke	% quiz/video inden undervisningen	P-værdi[1]
Video	47,2 %	41,7 %	5,6 %	0 %	5,6 %[2]	
Første gang (n=11)	54,5 %	27,3 %	9,1 %	0 %	9,1 %	P=0,64
Prøvet før (n=25)	44,0 %	48,0 %	4,0 %	0 %	4,0 %	
Quiz	22,2 %	38,9 %	13,9 %	0 %	25,0 %	
Første gang (n=11)	36,4 %	18,2 %	18,2 %	0 %	27,3 %	P=0,33
Prøvet før (n=25)	16,0 %	48,0 %	12,0 %	0 %	24,0 %	

[1]Chi-Square-test
[2]Til mine 2 undervisningsgange blev der uafhængigt at dette rapporteret (via Shakespeak) at henholdsvis 35 % (første gang)og 25 % (anden gang) hverken havde set videoer eller svaret på quiz inden undervisningen.

Tabel 7: Spg 4-5: Tidsforbrug i forbindelse med ”flipped classroom” og traditionel undervisning

	0-30 min	30-60 min	1-2 timer	2-4 timer	>4 timer	Deltog ikke	P-værdi[1]
Forberedelse							
Flipped Classroom	12,5	18,0	40.3	19,4	5,6	4,2	P=0,26
Traditionel undervisning	16,0	23,6	29,9	18,0	6,3	6,3	
Efterberedelse							
Flipped Classroom	22,9	20,0	21,5	22,9	10,0	2,9	P=0,33
Traditionel undervisning	22,9	24,3	19,3	23,6	7,2	4,3	

Gennemsnittet er taget af de 2 temaer med flipped classroom og 4 temaer uden flipped classroom.
[1]Chi-Square-test
Det samlede tidsforbrug tenderede til at være 20 (95 % KI 0,1;40) min højere ved ”flipped classroom” end traditionel undervisning (2-sidet parret t-test, P=0,051).

Betydningen af tidligere erfaringer

De studerende for hvem ”flipped classroom” var nyt var mere positivt stemt overfor denne undervisningstype end dem som tidligere havde stiftet bekendtskab med ”flipped classroom” (P=0.041) og de tenderede desuden til at mene deres udbytte var større (P=0,09) (se tabel 3). Der var ingen forskel på det samlede tidsforbrug (P=0.84) eller opfattelsen af om videoer og quiz inden undervisningen hjalp til bedre forberedelse og fornemmelse for hovedpunkterne (P$\leq$ 0,33) afhængig af om de tidligere havde stiftet bekendtskab med ”flipped classroom” (se tabel 6).

Betydningen af studerendes niveau

De studerendes gennemsnitskarakterer på uddannelsen betød ikke noget for forskellen i tidsforbrug mellem de to undervisningsformer (P=0,55). På samme var fortrukken undervisningsform og undervisningsformen med størst udbytte ikke afhængig af gennemsnitlig karakter (P$\leq$ 0,50) og karakteren betød ikke noget for hvorvidt videoer og quiz inden undervisningen hjalp til at forberede sig mere fokuseret og give en fornemmelse for om hovedpunkter var forstået (P$\leq$ 0,57). Til gengæld var der en tendens til at studerende med højere gennemsnit på uddannelsen tog flere quizzer. Medianen (IQR) var 5 (3;11) og studerende med gennemsnit på 4, 7 og 10 tog quizzerne henholdsvis 4,4 gange, 9,3 gange og 11,6 gange (P=0,12 [lineær trend]).

Diskussion

Det er tydeligt at de studerende har store forventninger til hvad undervisningen skal føre til selvom de ikke nødvendigvis møder velforberedte op til undervisningen. Selvom de studerende udtrykkeligt bliver opfordret til at forberede sig til ”flipped classroom” forøges den samlede forberedelsestid ikke og der er fortsat en stor gruppe af studerende som ikke forbereder sig. En af årsagerne til den blandede modtagelse af flipped classroom kunne nogle studerende udtrykker det i kursusevalueringen være at ”(. . .) hvis Flip classroom skal bruges i et fag, skal det være gennemgående for hele faget, det skaber et lidt rodet forløb når undervisningsformer blandes som det har været gjort her” og at ”(. . .) det vil hjælpe, hvis der fra starten er en helt klar struktur/gennemgang af Flip classroom princippet, så er det nemmere at følge. Jeg blev selv først klar over, at vi brugte Flip classroom i løbet af uge 2 og 3”. Modtagelsen af flipped classroom var dog uafhængig af om de har stiftet bekendtskab med denne undervisningstype tidligere, så det burde ikke være hele forklaringen. Flipped classroom modtages meget forskelligt blandt de undersøgte studerende. Det er tydeligt at denne undersøgte gruppe af bachelorstuderende er van til og værdsætter forelæsningerne, mens flipped classroom i stor stil kan være med til at bryde denne tryghed. Deres ønske om videoer i undervisningen er tydelig, men bare ikke som forberedelse og slet ikke på bekostning af forelæsninger. Med kommentarer i evalueringen som at der er ”Alt, alt for lidt gennemgang af selve pensum (...) - en stor del af os har brug for at HØRE pensum flere gange”, samt ”Ved benyttelse af Flip classroom, skal de enkelte undervisere stadig forelæse i emnet som en almindelig forelæsning” og ”da jeg er en studerende, som har haft stress og derfor ikke har det store overskud, kunne jeg slet ikke overskue det (...) og blev derfor væk fra undervisningen”. Det er desuden gennemgående hvordan langt størstedelen af de studerende som er positive over brugen af flipped classroom ønsker at bibeholde forelæsningen, omend få giver udtryk for at ”For mig fungerer det super godt, da det giver en god idé om, hvorvidt jeg har forstået det, der er blevet gennemgået, og hvor jeg eventuelt skal læse op og stille spørgsmål”. For at de studerende skal få det ønskede udbytte af ”flipped classroom” undervisning er forberedelsen blandt de studerende særdeles vigtigt. Eftersom et stort antal af de studerende møder uforberedte op og altså ikke har forudsætningerne til at følge med i undervisningen kan det diskuteres hvorvidt man til den enkelte undervisning skal tilgodese den gruppe af studerende som ikke forbereder sig eller man skal undervise som planlagt og optimere undervisningen for de 2/3 af de studerende der har forberedt sig helt eller delvist? Jeg mener man må tilgodese de 2/3 af studerende. Samlet set vurderer jeg at de studerende har forholdt sig mere aktivt til stoffet end i andre typer af undervisning og at læringen dermed er bedre. Da studerende normalt ikke er i stand til at fastholde opmærksomheden i mere end 20-25 min uden et skifte eller brud i undervisningen (Gibbs, 1981) vurderer jeg at læringen for den 1/3 som ikke forberedte sig ikke nødvendigvis ville have været bedre ved en normal forelæsning.

Konklusion

Studerendes præferencer for undervisning er ikke nødvendigvis ensbetydende med den bedst tænkelige læringssituation og det er derfor ikke et mål i sig selv at opfylde de studerendes ønsker for undervisning. Det er muligt at der kunne have været lagt mere fokus på kursets forskellige undervisningstyper, men overordnet vurderer jeg at der er potentiale i denne undervisningstype omend de studerende til tider giver udtryk for det modsatte. Det vigtigste er at få mere reel dialog ind i undervisningsformen og det at forhandle og diskuterer med studerende om det rigtige svar – og det mener jeg lykkedes.

Referencer

EDUCAUSE. (2012). 7 Things you should know about flipped classrooms. EDUCAUSE. EDUCAUSE Learning Initiative. Hentet fra https://net.educause.edu/ir/library/pdf/eli7081.pdf

Gibbs, G. (1981). Twenty terrible reasons for lecturing. *SCED occasional paper*, *8*.

Illeris, K. (2003). Towards a contemporary and comprehensive theory of learning. *International journal of lifelong education*, *22*(4), 396–406.

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

A Forberedelsesanvisninger

Forberedelse til ”Nyrefysiologi og væskebalance”

I skulle nu kende konceptet med ”flipped classroom” - altså at den traditionelle stofgennemgang ligger før undervisningen og at vi i undervisningen vil arbejde med mere komplekse opgaver. Her er ”køreplanen” for jeres forberedelse (videoerne tager i sig selv lidt under 1 time):

1. Start med at se Introvideo som er en power-point med oversigt over væskebalance: https://youtu.be/-nLhUZIVD3I
2. Se derefter video om ændringer i væskebalance og hvordan dette påvirkes af forskellige hormonsystemer (https://youtu.be/bfTd3npBvqw)
3. TAG QUIZZEN - Intro til væskebalance
4. Se disse 5 små videoer om nyrernes overordnede opbygning/anatomi (i denne rækkefølge):
   - Nyrernes overordnede opbygning: https://www.youtube.com/watch?v=7bpTiqe5R6c
   - Nefronets opbygning: https://www.youtube.com/watch?v=k5IF1j7b3fI
   - Glomerulus histologi: https://www.youtube.com/watch?v=EZhYTnRiPaA&list=PLzl4lgX_3RvcgRqo810pAcz9trinh0Irl&index=3
   - Væskeudveksling i glomerulus: https://www.youtube.com/watch?v=VMvD29-Agtg
   - Gennemgang af Nephronets funktion og dermed forståelse af nyrernes funktion: https://www.youtube.com/watch?v=vNvZaGcLzEo
5. Ud fra læringsmålene og det som der er blevet lagt vægt på i videoerne skulle det nu være nemmere/hurtigere at læse/skimme den foreslåede tekst (s. 478-512).
6. TAG QUIZZEN – nyrefysiologi

2

Brug af videoer og online quizzer til histologiøvelser i veterinær anatomi

Esben Østrup

Institut for Klinisk Veterinær- og Husdyrsvidenskab
Københavns Universitet

Introduktion

Kurset "SVEB10387U Veterinær Anatomi og Fysiologi - 2" udbydes på det Sundhedsvidenskabelige Fakultet, Københavns Universitet i blok 4 og undervises på første år af veterinæruddannelsen, hvor det er et obligatorisk kursus. Der er ca. 180 studerende tilmeldt kurset hvert år. Kurset har en kompleks opbygning med flere del-element. Dette udviklingsprojekt fokuserer på øvelsesundervisningen i forbindelse med den specielle histologi. Formålet med denne del af undervisningen er, at de studerende skal forstå den histologiske opbygning af organerne og blive i stand til at identificerer specifikke histologiske strukturer i vævene, ved at arbejde aktivt med udvalgte histologiske præparater fra de enkelte organsystemer. Øvelserne varer 90 minutter og finder sted i de to mikroskopisale, der er tilknyttet veterinær anatomi. Alle 180 studerende bliver undervist samtidigt. Udover underviseren er der 3 studentermedhjælpere. Underviseren kan kommunikere med de studerende, der er fordelt på to sale, via mikrofon. Derudover kan underviseren demonstrere histologiske præparater eller vise PowerPoint, der bliver transmitteret via TV-skærme i de 2 sale. Alle studerende har en kasse med histologiske præparater. Derudover, har de adgang til KU's virtuelle mikroskop (VIRMIK), hvor der er et eksemplar af de enkelte præparater. Der er ikke en decideret øvelsesvejledning til øvelsen, men de studerende har et kompendium, hvor der er en liste med de detaljer, de studerende skal kunne identificere. Traditionelt indledes øvelsesseancen med at underviseren gennemgår detaljerne i de præparater, de studerende skal arbejde med til øvelsen. De studerende følger gennemgangen på TVskærmene. Efter endt gennemgang går de studerende selv i gang med på deres egne præparater. Har de problemer eller spørgsmål, kan de få hjælp fra instruktørerne eller underviseren. Nå de studerende mener, at de har været det hele tilfredsstillende igennem, kan de gå.

Problem

Jeg har tidligere været underviser på disse histologiøvelser, og i den forbindelse er jeg stødt på flere problemer med undervisningsformen. 1) De studerende møder uforberedte op til øvelserne, 2) introduktionen tager uforholdsvis meget af de studerendes tid, hvor de har mulighed for selv at arbejde med præparaterne og få hjælp af underviserne til specifikke problemer, 3) en stor del af de studerende bruger ikke tiden fuldt ud, men forlader øvelserne relativt hurtigt efter den fælles gennemgang i starten af øvelsen. Disse problemer er ikke unikke for min undervisning, men er også blevet observeret af de andre undervisere og af studenterinstruktørerne på kurset. Der er tale om problemer, der er relevante både for undervisere og studerende. Det er et problem for underviseren, at de studerende ikke møder forberedte op til øvelserne, da underviseren ofte føler sig nødsaget til at lave en mere detaljeret introduktion, for at sikre at de studerende alle har samme udgangspunkt. Det er dog i høj grad også et problem for de studerende, der forventer at få en detaljeret gennemgang i begyndelsen af øvelsen, hvorfor de ikke føler, at det er nødvendigt at forberede sig. Derudover er der mange studerende, der går fra øvelserne relativt hurtigt efter den teoretiske introduktion. Det er et problem at de ikke deltager i den del af øvelsen, hvor de selv skal arbejde med præparaterne, da indlæringen så primært bliver passiv og ikke aktiv. Da det er en stor stofmængde, der bliver gennemgået på kort tid i forbindelse med den teoretiske introduktion kan det medfører at de studerende orienterer sig mod en overfladeorienteret læringsstrategi, og derved ikke opnår samme kvalitet i læringen (Ulriksen, 2014).

Baggrunden for problemet

Når man som underviser føler at de studerende ikke møder forberedte op til undervisningen og ikke udnytter tiden til øvelserne optimalt, kan man forledes til at tro, at de studerende ikke føler, at de selv har ansvaret for deres egen læring. I forprojektet på universitetspædagogikum undersøgte vi hvordan førsteårsstuderende på dyrlægestudiet så på ansvarsfordelingen i forhold til de studerendes læring. Her blev det tydeliggjort at de studerende selv mente at de havde fuldt ansvar for deres egen læring, og at underviserens primære ansvar, set fra de studerendes synspunkt, var at levere en velforberedt og engageret undervisning. De studerende gav dog også udtryk for, at det ofte var vanskeligt at gennemskue undervisningsmaterialet, og finde ud af hvilke elementer, der var vigtigst at forberede i forhold til den aktuelle undervisning. Dette fandt de studerende demotiverende og det medførte at studerende ofte ikke fik forberedt sig optimalt. I dette udviklingsprojekt vil jeg undersøge, om man ved at lave nogle enkelte ændringer i histologi-øvelserne, kan øge de studerendes forberedelse, øge den tid de studerende arbejder aktivt med præparaterne til øvelsen, samt at mindske andelen af studerende, der går tidligt fra øvelserne.

Overvejelser om ændringer

Det underliggende problem er tilsyneladende at de studerende mangler motivation, dels til at forberede sig, og dels til at udnytte tiden til øvelserne og arbejde aktivt med præparaterne. Motivation er væsentlig for læring og er en del af drivkraften, der er én af de tre dimensioner i Illeris' læringstrekant (Ulriksen, 2014). Uden motivationen vil de studerende ikke involvere sig og fortsætte sin deltagelse i læringsforløbet. Udover at de studerende mangler motivation, er det også et problem at den teoretiske introduktion fylder en stor del af øvelsestiden, så de studerende får mindre tid til selv aktivt at arbejde med præparaterne. Det er tidligere beskrevet at E-læringsteknikker kan være med til at motivere studerende til at forberede sig hjemmefra (May, 2009). Et af de elementer, der kan benyttes, er videoer, der er en vigtig del af flipped class-room princippet, der med succes er blevet anvendt på KU af professor Jan Halborg Jensen (Gaihede, 2013). Der er flere fordele ved at lave den teoretiske introduktion i form af videoer. Det gør det nemmere for de studerende at finde ud af hvad de skal forberede sig på, det sikre at alle har samme udgangspunkt forud for øvelsen og det gør det muligt for de studerende at gå direkte i gang med øvelsen. Der er dog også enkelte udfordringer og ulemper ved at lave den teoretiske introduktion i form af videoer, der skal være tilgængelige for de studerende forud for øvelserne. Først og fremmest er der tekniske udfordringer i forbindelse med fremstillingen af videoerne. Videoerne, skal være nemme at producere og redigere, for at det skal være muligt for alle underviserne at benytte sig af det. Derudover skal videoerne kunne distribueres blandt de studerende på en måde, hvor alle har mulighed for at få adgang til dem, og den tekniske kvalitet skal være tilfredsstillende, for at de studerende vil benytte sig af dem.

Udover videoer benytter flipped class-room sig også af internetbaserede quizzer, til at motivere de studerende og sikre alignment. I dette kursus vil denne form for quizzer kunne bruges som opsamling sidst på øvelsen, hvilket kunne motivere de studerende til at blive længere tid til øvelserne. I forbindelse med udarbejdelse af elektroniske quizzer, er det vigtigt, for de studerende at de har en god alignment og for at underviserne vil brug dem er det vigtigt at det ikke tager uforholdsmæssigt meget tid at lave dem. Derudover er det vigtigt, at spørgsmålene er på et niveau, hvor størstedelen af de studerende kan svare rigtigt, for at det ikke skal virke demotiverende (Mathiasen, 2015).

Metode

Ændringer i øvelsesundervisningen

Introduktionsvideoer

Undervisningsvideoer kan laves på flere forskellige måder, bland andet som pen-cast eller speak over PowerPoint præsentationer. Professor Jan Halborg Jensen, der har omlagt sin undervisning til flipped class-room undervisning, anbefaler brugen af PowerPoint baserede videoer (Jensen, 2016). For at produktionen af videoerne ikke skulle blive en uoverkommelig opgave, valgte jeg at lave dem med speak over PowerPoint præsentationer. Grundlaget for powerpoint præsentationen var billeder hentet fra VIRMIK. En af fordelene ved at bruge billeder fra VIRMIK, er at det er samme præparater de studerende har adgang til, og de studerende bruger ofte selv VIRMIK i forbindelse med undervisningen. Jeg valgte at lave videoerne på en tablet-computer (Microsoft Surface Pro 3), der gør det muligt at kombinere PowerPoint præsentationer med pen-cast, hvor man kan tegner eller skriver direkte i præsentationen, mens man optager videoen. Derudover er det en ultra-mobil platform, der gør det muligt at lave videoerne hvor som helst. Jeg lavede videoer til tre øvelser, med mellem 2 og 4 videoer per gang. Videoerne havde en varighed på mellem 2 og 20 minutter. Til den første øvelse, lagde jeg videoerne på Absalon, men der var flere af de studerende, der havde problemer med at se dem. Til de to efterfølgende øvelsesgange lagde jeg videoerne på Youtube. Forud for den første øvelsesgang, gjorde jeg de studerende opmærksomme på, at de skulle forberede sig til øvelserne ved at se videoerne, og at der ikke nogen teoretisk gennemgang til selve øvelsen.

Quizzer

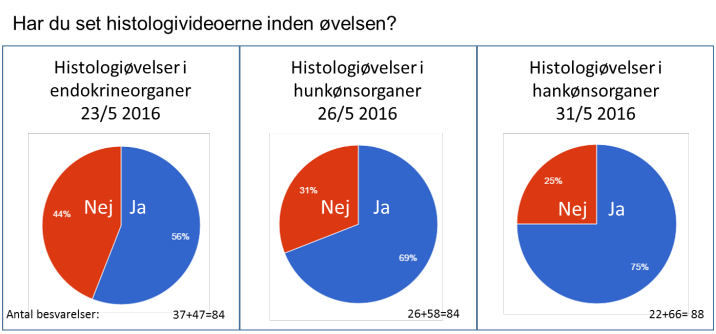
Grundet de fysiske rammer for histologiøvelserne, er det vanskeligt at lave en fælles opsamling på øvelserne, da holdet på de 180 studerende er delt i to lokaler. En måde at lave en fælles opsamling er online quizzer. For at sikre at der var god alignment til eksamenen, baserede jeg quizzerne på gamle eksamensopgaver. Jeg benyttede Shakespeak som platform, og quizzerne blev stillet enten som multiple choice eller sandt falsk. En stor del af eksamensspørgsmålene til anatomi består af billeder af organer eller anatomiske strukturer, der skal navngives. Da Shakespeak er integreret i PowerPoint, er det ikke et problem at basere spørgsmålene på billeder. Der var omkring 15 spørgsmål som afslutning på hver øvelsesseance. Derudover inkluderede jeg 2-3 spørgsmål jeg kunne bruge til at evaluere de ændringer jeg havde foretaget.

Evaluering af ændringerne

Jeg evaluerede de ændringer jeg havde foretaget dels ved at observere de studerende og tale med dem i forbindelse med øvelserne og dels via en Shakespeak baseret evaluering. I slutningen af hver øvelsesgang spurgte jeg de studerende om de havde set videoerne forud for øvelsen og stillede dem enkelte spørgsmål vedrørende den tekniske kvalitet af videoerne og brugen af Shakespeak. Fordelen ved at lave en Shakespeak baseret evaluering i forbindelse med de enkelte undervisningsgange, er at man umiddelbart kan bruge resultatet og foretage ændringer forud for næste undervisningsgang. Derudover tror jeg også at det virker motiverende for de studerende, når de kan se at underviseren er interesseret i at udvikle undervisningen i et direkte samarbejde med dem. Derudover fik de studerende mulighed for frit at komme med skriftlige kommentarer ved afslutningen på den sidste øvelsesgang. Fokus for min evaluering var til dels om de studerende benyttede sig af videoerne til forberedelsen, og dels om den tekniske kvalitet af videoerne var tilfedsstillende

Resultat og diskussion

Hvis det skal give mening at lave videoer til brug for de studerende som forberedelse til øvelserne kræver det at de studerende rent faktisk ser videoerne. Til den første øvelse var det kun lidt over halvdelen, der havde set videoerne forud for øvelsen. Der var flere af de studerende, der til øvelsen gav udtryk for at de havde tekniske problemer med at få adgang til den på Absalon, og der var flere der foreslog at jeg skulle prøve at bruge Youtube til at distribuere videoerne i stedet for Absalon. Videoerne til de to efterfølgende øvelsesgange blev derfor uploadet til Youtube. Der var en stødt stigning i andelen af studerende, der havde set videoerne forud for øvelserne, og til den sidste øvelsesgang havde 75% forberedt sig ved at se videoerne (Figur 2.1). Da der ikke var en fælles introduktion til øvelserne kunne de selv bestemme hvornår de ville gå i gang. Jeg havde forventet, at de studerende ville komme dryppende i løbet af de første 15 minutter, men jeg observerede at der var flere der begyndte 5-10 minutter før øvelserne egentlig skulle begyndte og alle var tilsyneladende i gang til tiden. Derudover kom flere med velforberedte og relevante spørgsmål lige fra starten af øvelsen.



Figur 2.1: Andelen af studerende, der havde set videoerne inden øvelsen.

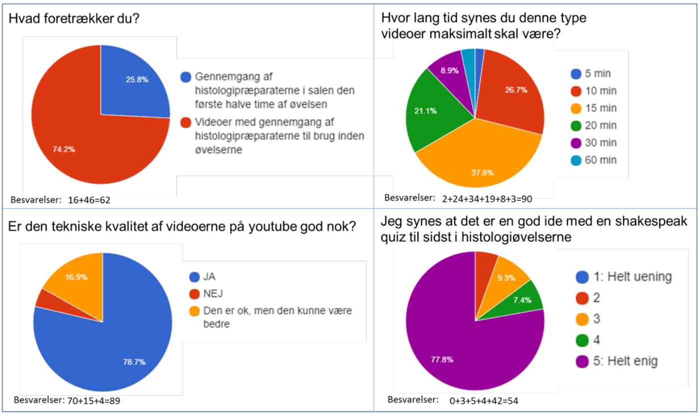
Da der ikke længere var en fælles introduktion til øvelserne krævede det at de studerende aktivt skulle forberede sig. Jeg havde tidligere haft på fornemmelsen at mange af de studerende var meget glade for den traditionelle detaljerede teoretiske gennemgang i starten af øvelserne, men adspurgt om hvad de foretrak, svarede 75% at de fortrak videoerne fremfor den fælles gennemgang (Figur 2.2). De videoer jeg lavede varierede i længde mellem 2 og 20 minutter, men i forbindelse med andre dele af kurset har de studerende haft videoer af op imod 1 times længde. Jeg spurgte derfor om hvor lang tid denne type videoer maksimalt skal være. Cirka 25% sagde at maksimalt skulle være 10 minutter og kun 35% kunne acceptere videoer, der var længere end 15 minutter. Dette stemmer fint overens med hvad der tidligere er blevet sagt om at den optimale videolængde er 7 minutter. Nogle gange kan det dog være nødvendigt at lave længere videoer for ikke at miste sammenhængen, dog skal de nok ikke være længere end 15 minutter, da man i så fald mister de studerende. Det blev foreslået at videoerne blev lagt på Youtube fremfor på Absalon, for at øge tilgængeligheden. Jeg var dog noget bekymret over om billedkvaliteten i videoerne på Youtube ville være tilstrækkelige. Der var dog stor enighed blandt de studerende om at kvaliteten var ok. Youtube har den fordel frem for Absalon, at videoerne er nemt tilgængelige fra alle platforme inklusive telefoner og man kan derfor se dem, når man har tid og lyst.

Udover mangel på forberedelse var histologiøvelserne også præget af at mange af de studerende gik tidligt. Et af målene med dette udviklingsprojekt var at undersøge om man kunne bruge en Shakespeak quiz som en form for opsamling på øvelserne, og om det ville motivere de studerende til at udnytte tiden fuldt ud. Et overvældende flertal af de studerende gav udtryk for at det var en god ide med en afsluttende quiz, og jeg kunne observere at langt størstedelen af de studerende blev den fulde tid. Jeg havde baseret quizzen på gamle eksamensopgaver, hvilket blev positivt modtaget.

De studerende var overvældene positive for de ændringer, der blev foretaget i forbindelse med dette udviklingsprojekt. Studenterinstruktørerne, der deltog i undervisningen som medhjælpere, gav også udtryk for at de studerende mødte mere velforberedte op til øvelserne og virkede mere engagerede end tidligere.

Konklusion

Brugen af korte videoer i stedet for en fælles teoretisk introduktion til øvelserne, giver de studerende ansvaret for, at de har den nødvendige teoretiske viden forud for øvelsen. Det medfører at de studerende aktivt forbereder sig og øger deres engagement. Derudover er man som underviser sikret, at alle får samme information. Brugen af Shakespeak quizzer i slutningen af øvelsen er yderligere en motiverende faktor, der medfører at tiden bli-



Figur 2.2: De studerende holdning til brugen af videoer og quiz.

ver brugt fuldt ud. Det er altså muligt, ved relativt simple ændringer at forbedre de studerendes forberedelse, øge den tid de studerende har mulighed for aktivt at arbejde med præparaterne samt at få de studerende til at blive længere og bruge tiden fuldt ud. Underviserne vil dog opleve at produktionen af videoer og quizzer kræver, at der skal bruges mere tid til forberedelse af øvelserne. Dette er især tilfældet det første år, hvorefter det kun bør være nødvendigt at lave mindre justeringer. Ændringerne er simple at implementere og kræver ikke, at der laves om på de gældende rammer for kurset. Derudover er det ikke nødvendigt at alle underviserne på kurset implementerer de foreslåede ændringer samtidigt. Dog kan det forventes, at de studerende vil efterspørge det i kursusevalueringerne.

Referencer

Gaihede, G. B. (2013). Fremragende undervisning on demand. *Universitetsavisen*. Hentet fra http://universitetsavisen.dk/uddannelse/fremragende-undervisning-demand

Jensen, J. H. (2016). Active Learning: Tools and Tips. *Blog*. Hentet fra http://www.tinyurl.com/janstips

Mathiasen, H. (2015). Digital voting systems and communication in classroom lectures. *Journal of interactive media in education. 1*(1), 1–8.

May, M. (2009). Resumé af E-læringsrapporten.

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

3

Kan en enkelt forelæsning befordre en aktiv og samskabende læringsproces?

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Introduktion

Biomedicin er en af fem specialiseringer, som dyrlægestuderende kan vælge på deres kandidatdel. Biomedicin består af en kombination af flere forskellige fagområder, som for eksempel genetik, forsøgsdyrsvidenskab, farmakologi, toksikologi og patologi. På kursets egen hjemmeside beskrives en Biomedicin-dyrlæge som en, der kan arbejde med forsøgsdyr, eksperimentel patologi, det molekylære og genetiske grundlag for sygdomsudvikling, udvikling af diagnostiske metoder, lægemiddeludvikling og eksperimentel kirurgi. Undervisningen i biomedicin varetages af mange forskellige undervisere, inklusiv mange gæsteforelæsere fra industrien, og er en blanding af forelæsninger og øvelser. Der er ca. 30 studerende på kurset.

Et punkt i kursusbeskrivelsen er, at de studerende skal introduceres til forskellige dyremodeller og deres anvendelse. Kurset inkluderer derfor en forelæsning, som hedder *"grisen som model for infektiøse sygdomme hos mennesker"*. Jeg har tidligere holdt denne forelæsning på helt traditionel vis, dvs. gennemgået en stor mængde fagligt stof over 2 x 45 min ved brug af en power point præsentation med ca. 80 slides. Jeg erfarede efterfølgende, at de studerende ikke kunne huske den information, de fik til forelæsningen, når de senere havde øvelser inden for samme område. Dette er ikke overraskende, da man normalt ikke er i stand til at fastholde opmærksomheden efter 20 min af et foredrag (Gibbs, 1981). Den traditionelle forelæsning, hvor kun læren er i fokus, og en stor mængde stof gennemgås i et højt tempo, understøtter overfladelæring (Marton og Säljö, 1976). Hvis de studerende skal kunne bruge deres viden i kommende fag eller i deres senere virke, skal undervisningen helst understøtte dybdelæring (Marton og Säljö, 1976).

Jeg vil derfor erstatte den tidligere traditionelle forelæsning om grisen som model for infektiøse sygdomme, med en mere studentercentreret forelæsning, der inkluderer studenteraktiverende undervisning. Da der ikke kan afsættes mere tid til undervisningen, medfører denne fornyelse, at den samlede mængde faglige stof, der gennemgås, falder. Dette aspekt vil, sammen med effekten af studenteraktiverende undervisning, blive belyst og diskuteret i denne opgave.

Didaktiske overvejelser

De studerende skal lære om de fordele, der er ved at bruge grisen som forsøgsdyr inden for infektiøse sygdomme. Derudover skal de have kendskab til, hvordan man udvikler en grisemodel, samt eksisterende grisemodeller. Hvis alt dette skal gennemgås til en enkelt forelæsning på 2x45 minutter, er det ikke muligt at indføre diskussioner og studenteraktiverende undervisning. En løsning kunne være at bryde op med ideen om, at hele pensum skal gennemgås for de studerende. Stoftrængsel fører til et højt tempo, som vil tilskynde flere af de studerende til at anlægge en overfladestrategi (Ulriksen, 2014, kap. 5, p. 125). I stedet kan forelæsningen bygges op efter princippet om *"den eksemplariske undervisning"* (Wagenschein, 2012). Herved sikres, at der opnås en dyb forståelse af essentielle key points, og at de studerende har de rigtige redskaber til selv at læse og lære det resterende materiale. Det materiale, der udvælges som essentielt, skal de studerende møde, fordi det er vigtigt i sig selv. Dermed har undervisningen materiale dannelsesmål ifølge Wolfgang Klafki (Klafki, 1983). Undervisningen er en forelæsning med en stærk rammesætning (Bernstein, 2000), hvor jeg udvælger indholdet og bestemmer tempoet. Det er dog vigtigt at give plads til en løbende tilpasning af indhold og tempo, afhængig af de studerendes niveau i den studenteraktiverende undervisning. Den studenteraktiverende undervisning indføres, fordi læring grundlæggende er en aktiv proces (Illeris, 2006). Selvom læring finder sted hos helt passive studerende, vil en inddragelse af aktiviteter i undervisningen øge de studerendes læring, motivation og relation til læren (Ulriksen, 2014, kap. 10). For en mere detaljeret beskrivelse af den studenteraktiverende undervisning, se metodeafsnittet.

De studerende i faget biomedicin er dyrlægestuderende, som er på sidste del af deres kandidatdel. De har lige afsluttet et kursus i håndtering af forsøgsdyr, der giver dem lov til at udføre dyreforsøg. Læring involverer altid det, de studerende ved i forvejen, og derfor må det antages, at de studerende er forberedte til at kunne lære fra forelæsningen om grisen som forsøgsdyr for infektiøse sygdomme. Grisen er over de sidste 10 år blevet et meget anvendt forsøgsdyr, fordi den ligner mennesker på en lang række punkter. Derfor er der stor sandsynlighed for, at de studerende kommer til at arbejde med forsøgsgrise, hvis de bliver *"biomedicin-dyrlæger."*

Formål

Formålet med projektet er at undersøge, om en reduktion i fagligt indhold, samt inddragelse af studenteraktiverende undervisning, kan gøre en forelæsning til en aktiv og samskabende læringsproces der understøtter dybdelæring. Dette gøres ved at:

- Skabe et miljø i undervisningslokalet, der befordrer aktivitet og dialog mellem de studerende og læreren.
- Integrere forskelige værktøjer i form af tavle, power point præsentation og udleverede opgaver for aktivt og visuelt at understøtte de studerendes indlæring.
- Reducere antallet af power point slides med 50 %.
- Indføre studenteraktiverende øvelser i form af summe-grupper, tegning og begrebskort.

Metode

Forelæsning af 2x45 min med overskriften "grisen som model for infektiøse sygdomme hos mennesker." Antal studerende = 27. Stofudvælgelse: Dispositionen for forelæsningen er opbygget som en omvendt pyramide (Appendix A). Forelæsningen starter med at gennemgå en figur, der viser, at brugen af grisen som forsøgs dyr er steget, efterfulgt af en tabel, der lister alle de fordele, der er ved at bruge grise som forsøgsdyr. Med udgangspunkt i teorien om den eksemplariske undervisning (Wagenschein, 2012), gennemgås en enkelt grisemodel for knoglebetændelse hos børn. Tidligere blev der gennemgået grisemodeller for 6 forskellige sygdomme. Der vises en video med en dreng, der har knoglebetændelse. Herefter spørger jeg: *"hvordan kan man lave en grisemodel, der afspejler det, vi ser hos* *drengen, og hvad skal man vide noget om for at udvikle en sådanne model?"* Via en diskussion er de studerende med til at nå til den konklusion, at man skal vide noget om sygdommens opståen og tidligere dyremodeller for sygdommen. Her er det vigtigt, at de studerende får en opfattelse af, at disse parametre altid er vigtige, når man skal udvikle en dyremodel. Næste trin er, at en allerede udviklet grisemodel for knoglebetændelse gennemgås meget detaljeret. De studerende skal forstå, at overvejelser omkring den anvendte bakteriestamme, forsøgets tid, dyrevelfærd, smertebehandling af dyr mm. altid vil være relevante, når man arbejder med dyremodeller for infektiøse sygdomme. Til øvelserne efter forelæsningen skal de studerende se på vævssnit fra grisemodellen med knoglebetændelse.

Virkemidler: For at understøtte de studerenes muligheder for at lære det, jeg gerne vil have de skal lære, anvendes forskellige virkemidler (**jen9**). Jeg er opmærksom på, at et af virkemidlerne er mig selv som underviser. Jeg gør meget ud af at bevæge mig rundt i undervisningslokalet, mens jeg taler. Det kan for eksempel være, mens jeg deler opgaver ud. Jeg varierer min stemmeføring for at understrege vigtige budskaber, og undgår at læse op fra power point præsentationen. Power point præsentation består af 35 slides og suppleres med tavlen, hvorpå sygdomsmekanismer tegnes og studerendes svar noteres. Jeg er meget opmærksom på, at der skal være mange brud i forelæsningen, så jeg hele tiden kan fastholde de studerendes fokus. Disse brud skabes primært af den studenteraktiverende undervisning. Studenteraktiverende undervisning:

- Summe-grupper. Til hver af de to første slides om hhv. antal forsøgsdyr i Danmark og grisens fordele som forsøgsdyr, får de studerende summe-tid to og to til at diskutere forskellige aspekter. Fx hvorfor er brugen af forsøgsdyr generelt faldet? Hvorfor er mus det hyppigst anvendte forsøgsdyr? Hvorfor er brugen af hunde faldet? Hvorfor er brugen af grisen steget? Hvad er de vigtigste fordele ved grisen som forsøgsdyr? Samlet set bruges der to slides frem for tidligere, hvor introduktionen fyldte 10 slides.

- Begrebskort og tegning. For at forstå sygdommen knoglebetændelse skal de studerende færdiggøre et udleveret mindmap over sygdommens udvikling. De skal med andre ord forbinde 20 begreber i den rigtige rækkefølge (Appendix B). De får 15 min til denne opgave. Herefter tegner jeg sygdommens udvikling på tavlen, mens vi diskuterer deres versioner. Mens jeg tegner, har de studerende fået udleveret en skabelon, de selv kan tegne med på. Efter forelæsningen udleverer jeg et korrekt mindmap (Appendix B).

Evaluering af undervisningen:

Ved forelæsningens afslutning blev de studerende bedt om at svare på 6 spørgsmål angående deres aktivitet under forelæsningen (Appendix C). Fire uger efter forelæsningen blev 10 af de studerende bedt om at svare på yderligere 3 spørgsmål angående, hvad de kunne huske fra forelæsningen, og om de foretrækker en stor mængde fagligt stof eller en mindre mængde stof, der arbejdes aktivt med (Appendix D).

3.1 Resultater

Lige efter forelæsningen

Stort set alle 27 studerende er enige om, at antallet af power point slides var passende. En enkelt studerende syntes, at antallet var for lille. Ud af 24 studerende, som svarer, at de deltager aktivt i undervisningen, rækker kun 50% hånden op i løbet af forelæsningen. Derfor har den studenteraktiverende undervisning bidraget til, at de studerende kan have en opfattelse af, at de har været aktive, selvom de ikke har rakt hånden op. Inkluderet i de 24 aktive studerende er en gruppe på 10 studerende, som svarer, at de er mere aktive, end de plejer at være til en forelæsning. Disse studerende har altså haft væsentlig gavn af, at der er blevet brugt studenteraktiverende undervisning. Af de 10 studerende, som deltog mere aktivt, end de plejer, rækker de 7 ikke hånden op i løbet af forelæsningen. Det tyder derfor på, at det primært er den studenteraktiverende undervisning i form af opgaver frem for klassediskussion, der har aktiveret dem. Ud af alle 27 besvarelser er der på 4 besvarelser skrevet en ekstra kommentar fra den studerende. Alle disse kommentarer er fra studerende, som har svaret, at de har deltaget mere aktivt, end de plejer. I alle kommentarerne påpeges det, at det var godt med interaktiv undervisning. Fire studerende, som rakte hånden op 3 gange i løbet af forelæsningen, svarer, at de ikke deltog mere i undervisningen, end de plejer.

Fire uger efter forelæsningen

Alle 10 studerende svarer, at de godt kan huske forelæsningen om brugen af grisen som model for infektiøse sygdomme. De studerendes svar angående, hvad de husker bedst fra forelæsningen, kan inddeles i tre grupper. Den første gruppe handler om indholdet af forelæsningen. I alt 6 studerende gengiver specifikt fagligt indhold fra forelæsningen. Det er især det faglige indhold, som blev gennemgået via den studenteraktiverende undervisning, der nævnes. I den anden gruppe er det selve aktiviteterne, der er i fokus. Herunder svarer 3 studerende, at de kan huske, der var mange aktiviteter, bl.a. tavle og begrebskort, men de nævner ikke specifikt fagligt indhold. Den sidste studerende svarer, at vedkommende husker forelæsningen som meget langtrukken. Af de studerende, som gengiver specifikt fagligt indhold, påpeger over halvdelen, at de husker den specifikke grisemodel for knoglebetændelse, men også generelle aspekter om at bruge grisen som forsøgsdyr i forbindelse med infektiøse sygdomme. Herudfra kan det antages, at den eksemplariske undervisning har givet mening.

En konsekvens af den eksemplariske undervisning og studenteraktiverende undervisning er, at mængden af fagligt stof der kan nå at blive gennemgået, falder. Ud af de 10 adspurgte studerende svarer 6, at de hellere vil arbejde intenst med en mindre mængde fagligt stof end gennemgå en større mængde overfladisk. Citat fra en studerende: *"Jeg foretrækker en enkelt model, som man arbejder i dybden med. Jeg husker meget bedre modellen for knoglebetændelse, sammenlignet med de 10 andre, der blev gennemgået for autoimmune sygdomme. Det blev meget rodet."* Af de resterende 4 studerende svarer 2, at de hellere vil have gennemgået en stor mængde stof, og 2 studerende svarer, at det afhænger af, hvad der forventes, de skal kunne til eksamen.

Refleksioner

Set i forhold til den didaktiske trekant (Hopmann, 1997) har den nye forelæsning fået et element af både metodik og kateketik. Det indhold, som de studerende udsættes for, bliver de tvunget til at gøre noget med (metodik) under forelæsningen, via den studenteraktiverende undervisning. Ved at være meget tilstede under de studenteraktiverende opgaver (jeg gik rundt mellem de studerende og snakkede med dem), kunne jeg vurdere de studerendes niveau, og dermed tilrette undervisningens fokusområder herefter. Det faktum, at der var god tid til at forklare det faglige indhold, samt tid til at stille mange spørgsmål og skrive de studerendes svar op, skabte en positiv relation til de studerende (kateketik). Dette resulterede i et godt læringsmiljø, hvor mange forskellige studerende bød ind i undervisningen. En studerende skriver i sine besvarelser: *"godt at hele holdet er med, det giver en god stemning."*

Summe-grupper er et godt redskab til at holde de studerende aktive og undgå, at de taber motivationen. Fra min forelæsning var det tydeligt, at summe-tid kan give de studerende en fornemmelse af at være aktive, uden at de nødvendigvis behøver at række hånden op. I den fælles opsamling efter de studerende havde fået summe-tid bed jeg mærke i, at dem, som svarede på mine spørgsmål, ofte startede deres sætning med *"Vi mener, eller vi snakkede om."* På den måde kan de studerende støtte sig til hinanden, og flere tør række hånden op. Ved brug af summe-tid kan alle de studerende i et undervisningslokale få følelsen af, at de sammen bidrager til forelæsningens indhold og udvikling. Kombinationen af at arbejde med begrebskort og tegning på tavlen for at få de studerende til at arbejde aktivt med forståelsen af en specifik sygdomsudvikling fungerede godt. I fremtidige forelæsninger kunne man prioritere at tegne hele begrebskortet på tavlen (uden at udlevere det første halvfærdige), og så give de studerende muligheden for selv at komme frem til alle begreberne.

Det er min generelle opfattelse, at eksamen er en væsentlig drivkraft for, hvordan de studerende lærer fagligt stof. Tidligere har dyrlægestuderende udtalt, at de gerne vil have mange power point slides med meget tekst, så de er nemme at læse til eksamen efter. Denne form for eksamensstyring (Case og Gunstone, 2003) understøtter overfladelæring og er en af grundene til, at de studerende ofte har svært ved at overføre deres viden fra fag til fag. På spørgsmålet om, hvorvidt de studerende foretrækker en stor eller lille mængde fagligt stof, som hhv. gennemgås overfladisk eller i dybden, svarer to studerende at det afhænger af, hvad de skal kunne til eksamen. De tager altså slet ikke stillign til deres læring. På dyrlægeuddannelsen er der tradition for, at alt lærebogsmateriale gennemgås slavisk. I mange af fagene er der en logisk struktur, som man er nødt til at følge. For eksempel giver det kun mening at gennemgå akut inflammation før kronisk inflammation. Jeg mener dog, at man grundet den meget begrænsede undervisningstid er nød til at vælge ud i det materiale, der skal gennemgås. Jeg mener, at den eksemplariske undervisning kan anvendes i langt højre grad, end det er tilfældet i dag. Det er dog vigtigt, at de studerende lærer begrebet og får forståelse for at trække elementer fra de gennemgåede eksempler ned over andre relevante områder.

Som underviser var det tilfredsstillende at have god tid til at levere undervisningen. Tidligere hvor forelæsningen indeholdt dobbelt så mange power point slides, blev tempoet alt for højt og forelæsningen fik karakter af en opremsning. Skal man prøve at besvare opgavens titel *”Kan en enkelt forelæsning befordre en aktiv og samskabende læringsproces, der understøtter dybdelæring?”* er svaret; generelt ja, og jeg tror, det var tilfældet for nogle af de studerende til forelæsningen. Det er dog også klart, at det er svært for de studerende pludselig at ændre læringsstrategi til en enkelt forelæsning. Derfor er det vigtigt, at der i flere fag arbejdes med at udbyde en undervisning, der kan omvende de studerende til at anvende en læringsstrategi, der understøtter dybdelæring.

Referencer

Bernstein, B. (2000). *Pedagogy, symbolic control and identity. Theory, research, critique*. Rowman og Littlefield Publishers Inc.

Case, J. & Gunstone, R. (2003). Going deeper than deep and surface approaches: A study of students perceptions of time. *Teaching in higher education*, *8*(1), 55–69.

Gibbs, G. (1981). Twenty terrible reasons for lecturing. *SCED occasional paper*, *8*.

Hopmann, S. (1997). Wolfgang Klafki och den tyska didaktiken. I M. Uljens (Red.), *Didaktik – teori, refleksion och praktik* (s. 198–214). Student-litteratur.

Illeris, K. (2006). *Læring* (2. udg.). Roskilde Universitetsforlag.

Klafki, W. (1983). *Kategorial dannelse og kritisk-konstruktiv pædagogik*. Nyt Nordisk Forlag Arnold Busk.

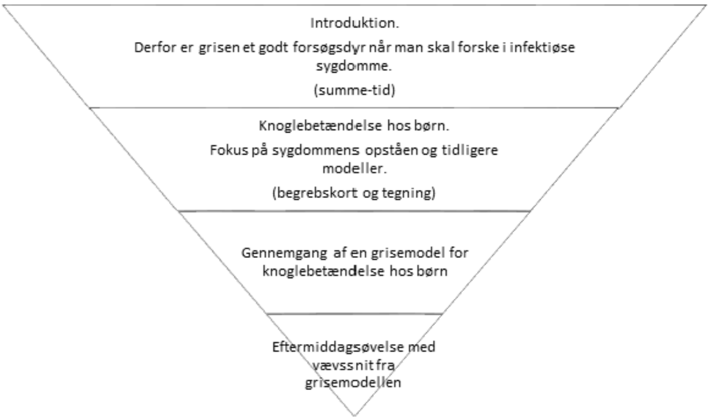
Marton, F. & Säljö, R. (1976). On Qualitative Differences in Learning: I - Outcome and Process. *British Journal of Educational Psychology*, *46*(1), 4–11.

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

Wagenschein, M. (2012). Om begrebet eksemplarisk undervisning. *MONA*, *4*, 42–66.

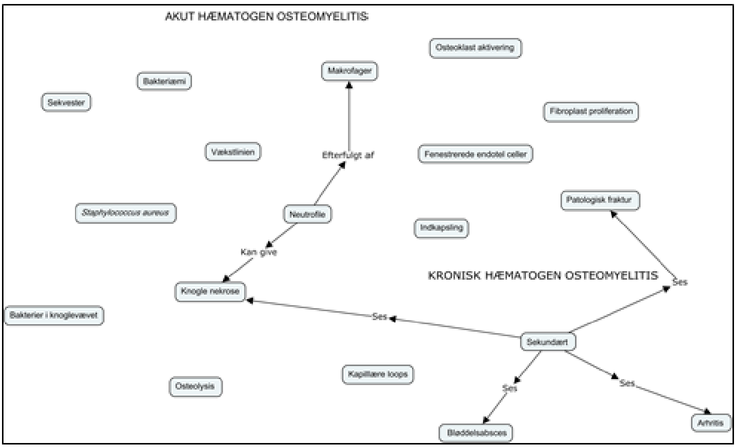
A

Oversigt over forelæsningens opbygning:

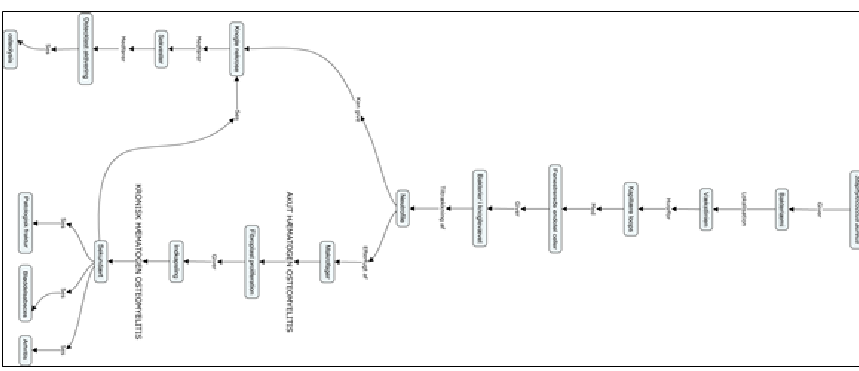


B

De studerende får tid til at prøve at forbinde begreberne i den rigtige rækkefølge.



Til sidst i forelæsningen udleveres et organiseret færdigt begrebskort.



C

Spørgsmål til alle studerende umiddelbart efter forelæsningen:

Var antallet af power point slides passende?
Deltog du aktivt i undervisningen?
Deltog du mere aktivt i undervisningen, end du plejer?

Rakte du hånden op 1 gang?
Rakte du hånden op 2 gange?
Rakte du hånden op 3 gange?

D

Spørgsmål til 10 studerende 4 uger efter forelæsningen:

Kan du huske forelæsningen om grisen som model for infektiøse sygdomme?
Hvad husker du bedst fra forelæsningen?
Hvad vil du foretrække?

> At en forelæsning gennemgår en stor mængde fagligt stof (fx 4 forskellige dyremodeller)?
> At en forelæsning gennemgår en mindre mængde fagligt stof (fx 1 dyremodel), der så arbejdes aktivt og detaljeret med?

4

Forsøg på at sikre 'Intended Learning' med simple ændringer i undervisningen på et fagintegreret kursus

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Baggrund

Den sundhedsvidenskabelige kandidatuddannelse Cand.Scient.San på SUND er målrettet professionsbachelorer (sygepleje, ergoterapi, fysioterapi), der har arbejdet med deres fag i nogle år. Fælles for dem er, at de nu er i gang med en uddannelse, der skal kvalificere dem til at indgå i tværfaglige – og tværvidenskabelige forskningsprojekter.

Kurset jeg underviser på, Integreret kursus i hjerte-og lunge, ligger på 2. semester og udover sygdomslære berører kurset fysiologiske, sociologiske, psykologiske og samfundsmæssige aspekter af emnet. Der er således en forholdsvis stor underviserstab om dette kursus, hvor min undervisning omhandler astma og allergi med fokus på det fysiologiske, patofysiologiske, diagnostiske og behandlingsmæssige aspekt og spænder over 2x45 min. holdundervisning med en uge i mellem.

Mine tidligere erfaringer med denne uddannelse og sammensætning af studerende baserer sig på en enkelt oplevelse sidste år, hvor undervisningen lå som to sammenhænge lektioner á 45 min samme dag.

Mulige problemer

Jeg fik af kursusledelsen udleveret kursusbeskrivelsen og studiemål inddelt i tre afsnit - *viden, færdigheder og kompetencer*. Det var ikke muligt ud fra kursusbeskrivelsen at vurdere i hvilken detaljeringsgrad indholdet skulle formidles og der var således en stor spændvidde, hvorimellem både de studerende og jeg som underviser kan navigere i. Min prioritering er at min undervisning kommer først, dernæst sat i sammenhæng med kurset og endeligt i sammenhæng med uddannelsen. Min forberedelse og de studerendes udbytte af de to lektioner er det første min opmærksomhed er rettet mod og dernæst, at de studerende kan sætte det i relation og i sammenhæng med andre dele af dette integrerede kursus og endeligt til deres kandidatuddannelse.

Som jeg ser opbygningen af denne uddannelse er det fra kursusledelsen bestemt, at den skal give de studerende *kompetencerne* til at *"analysere anvendeligheden af et studiedesign i forhold til et forskningsspørgsmål og redegøre for valg af ideelt studiedesign til løsning af et problem"* (fra kursusbeskrivelsen). For at opnå dette skal de studerende opnå viden og færdigheder inden for hvert enkelt sygdomsområde og dermed gøre dem lige egnede til at indgå på arbejdsmarked (=tværfagligt forskningsprojekter) inden for et givent sygdomsområde.

Jeg skal som underviser gennemgå både det faglige indhold omhandlende astma og allergi og samtidig arbejde for at give de studerende beskrevne kompetencer med afsæt i mit emne.

1) Det første problem, som dette rejser er *stoftrængsel*, som er et problem for de studerende, da det kan være forbundet med en vis risiko for overfladelæring grundet mængden af nyt stof ift. den tid, der er til rådighed.

Som led i min forberedelse til undervisningen sidste år benyttede jeg mig af den didaktiske relationsmodel med fokus på bl.a. rammesætning, indhold, arbejdsformer og målgruppe (de studerendes forudsætninger).

Da jeg overordnet så på relationsmodellen, så jeg at der ikke var en optimal (constructive) alignment mellem de enkelte elementer forstået på den måde, at studiemålene er vagt definerede og meget brede ift. den tid, der er til rådighed. *Viden og færdigheder* i studiemålene er relateret til de organspecifikke emner, mens *kompetencer* er relateret til uddannelsen som helhed og til de forventninger, de studerende kan møde, når de engang skal indgå i tværfaglige forskningsprojekter. Dette pålægger underviseren en svær (undervisnings)opgave.

Dernæst var formen ikke den optimale, idet den mest af alt havde karakter som en forelæsning, som beskrevet i lærebogen (Ulriksen, 2014), selvom det kun var for ca. 30 studerende. Endeligt er der evalueringsformen (eksamen) der på dette fagintegreret kursus er en mundtlig eksamen i et af de mange sygdomsområder, som de studerende er blevet undervist i løbet af kurset.

2) Ovenstående kan samlet set også medføre at de studerende anlægger en overfladestrategi gennem kurset, og på denne måde kan tilegne sig lidt viden om det meste stof, da de netop kan blive testet i alt, der er blevet gennemgået. Dette vil være et problem for de studerende, da de ikke vil bevæge sig meget mere end til de første trin på en læringstaksonomi (Blooms eller SOLO). Det vil også være et problem for de samarbejdspartnere, som de studerende skal være i et tværfagligt team med efter endt uddannelse.

Det tredje problem jeg oplevede sidste år var, at den aktive deltagelse fra de studerende var noget mindre end hvad jeg ellers er vant til i min undervisning fra andre sammenhænge. Velvidende at nogle studerende kan være aktivt lærende, selvom de sidder passivt, fandt jeg det alligevel påfaldende, at det var så svært at få dem aktiveret. Jeg overvejede derfor hvilke dele af en undervisningssituation, der kunne forklare denne situation; studerendes forudsætninger, manglende opmærksomhed eller tydelighed af læringsmål for det pågældende emne, rammer for undervisningen eller undervisningsformen.

3) Der er ifølge lærebogen mindst tre gode grunde til at inddrage de studerende aktivt; med hensyn til læringen, motivationen og forholdet mellem underviseren og de studerende. Særligt de to første anser jeg som vigtige i denne sammenhæng, da jeg kun møder dette hold en enkelt gang i løbet af deres uddannelse. Hvad angår læringen, kan manglende aktiv inddragelse vanskeliggøre min mulighed for at sikre at de studerende opnår flere niveauer på en læringstaksonomi ved at variere undervisningen.

Alt i alt kan ovenstående siges at være problematiseret ved at der er tale om en heterogen gruppe (med forskellig uddannelsesmæssig baggrund), som nu er på en uddannelse, der skal give dem kompetencer til at indgå i tværfaglige forskningsprojekter inden for et givent sundhedsområde. Der er for det kursus jeg er en del af ikke optimal alignment mellem studiemål, indhold og evaluering og det kan være udfordrende at sikre at de studerende opnår en dybdelæring af det indhold, de præsenteres for i de to lektioner, da der er ikke er en udpræget aktiv deltagelse fra de studerende.

Mulige løsninger

Jeg vil i det følgende beskrive de ændringer, jeg havde planlagt mhp. at løse de problemer beskrevet ovenfor. Eftersom problemernes rod kan forklares i forskellige hjørner af pædagogisk undervisningsteori, men er relateret til hinanden vil løsningerne således også kunne appliceres til flere problemer på samme tid. Jeg vil for hver enkelt løsning beskrive dets gennemførelse, hvordan det fungerede, hvorfor det gik som det gik og hvad der er værd at tage med til det videre forløb.

Clickers

Dette værktøj brugte jeg af flere grunde; **1)** for at undersøge de studerendes faglige udgangspunkt, **2)** som et element for at variere undervisningen og dermed inddrage de studerende, **3)** undersøge om de studerende kunne demonstrere flere niveauer/trin på taksonomien ved at variere typen af de stillede opgaver og spørgsmål og på baggrund af dette justere i min undervisning og som **4)** monitorering af om der var nogle centrale pointer i undervisningen, som de studerende ikke havde fanget.

Jeg kunne inddrage dem allerede inden afholdelsen af undervisningen, da jeg kommunikerede med de studerende per mail, hvor jeg præsenterede mig selv og hvor jeg bad dem om at have enten laptop, tablet eller mobiltelefon med internetadgang, da dette vil blive brugt i undervisningen. Min overvejelse ved at gøre dette gik ud på at 1) skabe en relation til de studerende, som jeg ikke kendte i forvejen, 2) inddrage dem i undervisningen, 3) udvise mit engagement omkring min undervisning.

På selve undervisningsdagen startede jeg med en kort præsentation, at sætte rammerne for de to undervisningsgange, herunder at dialog under hele forløbet var meget velkomment, formål med undervisningen og hvad vi gerne skulle kunne nå. Inden jeg begyndte på selve indhold, startede vi første session med at anvende clickers, således både de studerende og jeg selv kunne få en fornemmelse af deres faglige udgangspunkt.

Når jeg efterrationaliserer må jeg erkende, at jeg ikke var helt tydelig omkring hvad formålet med at anvende clickers var – nemlig at jeg blandt andet også skulle bruge det til at se hvor meget de havde rykket sig ved at gentage samme spørgsmål og opgaver i næste uge. De første 15-20 min i en undervisningssituation er særligt vigtige, da de studerendes koncentration ikke holder til mere ved samme form for undervisning.

Af de forskellige parametre jeg har opstillet, som jeg gerne ville bruge clickers til i starten, blev det nok mest brugt til at jeg selv kunne fornemme hvor meget de kunne og jeg gik derefter lidt raskt i gang med undervisningen for ikke at spilde for meget tid. Dette kunne jeg, blandt andet gennem evaluering med mine to observerende vejledere, se efterlod lidt forvirring blandt de studerende. Men det gav mig også en fornemmelse af hvilke dele af indholdet, de studerende havde en vis kendskab til og på baggrund af dette hvor jeg skulle læggge særligt vægt på indholdet.

Da vi mødtes ugen efter gentog jeg samme spørgsmål og opgaver og min forhåbning var at mange flere kunne besvare (rigtigt), da bare det at give et svar kan tolkes som et udtryk for at den studerende føler sig klædt på til at løse opgaverne modsat ugen før, hvor der slet ikke blev svaret.

Jeg lod de studerende arbejde med clickers og vi gennemgik i fælles de enkelte spørgsmål og opgaver ved at sammenligne resultatet med ugen før. Og det gik som forventet – flere studerende havde svaret og flere havde korrekte besvarelser. Dette kunne jeg fornemme var en tilfredsstillelse for de studerende vurderet på baggrund af den livlige aktivitet og summen med positive tilkendegivelser. Samtidig viste det sig også som et godt redskab til at opdage om der var nogle centrale pointer i indholdet, som ikke var på plads. Fx opdagede jeg at 28% havde løst opgaven vedr. behandlingsprincipperne for astma korrekt, hvor det var 32% ugen for (hvor de endnu ikke havde haft undervisningen). Dette gav anledning til at gennemgå det igen mhp. større forståelse hos de studerende.

Da jeg efterfølgende reflekterede over dette, kunne jeg – for at inddrage de studerende yderligere – bede de studerende, der havde løst opgaven korrekt at forklare og redegøre for deres svar, men valgte at gøre det selv. Højst sandsynligt pga. vane og tidspres.

Det var tydeligt, at de studerende meget bedre kunne se formålet med clickers ved den sidste undervisningssession, hvor det også gav mening for dem at bruge, da det på den ene side var en evaluering af hvad de havde tilegnet sig af viden og færdigheder, men også en måde at fange evt. ”huller” i vigtigt indhold.

Overvejelser til fremadrettet brug af clickers

Det er vigtigt at have påtænkt og reflekteret over hvad resultatet af clickers skal bruges til. Dette mhp. at kunne forklare og indvie de studerende i formålet med at bruge dem de steder, det giver mening af indvie dem. Tilføjer det en dimension til undervisningen, som ikke kan fås på anden vis? Er det mest af alt ”underholdning” og demonstration af hvad man kan bruge teknologien til? Hvordan kan det siges at de studerende har rykket sig signifikant – hvornår er det svar tilfredsstillende for de studerende? For underviseren?

Man skal også være meget opmærksom på sine formuleringer. En af opgaverne var formuleret således, ”*Angiv mindst 3* risikofaktorer for astma”, hvor formuleringen, ”*Angiv flest mulige* riskofaktorer for astma” ville have været mere hensigtsmæssigt ift. mit formål – teste de studerende ny viden omkring risikofaktorer for astma. Det er vigtigt at være opmærksom på hvordan man vil håndtere situationen, hvis de studerende finder det vanskeligt at bruge clickers (logge på, bruge interfacen, mm.) og ikke mindst hvis teknikken ikke fungerer. For hvis clickers eksempelvis anvendes for at være tidsøkonomisk giver det ikke så meget mening at det tager uproportionelt meget tid ift. hvad det bidrager med.

Cases og Problembaseret Læring (PBL).

Cases

Jeg valgte at anvende cases i min undervisning af flere grunde, **1)** det giver mig mulighed for at teste om de studerende kan udvise flere niveauer på taksonomien, **2)** det fordrer de studerende til at tage den tilegnede viden og færdigheder i spil for at løse en opgave, som minder om den, de kan møde i praksis. For netop at gøre dette endnu tydeligere, valgte jeg at undlade at bruge de fabrikerede cases, men bruge en rigtig (anonymiseret) case omhandlende en af de patienter jeg selv har haft i et forløb. Tanken med dette var at gøre det mere troværdigt og jeg vurderede der var et større læringspotentiale i det indhold og de emner, vi kunne komme rundt om med denne case. **3)** Som et forsøg på inddrage de studerende og dette mhp. at støtte læringen og ikke mindst motivationen hos de studerende og **4)** vise mit engagement for emnet og undervisningssituationen, da jeg ved at have forberedt en helt ny case fra egen praksis også gerne vil vise at jeg gik op undervisningen blev så god og lærerig som muligt.

Jeg præsenterede casen så tæt på virkeligheden som muligt og med de informationer, jeg havde til rådighed. De studerende skulle på baggrund af sygehistorien indkredse hvilke problemer, casen rejste og komme med forslag til det videre forløb.

Dette er i fin tråd med Dolmans og Snellen-Balendongs beskrivelse af et effektivt casedesign, som skal indeholde såkaldte "cues" (stikord), der skal henlede de studerendes opmærksomhed hen mod det videre forløb.

De studerende havde ikke svært ved at indkredse de problemer, der så at sige var gemt i casen. Godt nok blev de hjulpet godt på vej af titlen for undervisningen og mit arbejdsområde, og derfor kunne sige sig selv, at der nok var tale om astma og allergi, men ikke desto mindre var de i stand til at identificere de relevante oplysninger og sætte dem i en sammenhæng, der igen fordrede til at deres viden og færdigheder blev anvendt på sådan en vis, der kræver en vis dybdelæring.

De studerende virkede motiverede og der var flere studerende, der var aktive og ikke blot de "sædvanlige". Hvis jeg skal prøve at forklare dette, kan jeg ikke lade være med at tænke på fra den gang jeg selv var medicinstuderende og arbejdede med cases. Det kan være enormt motiverende at prøve at løse opgaver og problemer, som meget ligner dem, man møder i praksis. Dette tænker jeg også var medvirkende til de studerende aktivitet.

En anden årsag vil jeg mene er, at jeg med præsentation af en helt ny case forberedt til netop denne undervisning kan fremstå som engagereret underviser, hvilket jeg har erfaret (egne erfaringer og teoretisk gennemgang på IUP-kurset) har betydning for forholdet mellem underviser og de studerende.

Jeg havde til førvejledningsmøderne med mine to vejledere fortalt om mine overvejelser om at implementere min helt egen case og vi havde derfor snakket om hvorfor jeg ville udskifte de fabrikerede cases med en "real life"-case. Til eftervejledningssamtalerne var de enige i at den nye case fungerede efter hensigten og gav anledning til god aktivitet, om end jeg kunne have brugt den i højere grad end jeg gjorde.

Adspurgt syntes de studerende, at det var spændende og givende at arbejde med en case taget fra den daglige praksis og det var tilfredsstillende for dem selv at kunne arbejde med casen eller se nogle af de andre studerende gøre det. Dette tolkede jeg som, at sammenhængen mellem indholdet til undervisning og anvendelsen i praksis blev lidt mere tydeliggjort.

Overvejelser til fremadrettet brug af cases

Her skal man også være opmærksomhed på om tiden brugt ved denne undervisningsform er givet godt ud og om det giver mening.

Der kan være en risiko for at casen ikke giver anledning til den forventede aktivitet og hvordan håndterer man den? Og hvordan kan det forklares

– er det et udtryk for at de studerende ikke har den tilstrækkelig viden og færdigheder til at kunne gennemskue casen? Er det en ualmindelig genert forsamling? Er der nogle sociale dynamikker eller studerendeforudsætninger, der kan have betydning?

En case kan også antage form som en slags ”mini-eksamen”, da man her kan få lov til at demonstrere viden og færdigheder, men også at man kan anvende disse på et mere abstrakt niveau til at løse et problem, der kan ligge meget tæt på den praksis, de studerende skal ud til efter uddannelsen. Det kan derfor forekomme at en eller en lille gruppe af studerende tager over og styrer undervisning. Her kan det også være en god idé at have overvejet en strategi for hvordan man vil håndtere dette.

PBL

De studerende skulle arbejde med et projekt mellem de to undervisningsgange, hvor de selv skulle opstille nogle studiemål med afsæt i det gennemgåede stof, litteraturlæsning og interesseområde. De arbejdede i små grupper af 3-4 og skulle efter første undervisningssession sende mig et studiemål for hver gruppe. Et af studiemålene var fx, ” hvilken betydning har amning for udvikling af astma?”

Hver gruppe fik altså defineret et *undersøgelsesproblem*, som de selv havde opstillet og havde til opgave at arbejde med i den efterfølgende uge. Jeg skulle ligeledes arbejde med de forskellige studiemål, de studerende havde sendt mig og vi ville mødes ugen efter og gennemgå de forskellige studiemål i plenum, hvor den enkelte gruppe havde ansvar for at byde ind med deres konklusion.

Tanken og formålet med denne undervisningsform var at give støtte op om de studerendes læring. Ved at lade de studerende arbejde med projekt og et problemorientering var det for at øge motivationen gennem et øget ejerskab til projektet.

Et andet og måske det mest overordnet formål med at anvende denne form for undervisning, er at give de studerende en udfordring, der meget vel kunne ligne hvad de kan blive mødt af på arbejdsmarked, hvor de netop skal kunne bidrage med viden til et sundhedsområde ved hjælp af evidensbaseret sundhedsvidenskabelig litteratur, som de studerende har taget kritisk stilling til.

Skal man se hvordan projektet og problemet er formuleret gennem Tamirs model, kan man sige at problemet er åbent (dog inden for astma og allergi), mens *fremgangsmåden* er givet, da de studerende er blevet oplært i at søge sundhedsvidenskabelig litteratur og det er en nødvendighed for at gennemføre projektet og endeligt er *svaret* åbent, da jeg eller de andre studerende også skal søge at finde svar på lige fod med den gruppe, der har stillet det pågældende studiemål.

Man kan dog stille sig lidt kritisk over for hvorvidt svaret egentligt er åbent, da de studerende nok vil have en vis forventning om, at jeg har "det rigtige svar" eller kan moderere med min kliniske erfaring.

Der var noget overlap mellem de forskellige studiemål, hvorfor jeg med fordel kunne slå dem sammen og derved komme godt rundt om emnet ved gennemgangen. Dét at der var overlap tolkede jeg også som at der var en stor interesse for netop dette spørgsmål, som jeg ikke selv berørte i min planlagte undervisning.

Vurderet ud fra aktivitetsniveauet, de fremlæggelser og præsentationer de forskellige grupper forestod, observationer fra vejledere og min egen oplevelse fungerede denne undervisningsform og dette forløb bestemt efter hensigten. Jeg kunne mærke, at de studerende med god overbevisning kunne ekstrahere resultaterne, fortolke budskaberne og komme med relevant kritik på de studier, som de hver især havde fundet frem til.

Grunden til, at dette var en god oplevelse kan muligvis forklares ved at oplevelsen af succes og tilfredsstillelse var at de studerende faktisk kunne demonstrere (både over for dem selv og underviseren) at de beherskede de kompetencer, der var opstillet for kurset. Den gode oplevelse var bestemt også tilvejebragt ved at det var nogle studiemål og projekter, som de selv havde været med til at definere og dermed større ejerskab og motivation.

Overvejelser til fremadrettet brug af PBL

I dette tilfælde fungerede denne undervisningsform efter hensigten og formen understøttede læringen. Jeg kunne også have oplevet en stor variation i hvor motiverede og engagerede de studerende gik til værks, hvilket kan have negativ indflydelse på dynamikken i undervisningssituationen. Motivationen hos de studerende ifm. PBL kan afhænge af den grad af frihed, de oplever ifm. problemformuleringen. Hvis underviseren har haft alt for stor indflydelse på at definere problem kan det have negativ indflydelse på motivationen. I mit tilfælde var problem relativt åbent, dog med den betingelse af det skulle omhandle astma og allergi.

Referencer

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

A Spørgsmål anvendt ifm. clickers i de to undervisningssessioner med en uges mellemrum

Korrekt svar er markeret

1. Hvor mange har astma i Danmark			
D. 14.6.2016		D. 20.6.2016	
Svarmulighed	**Svar i %**	**Svarmulighed**	**Svar**
40%	4%	40%	0%
5%	4%	5%	0%
8-10%	61%	8-10%	78%
30%	30%	30%	30%

2. Angiv mindst 3 risikofaktorer for astma			
D. 14.6.2016		D. 20.6.2016	
Antal angivet	**% af hele holdet**	**Svarmulighed**	**Svar**
2	35%	2	0%
3	56%	3	83%
4	9%	4	6%
5	0%	5	11%

3. Hvad udgør grundstenen i den samlede astmabehandling?			
D. 14.6.2016		D. 20.6.2016	
Svarmulighed	**Svar i %**	**Svarmulighed**	**Svar**
Udvidende behovsmedicin	45%	Udvidende behovsmedicin	55%
Allergi-medicin	13%	Allergi-medicin	14%
Inhalationsmedicin	32%	Inhalationsmedicin	28%
Fysisk aktivitet	11%	Fysisk aktivitet	3%
Kost med høj antioxidant	0%	Kost med høj antioxidant	0%

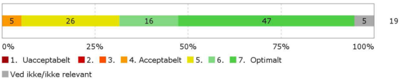
4. Kan man blive symptomsfri, når man har astma?			
D. 14.6.2016		D. 20.6.2016	
Svarmulighed	**Svar**	**Svarmulighed**	**Svar**
Ja	96%	Ja	100%
Nej	4%	Nej	0%

5. Hvis man er allergiker, kan man så forebygge astma?			
D. 14.6.2016		D. 20.6.2016	
Svarmulighed	**Svar**	**Svarmulighed**	**Svar**
Ja	91%	Ja	100%
Nej	9%	Nej	0%

B Skriftlig studenterevaluering vedr. udbyttet af undervisningen i astma og type 1 allergi

	Observeret minimum	Observeret maksimum	Gennemsnit	Respondenter
Hvordan vurderer du dit udbytte af undervisningen omkring Asta og allergi: - - Astma og type 1 allergi	4,00	7,00	6,11	18

Hvordan vurderer du dit udbytte af undervisningen omkring Asta og allergi:
- - Astma og type 1 allergi



5

Developing new teaching material for a BSc course: Student activating lectures

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Background

I was asked to teach in the BSc course "*Plant Ecophysiology*", taught at the Dept. of Biology, Univ. of Copenhagen. This course is an elective course in block 3. While the course has been taught for several years, some topics that are listed in the course description have not been included in the curriculum, and I was asked if I could teach those topics. Since it has not been taught before, I had to develop the teaching material without any examples or guidance from previous teaching sessions. I was asked to teach two different topics: (1) *Plant growth regulation* and (2) *Nitrogen Deposition, Growth and Nutrient Uptake of Mosses, Cyanobacteria and Nitrogen Fixation*. The first topic was taught from 11 – 12 am and from 1– 4 pm the same day, and the second topic was scheduled for 1 – 4 pm another day. Twenty-three students were present at these teaching sessions.

Challenges in designing new course content

There are several challenges to be encountered when planning new course material. The most important or most challenging parts for me are (1) to take the students' competences, learning and background into account when planning the course; (2) to translate the intended learning outcomes (ILO) into pedagogical practice; (3) planning according to the student learning and not the logic of the material (e.g. Knight, 2002). During the planning of the new course material, I tried to incorporate these issues and to accommodate those during the teaching sessions by e.g. probing the students' knowledge on each particular subject in the beginning of each teaching session, by stating the ILOs clearly in the beginning, and re-visiting them in the end.

A Pedagogic Perspective

Lectures are a time and cost efficient way to "teach" a large group of students. Yet, listening to a monologue is not as efficient as reading by yourself. Listening is a passive way of acquiring knowledge, while reading engages the mind, allows for exploration of ideas etc. Despite "traditional" lectures promoting often surface learning only, we are still using this form of teaching predominantly, out of habit, because we do not have enough time to explore alternatives etc. Shall we abandon lecturing altogether? Lectures still can give the students a sense for the material; they are opportunities to present a broader picture, to relate theories to observations, to provide a different perspective, and to explore topics not covered in the reading material. Further, by re-structuring and re-revising lecture-like teaching, we can achieve actual learning by the students.

Trigwell, Prosser, and Waterhouse, 1999 highlights that many studies have established a consistent relationship between surface approaches to learning and lower quality learning outcomes. Thus, if we want to achieve "deep learning" by the students, we have to guide them to construct a deeper understanding of topics by connecting old with new knowledge. This can be achieved by activating the students; making them think by themselves and having them solve problems. All of this is possible in a lecture teaching session. Trigwell et al., 1999 also note that those teachers who have the student as the focus of their activities, by encouraging self-directed learning, are more likely to encourage a deeper approach to learning.

Another problem is that lectures are often too long, and the attention of the students decreases after few minutes. Adults can keep an attention span in a lecture for no more than 15-20 minutes at a time (see e.g. Middendorf and Kalish, 1996 and references therein). Jenkins, 1992 argues that just breaking up lectures into short segments can act against that. These short segments can be achieved by simple breaks of the entire teaching situation, or by involving the students in group or pair exercises or discussions. Here, the students work actively and feel personally involved. Along those lines, Meade, 1997 identifies the most significant change facing universities is to expand the traditional teacher-centered method of teaching to include a greater range of student-centered learning methods. These can include case studies, peer assessment and group work.

Our brain handles information by reducing it into meaningful chunks (categories), and learning consists of fitting new information into already existing categories, or forming new ones. The students need to practice thinking with these new concepts. In a classroom situation, this can be achieved by asking the students to explain the new concept to a neighbor, to summarize it, to apply it etc. (Middendorf and Kalish, 1996).

Every student learns differently. Some students prefer or learn best via sensory input (sights, sounds etc.), others intuitively (insights etc.), and how students prefer the communication and organization of information (inductive vs. deductive) is student specific (Felder, 1988). This poses challenges to the teacher. However, by alternating and mixing teaching input types and the organization of information during a teaching session, the teacher has the possibility to accommodate problems arising due to that. Further, by allowing intervals for the students to think about what they have learned, the teacher facilitates reflective thinking. Interspersing a lecture with student activities keeps the student attentive and active. In particular, if the students are asked to explain new concepts or ideas to their peers, reflective and synthesizing thinking is promoted (e.g. Felder, 1988).

This paper describes the planning, implementation and evaluation of my newly developed teaching material. I will describe and discuss the two topics taught separately.

Topic 1: Planning and implementation

Ideas and Teaching Plan for the topic *Plant growth regulation*

The "problem" with this course day is that the topic is new to me. I am not an expert on this topic, and it is very much outside of my expertise. Also, this topic has never been taught before in the course. The advantage is that I can decide what and how to teach, although the topic and content is given by the textbook, which the students have to read.

My plan was to give an overview of each topic that is covered in the textbook with an interactive lecture. In particular, I will ask questions in between (every 3-5 minutes) to keep the students active, and the students are encouraged to ask me questions in between. I will avoid using the textbook too much in the teaching session, the students will have to read the textbook chapter anyway, and I do not want to repeat their reading material. This also means that the students have to take the responsibility and to have sufficient interest in the topic to work on their own.

To keep the students motivated and active through the entire teaching session, I will include aspects of the topic the students can relate to. E.g. How are the red “leaves” in the Christmas star (-plant) achieved? etc. Throughout the entire teaching session (4 h in total), I will ask the students to do several short exercises relating to the topics presented. This will be done in the manner of the “didactic game” (see Table 5.1): I will introduce the exercise (devolution), have the students deal with a problem in small groups (action), have the students present their thoughts and suggestions for solutions to the class (formulation), and we will assess their ideas together in the class (validation). The group size will depend on how many students will be there, but I was planning with 5 students per group. The students will have to complete 4 exercises throughout the teaching session.

To accommodate different learning styles (e.g. Felder, 1988), I try to motivate learning by relating the material to the rest of the course, by using different types of information (facts, data, experiments, concepts), and support creative questions and solutions.

Action	*Phase in the didactic game*
Question or problem is presented	Devolution
The students discuss the question/problem in small groups	Action
One group presents their solution in plenum	Formulation
The group receives feedback, and other groups are invited to the discussion	Validation
The solution is presented	Institutionalization

Table 5.1: Structure of the “didactic game”

Outcome of the teaching session / Reflection, Topic 1

Overall, the teaching session went nicely. The students were active, asked questions and completed the exercises. The students had a long teaching day, starting at 9am until 4pm, and most of the teaching was in the form of lectures, sitting in the same room all day. Yet, the students kept being active until the end of the session, and I made sure that I asked and involved the class every 3-5 minutes. However, it was always the same few students that answered my questions. Asking questions every 3-5 minutes might be too much, decreasing the frequency of questions might counteract this issue.

I started the session by introducing myself, followed by the ILOs for this session, which I re-visited at the end of the session with the help of the students. I.e. I posted the ILOs and asked the students if/how we have achieved those, which worked well. This was also done for the second teaching session I describe below.

I tried to break up my "lecture" with short exercises. The book chapter, the students were supposed to read was content rich, and I though it would be best to introduce every sub-topic with an interactive lecture (asking many questions in between) for ca. 20 min, and to conclude each subtopic with a short exercise, which worked time wise as planned.

The exercises were done in student groups of 5, and they had ca. 5-8 minutes for the group discussion. For the small exercises to be dealt with in small groups, I picked the group that should present their ideas and results, to make sure that not the same students respond. That worked well. However, given that the students used their computers, and could look up topics, the exercises might have been too easy to solve for them. On the other hand, the exercises were thought to promote discussion within the group, as well as to break up the lecture part, which worked well.

Although it went fine, I am not sure if I would do it the same way again. It was very exhausting for me as a teacher to "entertain", be attentive and respond for 4 hours. For another teaching session, I will consider giving the students fewer but longer exercises, e.g. 30 min for an exercise with 15 min. discussion afterwards. This would be less exhausting for the students and for me. Also, in this teaching situation, all student groups got the same exercise to solve. Maybe it would be more interesting to develop different exercises for different groups and then the students have to describe their exercise and explain and justify their solutions to the entire class, without repeating the other groups' discussion points.

To conclude, the teaching session went okay, but in the future, I could imagine trying something different, e.g. fewer but longer exercises and different exercises for the different groups to promote discussion in the entire class. But on the other hand, that would require more preparation time for the teacher, which most of us do not have.

Topic 2: Planning and implementation

Ideas and Teaching Plan for the topics *Nitrogen Deposition, Growth and Nutrient Uptake of Mosses, Cyanobacteria and Nitrogen Fixation*

Given the above described findings and suggestions (deep learning approach), I will try to keep the students activated (see below), I will set time aside for breaks as well as for group work. In this three-hour slot, I aim to cover three topics that have not been taught before in this course. Further, the students do not have a textbook for this particular topic. Although the topics have overlaps with my own research, it does pose some challenges to me as a teacher since it is difficult to get the level and depth of the topics and teaching right. What seems obvious to me might be completely news to the students. To try to accommodate for that, I will pose a question in the very beginning of the teaching session to "probe" the knowledge of the students, and hope I can revise my teaching accordingly during the session. I will ask questions throughout the teaching session to make sure the students are still following, and also to keep them activated. My plan for the teaching session is to deal with each topic (3 in total) for ca. 45 minutes. That gives enough time for breaks in between, as well as enough time in the end, in case it would be needed. I am planning to introduce each topic with a "hook" e.g. newspaper headline, a question to be solved in pairs, or nice photos to get the students' attention. Then, I would like to give short lecture-like overviews on each topic. These short overviews will be interactive, that is, I will try to keep the students active by asking questions in between. The short introductive lectures will be for ca. 20 – 30 minutes, after which we have 25 – 15 minutes time for group work (4 – 5 students). The students will have ca. 5 minutes to discuss the exercise I will give them in small groups, after which we will discuss their conclusions and suggestions in plenum (10 – 20 minutes).

After teaching the same group last week, I thought I could introduce something practical. The students are sitting in the same room since 9am, and I noticed they were getting tired in the afternoon. I would like to do a short demonstration of how mosses can change their surrounding by decreasing the pH. This takes some minutes, and I will need to start setting up the experiment first thing in the teaching session. After the setting up, I will start with the teaching session, and we will check the "experiment" during the second topic of the teaching session ("moss growth"), after ca. 1 h. That gives the students time to think about the experiment and to formulate hypotheses and possible explanations. The demonstration will be short, thus, I will still use also the short exercises for each of the three topics. I will ask two students to volunteer to help me setting up the experiment since the entire class would not fit around the table and would not be able to see the experimental set-up.

In this teaching session I will use a mix of teaching methods: a practical demonstration, discussion-groups, pair-share and an interactive lecture.

1. Exercise and group work: the students will get a world map and they have to guess and mark where they think high and low nitrogen deposition takes place, and they should be able to give reasons for their guesses. This will be followed by a plenum discussion, and a resolution (see Table 5.1). Thus, this group work will be structured like a “didactic game”: I will introduce the background and exercise (devolution), have the students deal with a problem in small groups (action), have the students present their thoughts and suggestions for solutions to the class (formulation), and we will assess their ideas together in the class (validation). The last step of the “didactic game” (institutionalization) will not be very pronounced for this exercise, but they will need the acquired knowledge to be able to solve the last exercise for topic 3.

2. Exercise and group work: the students will get data in small groups and I will ask them to study the data so that they can come up with a description that can explain the findings. The ideas from the different groups will be discussed in the class, and I will finish this part with the resolution.

3. Pair-Share: I pose a question to the class, and the students will be able to discuss the problem/solution with their neighbors, before they are asked to present their solution to the class. The answers by the student will be institutionalized with my own research data, and will be connected back to the first exercise.

Outcome of the teaching session / Reflection, Topic 2

This session went nicely. The topic was closer to my own research, and I felt more comfortable teaching it. Further, I could intersperse the lecture with my own research, which is fun for me, and gets the students interested, and gives them insights into research.

After the introduction (welcoming etc.), I started with the demonstration experiment, for which I had two volunteers to help me. The demonstration went well, the students seemed interested. The students could see by themselves what happened instead of just being shown a graph by me. When I asked them (after 1 h) what happened and why, the students came up with explanations and seemed to have understood the underlying mechanisms.

The interactive lecture worked well. The students responded to my questions, and they were active until the end of the 3 h session. The two exercises, which they had to solve in small discussion groups worked nicely. I could see that each group was discussing the problem and all groups completed the exercise. I picked one group to present their solution to the entire class, which also worked well.

I also brought a moss sample to for the second part of the lecture, which I gave around so that each student could “feel” what a moss is. We could then discuss what is “special” about mosses, and what are the differences compared to vascular plants. This helped the students who learn best via sensory input.

Towards the end of the lecture, I demonstrated how we measure nitrogen fixation in the laboratory. I brought a sample from a running experiment and explained where it came from (Disko island), and what we are doing with the samples (exposing it to freeze-thaw cycles). This got the students interested and they got to see how we are implementing experiments.

The overall timing of the 3 h session went well. We had short breaks after each topic, so that the break in content overlapped with a physical break.

Improvements for the future

Besides what I mentioned already in the text above (e.g. longer but fewer exercises), I could be better in asking follow-up questions to students after they have given me an answer to my questions. Similarly, I could invite the group to a discussion on a question posed by the student, instead of only me giving the answers. When I ask follow-up questions, I should be better in keeping the intended learning outcomes (ILO’s) in my mind to get the students to understand and achieve the ILO’s. I should further use the ILO’s more during a teaching session, to connect the topics and discussions back to them. The topics I am teaching provide the possibility for case based teaching, which I aim to try in the future.

References

Felder, R. M. (1988). Learning and teaching styles in engineering education. *Engineering Education*, *78*, 674–681.

Jenkins, A. (1992). Active learning in structured lectures. In G. Gibbs & A. Jenkins (Eds.), *Teaching large classes in higher education*. London: Kogan Page Ltd.

Knight, P. T. (2002). *Being a Teacher in Higher Education*. England: Open University Press.

Meade, P. H. (1997). Challenges Facing Universities: Quality, Leadership and the Management of Change. Dunedin: University of Otago.

Middendorf, J. & Kalish, A. (1996). The 'change-up' in lectures. *The National Teaching & Learning Forum*, *5*, 1–4.

Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. *Higher Education*, *37*, 57–70.

6

Using problem-based active learning strategies in large classes

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Introduction

Teaching basic immunology

"Veterinary Basic Immunology" is a required second-year course with a core curriculum on immunological concepts and theory that have important implications for immunodiagnosis, prevention, and control of animal diseases. The 180 veterinary students in each class are traditionally being taught as in the other basic veterinary courses with a primary focus on didactic lectures and a teacher-centered pedagogical approach. I started last year giving lectures on chapters from the text book, and additionally had 60 of the students for one week laboratory exercises. The students expressed a wish to have more hours with the problem-solving questions like those we worked with during the lab exercises, but were at the same time reluctant to change the lecture setting. This may likely reflect unawareness among the students of other methods of teaching that does not rely on passively receiving information from a lecturer. The lecture-based learning format often promotes superficial memorizing material enough to pass the exam with a decent grade, but it was clear during the exercise week that the students could not remember and explain basic things lectured the week before. This is not surprising as the attention span during a lecture is shown to be only 15 min (Wankat, 2002). Research also indicates that this kind of teaching is not an efficient method to reach the educational goal of effectively being able to apply and integrate information from basic science into real life problem-solving situations which are necessary skills in the clinics

(A. Y. Kolb and Kolb, 2005). I therefore wanted to substitute the traditional lectures with a more student-centered pedagogy in which students actively learn the immunological concepts through experience of solving a problem and integrating multidisciplinary material from microbiology, immunology, and pathology into a clinical context, with the hope of helping the students to gain a deeper knowledge and understanding of the curriculum.

Didactic considerations

Active learning is an educational practice that engages students in the learning process and improves conceptual understanding (Prince, 2004); however, it is a challenge to actively engage large classes.

Especially in health science, problem-based and case-based learning methods, which are usually more student engaging, are difficult to apply to large classrooms due to the large course curricula that needs to be delivered in a limited amount of time. One solution could be to break up with the idea that all text book curricula needs to be presented for the veterinary students. The limited amount of classes can instead be seen as an opportunity to provide the students with the right tools to self-directed learning. It is important to keep in mind that students are not pupils and it is therefore reasonable to expect the students to take responsibility for own learning as long as they are guided with e.g. clear learning outcomes and relevant exercises that yield contextual perspectives on the textbook knowledge they gain (Ruhl, Hughes, and Schloss, 1987; Wiggins and McTighe, 2005).

Furthermore, theories of constructivist model of learning rely on the student to construct a reality from the information received through the teaching experience (Piaget and Inhelder, 2008; Prince and Felder, 2006). The principle is incompatible with the lecture setting currently used in immunology teaching because construction of meaning is based on prior knowledge and requires effective instructions that creates connections to familiar situations (Biggs, 1996). Social constructivism theories based on Vygotsky (Vygotsky, 1978) further includes student's reactions to the experience primarily through interaction with others. Problem- and case-based learning offers a way to include these theories in the teaching environment because the students can reach the educational goals by actively applying the immunological principles to real-life problems from the clinics. This can favorably be done through group discussions to reinforce activation of prior knowledge.

Aim of project

The aim of the project is to investigate whether traditional didactic lectures in large classes (>100 students) can successfully be redesigned into an active, collaborative, problem-based learning process that fosters deeper learning and better perceived information retention. The hypothesis is that this can be obtained by approaches often applied in smaller class rooms:

1. By modifying the classroom environment to become conducive to more interactive engagement between the students and the teacher.
2. By integrating black board and 'information and communication technology' based activities as an educational tool to actively and visually assist knowledge transfer.
3. By centering teaching activities on case-based problems that facilitate the students to activate prior knowledge and place learned fundamental concepts into clinical context.

Methods

Large class teaching strategies

The described approaches were tested during two lectures with 150-180 students present in veterinary immunology. In the first lecture on mucosal immunology, part (i) was implemented by encouraging small two-and-two discussion before they answered the questions I raised. Interaction with all students is simply not possible, but peer learning offers a tool by which students interact with other students to achieve educational goals and gain collaborative skills. I therefore paused periodically to let the students clarify notes with each other in order to give them a chance to ask further questions. Due to part (ii), I also wanted to include more variation into my teaching methods, by e.g. drawing principles on the blackboard and using you-tube videos of different immunological concepts. The purpose of using these were a) to slow down teaching and to break the comfort zone as they e.g. had to pick up a pen and start drawing with me, b) to visually assist learning for the students by e.g. providing static overviews of the material taught, with large drawings implementing more and more things during the class, and c) provide repetition of already known material with e.g. a video that included material from previous lectures and often across different topics or chapters in the book, in order to integrate the new knowledge in an "old" perspective. It was my hope that these breaks in the monologue would improve deeper learning in the long run because it was meant as an educational tool to benefit the students that don't learn best by passively receiving information (which is probably most of them), and also to keep them activated, e.g. by asking them "explain to me/classmate or write down what this video is about?" or "okay, find paper and pen and make this drawing with me".

In my second lecture on hypersensitivity, I based the lecture on clinical cases in order to include part (iii). By placing the immunological concepts into a clinical context, the idea was to provide the students with a more multidisciplinary approach to learning with the purpose of creating a need-toknow the concepts/theories before teaching. Learning for meaning's sake has been shown to advance study habits that help reach a deeper learning (Vernon and Blake, 1993; Gallagher, 1997). I therefore started the lecture with a case from mucosal immunology that was briefly included in the previous lecture, and expanded it into a new/different perspective that fit to the hypersensitivity topic. Case-based learning is of course more doable in small exercise classes where students can be given time to research on their own unknown phrases and background on the disease that they are not already familiar with. To meet this criterion in the large classroom, I therefore gave the students time to consider and discuss what was going on before I went through relevant immunological pathways. Later, it was up to the student to include this into understanding the case by e.g. asking: "so now, what would you do with this dog in the clinics based on what we just learned?"

Evaluation and Conclusions

Active learning in large classes

I wanted to modify the classroom environment to become conducive to more interactive engagement by increasing peer learning and thereby start an active dialogue. I learned that the form of questions matters. Open questions that lead to longer discussion between students are preferable instead of short false/true statements that I have to correct, e.g. "what role does mucosal dendritic cell play in tolerance?" for which they have to discuss the whole process of tolerance development, rather than the following lines of questions I would often end up with: 1. questions: "what does the mucosal dendritic cell do?", 1. answer "grap antigens from the lumen", 2. question "what function does that have?" 2. answer: "it presents it to the T cells", 3 questions "and then what?" 3. answer "it induces regulatory T cells", 4. question "what role do they have?" 4. answer "they create tolerance for gut antigens". Also, it was my experience that pausing periodically and let students clarify knowledge with each other resulted in more students becoming confident enough to ask clarifying questions. 60% on the evaluation wrote that they often know the answer but don't like to speak up in a large classroom; however discussing the answer with a classmate first increased the likelihood of them answering (App. A). This is very positive as the pause procedure has been shown to increase long-term rentention dependent on student attention and activity during the lecture (Ruhl et al., 1987).

It is comfortable and easy for students to lean back and let the teacher do the work which is why, I guess, almost 60% of the students prefer orderly powerpoint presentations of all the figures in the textbook with the most important facts highlighted (App. A). Also, this explained why 70% marked on the evaluation that they did not read the textbook before the class because they read later when they have the notes and can supplement them so they are easy and ready to find for the exam. However, this learning strategy does not inspire deeper learning which is clear when I get the same students two years later for more advanced immunology in biomedicine - they don't remember even the most simple immunological concepts and are even less capable of using these in another context. To break the 'comfort-zone' during my lectures I have therefore tried to visually assist knowledge transfer by integrating black board and 'information and communication technology' based activities such as you tube videos. It was however clear from the evaluation that in the large classes this specific approach with frequent exchange of education media has to be done only when considering e.g. how many details can be shown on a blackboard versus how much needs to be blown up on a powerpoint, or make remarks on facts that differ between e.g. videos and textbook material/curriculum. There has to remain a certain degree of black and white or right and wrong, otherwise too much information on unknown aspects or different explanations becomes confusing and seems to limit learning of the basic things. While some students love the variation, I also learned that it is important to give the students a feeling of structural order as in the book because otherwise other students will find the lecture messy. I therefore took this into consideration in the second lecture and prepared powerpoint slides like a script or screenplay, and then supplemented with exercises, drawings on the blackboard, discussions and videos that were all the time referred to in the powerpoint with e.g. an arrow on “you tube video” or an icon of a blackboard when drawing, to create a visual overview (App. B). As long as the students knew what ‘subject folder’ to put the received information into and major points were repeated, it was my impression that the majority of the students liked the variation because it keeps them activated, and I was pleased to see that only 10-15% of the students felt that they didn’t have an understanding of the learning outcomes when they left the classes (App. A and C).

Using problem-based learning strategies

The purpose of using problem-based learning was to provide motivation for learning and promote better learning skills as introducing activity into the lecture hall does not in itself foster longer retention of knowledge (Di Vesta and Smith, 1979). Furthermore, my view on the veterinarian education has, since I was a student, been that dividing all the basic courses up before going into the clinics is not an efficient method to reach the educational goal of effectively being able to apply and integrate information from basic science into real life problem-solving situations which are necessary skills in the clinics. It was my hope, that by centering my teaching activities on relevant diseases that doesn’t necessarily cover immune mechanisms from just the one chapter in the book that I am lecturing, the students would learn the fundamental immunological concepts through experience of solving a problem that include a more practical interdisciplinary approach. I have learned two things from the case-based approach: a) It seems to be easier for the students to remember stories than figures in a book, and I could benefit from the cases I included in my previous lectures or from the exercises by building new knowledge on top of what I knew everyone had already been through. This also created a need to join my lectures, to follow the story. b) It is important to make clear that it is a not a clinical teaching course but to let the students know why I teach the way I do in order to develop problem-solving skills that they need also in the clinics. Real-life problems cannot be solved by finding a single figure, but they will have to combine their knowledge across disciplines within and beyond immunology. Several students wrote that it was challenging even though they found the cases relevant because they focus on one chapter at a time with specific learning outcomes, and don’t have the overview yet; but I hope to be able to help them with this through practice and by clarifying and repeating conclusions and with constant references to previous knowledge and cases. It was my experience that repetition through variation and encouragement of thoughtful engagement of the students improved deeper learning and hopefully also more creative thinking in the future.

References

Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher education*, *32*(3), 347–364.

Di Vesta, F. J. & Smith, D. A. (1979). The pausing principle: increasing the efficiency of memory for ongoing events. *Contemporary Educational Psychology*, *4*(3), 288–296.

Gallagher, S. A. (1997). Problem-based learning: where did it come from, what does it do, and where is it going? *Journal for the Education of the Gifted*, *20*(4), 332–362.

Kolb, A. Y. & Kolb, D. A. (2005). Learning styles and learning spaces: enhancing experiential learning in higher education. *Academy of management learning & education*, *4*(2), 193–212.

Piaget, J. & Inhelder, B. (2008). *The psychology of the child*. Basic books.

Prince, M. (2004). Does active learning work? a review of the research. *Journal of engineering education*, *93*(3), 223–231.

Prince, M. & Felder, R. M. (2006). Inductive teaching and learning methods: definitions, comparisons, and research bases. *Journal of engineering education*, *95*(2), 123–138.

Ruhl, K. L., Hughes, C. A., & Schloss, P. J. (1987). Using the pause procedure to enhance lecture recall. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children*, *10*(1), 14–18.

Vernon, D. T. & Blake, R. L. (1993). Does problem-based learning work? a meta-analysis of evaluative research. *Academic medicine*, *68*(7), 550–63.

Vygotsky, L. S. (1978). Mind in society: the development of higher mental process. Cambridge, MA: Harvard University Press.

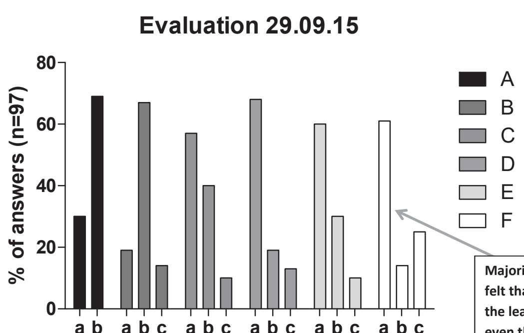
Wankat, P. C. (2002). *The effective, efficient professor: teaching, scholarship, and service*. Allyn and Bacon.

Wiggins, G. P. & McTighe, J. (2005). *Understanding by design*. Ascd.

A

Appendix A: Evaluation of my lecture on mucosal immunity for veterinary students in 'Basic Immunology Course'

A. Did you read/look at the curriculum for today before the lecture?
   a. YES
   b. NO
B. Did you find the lecture difficult?
   a. YES
   b. MEDIUM
   c. NO
C. Do you prefer going through all the figures of the book on powerpoint or drawing overviews on the blackboard as today?
   a. Powerpoint figures
   b. Black board
   c. Makes no difference
D. Do you think the video increased your learning of today's curriculum?
   a. YES
   b. NO
   c. Don't know
E. Do you think a few minutes 2-and-2 discussion increases your chance of volunteering to answer in plenum?
   a. YES
   b. NO
   c. Don't know
F. Did you learn what you expected considering the learning outcomes?
   a. YES
   b. NO
   c. Don't know



Majority of the students felt that they had learned the learning outcomes even though most of them hadn't read the book before the lecture and thought it was a difficult topic.

Most students made the comment that they would prefer a mix of drawings on the blackboard for overviews but details on powerpoints figures that would otherwise be too small to see in the back of the lecture room.

IGE-MEDIATED IMMUNITY AND ALLERGY

CHAPTER 14

22.10.15

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LÆRINGSMÅL

- Definere allergi, atopi og hypersensitivitet.
- Forklare hvilke mekanismer der forårsager de symptomer de er associeret med en IgE medieret allergisk reaktion.
- Beskrive hvordan et Th2 immunrepons både kan yde beskyttelse mod en helminth infektion og lede til kronisk sygdom.
- Diskutere prædisponerende faktorer for allergi, incl. genetiske polymorfier og hygiejnehypotesen.
- Give eksempler på allergiske sygdomme i dyr.

ALLERGY AND ATOPY

An allergy is an overreaction of the immune system to a normally harmless substance called an allergen
(A pathological manifestation of hypersensitivity)

Atopy is the genetic predisposition to allergic disease

Case from last time: Vaccinated German Shepherd

Symptoms: Reoccurring sneezing, nasal discharge, intermittent diarrhea.

Treated since young regularly with antibiotics due to infections.

Now as 3 years old: severe diarrhea, weight loss, loss of appetite, constantly scratching face, licking sides/belly and paws – bald spots and inflammation. The dog is further diagnosed with disseminated fungus Aspergillus terreus.

Diagnosis: ELISA IgA: IgA low levels

Primary immunodeficiency:
Selective IgA deficiency
Secondary: food allergy

Treatment:
-Use of cyclosporin, 1% topical tacrolimus and ketoconazole show excellent results in most cases
-Hypoallergenic (hydrolyzed) diets

NEW CASE: ANTON

Signalment: 3 year old, male, English Setter.

History and physical examination:
- Severe pruritic skin disease began 6 months ago.
- Erythema and alopecia in face, axillary and inguinal skin.
- Conjunctivitis and cheilitis (lip inflammation)
- Lichenification (thick and fissured skin) of paws

FLEE-ALLERGY DERMATITIS (FAD)

Pruritus = kløe

CASE

Signalment: 3 year old, male, English Setter

Diagnostic procedures:

- **Effective flee control and no evidence of flees**
- **Hydrolyzed protein hypoallergenic diet for 3 weeks: no change in skin disease**

HYPERSENSITIVITY REACTIONS

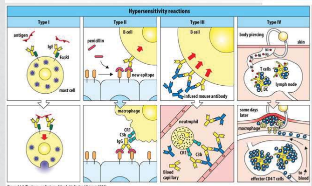


Figure 14.2 The Immune System, 4th ed. (© Garland Science 2015)

YOUTUBE VIDEOS

Type II https://www.youtube.com/watch?v=lu-b46SIADM

Type III https://www.youtube.com/watch?v=bJqQcBUIfoI

Type IV https://www.youtube.com/watch?v=e1qpbOivO_Y

EXERCISE: MANIFESTATIONS OF HYPERSENSITIVITY REACTIONS

	TYPE I (IgE mediated)	TYPE II (Antibody)	TYPE III (Immune complex)	TYPE IV (Delayed T cell)
Allergic				
Autoimmune	-			
Infection	Helminth (Th2)			

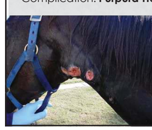
ANSWERS: MANIFESTATIONS OF HYPERSENSITIVITY REACTIONS

	TYPE I (IgE mediated)	TYPE II (Antibody)	TYPE III (Immune complex)	TYPE IV (Delayed T cell)
Allergic		Blood Transfusion	"Farmers lung" Serum sickness Bovine insulin	Contact dermatitis
Autoimmune	-	Hemolytic anemia	Equine "Strangels" Lupus	Type 1 diabetes
Infection	Helminth (Th2)	Intracellular virus	Canine Leishmania	Intracell. Mycobac. (Tuberculin)

EQUINE "STRANGLES"

Infection with *Streptococcus Equi* leading to contagious upper respiratory tract infection

Complication: **Purpura Hemorrhagia**



HYPERSENSITIVITY REACTIONS

I = **A**llergy, **A**naphylaxis, and **A**topy

II = anti**B**ody

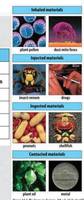
III = immune **C**omplex

IV = **D**elayed

ALLERGENER LIGNER HELMINTER

Helminth species	Helminth antigen	Common related allergen
Herring worm (*Anisakis simplex*)	Cystatin	Minor cat allergen
	Cytochrome *c* oxidase subunit 3	Bermuda grass pollen antigen
	Troponin C	German cockroach allergen
Blood fluke (*Schistosoma mansoni*)	Cathepsin B-like cysteine protease	Papain
Roundworm (*Ascaris lumbricoides*)	Glutathione *S*-transferase	Dust mite allergen
Malayan filaria (*Brugia malayi*)	Tropomyosin	Tropomyosin

Figure 14.24 The Immune System, 4th ed. (© Garland Science 2015)



PARASIT INFEKTIONER PRIMÆRT I TROPISKE LANDE

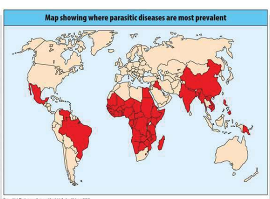
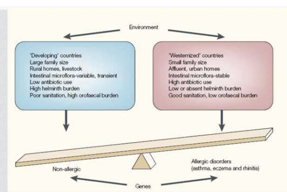


Figure 14.4 The Immune System, 4th ed. (© Garland Science 2015)

HYGIENE HYPOTHESIS



GENETISKE POLYMORFIER PREDISPONERER FOR ALLERGI

Gene	Nature of polymorphism	Possible mechanism of association
MHC class II genes	Structural variants	Enhanced presentation of particular allergen-derived peptides
T-cell receptor α locus	Non-coding variant	Enhanced T-cell recognition of certain allergen-derived peptides
TIM gene family	Promoter and structural variants	Regulation of the T_H1/T_H2 balance
IL4 (IL-4)	Promoter variant	Variation in expression of IL-4
IL4R (IL-4 receptor α chain)	Structural variant	Increased signaling in response to IL-4
High-affinity IgE receptor β chain	Structural variant	Variation in consequences of IgE ligation by antigen
ALOX5 (5-lipoxygenase)	Promoter variant	Variation in leukotriene production
$β_2$-Adrenergic receptor	Structural variants	Increased bronchial hyper-reactivity
ADAM33	Structural variants	Variation in airway remodeling

Figure 14.21 The Immune System, 4th ed. (© Garland Science 2015)

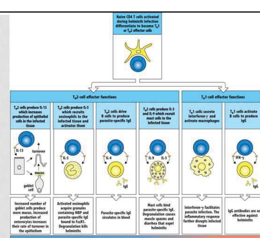


Figure 10.27 The Immune System, 4th ed. (© Garland Science 2015)

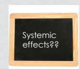
TYPE I HYPERSENSITIVITY

- https://www.youtube.com/watch?v=KX4DUlfurkk

MAST-CELLE EFFEKTOR MOLEKYLER
(NEDBRYDENDE ENZYMER OG INFLAMMATORISKE MEDIATORER)

Class of product	Product	Biological effect
Enzyme	Tryptase, chymase, cathepsin G, carboxypeptidase	Remodel connective tissue matrix
Toxic mediator	Histamine, heparin	Poison parasites Increase vascular permeability Cause smooth muscle contraction
Cytokine	TNF-α (some stored preformed in granules)	Promotes inflammation, stimulates cytokine production by many cell types, activates endothelium
	IL-4, IL-13	Stimulate and amplify T_H2-cell response
	IL-3, IL-5, GM-CSF	Promote eosinophil production and activation
Chemokine	CCL3	Attracts monocytes, macrophages, and neutrophils
Lipid mediator	Leukotrienes C_4, D_4, and E_4	Cause smooth muscle contraction Increase vascular permeability Cause mucus secretion
	Platelet-activatingfactor	Attracts leukocytes Amplifies production of lipid mediators Activates neutrophils,eosinophils, and platelets

Figure 14.16 The Immune System, 4th ed. (© Garland Science 2015)



Urticaria (hives): primært forårsaget af histaminfrigørelse fra hudens mastceller, øget karpermeabilitet og ødem

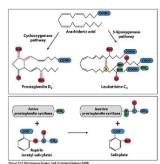
(bleg rød, lokal, kløende hævelse)

Angioødem: ødem i både dermis og subkutis som følge af aktiverede mastceller i det dybere subkutane væv

(mere diffus hævelse)

EICOSANOIDER

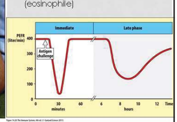
- Eicosanoider dannes af C20 fedtsyrer fra cellemembranen
- 100x virkningen at et histaminmolekyle



EARLY- AND LATE-PHASE REACTION

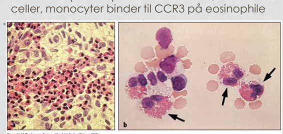
Hvordan tester vi for allergi:

- Straks reaktion pga. histamin, TNFα
- Senreaktion pga. leukotriner, cytokiner og rekrutterede celler (eosinophile)



EOSINOPHILS

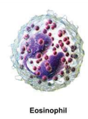
- Normalt lavt antal eosinofile
- Øget produktion ved IL-5 stimulering
- Kemokiner (Eotaxin) fra endothelceller, aktiverede T celler, monocyter binder til CCR3 på eosinophile



EOSINOPHIL FUNCTION

Class of product	Product	Biological effect
Enzyme	Eosinophil peroxidase	Poisons parasites and mammalian cells by catalyzing halogenation Triggers histamine release from mast cells
	Eosinophil collagenase	Remodels connective tissue matrix
Toxic protein	Major basic protein	Poisons parasites and mammalian cells Triggers histamine release from mast cells
	Eosinophil cationic protein	Poisons parasites Neurotoxin
	Eosinophil-derived neurotoxin	Degradation of RNA Antiviral effects
Cytokine	IL-3, IL-5, GM-CSF	Amplify eosinophil production by bone marrow Cause eosinophil activation
Chemokine	CXCL8	Promotes influx o f leukocytes
Lipid mediator	Leukotrienes C_4, D_4, and E_4	Cause smooth muscle contraction Increase vascular permeability Cause mucus secretion
	Platelet-activating factor	Attracts leukocytes Amplifies production of lipid mediators Activates neutrophils,eosinophils, and platelets

Figure 14.20 The Immune System, 4th ed. (© Garland Science 2015)



BASOPHILS

- Ligner mastceller, men er udviklingsmæssigt mere lig esosinophile
- TGFb og IL-3 inducerer dannelse af basophile men hæmmer eosinophile
- Fremmer TH2 response vha. IL4 og IL13
- Inducerer IgE isotype switch i B celler vha. CD40 ligand

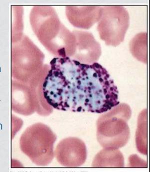


Figure 14.21 The Immune System, 4th ed. (© Garland Science 2015)

ALLERGIC ASTHMA

- Allergener aktiverer submukosale mast celler og histamin-frigørelse i de nedre luftveje

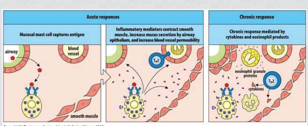


Figure 14.35 The Immune System, 4th ed. (© Garland Science 2015)

CHRONIC ASTHMA

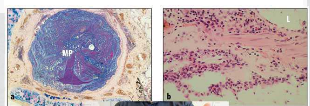
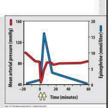


Figure 14.36 The Immune System, 4th ed. (© Garlan

ANAPHYLAXIS

Allergener i blodet:
Dissemineret mast-celle aktivering



"Shock-organs"

- Mennesker, ruminanter: Luftveje
- Heste, svin, katte: luftveje og mave-tarmsystem
- Hunde: Lever – massiv ophobning af blod -> reduceret blodtryk

CASE

Signalment: 3 year old, male, English Setter

Diagnostic procedures:

- Effective flee control and no evidence of flees
- Hydrolyzed protein hypoallergenic diet for 3 weeks: no change in skin disease

C

Appendix C: Evaluation of my lecture on hypersensitivity for veterinary students in 'Basic Immunology Course'

A. Did you find the lecture difficult?
  a. YES
  b. MEDIUM
  c. NO

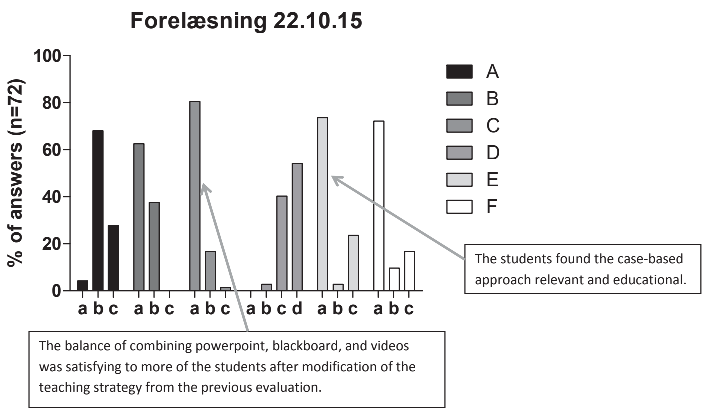
B. Did the initial repetition (incl. vidoes) of Type II, III, IV hypersensitivities help understand the reactions?
  a. YES, I did not have a clear understanding of them before the lecture
  b. NO, I already understood them before the lecture
  c. NO, I still don't understand them

C. Do you think the balance between powerpoint slides, blackboard and videos was okay?
  a. YES
  b. NO, too much of …_________
  c. NO, I prefer using only … __________

D. How much of the 2 hour lecture did you pay attention (active listening/participation)
  a. 0-25%
  b. 25-50%
  c. 50-75%
  d. 75-100%

E. Do you think the atopic dermatitis case was relevant to include and increased your learning?
  a. YES
  b. NO
  c. Don't know

F. Did you learn what you expected considering the learning outcomes?
  a. YES
  b. NO
  c. Don't know



7

Building a collaborative learning environment with the aid of new technologies

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Summary. This pedagogical exercise focuses on the role of new technologies for aiding collaborative learning and students' engagement. Under the general goal of well aligned courses, new technologies can be useful for aiding engagement through well designed teaching activities, being a tool for supporting different ways of student participation in the classroom. From this approach, the role of new technologies is examined for the implementation of those activities, which are specifically designed for motivating and activating a collaborative learning process in the classroom. It is proposed that, irrespective of using traditional or new technologies, *inquiry*, *reflection* and *discussion* are key concepts for a successful implementation of engaging teaching activities. *Keywords*: engagement, motivation, active learning, inquiry, reflection, discussion

Building a collaborative learning environment with the aid of new technologies

The construction of new knowledge in the classroom, for its implementation in the multiple contexts of real life situations, requires an active and deep learning process (Dolin, 2015). It involves students' engagement and collective collaboration (in small groups or in one big group) in the learning activities, while demanding an individual effort to reflect on previous knowledge. Students need time to absorb all the new information and place it together with their own knowledge, giving form to a deeper understanding of concepts, tools and skills. In this way, engagement requires both active learning and motivation (Barkley, 2009), where *inquiry*, *reflection* and *discussion* are closely interrelated, allowing active thinking and communication, under the basic premise that to *think is to try to solve a problem.*

Focusing on how students can be encouraged to participate in teaching activities (TAs), the design of inviting and motivating TAs is an important issue. Firstly, TAs should aid students into achieving an integrated understanding of new knowledge, allowing their engagement and following their performance along the learning process. Secondly, TAs should be designed so that students feel that they are valued members of the group's learning process, where they can actively participate and be included in the generation of knowledge. Hence, by appropriate "hands-on" and "minds-on" activities, students can work together with peers while developing and transforming their own abilities for the acquisition of specific research and reasoning skills.

In this approach, TAs are examined together with collaborative learning, presenting an open problem to the whole group of students in the classroom (as one big group), that requires all their attention. The problem is proposed by the teacher, which here consists in an economic experiment game for making optimal decisions under uncertainty. The problem is a simulated situation that occurs in real life, where students have to play specific roles as if they were buyers or sellers, or bidders. Hence, this sort of teaching activities should motivate students to use (course-specific) economic concepts, together with the knowledge being generated in the activity itself, and propose analytical or intuitive solutions leading to the transformation of their previous knowledge. Hence, as it is proposed here, such a transformation unravels along the basic constructive pillars of inquiry, reflection and discussion.

The purpose of this paper is to examine the use of new technologies for the implementation of *engaging* TAs, regarding the way that different attitudes towards participation and learning can be guided into a collaborative learning process. Therefore, new technologies can be used to support an *easy-access* participatory environment, transforming the classroom into a dynamic scenario where students can easily participate, being motivated by a well-designed activity where different viewpoints are considered and active thinking develops together with peers. In consequence, a basic problem to be addressed here consists in evaluating the appropriateness, advantages and disadvantages, of using new technologies for building a collaborative learning environment in the classroom. Thus, we will examine some teaching situations where traditional and new technologies are used to support students' participation for new knowledge acquisition.

In order to discuss the use of new technologies in the implementation of TAs, a couple of teaching sessions have been designed. A first session develops on traditional technologies, i.e. face-to-face communication, while a second one makes intensive use of new technologies through a completely online activity, i.e., interaction is aided by the online system. After presenting the overall results comparing both sessions, a discussion will follow on the role of new technologies for achieving a collaborative learning environment inside the classroom.

Method

Participants

The participants for this pedagogical exercise were the students for the course Contracts and Cooperatives, which is part of the MSc programmes in Agricultural Economics, Agricultural Development, and Sustainable Development in Agriculture at the Faculty of Science, University of Copenhagen. In total there were 27 students enrolled, all of them with previous knowledge on basic microeconomic concepts, and the activities were implemented with the same group of students for both sessions.

Materials and Procedure

For the implementation of the TAs, traditional technologies consist in verbal communication, pen, paper, and the blackboard. Regarding new technologies, they are studied by means of the online Veconlab Virginia University webpage http://veconlab.econ.virginia.edu/, where students participate through their electronic devices like smartphones, laptops, etc., following the economic games setup from Holt, 2007.

The proposed activities require that students reflect and make inquiries on how they can solve specific decision problems under uncertainty. The problems are presented like an economic game, which can be repeated for a finite number of times. After each repetition, students should reflect on the outcome of the game, and discuss among them and with the teacher about the strategies and reasons for their behavior. The teacher then guides the discussion towards the relevant concepts, allowing students to engage while developing their own deep learning process. In this way, the proposed methodology for implementing TAs under a collaborative environment requires students to question themselves, search for answers, reflect, and discuss the way the problem can be solved. Under this setting, the use of technologies is examined by comparing the outcome of two types of activities, one making use of traditional technologies and the other making use of new technologies.

Activity with traditional technologies. Here students come up to the blackboard. Two of them play the role of car dealers and the rest of them play the role of car owners that want to sell their car at the highest possible value. Owners know the (good or bad) quality of their car by taking a random piece of paper with the description, which has been previously prepared by the teacher. Dealers ignore the quality of the cars, but desire to attract all the good cars while maximizing their profit. For doing so, they post their buying price on the blackboard and wait for sellers to come and make the trade. They can negotiate a different price, after watching the competition and negotiating with the car owners. The winner is the dealer with highest profit, and the game is repeatedly played with different car dealers.

Activity with new technologies. Here students connect directly to http://veconlab.econ.virginia.edu/cv/cv.php through their laptops or smartphones. The teacher has previously prepared the session, setting up the parameters for the specific auction procedure where students play the role of bidders. They login to the session and start reading the instructions on the online platform. First they read a general description of the basic concepts. Then they study some examples of the bidding mechanism, followed by a more detailed description of the auction procedure in which they will be participating. In the next step, they are asked a couple of questions, revising if they understood the procedure, and they are allowed to continue or go back if they need to revise key concepts. Finally a summary of the instructions is given, and the common value auction begins, interacting between them in pairs through the online platform, but ignoring precisely whom they are being matched up with.

Results

The first traditional activity required face-to-face interactive communication among students. All of them participated. This type of activity was very entertaining to see as it developed, as students felt more and more comfortable in communicating their ideas as the game continued. Knowledge was being actively generated, as dealers shouted the prices trying to attract more sellers of good cars. Some of them failed, either because they didn't attract sellers, or because they incurred into losses for buying only bad cars (illustrating the point of the theory), while others succeeded, attracting good cars and making a profit. A final winner was identified and a general discussion followed.

This activity succeeded at opening a sort of participation window in the classroom space, making it *natural* for students to pop in their own reflections and questions throughout the game activity and the following discussion. Students were highly motivated, which was very helpful for engaging students in discussing the relevant concepts for the course content.

On the other hand, the new technologies' activity had also total participation, verified by the teacher through the online platform, which allowed controlling the students' actions and address any possible doubts or problems that students could have. After the online bidding, the teacher focused on discussing the results, aiming at building together with students a collaborative environment in the classroom. The discussion grew from reflecting on the online activity and discussing the students' behavior in the game, pointing at the new concepts that were going to be formally treated afterwards in the course.

Supporting the discussion inside the classroom, the online game-activity was summarized by the same online platform, representing the students' actual behavior and how they solved the theoretical open problem of dealing with imperfect information (under the game setting, replicating the natural conditions of real life situations). That is, while students behaved as bidders, they had to make decisions based only on signals about the real value of the commodity that was going to be traded. All their actions were recorded by the system as they played, and after the bidding ended and the general reflection and discussion started, the online platform offered a new dimension to the learning environment, as the group became easily aware of their decisions by seeing them represented in the screen. This summarization of the activity motivated students to participate and comment on their own input for the generation of knowledge in the classroom. In this way, the online activity supported the discussion based on the students' actual experience, representing their knowledge, and even motivating them by presenting their own personal effort in undertaking a deep learning process.

Discussion

Based on deep-learning pedagogy concepts (Dolin, 2015; Entwistle, 2009), the whole system approach (Biggs and Tang, 2012) to the constructive alignment of a course enables a satisfactory learning and teaching experience. From this perspective, courses need to follow an optimal and fair design, allowing students to understand and achieve the intended learning outcomes (ILOs) and develop the relevant competences.

Overall, a well aligned course should have the ILOs coherently stated with respect to the TAs and the assessment tasks (ATs). For the TAs under study, the ILOs were the following,

- Describe the different problems arising from asymmetric information
- Reflect on theoretical and practical solutions for handling asymmetries in information

The problem arising from asymmetric information in the first activity referred to the dealer attracting only bad cars, being there adverse selection. In the second activity, it referred to winning the bid while incurring into losses, due to ignorance on the actual true value of the bid. Then, it becomes evident that the activities were designed to introduce the concept of asymmetric information, by posing an open problem where students needed to handle the uncertainty (*asymmetries of information*) of the simulated situations and arrive at solutions based on their own reflection and inquiry. The discussion following the role-play activities focused in examining their own solutions, and comparing them with the theoretical optimal solution.

In this sense, the discussion of the activities through the knowledge that was generated by students themselves was a very important (validation) phase in the deep and collaborative learning process. As their actions were recorded, either by their own written records and oral participation or by the online application, students could actually notice their inclusion in the group's learning process. In this way, the success of the TAs depended on having students participate and feel included in the generation of new knowledge, supporting the whole group discussion by their actual behavior in the game.

In the traditional activity, the blackboard functioned as a window for participating and building knowledge, as a tool bringing together the attention of students, like the common ground for materializing the knowledge being generated by everyone inside the classroom. So, what could be expected from the use of new technologies is nothing else than to bring into the classroom an open and easy access *blackboard* for everyone, sharing knowledge in the online platform and representing that knowledge for everyone to analyze (as opposed to the individual control sheets of the traditional activity which remain hidden unless the teacher summarizes them, with the respective time consuming effort which may be enough to lose the students' attention). In this way, although technologies may facilitate the representation of knowledge, building a collaborative environment inside the classroom does not depend solely on using new or traditional technologies, but rather on using the knowledge being generated by everyone in the activity through interesting and engaging discussions.

Thus, technological support can be useful for having active and open interaction with students, allowing them to discuss the activity's results by relating to an online platform that instantaneously represents everyone's knowledge. In this sense, new technologies may enhance the means for knowledge representation, aiding the emergence of a healthy dynamic among teaching and expectations, but stressing that they still require the appropriate framework for their successful implementation. Under this approach, it is proposed that the key pedagogical concepts for undertaking engaging activities consist in inquiry, reflection and discussion.

From a constructivist view (see e.g. Dolin, 2015), the individual learns by interacting with the surroundings, through the active and conscious activation of perception. Thus, the learning process develops from interpretation, reflection and adaptation, where the personal and structured view of the world has to somehow make room for new knowledge. Hence, new concepts have to be formed and reshaped, together with a deep understanding of scientific tools and skills for problem solving under multiple contexts. In this way, constructivism suggests a deep relation between inquiry and reflection. It can be conceived as a process of controlled reasoning of concepts through introspection and serious thought, attaining and transforming knowledge for problem-solving purposes. Besides the two learning dimensions of *inquiry* and *reflection*, a third one is included for representing the construction of knowledge in the classroom, referring to the interaction with peers (and the teacher) through the *discussion* of the relevant/new conceptual tools and skills. This last dimension allows students to verify and validate their (ongoing) comprehension of ILOs and competences.

As a final note, it should be expected that under a collaborative environment, students would find it easier to think and express their own take on reality, as opposed to having only introspective/theoretical exercises (which come with an important dose of artificiality and are commonly used by the teacher) to introduce and learn the new concepts. Furthermore, discussion leads to understanding the state of things together with peers, and to think about concepts and their meaning, motivating students through the social component of learning. Hence, deep and active learning should be more likely to occur in collaborative environments, where students bring themselves the questions on the artificiality of the classroom activities and reflect on how it would be in the real life. Therefore, traditional teaching could be enhanced not only by an adequate use of new technologies, but also by problem-solving activities, like open ill-framed problems (real-world situations that require bringing together both new and old knowledge) that (somehow) replicate real-life cases, supporting the deep and individual/social learning effort of students in well aligned courses. As it stands, the examination of these ideas on the relationship between problem solving, deep learning, motivation and new technologies, is left for future research.

Conclusions

The pedagogical exercise examined in this paper develops around the construction of new knowledge in the classroom by motivating an active and deep learning process through well designed TAs. Furthermore, the role of new technologies was explored for supporting TAs, aiming at engaging students into a collective learning collaboration. In this way, inquiry, reflection and discussion were identified as key concepts, allowing active thinking and communication for generating knowledge through interesting and engaging TAs.

In the particular situations analyzed in this exercise, it was more difficult to represent the participants' knowledge in a traditional setting, as oral negotiation took place, and the individual results were gathered in a piece of paper (the dealers' control sheets) that had to be later summarized in order to identify the winner. This summarization task was time consuming, on the contrary to new technologies, where the participants' knowledge was automatically represented for everyone to see and discuss around it.

Nonetheless, there are important risks on the use of new technologies, as they do not assure the successful implementation of TAs all by themselves. In this sense, this exercise is intended as a conscious reflection on the necessary aspects to be considered for implementing engaging TAs, while making efficient (and desirable) use of new technologies in the classroom.

For future research, problem-solving activities could be examined together with economic games, exploring the relationship between deep learning, motivation and technological support for the successful implementation of inquiry-based learning (see e.g. Edelson, Gordin, and Pea, 1999).

References

Barkley, E. F. (2009). *Student engagement techniques: a handbook for college faculty*. John Wiley & Sons.

Biggs, J. & Tang, C. (2012). Aligning the curriculum to promote learning. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (pp. 198–199). Boston, MA: Springer US.

Dolin, J. (2015). Teaching for learning. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 65–91). Samfundslitteratur.

Edelson, D. C., Gordin, D. N., & Pea, R. D. (1999). Addressing the challenges of inquiry-based learning through technology and curriculum design. *Journal of the learning sciences*, *8*(3-4), 391–450.

Entwistle, N. (2009). *Teaching for Understanding at University – Deep Approaches and Distinctive Ways of thinking*. Palgrave MacMillan.

Holt, C. (2007). *Markets, games, & strategic behavior*. Boston: Pearson.

Part II

Course design and redesign

8

Design af kurset “Statistical Analysis of Spatial and Observational Ecological Data in R”

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Introduction

Jeg har valgt at skrive om designet på et kursus i statistik og dataanalyse og brugen af R, et statistisk programmeringssprog, på kandidat-delen på biologi. Kurset var slået op som et 7.5 ECTS-point kursus med mig som kursusansvarlig og primær underviser. Desværre var der kun én enkelt tilmeldt studerende, og kurset blev aflyst. Jeg har derfor ikke mulighed for at inddrage noget empiri hvor jeg prøver mine idéer af i praksis. Den praktiske del af opgaven består altså i at jeg har forsøgt at implementere ideerne fra Universitetspædagogikum i en konkret plan for undervisningen. I forhold til den pædagogiske litteratur tager jeg først og fremmest udgangspunkt i lærebogen (Ulriksen, 2014).

Hvad er problemet, hvorfor er det relevant og hvem er det et problem for?

Statistik er et fag som de fleste biologer ikke bryder sig særligt meget om, og for mange er motivationen lav for at tilegne sig de færdigheder der ligger i det. Jeg tror en del af årsagen er at mange studerende ikke har en selvstændig interesse i statistik, og det bliver ikke kommunikeret tydeligt nok til dem at her er et fag der giver dem de kompetencer de har brug for til at kunne planlægge og udføre et selvstændigt forskningsprojekt. Altså at dataanalyse er en af de centrale færdigheder for at kunne lave det arbejde de drømmer om. De fleste studerende opdager halvvejs gennem specialet at de mangler statistiske færdigheder, og på det tidspunkt er der nogle der tilegner sig dem selvstændigt, mens andre kommer i vanskeligheder.

Det centrale problem jeg ønsker at arbejde med er at statistik i meget høj grad er præget af overfladelæring for de studerende. Det er meget almindeligt at de studerende kommer væk fra et statistikkursus med nogle konkrete opskrifter på at kunne lave bestemte analyser, en fornemmelse af at de har hørt begreberne, og en god portion forvirring (eller frustration, for de studerende der har et stort ønske om at forstå dybere). Dette baseret på mit overordnede indtryk, da jeg ikke har lavet specifikke kvalitative interviews med studerende.

Det er mit indtryk at selve undervisningen i statistik tit er anlagt så den opmuntrer til overfladelæring. Statistiske metoder præsenteres ofte med en liste af antagelser der skal være opfyldt for at man kan bruge en test, som de studerende forventes at lære udenad eller kunne slå op i. Hver type test præsenteres med en liste over hvilke tilfælde den kan bruges. Det implicitte billede er at statistisk dataanalyse består i, billedligt talt, at gå ind i et arkiv med tests, identificere den rette hylde, og så tage den rigtige test ned og anvende den. Det er imidlertid et misvisende billede af hvad statistisk dataanalyse er, der ikke hjælper de studerende når de når til at skulle bruge det til deres egne selvstændige projekter. Det beskrevne problem med overfladelæring er derfor et problem for de studerende, og faktisk et ganske stort problem. Overfladelæring styrker ikke de studerendes motivation, og giver en fornemmelse af at faget er kedeligt. Samtidig vil de ofte senere i studiet have brug for en selvstændig dybdeforståelse for at kunne anvende det de har lært i deres egne projekter, og forsinkelser i dataanalyse kan give problemer for studerende der har brug for at færdiggøre deres projekter til tiden. Samtidig er data-analyse en af de kompetencer som mange studerende vil få brug for efter studiet, ikke mindst hvis de vælger at gå forsker-vejen.

Hvad er baggrunden for problemet

Problemet med overfladelæring har flere årsager:

Stoftrængsel

Statistisk dataanalyse er et meget omfattende område i sig selv, og blot at lære brugen af de værktøjer som vil være relevante for de fleste biologistuderende, i teori og praksis, må nødvendigvis tage lang tid. Faget er i høj grad baseret på at opnå en færdighed, og for at opnå den færdighed kræves der en ret bred tilegnelse af teknikker. Det får underviserne til at anlægge et højt undervisningstempo, for at sikre at de når hele vejen rundt om stoffet. Min gamle statistiklærer, som har designet det nuværende statistik-fag på biologi, startede kurset med at sige: *"Vi tilstræber et tempo i undervisningen, der er som en bus der kører fra stoppestedet lige før I er kommet til det. Vi kører så langsomt at de fleste ikke når at give op og gå ind på fortovet, men så hurtigt at ingen rent faktisk indhenter bussen, sætter sig ind, og slapper af på sædet".* Jeg kan huske at den dedikation til at køre fra de studerende gjorde indtryk på mig.

Læringsbasis

En anden vanskelighed er at den teori de skal lære ikke bygger naturligt oven på viden fra andre dele af studiet, og det derfor ikke er nemt at identificere zone of nearest learning. For at få en grundlæggende forståelse af de ofte avancerede statistiske teknikker prøver man i undervisningen ofte at gennemgå den underliggende matematik, men det kan forværre vanskeligheden, da de studerende tit ikke har den nødvendige basis for at forstå f.eks. matrixberegninger og linear algebra. Forsøget på at etablere en grundforståelse går derfor hen over hovedet på dem.

Relevans

Endelig kan det være svært for de studerende at se at statistikken er relevant for dem, idet de tit har kurset før de starter på specialearbejdet, og derfor ofte ikke har arbejdet mere dybtgående med egne data. De enkle øvelser og eksempler der anvendes i undervisningen ligger tit langt fra de biologiske spørgsmål de er optagede af, og det kan derfor være svært for de studerende at se hvad de skal bruge det til. Det motiverer de studerende til at lære med henblik på at bestå eksamen snarere end for at tilegne sig stoffet, hvilket også fører til overfladelæring.

Hvad kan man gøre for at afhjælpe det?

Helt overordnet kan man arbejde med en kultur baseret på overfladelæring på flere forskellige måder:

Man kan reducere problemet med stoftrængsel ved at udvælge kraftigt i stoffet, og acceptere at der er elementer, der absolut er relevante for de studerende, der ikke bliver behandlet i undervisningen. Det kræver at man identificerer eksemplars, altså enkelte teknikker og sager der kan give en mere overordnet indsigt i faget som sådan. Dataanalyse har en både lodret og vandret vidensstruktur, vandret idet forskellige analyser lægger sig ved siden af hinanden og supplerer hindanden, lodret idet mange teknikker bygger oven på de samme grundlæggende forudsætninger og overvejelser. Teknikken er her at udvælge såkaldte eksemplars, der giver de studerende mulighed for selv at gøre sig de grundlæggende overvejelser, men også viser bredden af teknikker.

Man kan også basere læringen på problem-baseret undervisning, dvs. løsning af opgaver og samarbejde mellem studerende. Dette er den type af undervisning der er lagt vægt på at vi arbejder med i Universitetspædagogikum. Ved at stille friere opgaver øger man nødvendigheden for de studerende af at få en dybdeforståelse af stoffet, og motiverer dem til at tilegne sig den forståelse. Ved at arbejde i dybden med konkrete biologiske problemer tydeliggør man også forbindelsen mellem dataanalysen og de øvrige fag på studiet.

En større udfordring er hvordan man håndterer at de studerende har meget forskelligt indgangsniveau, og at en del, i øvrigt dygtige, studerende ikke har tilstrækkelige matematisk viden til at forstå den grundlæggende matematik bag de statistiske teknikker. Mit forslag, som jeg er usikker på om virker, er at eksperimentere med at prøve at undervise de studerende i matematikken på en mere indirekte og intuitiv måde – for eksempel ved at bruge snore og farvede sten til at visualisere forudsætninger og teknikker.

Hvad har jeg gjort konkret?

For at imødekomme problemet med overfladelæring har jeg valgt en strategi der baserer sig på problem-baseret læring, hvor de studerende indlærer ved at arbejde med økologiske problemstillinger der ligger tæt på dem der indgår i undervisningen i øvrige fag. Mit mål er, ikke at køre en bus der kører fra de studerende, men snarere en hjælpevogn som dem der kører i Tour de France, der sørger for at give vejledning og en opmuntring på vej op ad Alpe d'Huez. Kerne-indsigten som jeg ønsker at overgive til de studerende er at data-analyse er en kreativ del af den videnskabelige proces, og at der findes mange måder at gribe det an på. Derfor må al analyse tage udgangspunkt i at stille sit videnskabelige spørgsmål så præcist så muligt, og så lade analysen afspejle det, snarere end automatisk at vælge en bestemt test.

Udvælgelse af stof

De studerende arbejder med 3 økologiske datasæt, der bliver ved med at dukke op i forskellige undervisningstimer, til at illustrere forskellige elementer. Datasættene er: Et datasæt med artsrigdommen af forskellige dyregrupper fra forskellige øer fra hele verden (fra en artikel af Bunnefeld & Phillimore, Ecography 2010); et datasæt med skove i Volzhsko-Kamsky nationalparken (fra statistikbogen ”Analyzing Ecological Data” af Zuur et al., 2007); og et datasæt med artsudbredelser og fylogenier for kolibrier, der er en del af mit lab’s datasamling. Data er udvalgt så de kan bruges til at svare på mange forskellige spørgsmål, og er rimeligt eksotiske og biologisk spændende. Disse data fungerer som en form for eksemplars.

Der er en risiko som jeg dog er bekymret for ved at anvende de samme data flere gange. Hvis de foretager lignende (men tiltagende sofistikerede) statistik på de samme data kan det skabe forvirring over hvornår de laver noget der er forkert, eller i hvert fald ikke optimalt for et datasæt.

Evaluering

Jeg integrerer formativ evaluering i undervisningen. Idet udgangspunktet for kurset er at give de studerende en færdighed til at foretage selvstændig analyse, og at få erfaring med at tage valg og vurderinger i analyseprocessen, giver det ikke mening at afslutte kurset med en eksamen baseret på at kunne svare rigtigt på en række spørgsmål. I stedet sikrer jeg constructive alignment mellem målet og kursets elementer ved at lægge fokus på selvstændigt arbejde i undervisningen, og ved at evalueringen foregår som en aflevering af 3 projektrapporter i løbet af kurset. Rapporter afleveres i RMarkDown, som er et format der kombinerer grafik, computerkode og formateret tekst. RMarkDown er i sig selv et læringsmål for kurset. Rapporterne skrives 2 og 2 baseret på en selvstændig dataanalyse med et økologisk spørgsmål, og der afsættes en undervisningstime til mundtlig feedback til individuelle grupper efter hver rapport.

Arbejde med artikler

Et andet element som skal øge relevansen og sammenhængen med de øvrige ting de lærer på studiet er arbejde med analyser i publicerede artikler, gerne artikler der har data og analysekode som supplementary materials. En ofte underkendt funktion af statistiske færdigheder er at kunne vurdere og forstå andres artikler. Der vil hver uge være diskussion og gennemgang i grupper på 4 af en artikel, baseret på nogle spørgsmål stillet på forhånd af mig. De vil bla. blive bedt om at identificere tvivls-spørgsmål, uudnyttede muligheder og evt svagheder. Undervejs vil eleverne 2-3 af gangene herefter prøve at gentage analysen fra artiklen, og evt inddrage de muligheder de har identificeret. En af disse gange vil de skulle skrive en rapport, der er en af de 3 der nævnes ovenfor.

Fri arbejdsform og gruppearbejde

Som beskrevet ovenfor vil en del arbejde bestå i gruppe-arbejde, og der lægges vægt på at opgaverne stilles så de studerende må læse i hjælpefiler – eller i hjælpefora på internettet – for at kunne besvare opgaverne fuldt ud. Dette er den samme proces mange specialestuderende gennemgår senere, hvor de ikke nødvendigvis kan få god feedback på det analytiske. Her har jeg også én bekymring: at de studerende har svært ved at følge den mindre strukturerede form og forfalde til facebook m.m. når det bliver vanskeligt at se det næste skridt.

Hands-on

Endelig vil jeg prøve at håndtere det vanskelige problem at statistik bygger på relativt kompleks matematik som der ikke er mulighed for at lære de studerende at forstå til bunds med mindre de allerede har en stærk matematisk baggrund. Jeg tror man kan opnå en del ved at lade de studerende få ting i hænderne. F.eks måle vægten på en række småsten, og lave en fordeling og gøre det samme med sneglehuse (sikkert normal, hvis det er samme art, log-normal hvis det er forskellige arter), og bruge det som udgangspunkt for en diskussion af fordelinger (eller af, fra bunden – hvad ville de studerende gøre hvis de skulle udvikle en test for om den ene art havde større huse end den anden). Eller at bruge en pind og elastikker på søm til at udtrykke hvordan least squares (cirka) virker når man fitter en trendlinje. Eller at have små stykker plastik (hvis man kan skaffe det) som man kan lægge oven i hindanden for at illustrere additiv effekt af variable i en multipel regression.

Er der dokumentation for at det fungerer?

Jeg har ikke pt. nogen dokumentation for at mine idéer vil fungere. Jeg har dog det indtryk, bla. fra lærebogen, at der er bred empiri der understøtter at gruppearbejde, problem-baseret læring, og en satsning på dybde-forståelse er en effektiv undervisningsform. Nu blev kurset aflyst i år, men det giver mig tid til at udvikle idéerne endnu mere konkret, og evt at opsætte en prøveballon med nogle af de her elementer i forbindelse med noget af den anden undervisning jeg skal lave på andre kurser i det kommende år.

Hvilke overvejelser gør jeg nu? Er der flere perspektiver?

Der er masser af muligheder for at gøre det mere spændende. Det kunne være f.eks. spændende at lade de studerende generere et datasæt for holdet (højde, køn, geografisk baggrund, familiebaggrund etc.) og så også bruge det datasæt gennemgående. Det kræver dog nok et hold på mindst 30 personer at få data nok til det, så det er et perspektiv på længere sigt. Perspektivet er at blive ved med at udvikle kurset. Jeg forestiller mig at skruer man det rigtigt sammen kan man lave et rigtigt sjovt og interessant kursus, der samtidig giver de studerende baggrund for at lave et bedre speciale end de ellers kunne have gjort – og måske med mindre frustration.

Referencer

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

A Learning outcomes

Statistical Analysis of Spatial and Observational Ecological Data in R (REcoStat)

Education

MSc Programme in Biology

Content

The course aims at giving biology students the tools to perform independent data analysis for projects in ecology, and to understand and critically debate statistical data analysis in published papers. The main tool used in the course is the scientific programming language R, which is the de facto standard for ecological data analysis. The course focuses primarily on comparative analyses and observational data, which pose different challenges than designed experiments. The exercises will give the students an overview of the tools and packages available for analyzing and visualizing ecological data. Students will work independently on data analysis projects that focus on building the competence to do independent data analysis projects. Students are recommended to take the course during or prior to beginning their MSc thesis project.

Learning outcomes

After completion of the course, the student is expected to be able to:

Knowledge:

- describe the basic elements of the R programming language
- detail the statistical methods available for analysis of observational data
- describe the issue of pseudoreplication and autocorrelation, and detail the possible methods to deal with it
- know functions implemented in the R packages vegan for community ecological data analysis, nodiv and ape for working with macroecological data with phylogenetic trees, sp and raster for spatial data, ggplot2 for data visualization and dplyr for manipulation of data sets
- describe the difference between frequentist and bayesian statistics

Skills:

- use R to load data sets and do basic data analysis tasks
- program simple functions and simulations

- use the R documentation to find solutions for coding problems
- produce basic figures, such as scatter plots, histograms and bar plots for data visualization
- test and summarize statistical models of ecological data
- identify the assumptions of statistical tests and test if they are met
- use standard linear regression, and derived techniques, such as spatial linear models, generalized linear models with different error families, phylogenetic regression, and random effects.
- use the Rmarkdown syntax to produce a lab log of the analytical processes in a statistical analysis

Competences:

- work independently to perform statistical analyses in ecology
- understand the biological background and significance of different statistical tests and outcomes
- critically debate and replicate analyses in published research papers
- identify the right packages and tools for their data and problem
- identify and acquire the necessary knowledge to conduct novel types of analysis

Teaching and learning methods

The teaching will consist of class-room teaching that blends lectures with practical exercises. The practical exercises will be supplemented with discussions of analyses and discussions of some published papers. Three times during the course, the students will work in groups to prepare a lab report detailing a statistical data analysis, written in Rmarkdown.

Academic qualifications

The students should be familiar with basic statistical terms, such as variance, mean, normal distribution, common linear regression, significance and hypothesis testing. No previous experience with R or statistical software is assumed. Students familiar with R must expect to experience some repetition, as this constitutes an important element in the course.

Exam

Credit: *7.5 ECTS*
Type: *Assesment based on participation and the delivered reports.*
Marking: *passed/not passed*
Censorship: *No external censorship*

9

Redesign af kursus i Biogeography of Species Interaction Networks

Bo Dalsgaard

Center for Macroecology, Evolution and Climate
University of Copenhagen

Fag og baggrunds information

Et intensivt 1-uge kursus (Biogeography of species interaction networks) for kandidat og PhD studerende udbudt på Brasilianske universiteter. Jeg er hovedansvarlig for kurset, hvor der også er en dansk og en brasiliansk post-doc der underviser. Formålet med kurset er, at give de studerende et indblik i de basale koncepter der ligger bag en "netværks tankegang" og hvordan det kan bruges til, at forstå biogeografiske principper. Desuden lære de studerende rent praktisk at lave nogle udvalgte netværks udregningerne, og de skal under kurset udtænke og arbejde med egne projekt ideer. Et af vores håb er, at nogle af dem bliver inspirerede til, at bruge netværks analyser i deres egne kandidat eller PhD afhandlinger.

Problem (eller udfordring) jeg vil arbejde med

Kurset blev lavet fra bunden i 2015, inden jeg havde nogen form for pædagogisk indsigt. Der er derfor meget der kan forbedres på det pædagogiske plan – stort set alt – hvoraf jeg vil arbejde med:

A. studenter aktiverende elementer i forelæsningerne, som i 2015 var 45-min monologer;
   - Dette er både et problem for de studerende som højst sandsynligt keder sig og ikke kan koncentrere sig i 45-min, dvs minimal dybdelæring, og også et problem for mig som underviser da jeg faktisk også keder mig under 45 min monolog forelæsning!

B. variere måden at have artikel diskussioner, som i 2015 var udført på én måde, nemlig at vi undervisere havde forberedt nogle spørgsmål som de studerende diskuterede i små grupper i 20 min hvorefter vi i plenum diskuterede spørgsmålene.
   - I 2015 udgaven fik kritik at dette da det var kedeligt at gøre det samme syv gange inden for en uge, så det er et problem for de studerende der dermed taber motivationen og dermed også mindre dybdelæring.

C. Kursus strukturen med separate ”forelæsninger” og ”artikel diskussioner” kunne med fordel brydes.
   - Samme problem som ovenstående punkter, dvs både problem for de studerende som taber motivationen pga den manglende variation og interaktion, og problem for mig som underviser der heller ikke kan lide de lange sessioner med monologer.

D. Den først dag af kurset var i 2015 studenter power-point præsentationer af deres MSc/PhD projekter, med det formål dels at få introduceret alle, få lidt viden om deres arbejde og niveau, og dels at få alle i gang med at snakke fra starten af kurset.
   - I 2015 udgaven af kurset fandt jeg dog dette en kedelig måde at gøre det på, og dels blev det på denne måde lidt for formelt, hvilket ikke var hensigten (tværtimod) og der var generelt ikke specielt meget studenter-studenter interaktioner. Desuden havde det givet de studerende en del arbejde inden kurset som var bedre hvis de havde brugt på at læse de artikler de også skulle læse til kurset. Så de studerendes tid inden kursus start kunne være brugt bedre.

E. Den sidste dag arbejdede vi i 2015 med at integrere den viden de havde tilegnet sig på kurset med deres egne MSc / PhD projekter; der var der ikke nogen skabelon givet til dem udover ”udarbejde nogle projekt ideer”. De skulle igen lave en powerpoint præsentation af dette og præsentere deres projekter.
   - Som på første dagen blev det lidt for formelt, og desuden havde de ikke fået et godt redskab til at udvikle projekter.

Hvad er baggrunden for problemet?

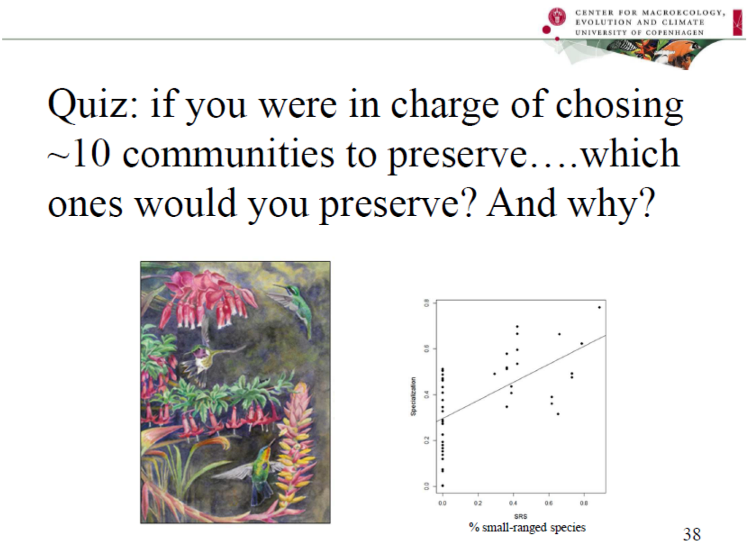
Et gennemgående problem med 2015 udgaven af kurset var, at det var alt for lidt fokuseret på at understøtte de studerendes læring (mere på at vi undervisere leverede en gang undervisning), konkret at: (A) der var for lidt interaktioner mellem underviser og studerende under forelæsninger, hvilket både gør undervisningen kedelig og at de studerende ikke kan koncentrere sig i alle 45 min, minimal dybdelæring, og dels gør at man som underviser ikke ved om de studerende forstår stoffet; (B) for lidt interaktion mellem de studerende, og dermed for lidt peer instruction, (C) for lidt variation - både den overordnede kursus struktur og også inden for de enkelte timer (feks ved artikel diskussioner, se 1B ovenfor), og de studerende vil derfor højst sandsynligt tabe motivationen; (D) vi kunne også ligge mere ansvar ud til de studerende og dermed gøre dem mere medansvarlige for lærings-processen, feks ved at inddrage dem i generering af spørgsmålene til artikel diskussionerne. Dermed vil de få et større medansvar for lærings processen, hvilket både burde øge deres motivation og læring. Helt overordnet kunne kurset således langt bedre understøtte dybdelæring.

Hvad jeg vil gøre for at løse eller afhjælpe problemet

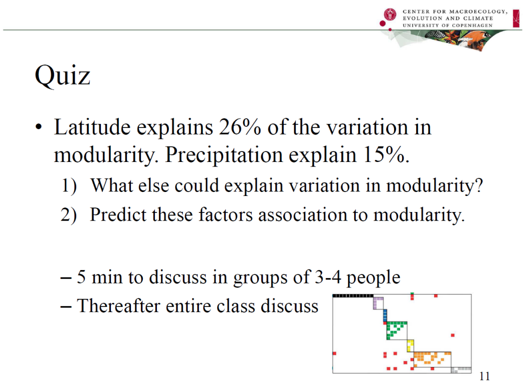
Jeg vil gennemrevidere kurset, og strukturere det således at der maksimalt er ca. 15 minutter mellem at de studerende er aktiveret på den ene eller anden måde, f.eks. med en quiz og par/gruppe-arbejde, mind mapping øvelser, skift mellem forelæsning og artikel diskussion, etc. Jeg vil også ændre første dagen totalt, således at vi har en hurtig 1 min uformelt mundtlig præsentation af hver studerende til kort at sige hvad de hedder og om de arbejder med kursets emne til dagligt, og om man er kandidat eller phd-studerende – og så bruge resten af tiden på at arbejde i grupper og udvikle ideer via SAVI CANVAS konceptet (se nedenfor), og til sidst på dagen præsentere dette som gruppe. Hver studerende vil også bruge SAVI CANVAS på sidste dagen af kurset til at udvikle deres egne projekt. Så det revidere kursus vil have et stærkt studenter-fokuseret undervisningsform med stor variation der gerne skulle stimulere dybdelæring.

Hvad har jeg gjort?

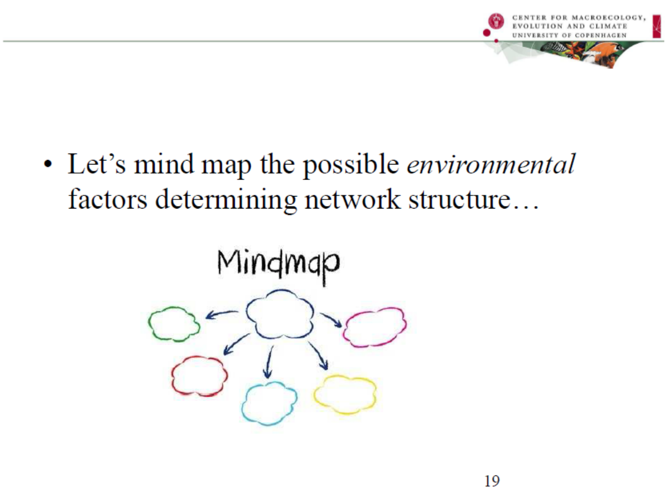
Kurset blev afholdt d. 11-15 Juli 2016 på Federal University of Mato Grosso do Sul (UFMS) i Brasilien, og jeg brugte ugen optil kurset til at revidere det. Dels reviderede jeg den overordnede struktur, så nogle af forelæsningerne feks smeltede sammen med artikel diskussioner og dermed blev der disse dage ikke forelæst mere end ca. 15 min inden der var overgang til en artikel diskussion eller en quiz/gruppe arbejde. Dels indlejrede jeg hver formiddag inden frokosten 30-min til at samle op på hvad vi havde lært i løbet af dagen før og om morgenen, for at kunne evaluere de studerendes forståelse og review af stoffet (space learning). Nedenfor beskriver og dokumenterer jeg hvordan jeg reviderede (A) forelæsningerne, (B) artikel diskussionerne, samt (C) først + sidste dagen med projekt udvikling som tema: A. Under forelæsninger havde vi indlejrede små quizzer som de studerende diskuterede enten i par eller i små grupper, som dermed aktiverede de studerende og deres læring, gav os undervisere feedback på de studerendes forståelse og også varierede undervisningen. Vi lavede også nogle mind mapping øvelser, se fire eksempler nedenfor.



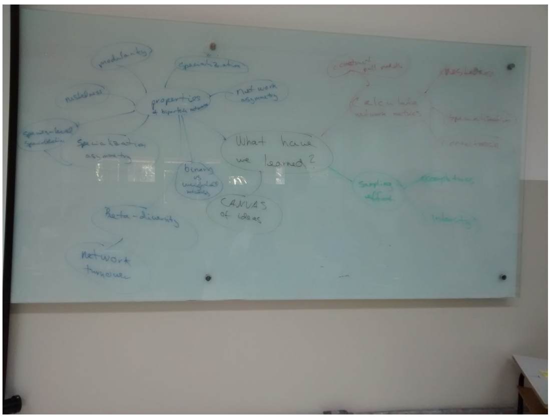
Ovenfor et eksempel på en quiz indlejret i en forelæsning. De studerende fik et par minutter til at diskutere i par, hvorefter vi snakkede om det i plenum. Spørgsmålet her er med vilje valgt så det både inddrager den viden de studerende har fået under forelæsningen samt appellere til ”real-world” situationer som biolog, hvor der ikke er penge nok til at bevare alle dyr og planter (institutionalization).



Ovenfor et andet eksempel på en quiz indlejret i en af forelæsningerne.



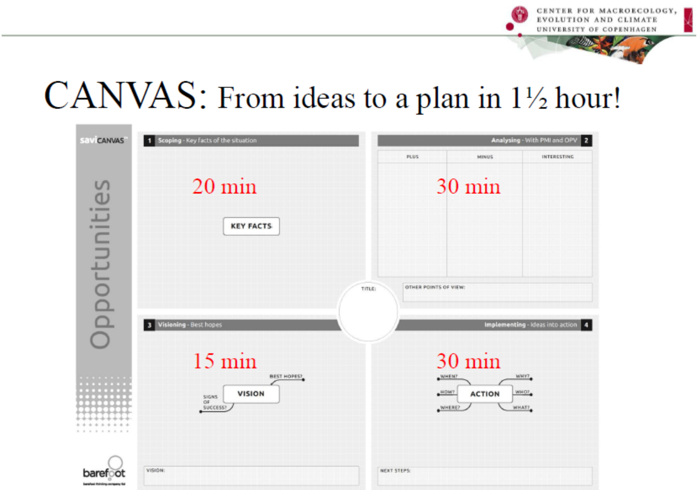
Ovenfor et eksempel på en mind mapping øvelse de studerende fik til opgave at udføre. Èn af de studerende skrev på tavlen mens de andre kom med input. De fik 5 minutter til øvelsen. De studerende kom frem til rigtig mange af faktorerne jeg ville nævne, men ikke dem alle. Så det både fortalte de studerende at de faktisk allerede havde en god viden, og fortalte mig hvad de manglede af forståelse så jeg kunne fokusere mere på det.



Ovenfor en anden mind mapping øvelse hvor vi midt på ugen repeterede hvad de havde lært i løbet af de første 2½ dag.

B. Vi varierede måden at have artikel diskussioner på, så de i år blev udført på tre forskellige måder: (1) vi som undervisere stiller spørgsmålene, (2) hver af de studerende bruger de første 5 minutter på at skrive et enkelt spørgsmål ned på en post-it og giver dem til underviserne, som udvælger 4-5 spørgsmål at diskutere, (3) laver en PMI (Plus – Minus – Interesting) på den pågældende artikel. I alle tilfælde er den første fase især fokuseret på studenter-studenter interaktioner og dermed peer instruction, mens den sidste fase er i plenum. Nedenfor billed fra diskussioner.

C. Den første og sidste dag til udvikling af projekter blev totalt revideret, nu brugende SAVI CANVAS konceptet, og med de studerende afsluttende dagene med at præsentere hvert af de fire del-elementer af CANVAS'en. Om mandagen, den første dag på kurset, blev dette udført i gruppe arbejde, dog startende med en individuel brainstorm af ideer, så en udveksling af ideer i par (think-pair-share) og derefter samlet i grupper af fire studerende, som arbejdede resten af dagen sammen på CANVAS'en. I forhold til 2015 hvor de studerende bare præsenterede færdige power-point slides, så øgede dette: (1) klart interaktions niveauet og der skabtes en super stemning med en summen inden for grupperne, (2) peer instruktion indenfor grupperne og mellem grupperne ved præsentationerne som blev fuldt op med 2 minutter til spørgsmål. Vi gentog dette sidste dag af kurset, denne gang individuelt med hver studerende arbejdende på at udvikle egne projekter. De studerende fandt det nemmere at lave CANVAS'en om fredagen, hvor de allerede havde prøvet konceptet og tilegnet sig mere viden indenfor netværks tankegangen. Se nedenfor en slide om CANVAS konceptet og dels nogle fotos fra mandagen med gruppe arbejde.



Ovenfor en slide illustrerende CANVAS konceptet og dets fire dele: 1) brainstorming, 2) en PMI – Plus Minus Interesting – analyse af de to bedste ideer, resulterende i en subjektiv måde at udvælge det bedste projekt, 3) visionen for det valgte projekt, 4) lave en ”action plan” for det valgte projekt. Hvert del element blev først illustreret af os underviserne.

Ovenfor CANVAS gruppe arbejde.

Ovenfor præsentation af CANVAS'en (5 minutter), med medstuderende lyttende og efterfuldt af 2 minutter til spørgsmål fra medstuderende og undervisere.

Hvordan har jeg produceret dokumentation for, hvordan det fungerede? Hvordan har jeg behandlet denne dokumentation?

- Dels sammenlignede jeg selv hvordan jeg fornemmede undervisningen var i 2015 med den reviderede udgave i 2016, så en subjektiv sammenligning af 2015 og 2016 udgaven af kurset.
- Dels brugte jeg meget tid på, at spørge om de studerende forstod opgaverne vi stillede, altså evaluerede løbende sammen med de studerende undervisningen. Og dels havde jeg via de indlejrede opgaver og spørgsmål konstant feedback på deres forståelse via deres svar.
- Desuden brugte vi til sidst på kurset tid på at de studerende evaluerede kurset, dels anonymt gennem et spørgeskema og dels mundtligt. Desværre havde jeg ikke en evaluering fra 2016 at sammenligne med. Nedenstående resultatet af kursus evalueringen.
- Desuden spurgte jeg også en bestemt studerende (Vitor Sanches) omkring dennes opfattelse af kurset. Jeg spurgte Vitor da han selv er underviser på et gymnasium og blandt har været i Finland for at lære hvordan de udføre deres undervisning. Så jeg synes, at Vitors mening

fra en studerende synsvinkel (og med en undervisers indsigt) ville være god feedback til mig. Nedenfor er lidt skrift fra Vitor.

Course "Biogeography of species interaction networks" taught at UFMS, Brazil, 2016

Question	**1**	**2**	**3**	**4**	**5**
How did you overall find the course?	0	0	0	4	19
Was the scientific level appropriate?	0	0	1	4	18
Was it possible to understand the teacher's english?	0	3	8	5	7
How did you find the overall structure or schedule of the course, mixing lectures and paper discussion?	0	0	0	4	19
How did you find having group work during lectures?	0	0	0	5	18
You developed ideas using the CANVAS approach. What did you think about this during Monday?	0	0	6	5	12
You developed ideas using the CANVAS approach. What did you think about this during Friday?	0	0	0	7	16
We evaluated the CANVAS by each of you presenting the CANVAS. What do you think about this?	0	0	2	3	18
We varied the way we did the Paper Discussions during the week. How do you evaluate this?	0	0	0	7	16
Paper Discussions - teacher's question	1	1	1	8	12
Paper Discussions - Students's question	0	1	7	6	9
Paper discussions - PMI	0	1	5	6	10
What did you think of the excersises?	0	0	2	10	11

Scale: 1 = poor, 2 = ok, 3 = good, 4 = great, 5 = excellent
Total nr of students: 23

From: Vitor Quadros Altomare Sanches
613, Julio Verne st, Dr. Albuquerque, Campo Grande, MS, Brazil
Doctorate student from UFMS.
Zip: 79.060-230

Campo Grande, July 27th, 2016

To: Whom may concern.

My name is Vitor Quadros Altomare Sanches, I'm a doctorate student in Ecology at Federal University of Mato Grosso do Sul (UFMS), Brazil. I teach Biology at Federal Institute of Education, Technology and Innovation of Mato Grosso do Sul (IFMS). I met Bo Dalsgaard through my doctorate university where he, with more two professors was the lecture in a course called "biogeography of species interaction network", 11-15th, July, 2016. I've never worked with this subject, but de course plan got my attention. A very student centred plan, with activities and foccusing in learning by doing.
The course was great. Almost everything runned as planned. Bo is very professional, but at the same time is very close from his student. A very opened professor. Able of hearing his students. Vigotysk and Paulo Freire are very well represented in his classes. All subjects where very well explained and assessed. And the reviews where constants.
If I hear that Bo will give another course close by me, I would like doing it.

Vitor Quadros Altomare Sanches

Hvilke overvejelser gør jeg mig i lyset af udviklingsprojektet? Hvordan kan jeg forklare, at det gik som det gik? Hvilke perspektiver rejser det for en videre udvikling, som kan afhjælpe problemet?

Både de studerende og os undervisere var rigtigt glade for modellen med aktiv studenter inddragelse og aktiviteter, og den variation der var skabt gennem kurset. Første dagen som før var formel og med forholdsvis lidt interaktion blev i år uformel og dynamisk med masser af interaktion. Den lavede en god start på kurset, og de studerende havde desuden lært CANVAS teknikken som de skulle bruge igen om fredagen til udvikling af egne projekter. Der var selvfølgeligt enkelte studerende der skulle adaptere til den interaktive undervisningsform da man i Brasilien normalt underviser med ”klassiske” 45 min monolog forelæsninger, men de fleste kom med på vognen og interagerede i plenum – og alle snakkede løs under gruppe arbejdet. Indlejring af spørgsmål undervejs i ”forelæsningerne” øgede klart de studerendes engagement, og dermed forhåbentligt læring, i forhold til 2015 udgaven. Og de studerende kunne rigtigt godt lide at artikel diskussionerne blev udført på forskellig måde fra gang til gang. Overordnet fungerede undervisningen rigtigt godt, synes både de studerende og os som undervisere. Og det var første gang, at jeg personligt som underviser syntes, at det ligefrem var sjovt at undervise – dejlig fornemmelse!

10

Studenter-undervisning: At flytte de studerende til den aktive rolle giver motivation og øget læring

En omlægning af et forløb i kurset Advanced Spectroscopy

Joachim Møllesøe Vinther

Institut for Lægemiddeldesign og Farmakologi, Københavns Universitet†

Motivation

Der er en tendens til at såvel studerende som underviser oplever en mangel på energi/motivation i forbindelse med blokstrukturens 8-17 undervisningsdage (Science på Københavns Universitet), når den klassiske opbygning med forelæsning, regneøvelser og computer/laboratorieøvelser anvendes. Virkningen af en omlægning til studenter-undervisning ønskedes derfor undersøgt.

Indledning

I forbindelse med overtagelse af et undervisningsforløb på 1 halv og 1 hel dag, hvor den tidligere underviser gav udtryk for at specielt den hele dag føltes meget lang for såvel studerende som underviser, besluttede jeg at ændre undervisningsformen fra et meget traditionelt forløb, hvor en 4-timers session forløb med forelæsninger i to timer efterfulgt af regnetimer i to timer. Den første undervisningssession havde oprindeligt dette format og den anden det samme efterfulgt af 4 timers computerøvelser.

I det nye set-up bestod den første session af 1 time med introduktion med en TDS-baseret (dvs. faseopdeling som fx skitseret i (Ulriksen,

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2014, p. 291)) induktiv øvelse som skulle virke motiverende og inspirerende for de studerendes planlægning af deres eget undervisningsforløb. Derefter havde de studerende tre timer til at planlægge og forberede ca. ½ times undervisning hver, som skulle bruges i næste 4-timers session. Den sidste 4-timers session var afsat til en forskningsbaseret computerøvelse som afsluttede forløbet ved applicering af det tillærte teoretiske stof.

Hovedformålet med omlægningen var at flytte de studerende fra den passive rolle over i den aktive, hvilket mange studier (fx (Bonwell og Eison, 1991, Prince, 2004, Freeman m.fl., 2014)) peger på giver et større udbytte og i sig selv virker motiverende. Derudover var formålet at gøre de lange dage mere overkommelige for både studerende og underviseren, at styrke dybdelæringen og imødekomme flere elevtypers forskellige måder at lære på (Beck, 2013, s.607-610).

Effekten af omlægningen af undervisningen vurderes ud fra spørgeskemaer (bilag B), hvor de studerende blev bedt om at vurdere undervisningen (1. og 2. session) ift. den traditionelle form (som forudsættes velkendt blandt de studerende) samt via egne observationer ifm. undervisningen samt refleksioner i forbindelse med supervision (faglig såvel som pædagogisk vejledning) af dele af forløbet

Begrundelse for valg af omlægningen til studenter-undervisning

Som nævnt ovenfor, viser flere studier at aktiv læring forbedrer læringen og virker motiverende. Da det dertil er min opfattelse at de studerende bliver mere og mere passive i løbet af lange undervisningsdage samt at underviseren kan have svært ved at få energien til at slå til, var det vigtigt for mig at omlægge til et format, der både understøtter læring og flytter såvel ansvar som opmærksomhed over på de studerende. Dertil kommer ønsket om motivationsskabelse og studenterovervejelser angående læreprocessen. Emnet for de to undervisningsgange kunne tilmed bære præg af en stor mængde udenadslære førende til overfladelæringsstrategier (fx (Ulriksen, 2014, p. 124-127)), hvilket øger risikoen for, at de studerende dels taber motivationen dels glemmer hurtigt, hvis det ikke lykkes for dem at identificere nøgleelementer mv. dvs. systematiserer det tillærte ved at bevæge sig til de højere taksonomiske niveauer.

Valget af studenter-undervisningsformen fandt jeg opfyldte mange af de ovenstående betragtninger. De studerende kommer i den aktive rolle, de bliver tvunget i dybden med deres emne og tvunget til at identificere nøgleelementer i deres emne, da det var et krav til deres undervisning, at de skulle vælge fokus for deres undervisning samt udvælge/udarbejde en eller flere små-opgaver til deres medstuderende – krav der også skulle medvirke til at de nåede analyse-niveau.

For at fremme motivationen samt at give inspiration til de studerendes planlægning af undervisning, startede jeg første session med en kort PBL (problembaseret læring) session (fx (Ulriksen, 2014, pp.343-372)), hvor de studerende arbejdede induktivt med nogle data, hvorved de automatisk tillærte flere grundbegreber.

Da ændrede undervisningsmetoder kræver tilvænning og ofte skaber en vis modvilje hos de studerende samt på baggrund af et ønske om at fremme og fokusere de studerendes forberedelse, annonceredes undervisningsformen over den elektroniske undervisningsplatform en uge i forvejen. De studerende blev ved samme lejlighed tvunget til at danne grupper og vælge emne, således at de havde mulighed for at forberede sig specifikt og målrettet til første session.

Velvidende at de studerende ville have svært ved at forstå visse dele af deres emner og at tilrettelægge deres undervisning, valgte jeg at afsætte det meste af første session til, at de studerende skulle arbejde med forståelse og forberedelse af eget emne. Det er meget tid at afsætte til dette, men tanken var at de studerende ville være yderst motiverede og at der ville være tale om givtig dybdelæring.

Med den valgte tilrettelæggelse af undervisningen, ville den lange undervisningsdag desuden have de studerende i centrum næsten hele dagen, understøtte at de studerende selv italesætter det faglige indhold og skabe en afvekslende undervisning, hvilket forbenligt ville øge motivationen, gøre de studerende mindre passive og gøre dagen mere overkommelig for både studerende og underviser.

Opbygningen af undervisningen

Undervisningen er opbygget af tre 4-timers sessioner, hvoraf den første ligger en mandag formiddag og de næste en onsdag for- og eftermiddag. I korte træk fremgår forløbet af Figur 1.

Tabel 10.1: Forløbet af de tre sessioner.

Før 1. session	De studerende skal melde sig på et af fem emner i grupper af to-tre studerende. Dette foregår elektronisk. De bliver således også orienteret om undervisningsforløbet.
1. session	Kort forelæsning som introducerer emnet og motiverer vha. en induktiv opgave samt info om den forskningsbaserede afsluttende computerøvelse. Introduktion til forløbet: Vælg fokus/foki og opgave(r). De studerende arbejder med at forberede den undervisning som de skal stå for i næste session.
2. session	De studerende underviser i hver deres emne – ca. ½ time hver.
3. session	Kort introduktion til computerprogrammet og data De studerende arbejder først med let fortolkelige data og derefter med data fra forskningsprojektet som blev introduceret i 1. session

Observationer fra undervisningen

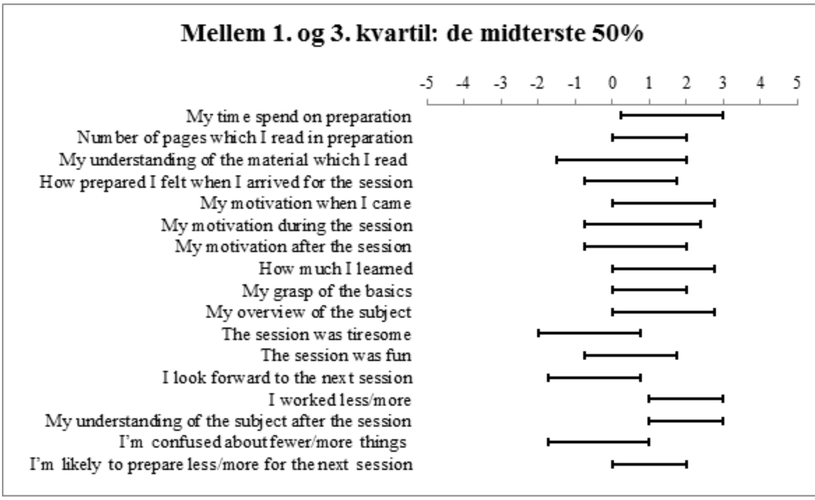
De studerende var med fra starten og den PBL-baserede session virkede efter hensigten. Derefter arbejdede alle studerende godt og målrettet med forståelse af deres eget emne og forberedelse af deres undervisning. Nogle få var frustrerede over, at det var svært, så det var rigtigt at afsætte undervisningstid til deres forberedelse. Flere grupper var meget målrettede og håbede på at blive færdige hurtigst muligt, så det var vigtigt, at der var klare krav til produkt samt mulighed for underviseren for at diskutere og dermed validere med grupperne undervejs – her opstod også mange gode diskussioner. Kravet om valg af fokus og udvælgelse af opgaver var klart medvirkende til at få de studerende hævet fra et reproducerende til systematiserende taksonomisk niveau (trin 4-5 i SOLO-taksonomien). Det skal dog også nævnes at to studerende udviste meget modvilje over formatet, da de efter eget udsagn ikke mente, at de ville lære ligeså meget af medstuderende som af underviseren. Det kom dog senere frem at den ene af de to har det meget svært med at holde oplæg foran mange mennesker, hvilket måske også kan forklare modviljen mod formatet.

Anden session bød på meget afvekslende undervisning, idet nogle grupper valgte at forelæse og afslutte med en opgave, nogle valgte at veksle mellem korte instruktioner og korte opgaver og andre at bede de studerende sætte sig helt op foran i en kreds om tavlen og løse udvalgte problemer i fællesskab. Niveauet var for enkelte mest reproducerende (trin 3 i SOLO-taksonomien), hvor de holdt sig til at fremlægge meget tekstnært og valgte en opgave fra bogen. De fleste havde imidlertid bevæget sig til trin 4-5, idet de udvalgte nøgleelementer og selv konstruerede flere meget illustrative opgaver af forskellige sværhedsgrader. Undervisningen bød på flere relevante og spontane diskussioner de studerende imellem. Kun sjældent blev jeg inddraget i underviserrollen og havde således mulighed for at indgå på et langt mere lige niveau med de studerende, hvilket lod til at indvirke positivt på studenter-lærer-forholdet i tråd med bl.a. læringscirklen (fx (Beck, Hansen og Damberg, 2013, s.632)). Det var meget positivt at se, hvordan et hold bestående af meget passive studerende blev aktivt diskuterende og bidrog fordi deres ligestillede stod for undervisningen – og løftede opgaven flot.

Tredje session startede ud med opvakte studerende, men flere af dem blev ufokuserede og gjorde opmærksom på, at de syntes øvelsen var irrelevant for deres videre studier. De spurgte endvidere til, hvad mindstekravet for øvelsen var. Dette manglende engagement var overraskende for mig og understreger vigtigheden af specifikke produktkrav, hvilket ikke var opfyldt, da opgaven var forskningsbaseret og resultatet dermed ukendt – dette havde jeg troet ville virke tilstrækkeligt motiverende, men var tilsyneladende demotiverende for flere på holdet, hvis prioritet var at blive hurtigt færdige. De har således været mere præstationsorienterede (elevtyper: (Beck, 2013, s.609)) end jeg havde antaget. Senere kom det frem, at en anden underviser på kurset havde givet en obligatorisk opgave med afleveringsfrist samme aften, og at kun én studerende havde afleveret denne opgave inden undervisningsdagen. Dette er således et eksempel på, hvordan eksterne faktorer kan indvirke negativt på undervisningen samt, hvor vigtig koordinering underviserne imellem er jf. Entwistles kongruens-begreb (Ulriksen, 2014, s.43). De studerende, der kastede sig ud i opgaven (delen uden kendt løsning), nåede alle et reflekterende niveau, hvor vi diskuterede muligheder og begrænsninger ved den anvendte metode.

Evaluering af omlægningen af undervisningen

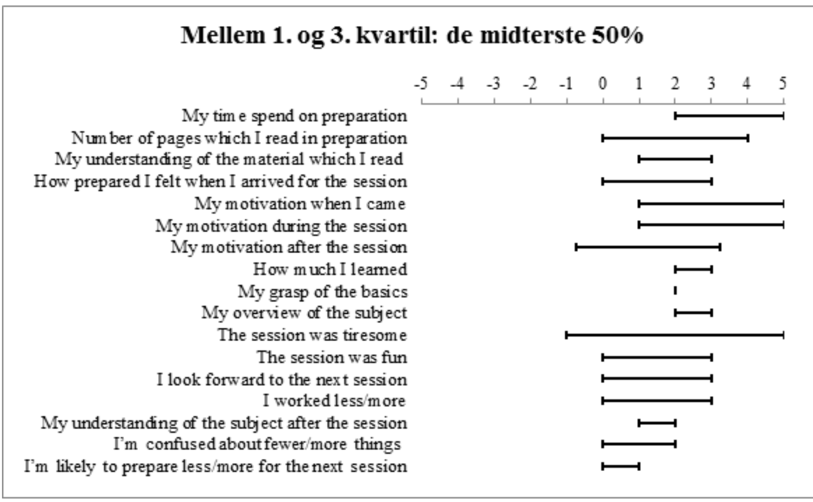
For at evaluere de studerendes egen opfattelse af undervisningsændringen blev de bedt om at besvare spørgsmål, der adresserede deres forberedelse, læring og motivation ift. den traditionelle forelæsnings-regneøvelsesbaserede undervisning. Denne evaluering anvendtes i session 1 og 2, da det var disse sessioner, der indeholdt ændringen af undervisningsmetoden.



Figur 10.1: Første session – intro-forelæsning med TDS element og de studerendes forberedelse af deres undervisning

Holdet bestod af ca. 15 kandidatstuderende, hvoraf 12 besvarede spørgeskemaet for session 1 og 11 besvarede for session 2. I Figur 2 og Figur 3 er afbildet intervallet for de midterste 50% af besvarelserne på den skala fra -5 til +5 på hvilken de studerende blev bedt om at afbilde undervisningen ift. den traditionelle form. Valget af afbildning af intervallet mellem 1. og 3. kvartil – altså de midterste 50% – er truffet for at undgå at de få ekstreme besvarelser (se bilag A "Alles besvarelser af spørgeskema") skal overskygge den store midtergruppes besvarelser. Specielt én studerende (lys grå udfyldt cirkel i bilaget) var meget frustreret over at skulle varetage undervisningen, hvilket afspejler sig i ekstremt negativ respons på session 1.

Hvis vi betragter besvarelserne for 1. session fremgår det, at de studerende mener, at de har brugt mere tid på forberedelse (My time spend on preparation) og læst flere sider (Number of pages which I read in preparation) til trods for, at de normalt har en større læsemængde, idet de denne gang kun skulle læse til deres valgte emne. Emnet må imidlertid være faldet dem svært, idet deres forståelse af det læste ikke vurderes højere end normalt (My understanding of the material which I read). Til gengæld vurderer de, at de i alt har arbejdet mere (I worked less/more) og har en signifikant bedre forståelse efter timen end normalt (My understanding of the subject after the session: +1-+3). De mener også, at de har en bedre forståelse af basis (My grasp of the basics), og at de har lært mere og måske mest overraskende, at de har et bedre overblik end normalt (My overview of the subject) – et punkt forelæsningen ellers måtte forventes at være egnet til at give. Desværre angiver de også, at de ikke har været særligt meget mere motiverede (My motivation when I came, My motivation during the session, My motivation after the session), hvilket er lidt overraskende, men måske skyldes, at flere er lidt nervøse over næste session.



Figur 10.2: Anden session - de studerende underviser hinanden

Hvis vi vender blikket mod 2. session, ser vi igen, at de studerende angiver, at de har forberedt sig signifikant mere (My time spend on preparation, Number of pages which I read in preparation, How prepared I felt when I arrived for the session), har lært betydeligt mere (How much I learned, My grasp of the basics, My overview of the subject, My understanding of the subject after the session) og følte sig mere motiverede under sessionen og da de kom (My motivation when I came, My motivation during the session).

Besvarelserne på spørgsmålene ”The session was tiresome” og ”I look forward to next session” er svære at konkludere noget ud fra, og det mistænkes, at de studerende har forstået dem på forskellige måde fx er det uklart om ”next session” referer specifikt til næste time eller mere generelt til denne type af time. Dertil kommer, at nogle studerende fokuserede meget på, at de ikke havde lyst til at skulle undervise næste gang, mens andre bredere betragtede næste session, fx det at andre studerende skulle undervise.

I alt synes udbyttet af undervisningsomlægningen, således at blive vurderet positivt af de studerende, der tilmed vurderer, at de opnår et bedre overblik end ved den traditionelle forelæsning – noget der ellers normalt fremføres som en styrke ved forelæsningen.

Diskussion og konklusion

Mange såvel undervisere som studerende har muligvis indvendinger imod at lade de studerende undervise hinanden – ”Får de formidlet det rigtige?”, ”Kan jeg stole på, at min studiekammerat har sat sig godt nok ind i det?”, ”Får de studerende de rigtige noter?” Imidlertid handler undervisning jo ikke kun om at få de rigtige noter, men i langt højere grad om at beskæftige sig med det stof, der skal tillæres – altså at de studerende er aktive med stoffet. Baseret på såvel spørgeskemaer som egne iagttagelser synes det, ud fra dette lille studie, klart at være en god mulighed at lade de studerende undervise hinanden. De kommer virkeligt i dybden med de dele af stoffet, de selv skal undervise i og når et højt taksonomisk niveau for den undervisning, de leverer, men som underviser skal man være opmærksom på, at dette ikke sker automatisk. Flere af de studerende skulle presses af specifikke krav til deres undervisning for at nå de højere taksonomiske niveauer. Det synes vigtigt at stille krav om udvælgelse af nøgleelementer, fokus og at de selv skal stille eller udvælge relevante opgaver til deres undervisning, da der ellers er en stor risiko for, at mange falder ned på et reproducerende niveau, hvor de slavisk ønsker at gennemgå teksten. En interessant pointe fra spørgeskema-besvarelserne er, at de studerende vurderer, at de har opnået et bedre overblik end ved traditionel forelæsningsbaseret undervisning efter sessionen med studenter-undervisning – et punkt flere studerende ellers a priori stiller sig skeptiske overfor. Læringen lader således til ikke at være i fare ved studenter-undervisning.

Et andet formål med omlægningen var at øge motivationen og engagementet ud på eftermiddagen. I løbet af formiddagen (anden session) virkede alle studerende mere motiverede og engagerede end ved traditionel forelæsning, hvilket stemmer overens med de studerendes egen vurdering af motivationen i løbet af anden session. Til gengæld var det småt med engagementet hos flere studerende ud på eftermiddagens computerøvelser – i hvor høj grad det skyldes det nævnte uhensigtsmæssige sammentræf med en obligatorisk aflevering, eller om det skyldes, at den forskningsbaserede opgave var for svær og skulle have været delt i mindre og dermed mere overkommelige bidder, er ikke klart. Der er derimod ikke noget, der tyder på, at det var omlægningen til studenter-undervisning (1. og 2. session), der var skyld i denne observation fra 3. session. Dog kunne computerøvelsen integreres endnu bedre med studenter-undervisningen.

Angående effekten på de studerendes forberedelse er der heller ikke noget at sige omlægningen på – de studerende vurderer klart, at de har arbejdet mere med stoffet og man kunne fristes til at mene, at dette var endnu en væsentlig årsag til det gode udbytte ved omlægningen af undervisningen.

Til gengæld synes det relevant at tænke i muligheder for at differentiere formen for at imødekomme studerende som synes, at det er for meget at stå foran alle holdkammeraterne – tvang til dette resulterede i dette forsøg i uhensigtsmæssig modvilje fra enkelte studerende, men kunne sagtens resulterer i fravær.

Afslutningsvis vil jeg på baggrund af dette lille forsøg konkludere, at studenter-undervisning ser ud til at højne de studerendes faglige og taksonomiske niveau og motivation i kraft af, at de beskæftiger sig aktivt med stoffet, samt at denne omlægning ifølge de studerende gav dem et bedre overblik over stoffet end den traditionelle forelæsning. Det er imidlertid vigtigt at notere sig, at et positivt resultat med studenter-undervisning ikke kommer af sig selv, men i stor udstrækning bygger på, at der i denne svagt rammesatte undervisningsform stilles tydelige produktkrav som dog stadig giver plads til kreativitet. Dertil er det vigtigt, at der gives tid til, at de studerende kan sparre med underviseren / underviseren kan validere de studerendes arbejder i forbindelse med forberedelsen af deres undervisning.

En stor tak til 2015/16-holdet i Advanced Spectroscopy for mere eller mindre frivillig deltagelse i det ovenfor beskrevne lille forsøg samt udfyldelse af spørgeskemaer som gjorde det muligt at besvare flere væsentlige elementer for undersøgelsen. Tak.

Referencer

Beck, S. (2013). Ungdomskultur og elevstrategier. I E. Damberg, G. Ingerslev, J. Dolin & P. Kaspersen (Red.), *Gymnasiepædagogik*. Hans Reitzel.

Beck, S., Hansen, D. R. & Damberg, E. (2013). Lærerrolle og professionsbevidsthed. I E. Damberg, G. Ingerslev, J. Dolin & P. Kaspersen (Red.), *Gymnasiepædagogik*. Hans Reitzel.

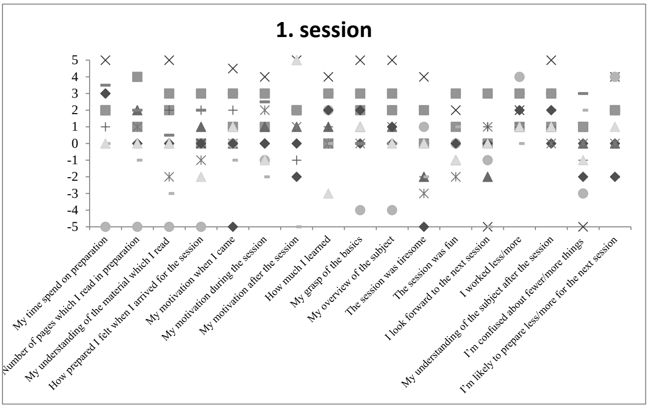
Bonwell, C. C. & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom.* Jossey-Bass.

Freeman, S., Eddy, S., McDonough, M., Smith, M., Okoroafor, N., Jordt, H. & Wenderoth, M. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proc. Natl. Acad. Sci. USA*, *111*, 8410–8415.

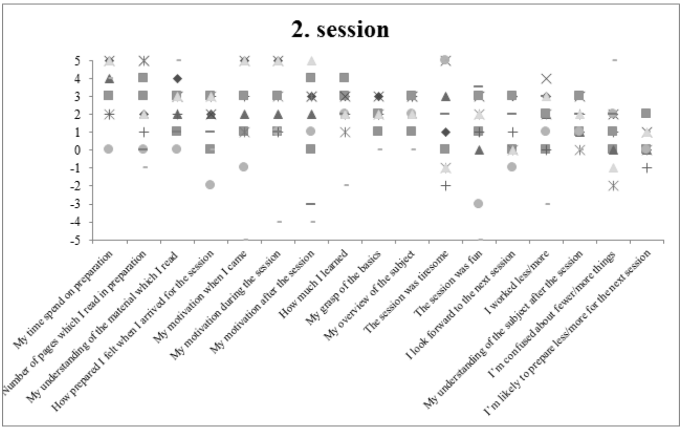
Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223–231.

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

A Alles besvarelser af spørgeskema



Figur 10.3



Figur 10.4

B Spørgeskema

Please answer the following questions indicating on a -5 – +5 scale, where **-5 = much less, 0 = equivalent, and +5 = much more** how you feel about the current teaching session as ***compared*** *to a traditional teaching session (i.e. lectures and exercises)*

Name (or sign or number or alias for tracking):

	-5					0					+5
1. My time spend on preparation											
2. Number of pages which I read in preparation											
3. My understanding of the material which I read											
4. How prepared I felt when I arrived for the session											
5. My motivation when I came											
6. My motivation during the session											
7. My motivation after the session											
8. How much I learned											
9. My grasp of the basics											
10. My overview of the subject											
11. The session was tiresome											
12. The session was fun											
13. I look forward to the next session											
14. I worked less/more											
15. My understanding of the subject after the session											
16. I'm confused about fewer/more things											
17. I'm likely to prepare less/more for the next session											

Figur 10.5: •

Compared to a traditional session, it was something different that I learned (e.g. methods instead of overview or. . . ?) [yes/no]
Please specify:

Other comments:

11

Udvikling af kurset Basal Ernærings-patofysiologi til uddannelsen i Klinisk Ernæring

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Indledning

Kandidat uddannelsen i Klinisk Ernæring (KE) er blevet udbudt på Institut for Idræt og Ernæring (NEXS) ved København Universitet siden 2003. Der optages årligt ca. 28 studerende på uddannelsen, hyppigst er den uddannelsesmæssige baggrund enten en professionsbachelor i klinisk diætetik (klinisk diætist), eller en universitetsbachelor i fødevarevidenskab eller biologi (udtræk fra intern studenterdatabase på NEXS). De senere år har uddannelsen været således bygget op at KE-studerende i de første 2 blokke på år 1 følger samme fag som de kandidatstuderende i Human Ernæring (HE), hvorefter de to studieretninger bliver splittet op (fig. 11.1).

På baggrund af anbefaling fra et aftagerpanel, der består af interne professorer og lektorer med interesse for klinisk ernæring, tidligere KE-studerende, samt læger fra de hospitalsafdelinger, som primært aftager kandidater i klinisk ernæring (bilag A), sammenholdt med kursusevalueringer fra nuværende studerende (bilag B), er det blevet besluttet at ændre opbygningen af KE-uddannelsen. Kursusevalueringen i bilag B, stammer fra faget Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi (15 ECTS), der betragtes som hovedfaget på uddannelsen. Her undervises i sygdommes indflydelse på ernæringstilstand og metabolisme af næringsstoffer og muligheder for påvirkning af sygdomsforløbet hos den enkelte patient gennem ernæringsterapi. At dømme fra de studerendes evalueringer, finder de kurset spændende og brugbart. De giver dog samtidig udtryk for at det ville være bedre hvis kurset forløb over flere blokke, så der var mere tid til

Kassogram - Klinisk ernæring, 45 ECTS-point speciale

	Blok 1	Blok 2	Blok 3	Blok 4
1. år	Nutrition Physiology	Evidence, Diet and health	Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi	Kvalitetssikring og ledelse
	Experimental nutrition physiology	Nutrition related diseases		Klinisk Borneernæring
2. år	Valgfri	Speciale		
	Valgfri			

Kassogram - Klinisk ernæring, 30 ECTS-point speciale

	Blok 1	Blok 2	Blok 3	Blok 4
1. år	Nutrition Physiology	Evidence, Diet and health	Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi	Kvalitetssikring og ledelse
	Experimental nutrition physiology	Nutrition related diseases		Klinisk Borneernæring
2. år	Klinisk praksis inkl. stresskommunikation*	Valgfri	Speciale	
		Valgfri		

Figur 11.1: Nuværende opbygning af kandidatuddannelsen i klinisk ernæring ved henholdsvis 45 og 30 ECTS speciale. Grå felter er obligatoriske elementer. Kurser er angivet på det sprog de udbydes på (Den uddannelsesspecifikke del af studieordningen for kandidatuddannelsen i klinisk ernæring, Københavns Universitet, 2015).

at fordybe sig i det pensum, der er essentielt for specialiseringen i klinisk ernæring. Dette fremgår bl.a. af nedenstående tre citater fra seneste kursus evaluering, studieåret 2014/15 (bilag B).

"Kurset virker ret essentielt for vores videre færden som KE'er, så det er ærgerligt at det kun løber over én blok. Det betyder nemlig at vi skal nå utrolig meget på ret kort tid. Hvis kurset varede 2 blokke kunne vi nå at blive rigtig gode til rigtig meget af pensum - som det er nu, er det gået så stærkt at man kæmper for at holde fast i det man synes man har lært og prøve ikke at blande tingene alt for meget sammen".

"Blokken er for kort i forhold til undervisningens indhold og høje niveau".

" [. . .] jeg ville sætte meget større pris på, og have langt bedre udbytte fagligt af, at dette kursus fik lov at fylde 2 blokke, da dette kursus er kerneessensen af uddannelsen for KE'er".

Aftagerpanelets anbefalede i overensstemmelse hermed oprettelsen af et nyt 7,5 ECTS kursus i patofysiologi, idet det bl.a. ville frigøre plads til mere fokus på selve ernæringsterapien på kurset *Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi.*

Det er således i 2015 blevet besluttet at første års kandidatstuderende i Klinisk Ernæring fra 2016 skal have et nyt obligatorisk fag i blok 2, for at opnå en mere dybdegående gennemgang af menneskets ernæringsfysiologi under normale samt patofysiologiske forhold, opnå mere indsigt i ernæringsterapi ved forskellige sygdomme, og nå omkring væsentlige elementer, der er for komprimerede eller helt undlades i uddannelsen nuværende form. Formålet med denne afsluttende opgave på mit adjunkt pædagogikum forløb er at beskrive udviklingen af faget *Basal Ernærings-patofysiologi* med fokus på udarbejdelse af målbeskrivelsen. Kursusbeskrivelsen er indsendt til studienævn for Studienævn for Fødevarer, Human Ernæring og Idræt i november 2015, og forventes at blive tilgængelig i Københavns Universitets kursuskatalog i foråret 2016.

Beskrivelse af udviklingsaktiviteten og af dokumentationsformerne

Udviklingen af kurset er grebet an som bekrevet i de følgende afsnit. Første trin, identificeringen af behovet for et nyt kursus, er som beskrevet i indledningen baseret på anbefalinger fra et aftagerpanel samt kursusevalueringer fra nuværende studerende (bilag A og B).

Placering og organisering af kurset

Som det fremgår af fig. 11.2, vil kurset *Eksperimental Nutrition Physiology* (7,5 ECTS) udgå fra KE uddannelsen, kurset *Nutrition Related Diseases* (7,5 ECTS) vil blive flyttet til blok 1, og det nye obligatoriske kursus med titlen *Basal Ernærings-patofysiologi* (7,5 ECTS) vil blive placeret i blok 2 på første år. Der vil således blive foretaget ændringer både i studieordningen for KE og i studieordningen for HE, mens det kun vil være nødvendigt at foretage ændringer i kompetenceprofilen for KE uddannelsen, idet HE uddannelse fortsat består af de samme kurser, blot i ændret rækkefølge. Det nye kursus vil udfylde et hul i kompetence profilen for KE-uddannelsen ved at gå mere i dybden end hidtil med celleopbygning og nekroser, funktion af mave-tarm kanal, lever, pancreas, lunger, hjerte og nyrer, samt konsekvensen for metabolismen under sygdomsmæssige forhold.

Sideløbende med det nye kursus vil de KE-studerende fremadrettet skulle følge kurset *Evidence, Diet and Health*, opbygningen af dette kursus er derfor naturligt indgået i overvejelserne for hvordan det nye kursus skal organiseres. Det er ikke vurderet relevant at inddrage elementer fra det udgåede kursus *Experimental Nutrition Physiology* i den justerede

KE-uddannelse. Baggrunden er at faget ikke vurderes at være relevant for størstedelen af de studerende i klinisk ernæring (bilag A).

	Blok 1	Blok 2	Blok 3	Blok 4
1. år	Nutrition Physiology	Evidence, Diet and Health	Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi	Kvalitetssikring og ledelse
	Nutrition related diseases	Basal ernærings-patofysiologi		Klinisk Børneernæring
2. år	Valgfri	Speciale		
	Valgfri			

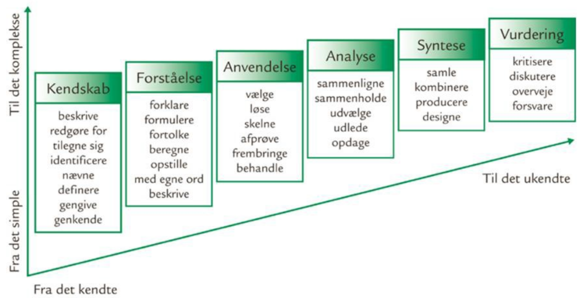
Figur 11.2: Opbygning af kandidatuddannelsen i klinisk ernæring fra studieåret 2016/17. Grå felter er obligatoriske elementer. Fag er angivet på det sprog de udbydes på.

Målbeskrivelsen

Det er et krav til kursusbeskrivelser for uddannelser der er tilknyttet Studienævn for Fødevarer, Human Ernæring og Idræt, at der foruden den obligatoriske målbeskrivelse skal indgå information om kursusindhold, undervisningsform og materiale, faglige forudsætninger, eksamensform samt arbejdsbelastning.

Kursusbeskrivelsen er udarbejdet med tanke på målgruppen, der inkluderer studienævn, undervisere, nuværende og fremtidige studerende samt censorer. Det er således søgt at gøre den præcis, uden at være hverken for indforstået eller generel. I målbeskrivelsen beskrives det ønskede læringsudbytte for de studerende via kategorierne viden, færdigheder og kompetencer (Christiansen, Horst og Rump, 2013). Til inspiration er anvendt Blooms taksonomi over det kognitive område (Krathwohl, 2002), samt SOLO (Structure of Observed Learning Outcome) taksonomien (Biggs og Collis, 1982).

Blooms taksonomi beskriver den studerendes læring over 6 stadier fra det simple kendte stof til det komplekse og ukendte, hvor den studerende på de sidste stadier, har opnået forudsætningerne for at mestre analyse, syntese og vurdering inden for fagområdet. SOLO taksonomien beskriver ligeledes den stigende kompleksitet i den studerendes forståelse af et emne, blot via fem stadier (Fig. 11.3). Fælles for taksonomi illustrationerne af læringsudvikling er at det antages at den studerende må mestre det foregående stadie for at kunne opnå det fulde udbytte af det næste.



1.trin	2.trin	3.trin	4.trin	5.trin
Eleven kan kun usammen-hængende information	Eleven kan identificere omskrive anvende simple procedurer,	Eleven kan opliste beskrive kombinere,	Eleven kan sammenligne kontrastere forklare årsager analysere relatere anvende,	Eleven kan teoretisere generalisere danne hypoteser perspektivere,
		samt beherske flere aspekter,	**samt** beherske og integrere flere aspekter til en helhed	**samt** bevæge sig fra det specifikke til det abstrakte
	men behersker kun enkeltdele	**men** integrerer dem ikke til en helhed		

Figur 11.3: Øverst ses Blooms taksonomi og nederst SOLO taksonomien. Begge figurer er lånt fra Primus - en grundbog og håndbog til almen studieforberedelse (ibog) af Føge og Hegner, 2016.

Hvis kategorierne i målbeskrivelsen søges overført til taksonomi tankegangen repræsenterer kategorien viden groft sagt de første to-tre trin i både SOLO og Blooms taksonomi. Hvor den studerende skal kunne beskrive og forklare basal viden. Denne basale forståelse er en forudsætning for at den studerende kan bevæge sig imod et højere abstraktionsniveau og er stand til at anvende sin viden til selvstændigt at skabe meningsfulde sammenhænge, diskutere stoffet samt potentielt bidrage til at skabe ny viden. Hvis den studerende behersker at bevæge sig fra det simple til det komplekse højere abstraktionsniveau, vil vedkommende befinde sig på de sidste trin illustreret i de to taksonomier (fig. 11.3), og vil beherske de mål der er angivet under kategorien kompetencer i målbeskrivelsen. Ved udvikling er nærværende målbeskrivelse er kategorien færdigheder ikke tolket som praktiske færdigheder, idet der ikke indgår undervisning i instrumentelle metoder og lignende på kurset. Der er i stedet beskrevet de teoretisk færdigheder det ønskes at den studerende opnår. For at blive i taksonomi tankegangen, så er kategorien beskrevet så den befinder sig som trinnet imellem viden og kompetencer. Målbeskrivelsen fremgår af tabel 11.1 og hele kursusbeskrivelsen af bilag C.

Tabel 11.1: Målbeskrivelsen udviklet til det nye kursus Basal Ernæringspatofysiologi.

Viden
- Beskrive absorption af næringsstoffer og metabolismen heraf i den raske organisme
- Beskrive sygdomsprocessers påvirkning af de enkelte organers funktion samt omsætning af næringsstoffer
- Beskrive immunforsvarets opbygning og redegøre for centrale immunologiske mekanismer ved bl.a. infektion og celledød

Færdigheder
- Formidle de basale træk i cellers funktion samt interaktion mellem organ systemer
- Forklare og diskutere ernæringsrelaterede problemstillinger opstået som følge af sygdom, både med fagfæller og øvrigt sundhedspersonale

Kompetencer:
- Integrere viden om cellers funktion, interaktionen mellem organ systemer og sygdomsrelaterede ændringer i organfunktion til at vurdere og diskutere de ernæringsmæssige konsekvenser
- Tage ansvar for eget læringsudbytte og bidrage til udbytterigt samarbejde med temagruppen med henblik på at udarbejde to skriftlige opgaver, samt mundtligt at formidle indholdet heraf til de øvrige studerende

Kursusindhold

Der er ved planlægningen af kurset tilstræbt at opnå sammenhæng mellem mål, undervisning og eksamen. Med henblik på dette er fundet inspiration i John Biggs constructive alignment begreb (Biggs og Tang, 2007), ved at tage udgangspunkt i det læringsudbytte det ønskes at de studerende skal opnå, og tilrettelægge undervisning og evalueringer/eksamen herefter, både i forhold til indhold og form. Et eksempel herpå er at de to obligatoriske temopgaver, der skal bestås i løbet af kurset, danner baggrund for den afsluttende mundtlige eksamination. Emnet for disse overopgaver er overordnet henholdsvis absorption og ekskretion, hvor de studerende skal forholde sig til processerne og samspillet mellem de forskellige organer ved fordøjelse og metabolisme af specifikke næringsstoffer. Der vil være faste rammer for overordnet formål, struktur og omfang af opgaverne, med henblik på at hjælpe de studerende til det rette fokus, og ligeledes for at kunne give underviserne mulighed for at designe deres undervisning i overensstemmelse med formålet for de gennemgående rapporter. Klare rammer vil desuden gøre det lettere for mig som kursusansvarlig at give feedback til de studerende. I timestrukturen vil blive afsat tid til at de studerende fremlægger temaopgaverne, få dage før deadline for aflevering. Formålet hermed er at give dem formativ feedback fra underviser samt medstuderende, som de potentielt kan nå at indarbejde i deres endelige opgave. Det antages desuden at denne form vil sikre, at flere af de studerende sætter sig grundigt ind i opgaverne, samt bliver trænet i at diskutere faget. Alt sammen nødvendigt for at de opfylder målbeskrivelsen for kurset, samt en investering i at opnå constructive alignment mellem mål, undervisning og eksamen.

De to temaopgaver har tidligere været en del af kurset Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi, dog uden at være en del af eksamen. Tidligere studenter evalueringer har peget på at det var i overkanten at skulle skrive de to opgaver på dette kursus, at de godt kunne se formålet med opgaverne, men ikke altid oplevede at få tilstrækkeligt med feedback. Ved at flytte opgaverne til det nye kursus under lidt andre former, er disse indvendinger forsøgt imødekommet.

Ved planlægningen af kurset har der desuden været fokus på at sikre constructive alignment fra et kollega perspektiv, forstået således at der skal skabes sammenhæng fra lektion til lektion, således at de studerende oplever en rød tråd og progression i deres læring igennem hele kurset trods skiftende undervisere. Som det fremgår af nedenstående citater fra studerende ved evaluering af kurset Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi (bilag B), oplever de netop at opnå denne sammenhængsfølelse, når der er få faste undervisere på et kursus:

"Godt med færre forelæsere, da det giver en mere rød tråd gennem forelæsningerne".

"[. . .] Det er godt at have faste og ikke for mange undervisere".

"[. . .]Kæmpe ros til at forelæsningerne var værd at komme til. Følte på intet tidspunkt at jeg spildte min tid og hellere burde bruge tiden på at få læst - som ofte har været et problem ved andre kurser grundet skiftende forelæsere, for stort pensum m.m. Her fik jeg meget mere ud af at være til undervisningen end at læse selv, hvilket var godt".

Udfordringen består i at det på nærværende kursus vil være nødvendigt at jeg inddrager en del forskellige undervisere, der har den nødvendige ekspertise inden for de forskellige emner. For at sikre kontinuiteten, har jeg derfor valgt at være meget synlig som kursusansvarlig ved så vidt muligt at være til stede ved gæsteforelæsninger. Foruden har jeg skemalagt hyppige opsamlinger, hvor jeg med de studerende vil diskutere relevansen af de emner, som gæsteforelæseren har været omkring i forhold til klinisk ernæring, både fra et uddannelses- og kursusperspektiv. Hyppig tilstedeværelse som kursusansvarlig kan desuden give værdifuldt indblik i hvad der fungerer godt og mindre godt, med henblik på at varetage en kontinuerlig udvikling af kurset fra år til år.

Med tanke på at opnå constructive alignment fra et kollega perspektiv vil jeg desuden arrangere et undervisermøde forud for kursusstart, hvor underviserne præsenteres for målgruppe, samt målbeskrivelse for kurset i relation til uddannelsen og specifikt kursusindhold. Det vil tilstræbes at den enkelte underviser bliver velinformeret om hvor dennes emne kommer ind i forhold til de øvrige underviseres emner.

Diskussion

Kurset Basal ernærings-patofysiologi udbydes første gang fra november 2016. Af gode grunde er det derfor ikke på nuværende tidspunkt muligt at evaluere hvordan det nye kursus samt ændringerne i studiets opbygning vil blive modtaget. Når det første hold af 1. års KE-studerende i 2017 har gennemført Basal Ernærings-patofysiologi i blok 2, samt det efterfølgende justerede blok 3 kursus Sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi, vil det på baggrund af kursus evalueringer blive vurderet om ændringerne på KE-uddannelsen og det nye kursus fungerer efter hensigten.

Mit arbejde med udvikling af kursusbeskrivelsen har jeg flere gange diskuteret med studielederen for Klinisk Ernæring og undervisningskoordinatoren på NEXS. Desuden er det diskuteret med min kollega, der er lektor i klinisk ernæring, har været med til at oprette uddannelsen og varetager kursusansvar for størstedelen af de kurser, der udbydes specifikt til KE-studerende. Sidstnævnte har bl.a. givet sparring i forhold til hvilke fagelementer kurset bør dække, og hvilke dele der kan flyttes fra eksisterende KE kurser. Det der primært har fyldt i diskussionen med de forskellige parter har været at nå til enighed om kursustitel samt kompetence profilen. Problematikken har været at ramme en titel der dækker indholdet af kurset præcist, uden at der er forvirrende overlap med de øvrige kurser der udbydes på uddannelsen. Der blev opnået enighed om at titlen Basal ernærings-patofysiologi opfyldte disse kriterier.

I forhold til udarbejdelsen af kompetenceprofilen har diskussionen med sparringspartnerne medført en udvikling mod formulering af en mindre specifik, mere generel målbeskrivelse for de kompetencer, som vi ønsker, at de studerende skal opnå i løbet af kurset. Målet med denne udvikling har været at skabe rum for fleksibilitet og udvikling ved den videre detaljerede tilrettelæggelse og justering af kursets form og indhold fra år til år.

Referencer

Biggs, J. & Collis, K. F. (1982). *Evaluating the quality of learning: the SOLO taxonomy, structure of the observed learning outcome*. London: Academic Press.

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university* (3. udg.). Open University Press/McGraw Hill.

Christiansen, F., Horst, S. & Rump, C. (2013). Kursusbeskrivelser. I L. Rienecker, P. S. Jørgensen, J. Dolin & G. H. Ingerslev (Red.), *Universitetspædagogik* (1. udg., s. 133–145). Samfundslitteratur.

Føge, P. & Hegner, B. (2016). *Primus – en grundbog og håndbog til almen studieforberedelse (ibog)*. Systime. Hentet fra https://primus.systime.dk/index.php?id=230

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: an overview. *Theory into practice*, *41*(4), 212–218.

Bilag 1

Det Natur- og Biovidenskabelige Fakultet 3.
februar 2014/shb
Københavns Universitet

Studielederens årlige redegørelse 2014

Kandidatuddannelsen i klinisk ernæring
Studieleder Susanne Bügel

A. Status for uddannelsen

1. Studiestatistik for kandidatuddannelsen i klinisk ernæring

Det er i de senere år lykkedes at komme op over den magiske grænse på 25 optagne studerende om året, men pga stor søgning i både 2011 og 2013 med mange kvalificerede studerende blev der optaget henholdsvis 28 og 30 studerende på uddannelsen i klinisk ernæring.
Der var pr. oktober 2013 85 studerende aktive på studiet.

Fra 2009-2013 er der mellem 11-20% af en årgang der kommer fra udlandet, primært Norge. Størstedelen, nemlig ca 73% kommer ind med en professionsbachelorgrad – altså ikke-SCIENCE. Over den samme 5-årige periode er det totale frafald på 4%.

Tabel 1 Oversigtsbillede årgang 2009 til 2013

	2009	2010	2011	2012	2013
Afbrudt	2		2		
Afsluttet	15	10	8		
Aktive	3	8	19	25	28
I alt (optagelsestal)	20	18	29	25	30

Ser man på gennemførselstider er der kun brugbare tal for 2009, 2010 og 2011.

	2009	2010	2011	2012	2013
Afsluttede	15	10	8		
I % af optagne	75	56	28		
<24 mdr	1		6		
24-27 mdr	6	4	2		
27-30 mdr	4	5			
30-36 mdr	3	1			
36-	1				

Datamaterialet er for lille til at man kan sige noget om hvorvidt der er en tendens til at studietiden er blevet kortere. Men jeg mener godt man af tallene kan udlede at størstedelen af forlængelserne er af 3-6 mdrs varighed.

B. Resultat af studielederens årgangsmøder med de studerende

På grund af sygdom og travlhed har der endnu ikke været afholdt årgangsmøde med de studerende. Det er planlagt til at skulle være medio februar 2014. Derimod har der været afholdt 4 frokost møder med hele KE 2013 holdet i løbet af efteråret 2013. Formålet med disse møder har været at give de studerende lejlighed til at identificere hinanden (de har kun fag fælles med HE og GS i blok 1 og 2). Samt at opsnappe og forebygge mytedannelser, problemer med studiestart etc. Ved mødet deltager både studielederen og en lektor i klinisk ernæring. Studielederen har givet sandwich ved disse møder så der har stort set været fuldt hus og indtrykket har været at de studerende er glade for disse møder. Ved disse møder har der været nogle diskussioner om relevansen af Experimental Nutrition Physiology, bragt op af de studerende. Som det kan ses længere nede overvejer vi faktisk at udskifte dette fag med et nyt for KE studerende. Derudover virker de studerende som om uddannelsen foreløbigt lever op til forventningerne. Vi overvejer at holde et par møder mere i foråret 2014.

For 2. års studerende er det planen at starte noget lignende, men som eftermiddagskaffe møder, for at styrke netværk og afbøde ensomhedsrelaterede ol. problemer i forbindelse med specialeskrivning. Det er første af denne slags møder afholdes medio marts 2014.

KE Advisory Board:
Der er i det forgangne år blevet nedsat et lille dialogforum af eksterne og interne eksperter som har afholdt et enkelt møde for at diskutere hvordan kandidatuddannelsen i klinisk ernæring kan styrkes. Dette dialogforum består af interne professorer og lektorer med interesse for klinisk ernæring, samt læger og KE kandidater fra de hospitalsafdelinger som primært aftager vores kandidater. Ved dette møde blev følgende diskuteret:

Hvilke ernæringsmæssige udfordringer er der på sygehusene lige nu - og i fremtiden?
Er de KE'er I har kendskab til, klædt godt nok på?
Er der elementer der ikke pt er berørt i uddannelsen og som vi bør indføre?
Vi har studerende i praktik på sygehusene, hvordan kan vi gøre det ophold endnu mere udbytterigt for både afdelingerne og de studerende?
Hvordan skal uddannelsen se ud i 2014?

Konklusion fra mødet med Advisory Board for KE: Optager 25-30 studerende årligt – disse følges med HE studerende i blok 1 og 2 og har selvstændigt obligatoriske kurser i blok 3 og 4. I blok 1 på andet år har studerende med en Uni-BA obligatorisk klinisk praksis, mens studerende med Prof BA har valgfag. Studiet afsluttes med klinisk relateret speciale á 30 ETCS for UNI-BA og 45 ETCS for Prof-BA. Klinisk praksis og specialer laves i samarbejde med hospitalsafdelinger, primært i HS området, men med hovedvejleder forankret på NEXS.

1) *Forskningsforankring* i internationalt konkurrencedygtigt forskningsmiljø.
2) *Unikke faglige kompetencer* – ved intensiv undervisning med kompetente undervisere.
3) *Karriereparathed - Vores studerende opnår* unikke faglige kompetencer.

1-3) er alle parametre som kandidatuddannelsen i klinisk ernæring i høj grad opfylder og som fortsat skal styrkes.

Panelets holdning var generelt at uddannelsens opbygning grundlæggende lever op til forventningerne hos aftagerne, men der kunne med fordel laves små justeringer. Kurset Nutritional Design and Status Assessment (er lige blevet ændret til Experiemental Nutrition Physiology) anses ikke for at være relevant for KE – det er absolut de færreste der ender i forskningsstillinger og det bør derfor være et valgfrit fag. Til gengæld kunne der med fordel indføres et kursus i patofysiologi på 7,5 ETCS – dette ville give overskud på sygdomslære, ernæringsfysiologi ved sygdom og ernæringsterapi til at der kunne komme lidt mere fokus på ernæringsterapi ved forskellige, specifikke sygdomme.
Disse ændringer vil også forårsage ændringer på HE – da kurset Experimental Nutrition Physiology ligger i blok 1, mens det nye kursus helst skal placeres i blok 2. (Denne ændring vil faktisk tillade øget optag på HE studiet, da

Experimental Nutrition Physiology har været det kursus der især var begrænsende for øget optag). Oprettelse af det nye kursus forudsætter dog at der ansættes yderligere 1 VIP.
Uddannelsen mangler desuden i høj grad relevante tilvalgsfag – og her blev der foreslået at der oprettes to nye tilvalgsfag. Et i "Ernæringsterapi til Intensiv patienter" og et i "Ernæring og fysisk aktivitet ved rehabilitering" Begge kurser forventes at kunne bidrage med at skabe nye jobmuligheder for især de studerende som har en UNI-BA og som derfor kun i sjælden grad ansættes på sygehusene. Udvikling og oprettelse af disse kurser forudsætter at der ud over ovenstående VIP ansættes yderligere 1 senior VIP eller 2 post.docs.

Efterfølgende har institutlederen og VILU været i dialog med forskellige interessenter for at afsøge muligheder, især i form af dele-stillinger med f.eks Rigshospitalets ernæringsenhed. Der er desuden i instituttets budget afsat midler til ansættelse af mere VIP personale og der diskuteres mulighed for en kombination af VIP på senior niveau og post.doc/adjunkt niveau.

C. Visioner og mål for fremtiden

Som beskrevet i ovenstående er der nu kommet turbo på planen om at styrke området med flere VIP på både junior og senior niveau og gerne som delestillinger med f.eks Rigshospitalet eller andre hospitaler i hovedstadsområdet. Det er planen at disse skal på plads i 2014. Når dette er på plads kan vi begynde at planlægge nye spændende kurser og forhåbentlig, i dialog med HE uddannelsen, foretage de nødvendige ændringer af studieplanen. Derudover er der behov for flere gode praksis og specialepladser på de omkringliggende sygehuse og det er håbet at et styrket samarbejde i form af delestillinger også vil øge mulighederne for at øge mulighederne og kvaliteten af disse praksis og specialepladser.

B

Bilag 2

Statistics

Results: Pato- and Nutritional Physiology, Diet Therapy B3-3F15

Statistics Skema A

31	could answer this evaluation form
23	have answered this evaluation form
74.19 %	answer percentage: (23/(31)) * 100

Skema A: 15 ECTS credit course

1	**My average weekly workload on this course was (incl. lessons, preparation, written work, etc.):**			**(23 answers)**
	Less than 20 hours	·	0	0.00
	20-30 hours	·	2	8.70
	30-40 hours	·	8	34.78
	40-50 hours	·	10	43.48
	More than 50 hours	·	3	13.04

Skema A: Course Evaluation

1	**Given my background, the academic level of the course is:**			
	Far too low	·	0	0.00
		·	0	0.00
		·	11	47.83
		·	12	52.17
	Far too high	·	0	0.00
2	**In my opinion, the workload on the course is:**			
	Far too small	·	0	0.00
		·	0	0.00
		·	15	65.22
		·	8	34.78
	Far too large	·	0	0.00
3	**I believe that I have acquired the competencies described in the course objectives**			
	Totally disagree	·	0	0.00
		·	2	8.70
		·	9	39.13
		·	9	39.13
	Totally agree	·	3	13.04
4	**In my opinion, the individual subelements (lectures, exercises, etc.) of the course were logically connected**			
	Totally disagree	·	0	0.00
		·	0	0.00
		·	1	4.35
		·	7	30.43
	Totally agree	·	15	65.22
5	**In my opinion, the teaching material was relevant to the course**			
	Totally disagree	·	0	0.00
		·	1	4.35
		·	7	30.43
		·	8	34.78

	Totally agree	·	7	30.43
6	**In my opinion, I have received relevant academic feedback on my oral and written work on the course**			
	Totally disagree	·	0	0.00
		·	0	0.00
		·	2	8.70
		·	11	47.83
	Totally agree	·	10	43.48
7	**In my opinion, I have had access to the necessary information about the course**			
	Totally disagree	·	0	0.00
		·	0	0.00
		·	2	8.70
		·	5	21.74
	Totally agree	·	16	69.57
8	**Overall, I find that the course has been useful**			
	Totally disagree	·	0	0.00
		·	0	0.00
		·	1	4.35
		·	1	4.35
	Totally agree	·	21	91.30
9	**What was good about the course? Why?**			**(23 answers)**

- Sammensætning af teori og øvelser, samt forelæsernes tilgang til stoffet.
- Jens er heldigvis fængende og god til at få de studerende til at deltage. Spændende kursus, som virkelig (endelig) giver en indsigt i klinisk ernæring! Godt med gæsteforelæsere, læger, både ift. afveksling, mest viden og nogen fra "det virkelige liv". Godt med rapportskrivning, og at man selv lavede grupper
- Det fungerer utrolig godt at der er udgangspunkt i et menneske og noget patofysiologisk - og at der så herudfra trækkes og videreudvikles på viden inden på kemi, biokemi, (pato-, ernærings-, generel)fysiologi, anatomi og generel ernæringslære.
  Med det mindre hold er der god interaktion i undervisningen.
  Det er yderst engageret undervisere som er på kurset - både interne og eksterne.
  De to gruppe rapporter er ret krævende og bringer store frustrationer - men indeholder samtidig et kæmpe læringspotentiale.
  Det er positivt at der er indlagt tid i skemaet til rapportskrivning.
  Case arbejdet og gennemgang giver også fantastisk læring.
- Progresseion i case undervisning som vi lærte mere og mere. Opgaveaflevering var hårdt men lærerigt
- Forelæsninger, case og opgaveskrivning
- Case opgaverne gav rigtig god mening ift. at koble teori på 'praksis'
- godt med færre forelæsere, da det giver mere en rød tråd gennem forelæsningerne. Lena var god.
- Casearbejde + rapportskrivning har været meget lærerigt! Yderligere hvordan de forskellige emner gennem kurset har været disponeret - både ift. sværhedsgrad (at man hele tiden bygger ovenpå sin viden og at 'lettere' emner kommer først) og ift. rapporternes indhold.
- I now feel
- Case arbejde fungerede godt, da vi herved forbinder viden fra undervisning med praksis.
- Jens og Lena har kørt kurset så godt.God kombination af forelæsninger, case arbejde og rapport skrivning.
- Rigtig godt at arbejde med cases, det har været savnet for en universitetsbachelor. God Fordeling af cases og forelæsninger. Fik meget ud af at arbejde med de to rapporter.
- De to hoved-underviserne var meget gode, virkelig god kvalitet. Det er godt å ha faste og ikke for mange undervisere.
- God undervisning, god sammenhæng mellem cases, opgaver og undervisning, og et godt fagligt udbytte.
- Case-arbejdet var fantastisk godt og meget praktisk orienteret. I det hele taget var der mange praktiske elementer som satte teorien i forbindelse med den hverdag vi forhåbentlig komme til at få efter end uddannelse. Kæmpe ros til at forelæsningerne var værd at komme til. Følte på intet tidspunkt at jeg spildte min tid og hellere burde bruge tiden på at få læst - som ofte har været et problem ved andre kurser grundet skiftende forelæsere, for stort pensum m.m. Her fik jeg meget mere ud af at være til undervisningen end at læse selv, hvilket var godt. Pensumsmængden var ligeledes passende.
- Rigtig godt og spændende kursus med god overensstemmelse mellem undervisning, opgaver, rapporter, case-arbejde og valgt pensum.

- Det gav større forståelse, at JRA var gennemgående underviser på kurset og kunne følge op på usikkerheder fra tidligere undervisning. At JRA forbereder os på, hvad der venter i praksis. Beundrende engagement fra JRA og enorm tålmodighed og ro til at forklare også pensum igen og igen. Denne blok har givet kandidatniveauet mening.

10	I would like to propose the following improvements	(23 answers)

- I stedet for at lægge rapportskrivning mandag og fredag, som er korte dage, vil det hjælpe på koncentrationen at have gruppearbejde halvdelen af de lange dage (tirsdag og torsdag) og resten af dagen forelæsning. Kurset kunne sagtens være på flere ECTS!
- Kurset virker ret essentielt for vores videre færden som KE'er, så det er ærgerligt at det kun løber over én blok. Det betyder nemlig at vi skal nå utrolig meget på ret kort til. Hvis kurset varede 2 blokke kunne vi nå at blive rigtig gode til rigtig meget af pensum - som det er nu, er det gået så stærkt at man kæmper for at holde fast i det man synes man har lært og prøve ikke at blande tingene alt for meget sammen!!!
- Evt. mere systematik gennemgang af case med henblik på hvordan det forgår eksamen.
- Flere cases. Evt. lidt færre undervisningsgange i diabetes og metS til fordel for en case gang eller to mere.

  Det ville være rart med gæsteforelæsere der underviste på et niveau, hvor vi fik noget fagligt ud af det. Forelæsningerne af [redacted] var ikke fagligt fyldestgørende, og vi var flere der havde håbet på en mere grundig gennemgang af mekanismer og processer relateret til de pågældende emner der blev undervsit i. Undervisningen var for overfladisk, og niveauet mindede mere om en undervisning på bachelorniveau.
- Generelt bør dette kursus være længere.
  Derudover har det været svært/lidt forvirrende at have case med både Jens og Lena, da der har været flere episoder med modstridende svar/forklaringer på, hvordan casen bør løses.
- ændre på skema strukturen tirsdag og torsdag, når der var forelæsning heledagen.
  gennemgåelse af cases mere punktlige.
- Evt. litteratur/undervisningsmateriale der vedrører (danske) patienter? Lidt i stil med Region H's screeningsskema -> altså en slags 'lærebog' ift. patienthåndtering? Synes litteraturen har været meget akademisk og biokemisk - kunne godt savne en bog der beskriver de forskellige 'patientgrupper', da casearbejde + eksamen omhandler dette.
  Da eksamen også inkluderer spørgsmål vedrørende studier og analyse af studier kunne jeg godt savne at dette gennemgås i undervisningen - og at det ikke udelukkende antages at vi ved dette på forhånd.
- Det ville være så godt, hvis kurset kunne fylde 2 blokke. Der er så meget relevant vi skal nå, som er presset ind på en blok. Og så kunne man fjerne evidens deith and health for KE studerende. Nu er jeg fødevare-baselore og jeg synes vi har haft rigeligt om det der blev gennem gået i evidens kurset, så jeg ville sætte meget større pris på (og have langt bedre udbytte fagligt), af at dette kursus fik lov at fylde 2 blokke, da dette kursus er kerne-essensen af uddannelsen for KE'er.
- Jeg ville gerne have gennemgået nogle af opgaverne fra eksamenssættene ud over casene.
- At immunologi-delen samt celledød udelades. Det er kendt stof fra sygdomslære samt andre fag og der kan med fordel fokuseres mere cellebiologi og evt. energimetabolisme.
- Jeg følte mig godt forberedt til case-delen af eksamen, men ikke til den del der drejede sig om analyse af et studie - det bør der være mere fokus på. Vi er tideligere blevet undervist i analyse af studier i andet fag og blevet testet i det, ved eksamen tilhørende det pågældende fag. når vi testes i det i et nyt fag, bør der være undervist i det her også, da det jo er noget nyt fra forrige fag.
- Jeg har været meget tilfreds med blokken, men ville ønske, den var længere. For mig ville faget Evidence, Diet and Health have givet langt bedre mening som supplement til denne bloks undervisning. Blokken er for kort ift. undervisningens indhold og høje niveau. Kommende arbejdsgivere forventer, kandidater kommer ud som specialister og kender til al den nyeste viden, men det er meget kort tid, vi har på denne blot til at sætte al undervisning i sammenhæng.
  Vi havde cases gennem blokken, men de 2 øvrige spørgsmål tæller 25/35%. Jeg mener ikke, der er tid på blokken, men det havde været optimalt, hvis vi kunne have haft fokus på de øvrige eksamensspørgsmål også.

Back Group by user Group by question

Bilag 3

LLEK…..U Basal Ernærings-patofysiologi

Kursusinformation

Sprog Dansk

Point 7,5 ETCS

Niveau Kandidat

Varighed 1 blok

Placering Blok 2

Skemagruppe A (tirs 8-12 + tors 8-17)

Kursuskapacitet Ingen begrænsning**.**

Studienævn Studienævn for Fødevarer, Human ernæring og Idræt

Udbydende institut Institut for Idræt og Ernæring

Kursusansvarlig Lena Kirchner Brahe

Uddannelse Kandidatuddannelsen i klinisk ernæring, obligatorisk

Kursusindhold

Opbygning og funktion af kroppens celler og organsystemer, absorption og ekskretion af næringsstoffer, metabolismen i de forskellige væv såvel som den integrerede metabolisme. Fokus vil være på mave-tarm-kanal, lever, hjerte, lunger og nyrer, og på sygdomsrelaterede ændringer i kroppens funktioner. Kurset vil desuden inkludere undervisning i basal immunologi.

Målbeskrivelser

Viden:

- Beskrive absorption af næringsstoffer og metabolismen heraf i den raske organisme
- Beskrive sygdomsprocessers påvirkning af de enkelte organers funktion samt omsætning af næringsstoffer
- Beskrive immunforsvarets opbygning og redegøre for centrale immunologiske mekanismer ved bl.a. infektion og celledød

Færdigheder:

- Formidle de basale træk i cellers funktion samt interaktion mellem organ systemer
- Forklare og diskutere ernæringsrelaterede problemstillinger opstået som følge af sygdom, både med fagfæller og øvrigt sundhedspersonale

Kompetencer:

- Integrere viden om cellers funktion, interaktionen mellem organ systemer og sygdomsrelaterede ændringer i organfunktion til at vurdere og diskutere de ernæringsmæssige konsekvenser
- Tage ansvar for eget læringsudbytte og bidrage til udbytterigt samarbejde med temagruppen med henblik på at udarbejde to skriftlige opgaver, samt mundtligt at formidle indholdet heraf til de øvrige studerende

Undervisningsmateriale

Lærebøger oplyses ved studiestart på Absalon.

Undervisningsform

Forelæsninger ved ansatte og eksterne specialister. Der vil løbende være opsamling af de forskellige delemner med henblik på at relatere til fagområdet klinisk ernæring. Der vil indgå enkelte teoretiske øvelser. Undervejs i kurset udarbejdes to temaopgaver med fokus på organsystemer involveret i absorption og ekskretion. Der vil være fremlæggelser af opgaverne med efterfølgende plenum diskussion. Opgaverne vil indgå i den endelige bedømmelse.

Faglige forudsætninger

LLEK10264 Nutrition Physiology og LLEK10263U Nutrition Related Diseases, eller dertil svarende viden, færdigheder og kompetencer anbefales

Tilmelding

Selvbetjeningen på KUnet

Eksamen

Point 7,5 ECTS

Prøveform Mundtlig eksamen; gruppefremlæggelse af temaopgaver med efterfølgende individuel eksamination. 20 minutters gruppe fremlæggelse + 10 minutters individuel eksamination.

Hjælpemidler ikke tilladt

Bedømmelsesform 7-trins skala

Censurform Intern censur, flere bedømmere

Reeksamen Som ordinær eksamen.

Studerende der ikke har opfyldt kriterierne for at gå til ordinær eksamen, skal aflevere opgaverne seneste 2 uger før deadline for tilmelding til re-eksamen, så de kan nå at få dem godkendt inden.

Kriterier for bedømmelse	Se venligst "Målbeskrivelser"

Arbejdsbelastning

Kategori	Timer
Forelæsninger	27
Kollokvium	24
Teoretiske øvelser	6
Projektarbejde	24
Forberedelse	124
Eksamen	1
I alt	206

12

Pedagogical benefits of a new student exercise

Pia Snitkjær

Department of Food Science
University of Copenhagen

Summary. 'Food Science and Culinary Techniques' is an MSc course offered at KU-FOOD that has faced important challenges due to both the very broad educational background of the students and practical hurdles. The course is continuously being improved and there is a great potential to strengthen various pedagogical aspects of the course. A new practical exercise within the topic 'baking' has been developed for the 2016 version of the course. From a pedagogical point of view, the new exercise will potentially improve the amount and quality of formative assessment in the course, it will contribute to student engagement and self-directed learning, it will support learning of both disciplinary and general scientific competences and it will strengthen the student's communication skills.

Introduction

The present pedagogical project is based on the MSc course (7.5 ECTS) *Food Science and Culinary Technique* (FSCT) offered at the Department of Food Science, University of Copenhagen. The course is based on a fundamental insight into food and its components but has a very practical approach. The main challenge with regard to teaching this course is the very broad educational background of the students, in particular the varying level of food chemistry and sensory science. Another challenge in the course was the decision to increase the uptake from 30 to 60, which was a last minute decision before starting the course in 2015. The 2016 version of the course is being developed to accommodate 60 students. The course is continuously being developed and many new initiatives have been taken this year to improve it.

The current project aims to identify pedagogical aspects that can be improved in the course and to develop a new student exercise within the topic ‘baking’ that supports pedagogical improvements of the course. The new baking exercise will substitute an existing kitchen exercise on baking. The key elements in this project are:

- Identifying pedagogical aspects that can be improved in FSCT.
- Developing a new student exercise that will substitute an existing kitchen exercise (to be implemented in the course in Sept-Nov 2016).
- Discussing how the newly developed exercise has the potential to improve several pedagogical aspects of the course.

The outcome of the project is described below with some references to the vast literature on pedagogy and student learning. At first the basic facts about FSCT in its current form are described.

Facts about the course

The course *Food Science and Culinary Technique* is offered at KU-FOOD and it is a mandatory 1st year course on the Master degree program *Food Innovation and Health* but also open to other students.

Course content

FSCT covers a range of scientific subjects centered on food and culinary techniques. It is a science-based course with a very practical approach. The main focus is on chemistry but the course also integrates topics from microbiology, sensory science and physics. The topics taught in the course are illustrated in Figure 12.1. The official course description can be found in appendix A.

The students

The course capacity was changed from the previous 30 students to 60 students in 2015 in order to accommodate the number of students wishing to attend the course. In 2015, 30 students accepted on the *Food Innovation program* plus another 20 students attended the course. Only students on MSc level are accepted for the course. The level in relevant scientific disciplines among the students accepted for the course varied considerably as did their culinary skills and kitchen experience. Students taking the course have over the years been a mixture of our 'own' students with a BSc degree in food science, students with a bachelor in health and nutrition (*in Danish* Professionsbachelor), international student with a science background and a few others. The significant number of students coming with a professional bachelor education poses a problem since they have a low level in organic and food chemistry and in general a very weak scientific background.

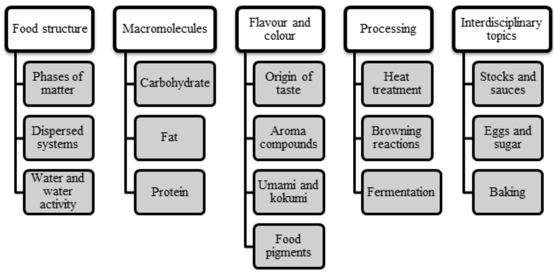


Fig. 12.1: Topics taught in the course *Food Science and Culinary Techniques*

Teaching methods

The course includes kitchen exercises, after-lab discussions and lectures. The lectures comprise traditional lecturing as well as individual/group work on study questions and minor assignments.

In 2015 the five kitchen exercises were: 1) Emulsions and foams, 2) Sous vide, 3) Stocks and sauces, 4) Baking and 5) Vegetables. Except for the first exercise on emulsions and foams, the exercises were all newly developed for 2015 edition of the course. The exercises are carried out in the 'gastro-lab', which is a research kitchen used for teaching, individual student work and research. The baking exercise was developed as a take-home exercise and carried out in groups by the students in their own kitchens. This take-home concept was new in 2015 and was well received by the students. The reason behind introducing this concept was lack of ovens for a baking exercise combined with the last minute decision to accept 60 students instead of the usual 30. We further believed that this concept had the potential to work well in FSCT and that it could open up some possibilities for further development of the course.

The exercises were all carried out in groups of 4-5 students as traditional exercises where students follow detailed instructions on the procedure. The round up on the practical exercises took place a few days later in an ‘after-lab discussion’, which was a lecture designed to follow up on the outcome of the exercise and the learning goals within the relevant topic in general.

Exam

In previous years the course exam consisted of a 4-hour written exam with questions based on the various topics in the course. In 2015 the exam was changed to a 24-hour take home exam. The questions were built up on a common theme but otherwise they were not much different from previous years. The big difference was of course that the students had access to the internet and could communicate with each other. The purpose of the new exam form was to make the exam reflect a real-life problem. Using the internet can to some degree be an advantage for problem solving but the students on the other hand had to be very careful selecting good sources on the internet, if using it. They also had the opportunity to discuss with peers, which is a realistic and often beneficial strategy when solving a problem.

Pedagogical aspects

In this section various pedagogical aspects of FSCT will be discussed focusing on room for improvement. The identified pedagogical issues will be used as background for the discussion on how the new baking exercise has the potential to improve the course.

Course organization

The course could benefit from better organization as well as thorough consideration of its content and level. In view of the challenges regarding students’ educational background, it has not been easy to establish the course content and structure. Additionally various practical constraints like availability of teachers and kitchen facilities but also last-minute planning and last-minute changes of the course content and structure have made the course organization problematic. For the 2016 version of the course various initiatives have been taken to improve organization. These include discussions and planning of the course content in relation to the scope of the course (see also section 12), and of how topics are presented and how they are integrated. Ideally the overlaps between topics taught by different teachers should be clear to the teachers and the overlap should be exploited. In order to do so more communication between teachers and more time for discussion and planning are necessary. Generally the effort in organizing the content better as well as having a course secretary for the first time have a great potential to improve the course.

Alignment

Alignment of the course content in relation to the course goals and in relation to the educational programme *Food Innovation and Health* are both relevant to discuss.

Food Science and Culinary Techniques covers the physical and chemical aspects of food and the relation between cooking/processing/handling of foods and the development of textures, flavours and colours in food. It also gives the students practical experience with foods and various culinary techniques. This course is the only course in the educational program covering the chemical /physical aspects of foods and culinary techniques until the final ‘thematic course’ and the master project.

The course could be improved by also training the students in experimental design and scientific argumentation in order to support the learning of these more general scientific competences, which are very relevant for the educational programme and for science in general (Dahl and Troelsen, 2015; Rienecker, von Müllen, Dolin, Musaeus, and Mørcke, 2015). This could easily be incorporated into the kitchen exercises that are already a part of the course. One could also argue that these generic competences ought to be part of the official course description.

When considering alignment of the course in relation to the goals of the educational programme but also in relation to the course exam (which of course ideally should reflect the course goal as well), communication skills are crucial. Knowing and understanding scientific concepts are not sufficient for solving problems beyond the frame of a university course. More individual /group assignments should be introduced allowing the students to practice their written and oral communication more. This would also increase the focus on critical thinking, self-directed learning, and increase the options for implementing formative assessment to a much higher degree in the course, which will be discussed further below. There is a great potential in developing the teaching methods to align the course better with the goal of the course itself as well as the educational programme.

Another challenge with regard to alignment is the large differences in the students' background and in particular their insufficient competences in basic chemistry and sensory science. The issue on students' background and their low level of academic skills when entering this as well as other courses is often observed and often discussed. One reason explaining the broad background of the students in this course is the wish (and need) to make the course and the educational programme available to as many students as possible. It is particularly students with a professional bachelor education (bachelor in nutrition and health) who struggle with the basic scientific skills. These students are on the other hand often motivated, have a broader insight in food and nutrition, and not least often have some culinary experience. Practical experience with food and cooking can be very beneficial frame of reference and a great motivation factor throughout the course.

The students' varying levels in relevant scientific disciplines like food chemistry and sensory science makes both teaching and alignment more difficult, however. On the one hand the teacher needs to design the best possible course seen from an ideal perspective, giving students the competences they need for subsequent courses and as a graduate and on the other hand the teacher must face reality and accommodate students that do not have the prerequisites for obtaining the skills and competences as defined in the ideal situation. Part of the solution could be to more clearly define and communicate the expectations to the students and to increase the possibilities for self-directed learning. In planning of the course for this year the starting level in basic themes like carbohydrates, proteins, fats and sensory science has been more clearly defined and will be communicated to the students. In order to support the students with a poor scientific background (and those that just need to refresh their memory) in these topics, a so-called 'recap' lecture of one hour will be offered to the students within the topics: fat, protein and carbohydrate, respectively. Basic sensory science that will not be taught in the course is offered as e-learning before the course starts. Further, the students will get access to online material on organic chemistry that can be used as supplementary material. In the further development of the course one could include quizzes to clarify the theoretical as well as the practical competences of the students when entering the course. The purpose of such quizzes should be to clarify and to make visible the diversity of competences among the students to the teachers as well as the students themselves.

Student engagement

As also discussed by Dahl and Troelsen, 2015 active learning and student engagement are key elements of good teaching. Since university courses traditionally have been centered around passive lectures, active learning is an issue in many courses.

Food Science and Culinary techniques is likewise an example of a course where this aspect could be improved. In the current version of the course various elements of student engagement are already implemented but the possibilities for further improvement are obvious.

One place to start could be the lectures, which ideally should contain a larger range of engaging activities. How to activate students during lectures is described in more detail by Dahl and Troelsen, 2015.

Another way to facilitate a higher engagement by the students in the course is through the kitchen exercises. The previous versions of the five exercises are built up as traditional ‘step-by-step instructions. This way of teaching practical work has been criticized, since it encourages the student to put ‘hands on’ but ‘mind off’ as stated by Rienecker et al., 2015.

Project based learning (PBL) is one tool to activate students and to engage them in the learning process. PBL also facilitates a connection between theory and practice which is often a motivating factor for students (Krogh and Wiberg, 2015; Duffrin, 2003; Willard and Duffrin, 2003). It is also a goal in itself that students see the connection between the theoretical contents of the course and real-life applications and this could also facilitate a better alignment. PBL is a tool that could be implemented more as part of the lectures or in relation to the practical work in the course. However, despite the great possibilities for student engagement that comes with PBL, some concerns are also present. It is a concern that limited supervision on the student projects would result in either wrong conclusions and/or superficial learning. With 60 students and limited teaching resources it could be a challenge to ensure that the students obtain the desired disciplinary understanding of a topic.

In conclusion, written assignments, whether these are in the form of PBL or not, could greatly heighten the level of student engagement in the course. The benefits of including written assignments in the course are discussed below.

Written assignments

In the current format, the course contains no written assignments. Previous versions of FSCT contained traditional reports after each kitchen exercise but these were eliminated mainly due to the work load associated with giving feedback on the reports.

One argument for introducing written assignment to the course is to align the course with the written exam. The further argument is that written communication of scientific subjects is an important competence to acquire. Very often knowledge is useless if one is not able to communicate it to others. It was very obvious from the 2014 and 2015 exams that the students in general do not have these competences already and thus need training. In other words obtaining knowledge and understanding complex problems within the scope of the course is not sufficient. The students must acquire qualifications in how to communicate as well. Written assignments in the course are therefore necessary in order to improve the students' ability to explain a problem and a suggested solution to the problem in scientific terms.

The written assignments can be implemented as part of the lecture, in relation to the practical exercises or as independent assignments. Ideally more than one approach should be taken in order to assist the student in obtaining these competences. As also discussed by Jørgensen, 2015, a written assignment should have a clear purpose, good instructions and the requirements for the assignment must be clear.

The main obstacle in obtaining the goal of more written assignments in the course is without doubt the lack of teaching resources. The time required to rethink the course content and the teaching methods is the first obstacle and the second obstacle is the time it takes to provide the necessary feedback to the students.

In order to approach the latter, one could use peer-feedback `as part of` the feedback on written assignments. This could be done alongside with whole-class feedback from the teacher. Improving the amount and quality of assessment is not only relevant in relation to written assignments but is a general pedagogical issue in the course that is described in more detail below.

Formative assessment

In the current version of FSCT no formalized feedback to the student is given. Discussion during the kitchen exercises and discussion in class may count for some formative assessment but in general feedback is minimized in view of the 'lack of teaching resources' argument. Feedback on the practical work is given as whole-class feedback and is based on a set of questions in the lab manual. Feedback on study questions is likewise given in class based on questions from the students. There is thus a great potential to improve the amount and the quality of formative assessment in the course but it has to be done within the constraints of the limited resources.

Peer feedback is one initiative that could be taken to improve the amount of formative feedback in the course with a limited amount of extra work for the teacher. Further arguments for using peer feedback are that it enhances active engagement of the students in their studies, it strengthens the students' understanding of a topic since feedback requires explanation and justification. Students also get to reflect upon what is good and why, which will support their own progress (Bloxham and West, 2004; Assessment Standards Knowledge Exchange, 2007) both within the discipline itself but also with regard to communication.

Peer feedback could be introduced as part of a classroom activity, for example individual or group work on study questions, in relation to written assignments of various kinds or in relation to the practical exercises.

Regarding the issue of minimizing the work load of the teacher when giving feedback, it is worth considering the possibly of giving elective feedback to students, meaning giving the students the choice of receiving feedback on e.g. a subset of answers to study questions or a subset of a written assignment. This will give the teacher the possibility to give some general feedback on the scientific writing with a somewhat limited effort. It further gives the teacher a qualified indication of the strengths and weaknesses of the students understanding of a problem /scientific concept and simultaneously their communication skills.

Elective feedback may also be combined with peer-feedback. An example could be to let students work on a list of study questions and hand over answers to a subset of these questions to a peer student in order for the peer to give feedback on the answers. Peer feedback could be supported by a round-up in class by the teacher to clarify selected questions.

The advantage of using elected feedback is also that the students are engaged and encouraged to take responsibility for their own learning – it encourages self-directed learning. They will need to consider 'what do I want feedback on' and 'what do I find challenging in this course' and this in itself could be useful knowledge for the teacher. Using elective feedback has the purpose of involving the students in their own learning process and focusing the feedback from the teacher where it is most needed.

Formative feedback in the lectures of the course could also be given by the use of clickers (or similar). This gives the teacher the possibility to assess the students' knowledge which can be a tool for the teacher to plan the teaching but it is also useful for the student in testing his/her knowledge throughout the course. It is a very quick way of giving feedback to the students. Using clickers in lectures can also support curiosity of the student and make them participate actively in class.

In general, when improving feedback in the course, several parameters should be considered. As also discussed by Rienecker and Bruun, 2015 these parameters are: what to give feedback on and how much, the criteria for the feedback (the scientific content, the written communication etc.) and who should give the feedback (teacher, peer student, computer).

A new student exercise

The baking exercise that was developed for the 2015 version of the course aimed to give the student hands-on experience with the material presented in class. In addition the exercise aimed to demonstrate a systematic investigation of a hypothesis derived from the literature, although this aim was not clearly defined and apparently not obvious to the students.

In order to improve the baking exercise from 2015 and simultaneously improve various pedagogical aspects of FSCT a new baking exercise has been developed. This will be implemented in 2016. The exercise includes four steps (more detailed information can be found in Appendix C).

1. Students identify a hypothesis based on literature (to be approved by teacher).
2. Students plan a baking experiment based on the approved hypothesis:
    - A draft of experimental design is made by the group, including a short description of the underlying science
    - Peer-review on experimental design by another group
    - Experimental design is revised based on peer review
    - Shopping list is generated
3. Students carry out the baking experiment (at home)
4. Students present the experimental plan and their result in class.

The students need to submit a draft of the hypothesis prior to a 5 hour planning session, where a supervisor will be present. During the planning session the must refine their hypothesis, make a draft of the experimental plan and peer review an experimental plan from another group. They must then finalize the experimental plan and submit it prior the day of the practical exercise. A baking lecture, introducing the scientific topic, is scheduled prior to the planning session. The experiment is carried out at home, after the students have picked up the ingredients. It will also be possible for the students to borrow equipment if needed or to use the kitchen facilities at the University if a home kitchen is not available. The presentations will take place in a 2½-hour session, where each group presents their work in clusters of six groups with one teacher present. This way of finalizing the baking exercise may very well be further developed at a later stage since there is a risk that these presentation sessions become a one-way monologue without fruitful discussion.

In order to guide the students toward a realistic hypothesis and experimental setup (under the given circumstances in the course), another of the five exercises (Vegetables) in the course is built up very similarly with a hypothesis to be tested, a small experiment to be carried out at home and assessment of the outcome of the experiment. In this exercise, the hypothesis and the experimental design are predefined. This exercise will be carried out prior to the baking exercise and can thus be used a guidance for the students when planning the baking experiment. Instructions for the previous exercise can be seen in appendix B. Instructions for the new student exercise can be seen in appendix C.

Discussion

By implementing the new baking exercise as described in section 4, as a substitute for the previous exercise (Appendix B), there is a potential to improve various pedagogical aspects of the course. The new baking exercise will not by itself revolutionize the course and it is important to mention that the new baking exercise is one out of several new initiatives that have been taken to improve the course. In fact four out of the five kitchen exercises have been redesigned for 2016 to support several of the above identified pedagogical challenges, and also the lectures are being continuously developed.

Therefore, although the discussion below focuses on this one new exercise, it is important to keep in mind that this initiative is only considered one step in the right direction.

Formative assessment

Lack of formative assessment was identified as being one important issue in the course. The new baking exercise includes formative feedback on three stages.

1. Feedback on hypothesis by the teacher, which will be given as part of the preparation session. This type of feedback will allow a discussion between the group and the teacher about what a good hypothesis is and why. Students must have their hypothesis approved before they can continue the exercise.
2. Peer feedback on a draft of the experimental design. The use of peer-feedback in this situation encourages the students to reflect on the criteria for a good experimental design which is valuable in order to improve their own. A successful peer feedback session requires that the students are introduced to giving and receiving feedback and also to the purpose of using this tool. Thus simple advice on how to give and receive feedback will be given to the students prior to the exercise.
3. In-class feedback by teacher and peer students on the oral group presentations. The feedback will focus on the outcome of the exercise (hypothesis, experimental design, and presentation of results) as well as on the oral and visual communication of the outcome. The feedback will be given to the individual groups but most likely it will also result in some general feedback on common difficulties/pitfalls in the assignment. Likewise, the feedback should include highlighting well-done assignments, pointing toward their qualities.

Written assignment

There were no written assignments in the course in previous years, but the need for training the students in written communication of scientific topics is obvious. Including more written assignments in the course has the purpose of aligning the course content with the exam but also aligning the course with the general competences expected when doing a MSc. The written assignment in the baking exercise comprises an experimental design and a hypothesis. The work is initiated in the planning session and finalized at home after having received feedback from peers. More initiatives regarding written assignments will be taken in the 2016 version of the course; these are however not described here.

According to Jørgensen, 2015, important issues to consider when designing a good written assignment are:

- What are the criteria for the solved assignment?
- What kind of assignment is necessary to reach the goal?
- Are there any study skills involved?
- Is it fixed or open?

I relation to the written assignment in the baking exercise, these issues are elaborated on below. The **criteria** for the written assignment are:

- The hypothesis is generated from the literature (preferably the curriculum, but exceptions can be made) and it is well defined and not too ambitious
- The experimental design is in accordance with the hypothesis
- The defined assessment methods are suitable considering the hypothesis and practical conditions
- The students express an understanding of the scientific topic by arguing in scientific terms
- The experiment is realistic considering the time and resources available
- The written communication/presentation is clear, concise and formulated so that a peer can understand the purpose and the content.

The written assignment is designed with the goal of supporting the students' achievements of certain competences:

- Communication of a scientific topic
- Academic thinking
- Scientific argumentation
- Giving and receiving feedback
- Self-directed learning
- Acquiring specific knowledge on a topic within the science of baking

The expected outcome of the written assignment thus comprises general academic competence, specific knowledge within the discipline as well as study skills.

The written assignment is to some degree open, meaning the students must identify and formulate their own hypothesis based on the curriculum or at least a closely related topic. The openness of the assignment calls for a high engagement in the assignment and group discussions. At the same time the assignment is reasonably closed with regard to the format since the purpose is to make it fit into an academic communication style and to make it fit into the frame of the course.

General vs. disciplinary competences

Teaching activities in science need to facilitate learning of disciplinary as well as more general skills like practical work, presentation of data as well as scientific communication and natural scientific argumentation, as also mentioned above. With regard to the practical work it is particularly important that students connect the practical work with the theory in order to benefit fully (Rienecker et al., 2015), as also discussed in section 12.

The redesigned baking exercise, as well as the additional four new exercises that will not be described here, in general facilitate more general competences and a better connection between theory and practice. The change from very fixed exercises, where the student follow a long detailed protocol to a more open exercise that in some of the exercises requires preparation beforehand, will promote more reflection on the connection between theory and practice. The new vegetable and baking exercises also support learning of skills like natural scientific argumentation and experimental set-up. These exercises are designed as small research experiment with a hypothesis, an experimental set-up including defined experimental parameters, an evaluation method and presentation of results.

Facilitation of more general competences in the course supports alignment of the course with regard to the exam and with regard to the competences that the student should obtain as part of their MSc program.

Student engagement

The new baking exercise enforces student engagement/active learning in several ways. The students are engaged in designing their own experiment based on the curriculum, they give peer feedback on experimental design and they must present the outcome of the exercise to the rest of the class. This way of engaging the students has a potential to

- motivate the student
- support self-directed learning and the ability to evaluate one's own work

- support critical thinking
- improve skills in giving and receiving feedback
- improve team building

One challenge with regard to the initiatives toward active learning is to ensure that the students take responsibility when giving a task. Students who are not willing to take responsibility for their own learning will not gain from these initiatives.

Conclusion

The new baking exercise is designed to give students specific competences within the scientific discipline of baking as well as general scientific competences like written communication, presentation of data and scientific argumentation. The exercise will further support study skills like evaluation of their own/peers' work and self-directed learning. Finally the new exercise will support important pedagogical aspects like higher engagement of the students, formative assessment and course alignment.

References

Assessment Standards Knowledge Exchange. (2007). *Making peer feedback work in three easy steps.* Oxford: Oxford Brukes University.

Bloxham, S. & West, A. (2004). Understanding the rules of the game: Marking peer assessment as a medium for developing students' conceptions of assessment. *Assessment & Evaluation in Higher Education*, *29*(6), 721–733.

Dahl, B. & Troelsen, R. (2015). Lecturing. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 179–188). Samfundslitteratur.

Duffrin, M. W. (2003). Integrating problem-based learning in an introductory college food science course. *Journal of Food Science Education*, *2*(1), 2–6. doi:10.1111/j.1541-4329.2003.tb00017.x

Jørgensen, P. S. (2015). Instructing written assignments. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 175–188). Samfundslitteratur.

Krogh, L. & Wiberg, M. (2015). Problem-based and project-organised teaching. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 215–227). Samfundslitteratur.

Rienecker, L. & Bruun, J. (2015). Feedback. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed.). Samfundslitteratur.

Rienecker, L., von Müllen, R., Dolin, J., Musaeus, P., & Mørcke, A. M. (2015). Disciplinary activities. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 251–257). Samfundslitteratur.

Willard, K. & Duffrin, M. W. (2003). Utilizing project-based learning and competition to develop student skills and interest in producing quality food items. *Journal of Food Science Education*, *2*(4), 69–73.

A Course description: Food Science and Culinary Techniques, 2016

Education
MSc Programme in Food Innovation and Health

Content
The course includes a series of lectures giving a scientific description of foods as a chemical and physical system. It relates to proteins, lipids, carbohydrates as well as topics within general chemistry (inorganic and organic), acid and bases, and interaction of these components.The course provides an understanding of the culinary techniques used in the production of foods and highlights the effects of food processing on the chemical and physical properties of the food product such as changes in structure and functionality.
Practical exercises in preparation of foods will be used as a stepping stone to the understanding of culinary techniques. The use of ingredients in various recipes will be evaluated and thereby demonstrate important experimental aspects of food processing and preparation. This will include after-lab discussions with reflections over culinary processes to understand how they contribute to palatability in foods.
The lectures and theoretical exercises will demonstrate how food components contributes to the functional properties in dry systems, crystalline states, emulsions, foams and other real food systems. During the practical exercises students will be trained in using various rapid sensory methods to asses foods.

Learning Outcome
Students will obtain a scientific understanding of the chemical and physical composition of foods and which changes occur when various culinary techniques are applied.
Students will obtain a theoretical and practical foundation for working at the interface of science and gastronomy.

A student who has fulfilled the aim of the course should be able to:
Knowledge

- Describe some important chemical reactions and physical changes during processing of foods.

- Identify factors of relevance for detection, perception and loss of aroma compounds in different solvents.

Skills

- Work in a gastronomic laboratory with specific culinary techniques and follow instructions to obtain a well-defined product.
- Explain the changes in foods taking place during preparation of food from a chemical and a physical point of view.
- Predict the outcome of various culinary techniques in relation to the composition of the raw material.
- Evaluate a complex food and communicate the compositional structure of the product.
- Evaluate the effect of various culinary techniques on the food structure and flavour.

Competences
Work effectively in a group with a practical exercise.

Literature
Margaret McWilliams (2014) - Foods: Experimental Perspectives, 7th Ed., Compendium, and Instructions for Practical Exercises

Teaching and learning methods
The teaching (lectures and exercises) contains introductory sessions for general understanding of food science in combination with practical exercises in a gastronomical laboratory in order to examine the effect of various processing methods on the chemical and physical properties of food. The practical exercises set the frame for group-oriented work and will be evaluated by afterlab discussions, problem-based learning, answering questions from the lecturers.

Remarks
It is recommended to follow the course on the first year of the MSc. Programme in Food Innovation and Health

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Exam

Credit	7,5 ECTS
Type of assessment	Written assignment, 24 hours Individual written assignment which must be completed within 24 hours on a specific topic based on the curriculum.
Exam registration requirements	Participation in afterlab discussions of practical exercises, min.80%
Aid	All aids allowed
Marking scale	7-point grading scale
Censorship form	No external censorship More than one internal examiner
Re-exam	If 10 or fewer register for the reexamination the examination form will be oral. If participation in afterlab discussions of practical exercises of min.80% have not been fulfilled, students must take the course again.
Criteria for exam assesment	
Cf. Learning outcome	

Workload

Category	Hours
Lectures	36
Theory exercises	52
Practical exercises	28
Preparation	66
Exam	24
Total	206

Course information	
Language	English
Credit	7,5 ECTS
Level	Full Degree Master
Duration	1 block
Placement	Block 1
Schedule	C Practical exercises Wednesday 13-17 and following afterlab discussions
Course capacity	30
Continuing and further education	
Study board	Study Board of Food, Human Nutrition and Sports
Contracting department	
Department of Food Science	
Course responsible	
Karsten Olsen	

B Instructions for baking exercise in Food Science and Culinary Techniques, 2015

Learning outcome

After the exercise you will be able to:

- Explain the effect of the main ingredients in baking
- Discuss the functionality of gluten and its interplay with other ingredients
- Predict the effect of kitchen procedure in various baking applications

Literature

Mc Williams: Chapter 17
McGee: Chapter 10 (521-571)

Content

- Preparations of 3 breads
- Preparation of 3 cakes
- Evaluation of breads and cakes

Start by making the three yeast doughs and while they are rising you can prepare the cakes.

A take-home exercise

This exercise should be carried out at home. So each group should find a kitchen that is suitable for carrying out the exercise. Make sure you have:

- An oven (conventional or convection)
- 3 bowls for mixing dough/batters (min 1½ l)
- 3 small bowls for mixing dry ingredients in the cake recipe (any bowl/container/pot will do)
- 3 plates for keeping the dough during rising
- A hand mixer
- Weighing scale
- Measuring teaspoon
- Spoon/spatula for mixing
- Measuring cup, 100 ml
- Thermometer
- Clean tea towel

If you are missing any of the things on the equipment list, you will need to borrow it from Gastrolab. Anything you borrow must be brought back to Gastrolab clean on the following day.

On Wednesday October 7th, you need to be in Gastrolab at 8 am to get all the ingredients and to borrow equipment if you need to do so.

Bread Each group must make 3 breads as described in Table 12.1. You need to follow the basic recipe, as shown below, but each group will make three variations. Bread I is always the basic one, prepared strictly according to the basic recipe, whereas bread II and III are variations of that recipe. It is important to be precise so that the three different breads only vary by the controlled experimental factor. Make the cakes while the bread is rising.

Group	Exp. factor	No.	Variations	To do
1 & 7	Flour type	I II III	12% prot. 10% prot. 14% prot.	Make 3 breads varying the type of wheat flour.
2 & 8	Kneading time	I II III	4 min 0 min 12 min	Make 3 breads varying the kneading time (step *b*) **after** the ingredients have come together to a coherent dough.
3 & 9	Fat addition	I II III	7 g 50 g 50 g late	Make 3 breads varying the amount of butter and the time for adding the butter. Bread numbers I and II are made following all steps in the basic recipe, but in bread III you must omit the butter in step *a*. Instead knead the butter into the dough in step *d*.
4 & 10	Sugar	I II III	4.8 g 0 g 25 g	Make 3 breads varying the amount of sugar.
5	Salt	I II III	3.5 g 0 g 7 g	Make 3 breads varying the amount of salt.
6	Liquid type	I II III	Water Milk Boiled and cooled milk	Make 3 breads varying the type of liquid. It is important that the three different liquids have the same initial temperature.

Table 12.1: Bread experiemnts

Basic bread recipe

Ingredients	Amount	To do
Wheat flour	210 g	a. Mix all ingredients to coherent dough.
Water	150 ml	b. Knead the dough by hand for 4 min after the dough has come together; use **a little** extra flour if necessary.
Salt, fine	½ tsp* (3.5g)	c. Let the dough rise at room temperature on a plate or in a bowl covered with a clean wetted dish cloth or cling film to double size (approximately 1 hour).
Sugar	1 tsp* (4.8g)	d. Knead the dough again for 2 min.
Butter, soft	7 g	e. Shape the bread into a round ball and place it in a labelled aluminium foil pan
Yeast	8 g	f. Cover again and let rise to double size (approximately 45 min), while preheating the oven to 180°C (convection oven) or 200°C (conventional)
***Measuring spoon (1 tsp = 5 ml)**		g. Bake approximately 25 min, until done.
		h. Cool on a rack

Cake

Each group must make 3 cakes as described in Table 12.2. You need to follow the basic recipe, as seen below, but each group will make three variations. Cake I is always (except in case of group 6) the basic one, made strictly according to the basic recipe, whereas cake II and III are variations of that recipe. It is important to be precise so that the three different cakes only vary by the controlled experimental factor.

Group	Exp. factor	No.	Variations	To do
1 & 7	Flour type	I II III	12% prot. 10% prot. 14% prot.	Make 3 cakes varying the type of wheat flour
2 & 8	Stirring time	I II III	0 min 5 min 10 min	Make 3 cakes, varying the stirring time (by hand) **after** all ingredients have been combined and no flour lumps can be seen (see step *f* in the recipe below).
3 & 9	Whisking time	I II III	3+1 min 1+½ min 0+0 min	Make 3 cakes, varying the time of whisking butter and sugar (step *d*) and egg (step *e*). When doing cake III, just stir the ingredients together quickly with a spoon or fork – no whisking with hand mixer.
4 & 10	Mixing order	I II III	SBE SE A	Make 3 cakes, varying the order in which things are mixed. Cake I is done according to basic recipe (SBE), first mixing sugar (S) and butter (B) and then adding eggs (E). Cake II (SE) is made by whisking sugar (S) and eggs (E) for 3 min in step *d*. Omit step *e* but add melted butter together with additional ingredients in step *f*. Cake III is made by omitting step *d* and *e* but instead combining all (A) ingredients in step *f;* use a hand mixer if you like.
5	Baking powder	I II III	½ tsp* 0 tsp* 1 tsp*	Make 3 cakes, varying the amount of baking powder (step *c*)
6	Baking powder	I II III	½ tsp* 0 tsp* 1 tsp*	Make 3 cakes, all of them by following a slightly different procedure than described in basic recipe (SBE). You should omit the whisking in step *d* and *e* but instead combine all ingredients in step *f*, use a hand blender if you like. Vary the amount of baking powder (step *c*).

Table 12.2: Cake experiemnts

Basic cake recipe (SBE)

The basic cake recipe is based on the common procedure that involves creaming sugar (S) and butter (B) followed by addition of eggs (E) and finally addition of milk and flour - in this exercise referred to as the SBE procedure. The basic recipe also contains baking powder for leavening the batter. The cakes should ideally go into the oven immediately after combining and ideally all three at the same time to avoid the oven door to be opened when rising. So prepare well by weighing out all the ingredients beforehand, turn on the oven and then start. Do step *a* with all three cakes, then *b, c, d, e, f, g and h* (or simultaneously if you have enough hands). Group 4 and 10 must be extra careful since the three cakes must be made by following 3 different procedures!

Ingredients	Amount	To do
Butter soft	5+125 g	a. Label the aluminium foil pan with a permanent marker b. Butter the aluminium foil pan with 5 g butter c. Mix flour and baking powder until no lumps of baking powder remain. d. Whisk sugar and butter using a hand mixer in another bowl, 3min. e. Add eggs to butter and sugar mixture and whisk 1 more minute using hand mixer f. Combine everything and stir carefully with a spoon or spatula until just combined g. Transfer the batter into the aluminium foil pan h. Bake at 180 °C in a preheated convection oven (200 °C in conventional) for 30 min or until done. The centre temperature will be about 80 °C when done. You can check doneness by using a sharp knife, a cocktail stick, a skewer or a toothpick - poke it into the middle. If it comes up with some wet batter, crumbs or stickiness on it, the cake needs to bake some more. i. Let it cool in the tin
Sugar	125 g	
Egg	2	
Baking powder	½ tsp*	
Wheat flour	125 g	
Aluminium foil pan		
***Measuring spoon (1 tsp = 5 ml)**		

Evaluation of breads and cakes

When cooled, cut bread and cakes into two halves. Put one half of each in a labelled plastic bag. Store at room temperature and bring them to the after lab discussion for demonstration of effects. Evaluate the volume, texture and flavour of the other half of the breads and cakes. Can you smell any difference, can you see any difference or can you taste any difference? Discuss your results in relation to the theory. Prepare yourself to briefly explain your results, and whether the results agreed with the expected outcome at the After Lab Discussion. Enjoy the rest of the goodies while you go through the additional questions below and discuss them in the group.

After Lab Discussion

Main content:

- Each group briefly explains what they did, the observed results and whether the results agreed with the literature.

Further questions :

- What is gluten and how is it formed?
- What is the effect of kneading a dough?
- Which role does oxygen play in gluten formation?

- What happens to the starch during mixing and baking of bread and cakes?
- What happens during the various stages of baking breads/cakes?
- Which flour should be used for various baking applications and why?
- What is the effect of salt, acid, fat and sugar on gluten structure?
- Explain the various methods used for leavening a dough or batter
- Could you use baking soda instead of baking powder in this recipe, why/why not?
- What is the predicted outcome when incorporating fat into dough after kneading the dough as compared to mixing it in together with the additional ingredients?
- Which role do eggs play in cakes?
- Which role does sugar play in breads and cakes?

C Baking

C.1 Instruction for the new baking exercise in Food Science and Culinary Techniques, 2016

Learning outcome
After the exercise you will be able to:

- Plan a small experiment based on a hypothesis
- Discuss the choice of experimental parameters and evaluation method with regard to aim of experiment
- Explain a specific subject within baking and the theoretical background using scientific terms

Literature
Coultate: p. 198-208
McGee: Chapter 10 (p. 521-571)

Content
The task in this exercise is to carry your own small baking experiment that is based on hypothesis generated from the literature and to clearly describe the underlying science and present the outcome in class. The exercise involves six steps:

1. Make a draft of your hypothesis (Assignment I)

2. Plan experiment (28/9 or 5/10): Submit draft and peer review (Assignment II).
3. Finalized the experimental plan (Assignment III)
4. Carry out the experiment at home (12/10 or 26/10)
5. Evaluate outcome of experiment and prepare presentation
6. Present outcome in class (31/10)

Assignments

`I. Draft hypothesis`

Submit your hypothesis and a few lines describing roughly how you plan to test the hypothesis through the online assignment Baking – draft hypothesis. See details below. You will get some brief feedback on the assignment before the planning session. Deadline 26/9 or 3/10.

`II. Draft experimental design (peer review)`

In the planning session (28/9 or 5/10) you will proceed with development of your hypothesis and your experimental plan. You must submit a draft of your experimental plan (fill out the template) no later than 3 pm, through the online assignment Baking – draft experimental design. Then the peer review process starts which you need to finish on the same day. See details below.

`III. Final experimental plan`

After having received your peer feedback you need to finalize your experimental plan and submit the final plan and a shopping list (google doc) through the online Assignment Baking – final experimental plan. Deadline 9/10 or 23/10

1. Hypothesis draft

Define a hypothesis and a rough plan of how you want to test the hypothesis in a small experiment that you will carry out at home. In order to do this you need to study the baking literature and use the literature to generate your hypothesis. You need to make it simple and carefully consider how this hypothesis can be tested in an experiment at home. The baking experiment is expected to have approximately the same extent as the experiment in the Vegetable exercise, but in this case you will get to decide the content and plan everything yourself.

2. Draft of experimental design and peer review
In the planning session, from 11-17, you need to:

1. Revise your hypothesis if necessary
2. Make a draft of the experimental design, using the template provided, and submit it though the online assignment no later than 15.00.
3. Read through your peer group's experimental design. Use the peer review template to give your comments to the experimental plan. Remember to make it is your job to support your peer group to improve their experiment. Submit the comments through the online assessment. Deadline for peer review is on the same day.

When planning your experiment and evaluating another group's experimental design, keep the following criteria in mind:

- The hypothesis must be generated from the literature and should be well defined and not too ambitious (given the time constraints)
- The experimental design is in accordance with the hypothesis
- The defined evaluation methods are suitable considering the hypothesis
- The students express an understanding of the scientific topic by arguing in scientific terms
- The experiment is realistic considering the time and resources available
- The written communication/presentation is clear, concise and formulated so that a fellow student can understand the purpose and the content.

3. Finalize your experimental plan
Revise your experimental plan based on the review comments you got from your peer group. It is up to you to choose how you want to improve your plan, and you are not obliged to make all changes suggested by the peer group. The final experimental plan must be submitted through the online assignment.
Make a shopping list for your experiment, using the google document provided in online assignment. You need to specify the amounts in either gram (g), milliliter (ml) or pieces (pc) as specified in the google sheet. You also need to specify if you need to borrow anything from Gastrolab.

4. Carry out the experiment
At 11 on the day of the experiment you can come and pick up the ingredients you have ordered in GastroLab. You can also borrow the equipment you have listed. The experiment must be carried out at home.

5. Evaluate outcome and prepare presentation

After completing the experiment you need to evaluate the results and decide how you want to present the outcome. What was the rationale and science behind your hypothesis?. Did your results support the hypothesis or not? Any explanation? Did you encounter any problems? Would you suggest any improvement to the design?

You need to prepare a presentation to be given in class. Consider carefully the way you present the results and your reflections of the experiment. Use figures as much as possible.

The presentation (10-15 min) must include:

- The hypothesis
- Theoretical background (what is expected and why – explain the underlying science)
- Overview of experimental set-up, including evaluation method (use figures!)
- Results (figures rather than text, could include pictures)
- Reflections on the experimental set up
- Conclusion

6. Present your experiment in class

The presentations will take place on October 31. Each group has 10 – 15 min for the presentation. Feedback to the presentation will be given by students and teacher.

C.2 Template for planning and peer reviewing baking experiment as part of the baking exercise, 2016

Hypothesis

Formulate a clear hypothesis based on the literature. It can be generated from a problem you have encountered at home or just something you find tempting to look into. More information on how to make a hypothesis and setting up an experimental design can be found on Absalon. Make a reference to the literature that supports your hypothesis.

Theoretical background

Describe briefly the theoretical background with a reference to the literature. For example, if you work on the protein content of flour, then explain how and why that is supposed to change e.g. texture.

Parameters that will be studied:
List the experimental parameter(s) you will study such as protein content of flour, amount of fat added, kneading time etc.

Experimental set up
Describe the details of which samples will be prepared and how the samples will be prepared. Use tables/figures whenever suitable (as much as possible)

Evaluation method
Describe the ways you will evaluate the products. Consider both sensory and objective measurements (eg. measure height of bread). Of course you will be very limited in evaluating your product at home but you still need to describe precisely what you will be doing. If you for instance want to evaluate perceived texture you need to specify exactly how.

Reflections on the design
Which weaknesses does your design have?
Are their obvious limitations and/or pitfalls to be aware of?

List of equipment
List all the equipment you will need to carry out the experiment.
If there is anything on your equipment list that you do not have at home, you can borrow it from Gastrolab (if available). In case so, you must list these items in the same excel file (separate sheet) as the shopping list (Absalon, folder: Baking).

Review of assignment (by the peer-review group)
When reviewing the experimental plan you need to evaluate the content of the text provided as well as the written communication of the content. Is the text comprehensive, correct and explained in an understandable way. **Suggest improvements.**
Make your notes in the table below and upload the document including your comments through the online assessment.

Peer review comments to the baking experiment	
Comments to:	Peer review comments
Hypothesis	Is it clear and concise and supported by the literature?
Theory	Does the description support the hypothesis and does it describe the necessary theoretical frame for the experiment?
Experimental design	Is the experiment well planned and well suited to test the hypothesis?
Evaluation	Are the evaluations of the products well planned and does it seem suitable in order to test the hypothesis?
Reflections	Any comments/ suggestions?
Written communication	Is the text clear, precise and well structured? Do tables and figures support the text and communication of the content in general?

13

Involving teaching assistants in the design of large courses

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Introduction

The use of teaching assistants in the execution of large courses is common practice across universities worldwide. However, this task is mostly conducted disjoint, where the course responsible sketch out the teaching assistants specific tasks, such as to assist during practical or theoretical exercises and correction of homework, reports etc. which then is being conducted in a *no questions asked fashion* by the teaching assistants often in an environment where the course responsible is not present. It boils down to that one person (the course responsible) constructs the material, which then is *thrown over the wall* to the other person (the teaching assistant) who is going to try to turn this material into learning. The result of this is often, that the good learning intentions behind the material is lost in this line of communication, where the teaching assistant lack the exact idea of the exercise, or sufficient background knowledge for framing the context, and further, that the course responsible is out of sync with the students hurdles in achieving learning. On the other hand the teaching assistants belong to per see the brightest part of the student spectrum and as such posses a capacity beyond what is utilized in such a traditional setup.

This project explores how to utilize teaching assistants in the process of designing a new course, and discusses the consequences of this involvement.

Background

On the second year of the bachelor in Food science, a mandatory course in data analysis is a part of the education. This course is nine weeks with one and half day per week at disposition. The course was normally taught to a broad spectrum of wet biological bachelor educations, but was in 2015 separated out to only the 80+ students following the bachelor in Food science. Following this, the course was to be designed from scratch and conducted for the first time in autumn 2015.

Course description

This course in data analysis for Food science and Nutrition is made up of the following ingredients

- Lectures
- Theoretical exercises
- Case studies
- Homework
- Multiple choice questions

Lectures

The lectures are traditional auditory lectures with dissemination of the theoretical mathematical background, pen and paper examples as well as examples involving computer coding. Across a week there are three lectures, each of 60 minutes.

Theoretical exercises

Each week there are four to seven theoretical exercises covering the curriculum. These are optional.

Case studies

Theoretical exercises often resemble an artificial task, and as such do not cover the entire process involved in conducting research including data analysis. In order to mitigate this, semi-open case studies are conducted throughout the course. Such a case study has duration of two weeks (from

Monday week one to Thursday week two) and is conducted in groups of three to four students. A case study consists of a dataset, some background information, and some rather open objectives. The goal is to get the students to think critically and define interesting questions, which they pursue with relevant data analytical tools. In contrast to the theoretical exercises, there are no exact answers.

In total there are four case studies, where the last count 25% of the final grade. The first three are optional. The dissemination format of the case studies is a voice-over recorded slide show of no more than 10 minutes.

Homework

Each week a single theoretical exercise is labeled as homework. In order to attend exam, seven (out of eight) homework needs to be accepted.

Multiple choice questions *Quick Quiz*

Each week a quick quiz of approximately ten multiple-choice questions is made available via Absalon. These questions are in line with the learning objectives of the week, and are top-of-the-head questions. The students are encouraged to use no more than 30 minutes on answering these before the last lecture of the week, where questions with low number of correct answers are given special attention.

Teaching assistant involvement

Each week has two times two hours, where the students can get help on theoretical exercises, case studies and homework from the teaching assistants. The teaching assistants correct the homework and the first three case studies.

Considerations on teaching assistant involvement

In large courses teaching assistants are used to surpass the students needs for one-on-one time with their lecture, and further to distribute the task of correcting homework. Here, the teaching assistants serve as the lectures extended arm.

Peer*ish* supervision

Teaching assistants are normally students on a later semester and/or Ph.D. students. The fact that they are closer in study age to the students, compared to the lecture, gives the immediate advantages of being more in sync with the students learning hurdles and hence benefit from the upsides of peer (to peer) supervision Benshoff, 1992. University professors can often have the problem of understanding the problems proposed by students, leading to answering the wrong questions and hence causing even further frustration from the students. Here, the more study age synchronized teaching assistants can contribute with different angles of perception and help unravel such problems.

Alignment

Distribution of the workload in correcting individual homework or case studies naturally posses a challenge concerning alignment. Answer sheets often minimize this problem, however, for tasks with less well-defined objectives, the response and grade to an assignment becomes more dependent on the correctors perception of the work, which is unwanted. In line with answer sheets, grading sheets sketching the different themes involved in an assignment, and examples of what a good, middle and bad response would cover, can help in breaking down the grading of such types of assignments, and making it more corrector independent. Calibration of correctors is the process where a set of correctors are aligned to use the same scale for grading, such that two independent correctors would assign the same grade and comments to the same assignment. Calibration can be pursued by selecting a subset of assignments, spanning the quality range, and let all correctors assign these, followed by a process leveraging the standards between correctors.

In this course we have used answer sheets for homework and grading sheets as well as calibration of correctors for the case studies.

Motivation and commitment

Ph.D. students often get the task of being teaching assistant assigned as a part of their job. However, there is no official merits gained from doing so, why teaching is often assumed as solely compromising the Ph.D. project.

Officially crediting the effort in running the course and a genuine interest in the material is thought to elevate the motivation by the teaching assistant.

Project outline

In designing the course **Fødevaredataanalyse 1** for 3rd semester bachelor students in food science, four teaching assistants were involved in the planning, construction and execution of theoretical exercises, homework and case studies. That is; each individual suggests curriculum components, being datasets, problem formulations, questions, etc. constructs relevant material including answer sheets and is involved in the teaching of this material.

The remainder of this paper lists how this process was facilitated, discusses pros and cons and proposes a cookbook for inspiration for others wanting to use teaching assistant involvement in course planning and execution.

Methods

We set out to design a new course from scratch. Instead of using an already existing book as basis, the core material was week notes. These notes lists:

- The topic in condensed form including key- equations and details
- Reading material
- Short video lectures
- Exercises
- Case study

In the construction of this material, the teaching assistants were involved in construction of exercises and case studies.

Practically, one month prior to course start, the course team (course responsible and teaching assistants) joined in a one-day workshop organized as follows:

1. Overview of course
2. Overview of relevant datasets available

3. Brainstorm on relevant questions for constructing exercises and cases based on the datasets in connection with the curriculum
4. Structuring of these ideas
5. Distribution of ideas among course team members
6. Two and two initial construction of material
7. Circulating material for additional inputs

After this workshop each individual finalized the material and constructed answer sheets, and shipped it to the course responsible for harmonization of layout.

Grading of case studies

After receiving the first case study, the assignments were distributed across the teaching assistants. Each corrector selected two assignments representing top and bottom respectively. All correctors, including the course responsible, reviewed these, in total eight assignments, and listed pros and cons for each. Based on this, a grading scheme partitioning the grading into three main categories was constructed, listing, within each category, what elements a good, middle and bad assignment encompasses.

For the remaining three case studies, the three main categories were unchanged, but with modification of what characterize a good and a bad assignment according to the specific case.

Results and Discussion

Of the total amount of exercises 40% were initialized and constructed by the teaching assistants. The rest were done by the course responsible. Generally, the range and character of the exercises were wider compared to if they were to be constructed by a single person. Especially the relevance in relation to food science, as well as the background details covered a broader range, reflecting the scientific diversity of the people authoring the material.

In the classroom, a lower number of questions concerning exercise ambiguities for the teaching assistant authored exercises compared to the course responsible authored exercises were observed.

Aligning the grading process of the cases via an initial corrector calibration and the use of grading schemes were considered effective and proved fair. However, the main factor here is the experience obtained from correction of tons of assignments. Here it is believed that the alignment effort depends on the teaching assistants being experienced in correcting from doing so.

Constructive alignment

A buzzword in course planning and execution is constructive alignment. Involvement of teaching assistants in the planning of a course naturally ensures alignment between the exercises and cases they author and how the teaching assistant supervises these. However, this obviously also posses the risk of the lecture being disjoint with exactly the same. Why there must be paid attention to alignment between these exercises and the remaining part of the curriculum. In this course it is a specific learning objective, that the students obtain proficiency on how to put data analysis in to context, in this case a food science and nutritional context. Selecting teaching assistants with a relevant food science or nutrition background helped in achieving this goal, as the face to face interaction is powerful in also communicating knowledge and perspective beyond what is needed for completing a specific task.

Showdown of the idea of the omniscient professor

In (especially) the Anglo-Saxon university tradition there is a strong knowledge hierarchy, where the idea of the all-knowing professor tends to prime how teaching conducted- and learning is achieved, this is also known as apprenticeship learning (Dolin, 2013, pp. 78-81). Realistically, this idea is only a good idea for certain types of courses, and even more, only for exceptional professors. The apprenticeship-learning model transfers only knowledge, which is a subset of the lectures knowledge, and the total learning achieved from such a course is bounded by the lectures knowledge. Contrary to apprenticeship learning, a constructivist learning approach assumes that the student learn from interacting with its surroundings being literature, learning resources, peers and the course environment as such (Dolin, 2013, pp. 70-78). Expanding the planning and execution of a course to include a whole team, and to actively utilize the knowledge, ideas and motivation from teaching assistants do not only expand the pool of knowledge from which the students can drink, but also phrases the same knowledge in different ways, and from a constructivism viewpoint this leads to a more diverse and rich learning environment stimulating means of contemplation and learning.

Further, including teaching assistants as active partners, especially in planning of a new course, and especially for young lectures, serve as a resource for validation of ideas and concepts.

Drawbacks

Inclusion of the people who do the work in planning of the work seems as a win win situation. However, there might be some minor issues to be aware of when outsourcing the design of central parts of a course.

Each year new teaching assistants comes with new ideas and consequently the course becomes less static and more floating in terms of exercises and cases, and thereby also to some extend in terms of curriculum, where some modifications must be encountered in order to have alignment between the course elements. Further, a fair amount of hours has to be put in to facilitate construction and compilation of material prior to each course.

The lecture must strive to be updated on the details of the individual exercises and cases, which is not necessarily inherent, when he or she has not authored those.

The construction of exercises prior to the course consumes approximately 20 working hours for each teaching assistant. Some of these can be accounted for by the lower demand of weekly preparation time, however, this covers not all of them.

Cookbook for implementing teaching assistants in course planning

Based on the experience from involving teaching assistants in designing a large course I have sketched out a cookbook for how to implement this in the course planing. These points are based on our initial course, supplemented with modifications and initiatives we anticipate to incorporate in the comming courses.

Start early

Set your team two month before the course (three if the course runs from September)

Workshop

Kick-off the course with a workshop, where the team is settled, and where you initialize construction of the material authored by the entire team. Focus on getting ideas on paper without paying too much attention to finer details. At the end of this workshop, the material should have a clear skeleton, such that it is straightforward to fill in the details and fix the layout. As course responsible you arrange lunch and coffee.

Finalizing the material

Distribute the material *as-is* after the workshop and let the individual teaching assistants finalize it, including pictures, data setup, answer sheet etc. Try to keep a fairly tight deadline on this one – one to two weeks after the workshop, in order not to loose details.

Harmonize

As the course responsible you harmonize the material to have fairly similar appearance. However, make sure to keep the individual fingerprint of the authors, and only correct spelling errors or ambiguous formulations. Keep an option for the teaching assistants to be quoted as authors on the exercises they have made.

Physical appearance

During the course, try to be present during theoretical exercises, case studies, etc. This is the best way to get immediate feed back on the student hurdles. Use some of these common hurdles to align the course via repetition during a lecture.

Merit the teaching assistants

Make a letter stating that the teaching assistants have been involved in designing a university course.

Conclusion

Teaching large courses comes with a number of obstacles related to work load and face-to-face supervision. As a way to compensate teaching assistants are commonly used for certain course tasks. However, these individuals posses skills beyond what is normally utilized in daily university practice. By utilizing teaching assistants as a resource in not only execution of the course but also in the design and planning, the course material gets more diverse and covers a broader range of perspective, while the teaching assistants are more comfortable and engaged in supervision of students.

References

Benshoff, J. M. (1992). *Peer consultation for professional counselors*. ERIC Clearinghouse.

Dolin, J. (2013). Undervisning for læring. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *Universitetspædagogik* (1st ed., pp. 65–90). Samfundslitteratur.

14

Aktiverende, tværfaglig og case-baseret undervisning til Naturressource-studerende

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Introduktion

De fleste universitetsuddannelser er præget af store indledende obligatoriske kurser, som samler alle studerende på en uddannelse trods forskellige ønsker om fremtidig specialisering. Denne tværfaglighed repræsenterer en stor udfordring for universitetsunderviseren hvis opgave blandt andet er at motivere de studerende, "nå ud til alle" og sikre, at læringsmålene nås, mens dumpeprocenten holdes nede. Problemet er dog ofte, at læringsmålene ikke rammer alle eller ikke er tilstrækkeligt klare. Nogle studerende har derfor svært ved at se relevansen af undervisningen de første år på universitetet og mister derfor motivationen, bliver passive, klarer eksamen dårligt og dropper måske helt ud af studiet. Der er derfor et behov for pædagogiske værktøjer, som kan motivere og aktivere de studerende til trods for obligatoriske kursusemner, som måske ikke rammer alles interesse. I nærværende udviklingsprojekt, som er en del af Universitetspædagogikum på Københavns Universitet, er det blevet undersøgt om aktiverende, tværfaglig og case-baseret undervisning kan øge motiveringen og aktiveringen af naturressource-studerende på det Natur- og Biovidenskabelige Fakultet. Med afsæt i den tilgængelige universitetspædagogiske litteratur og de foreløbige resultater af projektet konkluderes det, at læringsmålsbaseret undervisning kan have en aktiverende og motiverende effekt og at tværfaglighed blandt studerende med fordel kan udnyttes i undervisningen. Dette kan blandt andet gøres ved at anvende forskellige undervisningsformer inklusiv virkelighedsnære cases og temadage.

Baggrund

Dette projekt tager udgangspunkt i kurset "Jord, Vand og Planter"[1], som er et 7,5 ECTS bachelorkursus, der bliver udbudt ved Institut for Plante- og Miljøvidenskab. Kurset er en del af det obligatoriske grundforløb på Naturressourceuddannelsen på KU Science (Fig. 14.1).

	Blok 1	Blok 2	Blok 3	Blok 4
1. år	Naturressourcer og økologi		Indledende økonomi	Dyrs og planters diversitet
	Naturressourcers kemi 1	Naturressourcer: Forvaltning og økonomi	Cellebiologi	Jord, vand og planter

Figur 14.1: Grundforløbet for Naturressourceuddannelsen det første år på det Natur- og Biovidenskabelige Fakultet. Kurset "Jord, Vand og Planter" er placeret i blok 4.

På kurset er 70-90 studerende årligt tilmeldt. Disse er primært naturressourcestuderende, som senere ønsker speciale i Plantevidenskab, Miljøvidenskab, Naturforvaltning eller Miljøøkonomi. De primære fokusområder for disse 4 specialiseringer er beskrevet i Bilag A. Kurset tiltrækker også få studerende fra andre uddannelser (f.eks. Geografi og Geoinformatik, Biologi, Fødevarer og Ernæring og Biologi-Bioteknologi). Det er således en meget bred skare af studerende med forskellige forudsætninger og faglige interesser, der årligt møder op til kurset.

Målet med kurset *"Jord, Vand og Planter"* er at give de studerende en grundlæggende indføring i danske landskabstyper, klima, jordbund og plantevækst. Undervisningen er ret skarpt opdelt i disse 4 temaer og består primært af traditionelle forelæsninger og teoretiske øvelser. Der er 4 undervisere på kurset og kun en begrænset integrering af de 4 temaer i løbet af kurset. Der er dog en fælles ekskursion og 2.5 dag med eksperimentelle øvelser. Jeg underviser primært indenfor jordbundskemi og planteernæring, og jeg er ansvarlig for både eksperimentelle øvelser, forelæsninger og teoretiske øvelser. De eksperimentelle øvelser er obligatoriske og kræver fremmøde for at blive indstillet til eksamen.

[1] http://kurser.ku.dk/course/LPLB10306u

Problemformulering

På kurset *"Jord, Vand og Planter"* ønsker vi at give de studerende en bred naturvidenskabelig basisviden inden deres efterfølgende specialisering. Dette er umiddelbart et fornuftigt formål, men jeg vurderer, at undervisningen er for fragmenteret grundet de forskellige temaer og undervisere og bør i højere grad integreres for at fange og motivere de studerende. Til de obligatoriske eksperimentelle øvelser, som ligger i kursusuge 1-2, møder alle studerende op, men efterfølgende ser vi kun 50-60 % af de studerende, hvoraf en stor del er passive, hvilket resulterer i høje dumpeprocenter. I lærergruppen har vi diskuteret det ringe fremmøde. Måske skyldes det, at de studerende er uengagerede og ikke besidder de nødvendige matematiske og kemiske færdigheder for at kunne bestå kurset. En anden mulighed er, at vi i alt for ringe grad formår at beskrive relevansen af de valgte temaer og skabe alignment mellem temaerne i både undervisningen og eksamen.

En af de store udfordringer på kurset er de studerendes tværfaglighed. Det er vanskeligt at foretage tværfaglig undervisning, som rammer studerende med interesse for plantevidenskab, miljøvidenskab, naturforvaltning eller miljøøkonomi. Dette problem er blandt andet dokumenteret af, at vi altid modtager kommentarer vedrørende de studerendes baggrund under den årlige kursusevaluering. Nedenstående er et uddrag fra en tidligere evaluering:

"Niveauet var meget højt, og jeg følte tit at det ikke var henvendt til os, der læser miljøøkonomi eller naturforvaltning, da der nogle gange blev sagt ting som "når i nu engang skal ud og vurdere næringsstoftilgængeligheden..."(eller andre lignende ting) men sjældent noget, der var mere relateret til os andre, der for det første aldrig har haft cellebiologi og er mere politisk/økonomisk interesserede. Så den var lidt svær at sluge, både fordi man fik fornemmelsen af at det ikke var relevant for en og fordi niveauet var meget højt. Jeg formåede dog at klø på, specielt her til sidst.- jeg har læst alle kapitler 2-3 gange og det hjalp meget, både på fagligheden og interessen, men nogle gange var det svært at kæmpe sig igennem - da det jo var lidt svært at se relevansen i det".

Den studerendes kommentarer understøtter, at de forskellige baggrunde og interesseområder i højere grad bør imødekommes i undervisningen for at motivere de studerende. Med afsæt i denne problemstilling blev følgende undersøgt inden for 2 overordnede temaer:

Tema 1: Aktiverende undervisning

- Kan antallet af passive studerende reduceres ved at anvende forskellige pædagogiske værktøjer til aktiverende undervisning?
- Kan man med udgangspunkt i klare læringsmål øge de studerendes motivation og aktivitetsniveau?

Tema 2: Tværfaglig og case-baseret undervisning

- Kan der udvikles problemorienteret og case-baseret undervisning som favner alle studieretninger på kurset?
- Kan case-baseret undervisning anvendes til at skabe en højere grad af sammenhæng (constructive alignment) mellem forskellige kursustemaer og undervisere?

Teoretiske Overvejelser

Tema 1: Aktiverende undervisning

Forskning har vist, at studenteraktiverende undervisning har en lang række fordele(Prince, 2004). Aktiverende undervisning inddrager den studerende i læringsprocessen og bidrager til at fastholde opmærksomheden, fremmer kritisk tænkning, øger motivationen og forbedrer dermed også indlæringen. Aktiverende undervisning står ofte i kontrast til den traditionelle forelæsning, hvor de studerende passivt modtager information. Studenteraktivering kan dog med fordel inkluderes i den traditionelle forelæsning – eksempelvis som pauser med små teoretiske opgaver, quizzes, summe-øvelser, små praktiske opgaver eller demonstrationsforsøg. Den aktiverende undervisning veksler således mellem forskellige undervisningsformer, som er tilpasset læringsmålene. Den traditionelle forelæsning kan desuden ”krydres” med dialog mellem underviser og studerende – gerne i form af længere diskussionskæder (dialogisk diskurs)(Scott, Mortimer og Aguiar, 2006a).

Motivation er en vigtig forudsætning for aktiv studenterdeltagelse i undervisningen. I den forbindelse bør det understreges, at motivation ikke kun er et produkt af iboende interesse og fascination, men er i særdeleshed også et resultat af ”den gode undervisning”. De studerendes motivationen kan således øges ved, at underviseren udviser engagement og entusiasme men kan også forbedres ved at definere klare læringsmål (Intended Learning Outcome - ILO)(Biggs og Tang, 2007). Læringsmålene er med til at klargøre, hvad de studerende skal lære, og det bliver lettere for den studerende at følge med i egen læringsfremgang. Klare læringsmål motiverer også de studerende, tydeliggør relevansen af undervisningen, og gør de studerende bevidste om betydningen af deres egen aktive deltagelse. Læringsmålsbaseret undervisning kan desuden begunstige den dybere læring, såfremt læringsmål fremmer de kvalitative forståelsesniveauer (SOLO-Taksonomien)(Biggs og Tang, 2007). Det anbefales derfor, at definere klare læringsmål helt fra folkeskole[2]- til universitetsniveau (Biggs og Tang, 2007).

Tema 2: Tværfaglig og case-baseret undervisning

Det er velkendt, at traditionelle forelæsninger ikke er en effektiv indlæringsmetode, da denne undervisningsform ikke fremmer den dybere læring (Chew, 2014). Forskning viser derimod, at case-baseret undervisning har forskellige styrker. Case-baseret undervisning er en aktiv læringsform, hvor studerende anvender deres tilegnede viden og analytiske kompetencer på komplekse, virkelighedsnære scenarier. Det er således en effektiv måde at komplementere og understøtte traditionelle forelæsninger med problemorienteret undervisning (Coorey og Firth, 2013). Case-baseret undervisning er velegnet til at træne løsningsorienteret problemanalyse, og der er mulighed for at gøre dette i tværfaglige grupper og dermed simulere en realistisk jobsituation, hvor forskellige kompetencer og faglige baggrunde bruges til at løse et konkret problem. Case-baseret undervisning kræver grundig forberedelse fra underviseren, som desuden bør påtage sig rollen som diskussionsleder under afvikling af casen. En udfordring kan være at få de studerende aktiveret og få dem til at træde ud af den traditionelle modtagerrolle. Her er motivering igen en vigtig faktor, hvilket blandt andet kan sikres ved en grundig tilrettelæggelse af casen, afsmittende entusiasme fra læreren ved introduktionen og praktisk relevans af casen (for alle studieretninger på et kursus) (Krogh, Stentoft, Emmersen og Musaeus, 2013). Velvalgte cases kan desuden bidrage til at skabe sammenhæng (constructive alignment) mellem læringsmål, kursustemaer, undervisere, eksamen, studieprogrammer og efterfølgende jobsituationer.

Metode

Med afsæt i ovenstående universitetspædagogiske forskning og teori blev der identificeret handlingsmuligheder i forhold til spørgsmålene i problem-

[2] http://www.emu.dk/sites/default/files/laeringsmaalstyret_undervisning_i_folkeskolen_pixi_intro.pdf

formuleringen. Spørgsmålene under Tema 1 (aktiverende undervisning) blev primært besvaret ud fra erfaringer gjort under afholdelse af kurset i blok 4 2015. Spørgsmålene blev indledningsvis diskuteret med mine vejledere fra undervisningssupervisionen (kollega-, faglig- og pædagogisk vejleder) og nye ideer blev efterfølgende afprøvet (f.eks. inkludering af nye læringsmål – Bilag B og aktiverende undervisning i studenterhaven ”Oasen” på KU Science – Bilag C). Effekten af de afprøvede ideer blev evalueret med vejledergruppen og eventuelle justeringer til undervisningen i 2016 blev noteret. Effekten af de implementerede ændringer i 2015 blev desuden evalueret ud fra dialog med de studerende, ud fra kursusevalueringen og eksamensresultaterne.

Med hensyn til spørgsmålene under Tema 2 (tværfaglig og case-baseret undervisning) repræsenterer dette igangværende udviklingsarbejde. Under supervisionen i 2015 blev enkelte små cases afprøvet (f.eks. Bilag D), og effekten blev diskuteret med vejlederne, men den tværfaglige case udarbejdet i nærværende projekt (Bilag E) vil først blive afprøvet i de efterfølgende kursusår. Denne tager udgangspunkt i de enkelte studieprogrammer og kursustemaer og er blevet diskuteret med faglig vejleder og underviser på kurset Professor Søren Husted.

Resultater og Reflektioner

Tema 1: Aktiverende undervisning

Ud fra hypotesen om, at de studerendes passivitet og fravær skyldes en manglende forståelse for relevansen af kurset, udviklede jeg klare læringsmål til hver undervisningsgang (inklusiv de eksperimentelle øvelser) for at øge de studerendes motivation og aktivitetsniveau (Bilag B). Jeg startede hver undervisningsgang med en præsentation af læringsmålene og prøvede desuden at spørge hvorfor de studerende troede, at disse læringsmål var vigtige (for at fremme den dybere læring). For studerende der læste plantevidenskab (ca. 40 % af holdet), var der ingen tvivl om, at min undervisning var velplaceret på deres uddannelse, og disse studerende var generelt meget aktive - også under præsentationen af læringsmålene. For de andre studieretninger var det derimod mindre relevant eksempelvis at kunne måle pH i en jord, og studerende, der ønskede specialisering i naturforvaltning eller miljøøkonomi, var meget passive. Jeg bør derfor fremadrettet bruge endnu mere tid på at sætte dagens læringsmål og emne i perspektiv ved hver undervisningsgang for at nå ud til alle studerende.

En anden positiv effekt af inkludering af læringsmålene var, at min undervisningsplanlægning og udførelse af selve undervisningen blev mere struktureret. Jeg anvendte læringsmål i starten af hver forelæsning og vendte tilbage til dem i slutningen af undervisningsgangen for at lave en assessment af de studerendes udbytte af undervisningen. Desuden startede jeg altid min undervisning ved at præsenterede forrige lektions læringsmål for at opsummere tidligere undervisning. Samlet set havde dette en meget positiv effekt. Gennemgangen af læringsmålene var desuden altid dialogbaseret, hvilket også havde en aktiverende effekt.

Min undervisning har tidligere været meget baseret på envejskommunikation med traditionelle forelæsninger og teoretiske øvelser. Det har derfor været en stor udfordring at fastholde de studerendes opmærksomhed, når der til tider undervises fra 8-17. Inspireret af Universitetspædagogikum blev en lang række teknikker og pædagogiske værktøjer til varieret og aktiverende undervisning afprøvet i 2015. Efter tidligere at have mødt meget uoplagte studerende, blev jeg opfordret af en kollega til at lære de studerendes navne. Dette havde en utrolig god effekt, og det skabte et uformelt og trygt læringsmiljø. Med afsæt i dette miljø afprøvede jeg adskillige 5 minutters summe-øvelser. Under disse øvelser cirkulerede jeg rundt i rummet og hjalp studerende på rette spor. Jeg forsøgte desuden at få nogle af de stille og tilbageholdende studerende til at svare på spørgsmål ved først at bekræfte på tomandshånd, at deres svar var rigtigt for efterfølgende at stille dem samme spørgsmål på klasseniveau. Dette var overraskende effektivt og bidrog til at aktivere flere af de passive studerende. Jeg afprøvede desuden forskellige former for dialogbaseret undervisning. Jeg afprøvede både individuel og gruppevis dialog med de studerende under de eksperimentelle øvelser samt på klasseniveau under forelæsninger. Jeg forsøgte hele tiden at skabe dialog ved at stille spørgsmål undervejs. Det fungerede oftest rigtig godt. Mine vejledere gjorde mig dog opmærksom på, at jeg af og til stillede lukkede og ledende spørgsmål, hvorefter jeg hurtigt be- eller afkræftede, om svaret var korrekt. Dette fordrer ikke til dialog, og jeg vil fremadrettet give mere plads til, at de studerende kan diskutere på klasseniveau. Dette kan for eksempel gøres på baggrund af udvalgte cases, hvor jeg vil fokusere på dialogisk diskurs (inkludering af længere kæder og ikke kun I-R-E triader) (Scott, Mortimer og Aguiar, 2006b).

Et andet aktiverende element var brugen af planter i undervisningen. Der blev dyrket planter til kurset under forhold som adresserede forskellige emner i min undervisning. Jeg oplevede, at denne aktivitet skabte visuelle stilladser, som motiverede og øgede indlæringen, og jeg kunne desuden bruge planterne til at vurdere, om de studerende havde nået læringsmålene. Som en udbygning på dette inkluderede jeg i 2015 et forsøg i studenterhaven "Oasen" (Bilag C). I starten af kurset anlagde jeg et forsøg, som adresserede et centralt emne i min undervisning, og jeg refererede løbende til dette forsøg gennem min undervisning. Denne aktivitet førte til rigtig god dialog mellem studerende og underviser og blev meget positivt evalueret. Med afsæt i casen beskrevet i næste afsnit (Bilag E) vil jeg i 2016 anlægge et forsøg som i højere grad tilgodeser de forskellige studieretninger på kurset, og som fremmer integreringen af kursustemaerne.

Tema 2: Tværfaglig og case-baseret undervisning

Den aktiverende undervisning beskrevet foroven adresserede kun i begrænset omfang tværfagligheden blandt de studerende på kurset. De beskrevne aktiviteter tilgodeså således primært studerende som studerede plante- og miljøvidenskab. Et af formålene med projektet var derfor at undersøge, om det var muligt at udvikle problemorienteret og case-baseret undervisning, som favner alle studieretninger på kurset. I 2015 afprøvede jeg forskellige virkelighedsnære cases. Et eksempel er vist i Bilag D, som tog afsæt i et konkret og virkeligt problem, som jeg tidligere havde oplevet i et dansk tomatgartneri. Effekten af at kunne præsentere en praksisrelevant baggrundshistorie til en teoretisk opgave havde en motiverende effekt på de studerende. Casen inkluderede desuden elementer fra adskillige undervisningsgange og blev derfor anvendt til en opsummering af forskellige emner og en assessment af de studerendes læring.

Casen i Bilag D omhandlede primært mit fagområde og tilgodeså således ikke de faglige interesser for alle studieretninger på kurset. Jeg udviklede derfor en ny tværfaglig case til blok 4 2016 (Bilag E). Denne case tager også udgangspunkt i en aktuel problemstilling, men denne gang vil jeg inkludere tværfagligt gruppearbejde. Spørgsmålene i casen er formuleret således, at forskellige faglige kompetencer skal anvendes for at løse opgaven. Så vidt muligt vil jeg danne grupper som inkluderer studerende med forskellige interesser og fremtidige specialiseringer. Jeg vil desuden give de studerende forskellige roller i case-arbejdet for at udnytte tværfagligheden og fremme den reflektoriske og dybere læring. Jeg vil blandt andet bede de studerende besvare spørgsmålene ud fra landmandens, politikerens og naturforvalterens perspektiv. Efter første afholdelse af denne case vil jeg evaluere effekten ved diskussion med studerende og kollegaer på kurset og efterfølgende foretage nødvendige justeringer. Jeg mener desuden, at casen har potentiale til at blive udbygget til en temadag på kurset som inddrager alle undervisere. Temadagen forventes at kunne opsamle og integrere de forskellige kursustemaer og vil således fremme constructive alignment på kurset.

Konklusion og Perspektiver

Projektet har vist, at antallet af passive studerende kan reduceres ved at anvende forskellige pædagogiske værktøjer til aktiverende undervisning. Et trygt og nærværende læringsmiljø viste sig at være et vigtigt grundlag for den varierende, aktiverende og dialogbaserede undervisning. Projektet viste desuden, at læringsmålsbaseret undervisning kan anvendes til at aktivere studerende og strukturere undervisningsplanlægningen. Fremadrettet bør læringsmålene dog gøres endnu mere tværfaglige for at motivere alle studerende. I 2015 fokuserede jeg primært på at udvikle klare læringsmål til egen undervisning inden for emnerne jordbundskemi og planteernæring. Fremadrettet vil jeg i samarbejde med lærergruppen udvikle tværfaglige og mere overordnede læringsmål, som eventuelt kan anvendes på afsluttende temadage i kurset.

Med hensyn til case-baseret undervisning blev det vist, at denne undervisningsform har en motiverende effekt, hvis casen er relevant og problemorienteret. Effekten af den nyudviklede tværfaglige case vil blive evalueret efter blok 4 2016 – både men hensyn til studenteraktivering og constructive alignment. Jeg vil desuden i højere grad anvende problemorienterede cases som eksamensopgaver i fremtiden for at skabe bedre sammenhæng mellem de forskellige kursusaktiviteter.

Samlet set har udviklingsarbejdet på kurset *"Jord, Vand og Planter"* resulteret i en øget aktivering og motivering af de studerende, hvilket blev understøttet af positive evalueringer fra de studerende[3]. Der er desuden nu bedre sammenhæng mellem læringsmål, undervisning og eksamen. Kursusændringerne havde dog ingen signifikant effekt på de studerendes karakterer (eller på beståelsesprocenten), hvilket fortsat vil blive observeret de kommende år, når yderligere ændringer er blevet implementeret.

[3] https://www.dropbox.com/s/0nss91pmj4jay34/Teaching evaluation.pdf?dl=0

Referencer

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university* (3. udg.). Open University Press/McGraw Hill.

Chew, S. L. (2014). Food science education and the cognitive science of learning. *Journal of Food Science Education*, *13*(4), 65–67.

Coorey, R. & Firth, A. (2013). Integrated contextual learning and food science students' perception of work readiness. *Journal of Food Science Education*, *12*(2), 20–27.

Krogh, L., Stentoft, D., Emmersen, J. & Musaeus, P. (2013). Casebaseret undervisning. I L. Rienecker, P. S. Jørgensen, J. Dolin & G. H. Ingerslev (Red.), *Universitetspædagogik* (s. 201–214). Samfundslitteratur.

Prince, M. (2004). Does active learning work? a review of the research. *Journal of engineering education*, *93*(3), 223–231.

Scott, P. H., Mortimer, E. F. & Aguiar, O. G. (2006a). The tension between authoritative and dialogic discourse: a fundamental characteristic of meaning making interactions in high school science lessons. *Science Education*, *90*(4), 605–631.

Scott, P. H., Mortimer, E. F. & Aguiar, O. G. (2006b). The tension between authoritative and dialogic discourse: a fundamental characteristic of meaning making interactions in high school science lessons. *Science Education*, *90*(4), 605–631.

A Fokusområder for de 4 specialiseringer på naturressourceuddannelsen

Plantevidenskab[4] Fokus på de processer, som danner grundlaget for plantevækst og planteproduktion. Planternes biologiske, fysiske og kemiske processer samt jordbunds- og klimafaktorer.

Miljøvidenskab[5] Fokus på miljø, kemi, økologi og løsninger til bæredygtighed i produktionen.

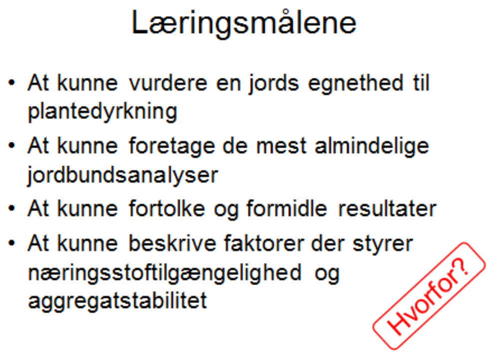
Naturforvaltning[6] Naturen som økologisk system med mennesket som bruger af naturen, og med de love og regler, vi sætter for at beskytte naturen og bruge den bæredygtigt.

Miljøøkonomi[7] Hensigtsmæssig udnyttelse og forvaltning af Verdens ressourcer.

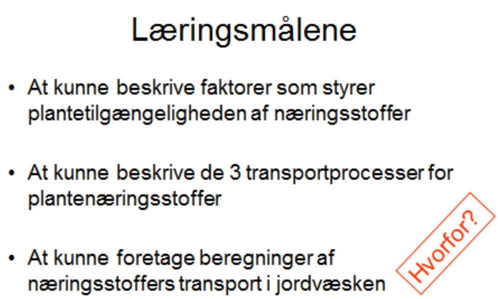
B Undervisningsemner og tilhørende læringsmål fra kurset i 2015

Eksperimentel øvelse 1-2 + teoretisk opsamling: Jordens tekstur, reaktionstal, ledningsevne, kationbytningskapacitet og basemætningsgrad

[4] http://studier.ku.dk/bachelor/naturressourcer/specialiseringer/plantevidenskab/
[5] http://studier.ku.dk/bachelor/naturressourcer/specialiseringer/miljoevidenskab/
[6] http://studier.ku.dk/bachelor/naturressourcer/specialiseringer/naturforvaltning/
[7] http://studier.ku.dk/bachelor/naturressourcer/specialiseringer/miljookonomi/



Forelæsning + teoretisk øvelse: Næringsstoftilgængelighed



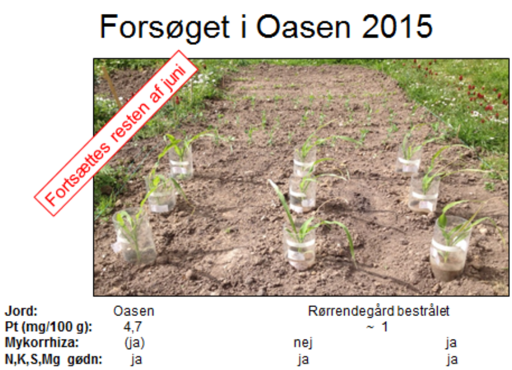
Forelæsning + teoretisk øvelse: Essentielle plantenæringsstoffer og næringsstofoptagelse

Forelæsning + teoretisk øvelse: Næringsstoffernes funktionalitet

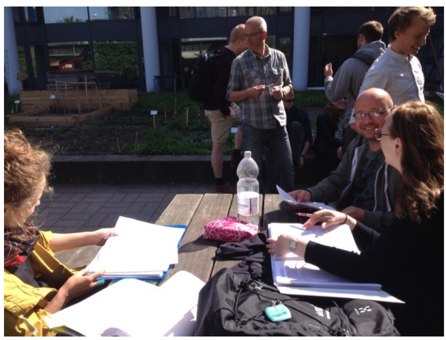
C Eksempel på aktiverende undervisning fra kurset i 2015

Nedenstående viser kursusrelevant dyrkningsforsøg som blev udført i studenterhaven ”Oasen” på KU-Science i kursusperioden (fra Facebook reklame i starten af kurset).

Nedenstående viser, hvordan dyrkningsforsøget i ”Oasen” blev integreret i en undervisningsgang omhandlende fosfor i planter og betydningen af symbioser med svampe.



Nedenstående viser kursusafslutningen og spørgetimen inden eksamen, som blev afholdt i ”Oasen”.



D Eksempel på case anvendt i 2015

Baggrund: I sommeren 2014 besøgte jeg nogle af de største tomatgartnerier i Danmark. I et af gartnerierne observerede jeg symptomer på næringsstofmangel, hvilket viste sig at skyldes en fejl i gartneriets gødskningsprocedure. Dette havde store økonomiske konsekvenser for tomatproducenten. De studerendes opgave var dermed med baggrund i deres viden om plantenæringsstoffer fra kurset at finde ud af, hvad gartneren havde gjort forkert.

a) Hvilke essentielle makronæringsstoffer optages af planter som kationer?

b) En gartner observerer intervenøse kloroser og nekroser på de ældste blade af sine tomatplanter (se billedet nedenfor). Han får derfor lavet en bladanalyse. Vurdér ud fra de visuelle observationer og de anførte koncentrationer fra bladanalysen, hvilket næringsstof planten mangler.

Næringsstof	Koncentration (mg kg^{-1} tørstof)
Nitrogen (N)	31000
Fosfor (P)	4200
Kalium (K)	14500
Svovl (S)	2100
Magnesium (Mg)	600
Calcium (Ca)	5700
Kobber (Cu)	11
Zink (Zn)	36
Mangan (Mn)	55
Jern (Fe)	225

c) Beskriv phloem-mobiliteten af det næringsstof, som tomatplanten mangler, og relatér dette til symptomernes placering på planten.

d) Beskriv de vigtigste funktionelle egenskaber af det manglende næringsstof, og relatér disse til de visuelle symptomer vist på billedet.

e) Hvordan kan gartneren afhjælpe denne næringsstofmangel?

f) Omregn koncentrationen af det manglende næringsstof til µg g-1 frisk plantemateriale. Det oplyses, at planten indeholder 93,5 % vand.

E Eksempel på disposition og tværfaglig case til undervisningen i 2016

Nedenstående case vil blive anvendt i slutningen af kurset – eventuelt på en temadag som integrerer de forskellige kursusemner, og dermed inkluderer alle undervisere. Det vil sige, at casen også vil blive anvendt som en opsummering af tidligere undervisning og til at vurdere om de studerende har nået udvalgte læringsmål (assessment).

Fagligt formål: Med baggrund i deres viden om kvælstof i jord og planter skal de studerende diskutere de mulige årsager til en dårlig kvalitet af dansk produceret korn. De studerende skal efterfølgende diskutere konsekvenserne af regeringens nye forslag vedrørende kvælstofgødskning.

Litteratur: Litteratur udleveret ved tidligere forelæsninger om næringsstoffer i jord og planter samt forelæsningsslides udarbejdet til casen. Dis-

position for 3 timers undervisning

9-9:45: Introduktion til dagens case med korte oplæg om følgende punkter (dialogbaseret):

- Plantetilgængelighed og transport af kvælstof i jord
- Optagelse, translokation og funktionen af kvælstof i planter
- Kvælstofgødskning i relation til udbytte, kvalitet og miljø
- Konsekvensen af tidligere kvælstofnormer?
- Introduktion til hovedpunkterne i regeringens 16-punktsplan (se nedenstående slide)

10-10:45: Opdeling i tværfaglige grupper og efterfølgende gruppearbejde, hvor følgende diskuteres:

- Med udgangspunkt i jeres viden om kvælstofs mobilitet i jord og planters foretrukne kvælstofformer, diskuteres de bedste gødskningsstrategier på henholdsvis en sandet og en lerholdig landbrugsjord.
- Med udgangspunkt i jeres viden om kvælstofs funktion i planter diskuteres konsekvensen af undergødskning i relation til udbytte, kvalitet og økonomi.
- Diskuter de potentielle miljømæssige og økonomiske konsekvenser af en øget kvælstoftildeling til danske afgrøder.
- Hvordan synes I, at ressourcerne bør udnyttes mest effektivt og bæredygtigt i fremtiden?

Resultatet af jeres diskussion præsenteres på de 5 padlets [8]

i) Optimale gødskningsstrategier

[8] https://da.padlet.com/

ii) Undergødskning

iii) Tidligere kvælstofnormer

iv) Nye kvælstofnormer

v) Ressourceudnyttelse

1-11:45: Koordineret af underviseren præsenterer hver gruppe deres bidrag til de 5 padlets. Der lægges vægt på, at synspunkter fra studerende fra forskellige studieretninger præsenteres.

11:45-12: Opsamling fra underviserne.

Nedenstående er eksempler på slides, som vil blive anvendt til introduktionen kl. 9-9:45 (punkt 4 og 5).

UNIVERSITY OF COPENHAGEN

Måske mere kvælstof på vej – 16 punkts planen

- Omfattende måleprogram og gradvis udfasning af reducerede gødskningsnormer
- De reducerede gødskningsnormer fjernes med en tredjedel om året, så der kan gødskes »**landbrugsfagligt optimalt**« i 2017 (under hensyntagen til nitratdirektivet.)
- Samtidig iværksættes hurtigst muligt et omfattende måleprogram for at få mere viden om kvælstoftransport til brug for gennemførelsen af målrettet regulering i 2016.
- Gødningsregnskaber fastholdes.

Løser det problemet?

15

Investigating and adapting the student interactions and student activating teaching methods of the course 'Veterinær retsmedicin og dyrevelfærdsvurdering'

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My motivation to work on the course of Veterinary jurisprudence and Animal Welfare Assessment is mainly because the evaluation of this course in the last years was 'improvable', I was told, and that means there has to be a change in the course to create a more positive learning environment for the students. This course is mandatory, but is also responsible to provide very important knowledge for the future Veterinarians they need every day in their profession; in my opinion, such a course should have a constructive learning atmosphere (Course information, 2014) and room for moral discussions and development (Bebeau, 2002). Veterinarians are key players in drafting animal protection laws, supporting and guiding legislation bodies and educating and informing society in animal ethics. Whenever there are no alternatives they are responsible for animals (eg. in pharmaceutical experiments) and their humane treatment until re-homing or of the professional euthanasia. It is the responsibility of Veterinarians to investigate and support alternatives to the killing of actually healthy animals, engage and ask for the agreement of ethical committees and mind everyone to the ethical considerations about sentient beings, such as animals, that we should have as humans.

Due to the great importance of the content of the course, I would like to take the challenge and modify the course as there are some reasons (or problems I hypothesize) why it might not receive full attention by the students. First of all it is an e-learning course and I think those bare a very challenging structure in themselves as a very important aspect of learning – the social aspect – might be missing (Insel, 2003). Students-teachers and students-students interactions are very limited by the format (Dohn, Thorsen, and Larsen, 2015) as they are not in direct and immediate communication and writing in a forum offers different possibilities as speaking in the class room. Secondly I would like to take a closer look on the student-centred and activating elements in the course that were already included and if necessary modify them to build a more motivating environment for learning and for being active and communicating students. I would therefore like to analyse how much interactions were going on in the last year, and then implement some interventions to try to improve the quality and quantity of social interactions. Finally I would like to evaluate the implementations in the sense of how frequent they were used by students and therefore quantify the student interactions in the new forums and tasks in this year.

Materials and Methods

For comparing the last year (2015) and the current year (2016) I analysed first how many interactions were in the recent 2015 course from students-to-students and students-to-teachers in the online forum in Absalon (the moodle system at KU). The threads in the discussion forum for the course members 'Diskussionforum for kursister' was regarded as place were student-student communication could take place. The folder 'Spørgsmål til undervisere vedr. Dyrevelfærdsvurdering' was regarded as teacher-student communication platform. The threads in the specific folders were counted and also the answers to the threads registered to arrive at a final number of 'interactions' (for further details see also table 15.1).

To enhance the communication between students I introduced more student activating methods of different kinds. First thing I introduced was a comment they have to write and upload in a discussion forum, phrasing one argument each of the three classical definitions of animal welfare and including the citation. This exercise corresponded with the papers they had to read for the module of the course and shall help to activate their passive knowledge from reading to build up competence on definitions of Animal Welfare by paraphrasing and categorizing. Secondly, I included an exercise were they could build up skills in learning to assess a welfare parameter which is frequently included in assessment protocols for dairy cows. They could watch a training video, try out to measure and control their results and finally compare themselves with colleagues, which was also partly a communication possibility. To give support and scientific background they got the reference of a paper investigating the same parameter and additionally giving advice on methodology. Thirdly, I added a new discussion forum and task in the Modul 6 - Adfærdsbehov og dyrevelfærd. Here the students could describe a behaviour-sequence in animals which they think represents a stereotypy and discuss among each other's if this is in line with the descriptors they have learned and the scientific definitions. This is in addition to video-examples they can see and papers for basic understanding of the topic. See also a summary in table 15.1.

Results and Discussion

Last year (2015), there were 5 topics in total opened by students in the 'discussion forum' of which two stayed unanswered, one had only one answer, one thread had 4 answers and one 8 with several students involved. Altogether there were 12 'interactions' from student to student. All the threads were on questions of 'retsmedicin'. Teacher-student: Six threads were opened by students in the 'velfærdsvudering' folder, of which two have no answer by a teacher, two have only one answer by a teacher and two have involvement of a second student in the answers. Altogether there were 16 'interactions' counted.

This year (2016), 3 students in total used the new interactive exercises and forums, with two students answering existing threads. Two students were asking questions to their colleagues in the students' discussion forum, with no answers so far but no student was writing in the teacher-student – forum so far. For details pls consult table 1. This means that at the moment the comparison between the year 2015 and 2016 showed a much lower participation of the students in the current year.

At the moment less than half of the 138 students have been active in (at least parts of) the course, as they can go through it from April to end of August, whenever they find the time for it.

Looking at the mandatory parts of the course, such as the QUIZZES, they have to answer before they can go to the exam, I can see that 67/76 students (Modul 2) and 81/82 students (Modul 6) still didn't answer the quiz in the 'Dyrevelfærdsvurdering' – part. Many of the students had to follow other courses during block 4 and will, most likely, go through the course in their summer break.

Table 15.1: Participation of students in the modules of 'dyvelfærdsvurdering' and the interactive parts (Absalon, last visited on 29/08/2016)

Modul in the course	**Topic**	**Student activating element**	**Method**	**threads 2015**	**answers 2015**	**threads 2016**	**answers 2016**
2 – Velfærds-vurdering og velfærdskontrol	classical definitions of animal welfare	write and present own definitions for the 3 main definitions of AW	Discussion forum	NA	NA	1	0
2 – Velfærds-vurdering og velfærdskontrol	lying down behaviour and IOR	Learn and practice how to measure the parameter with videos; present and discuss results; discover the meaning of reliability	Training presentation Training video, Data to assess, Discussion forum	NA	NA	2	6
6 - Adfærdsbehov og dyrevelfærd	stereotypy	write and present own observation of a stereotypy	Discussion forum	NA	NA	11	2
Spørgsmål til undervisere vedr. Dyrevelfærds-vurdering	Q&A with the course leader for animal welfare assessment	write a question	Discussion forum	6	9	0	0
Diskussion-forum for kursister	Q&A with other students	write a question or answer	Discussion forum	5	11	2	1
Total interactions				**11**	**20**	**16**	**9**

However, even now it can already be derived from the participation in the different parts, that the mandatory QUIZ-part is used by much more students than the voluntary TASK-part or the discussion forums that I introduced. My interpretation is that students are focusing on the obligatory parts of the course and mainly try to answer the questions correct (which they can try as often as they want). I further conclude that they work very target-orientated rather than subject or content-orientated and their main goal is to be accepted for the exam and not to practice animal welfare assessment. We could, of course, exchange this for next year: the exercises are mandatory, whereas the quizzes, with potential exam questions, are voluntary; then we might succeed in enhancing the competences and skills of our students with these exercises. Another possibility is to include the content from the exercises into the exam questions and quizzes; this might be a bit trickier as from their nature they are hard to cover by multiple choice questions. A slightly more positive assumption is of course that the students are in a phase of exploring the online-course at the moment and will intensify their studying through-out the summer and towards the exam. It is possible that they first want to gain knowledge through the materials that we provided and reading before they want to shift to the more practical and experimental part of the course. In the case of two students participating in the TASKS this could be verified as they were practicing with the QUIZ 1-5 days before they were writing in the discussion forum for the TASK.

Looking at the participation in the student-forums and the student-teacher forums, the opposite result as expected occurred: this year nearly no entries (so far). Either it was not attractive to communicate in the forums with colleagues and teachers or the questions will come later, once the students have worked more with the content and the practical parts.

I will, therefore, check all the results and forums again after the course has finished end of August to finalize my data collection and to be able to make a full comparison between the two course years and to evaluate the amount of student participation in the new TASKS and forums.

Conclusion

The low student participation in the forums, TASKS and discussions, which were implemented as improvements of social interaction in the e-learning course, make it, at the moment, hard to interpret the success of the intervention. A further analysis end of August will most likely give a clearer picture due to higher participation and progress of the students in the course in general. Furthermore we will aim at getting a form of evaluation of the new elements by the students and consider the option to have them as mandatory parts or exam questions for the next year to enhance the student activation and learning success.

References

Bebeau, M. J. (2002). The Defining Issues Test and the Four Component Model: Contributions to professional education. *Journal of Moral Education*, *31*, 271–295.

Course information. (2014). Kursusinformation SVEK13009U Veterinær retsmedicin og dyrevelfærdsvurdering (2014/2015). English title: Veterinary Jurisprudence and Animal Welfare Assessment. Obtained on 15/04/2016. Retrieved from http://kurser.ku.dk/course/svek13009u/2014-2015

Dohn, N. B., Thorsen, M., & Larsen, S. (2015). E-learning. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed.). Samfundslitteratur.

Insel, T. R. (2003). Is social behaviour an additive disorder? *Physiology & Behaviour*, *79*, 351–357.

Part III

Research based teaching and teaching based research

16

Om at uddanne til job i forskningsbaseret undervisning

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Prolog

Doktrin i tidsånden

"Fra forskning til faktura" er Anders Fogh Rasmussen-regeringens doktrin af 2003 på forsknings- og uddannelsesområdet. Doktrinens sigte er i højere grad at kapitalisere samfundets investering i forskning og uddannelse. Doktrinens mantra signalerer tilsvarende et mål om forskning i det hurtigt salgbare. En forløber for "fra forskning til faktura" var således den i øvrigt begrænset succesfulde forskerpatentlov af 1999 (Laursen, Jensen og Norn, 2013), med hvilken teknologioverførsel fra universitet til virksomheder foregår ved at disse betaler til forskere og universiteter for såkaldt *intellectual properties*.

Også Helle Thorning Schmidt-regeringens nedsættelse i 2013 af Udvalget for Kvalitet og Relevans i de Videregående Uddannelser ligger på linje med doktrinens sigte. Og aktuelt mener uddannelses- og forskningsminister Ulla Tørnæs, at en kommende taxameterordning for universiteterne bør indeholde en "beskæftigelsesparameter", som kan afspejle hvor mange med en bestemt uddannelse der ender i job (K. Kristensen, 2016). Ministeren anerkender samtidig regeringsgrundlagets beskrivelse af sammenhængen mellem studievalg og arbejdsmarked som "ikke god nok", og regeringens mål om en "mere praksisnær" undervisning.

Dilemmaer på vejen mod et videnssamfund

Både Ulla Tørnæs' udmelding (K. Kristensen, 2016) og nedsættelsen af kvalitetsudvalget [1] skal delvist ses som en art nødvendig reaktion på samfundets overgang fra elite- til masseuniversiteter, og ikke kun som en snæver forfølgelse af doktrinens mantra. Samtidig fremføres ofte vore hjerner som nationens eneste råstof, og udviklingen af et videnssamfund som nationens eneste chance for fremtidig velfærd (Sahl-Madsen, 2011).

Undervisere på landets universiteter kan derfor opleve dilemmaet: *Hvordan kan undervisningen være både forskningsbaseret og målrettet samfundets netop-nu-behov?* Læg dertil kravet, via belønningssystemer og ranglister, om, at den udførte forskning skal være såvel ”elite” som ”i verdensklasse” (Bock, 2011). Og notér, at et relateret dilemma i øjeblikket søges løst gennem ”dimensioneringen”, nemlig hvordan ”elite”-forskningsbaseret undervisning kan udføres for omkring en fjerdedel af en ungdomsårgang, som desværre ikke har udvist en til studenteroptaget tilsvarende forøget intellektuel formåen. Det ovenfor kursiverede dilemma er omdrejningspunktet for nærværende tekst.

Forskningsbaseringens nødvendighed

Universitetsloven påbyder landets universiteter at ”drive forskning og give forskningsbaseret uddannelse”; loven stiller ikke krav om en bestemt form for forskningsbasering, og betegnelsen ”forskningsbaseret” antages derfor i nærværende tekst som gældende i bredest mulige forstand. Forskningsbaseret undervisning kan for den enkelte underviser være en næsten ren undervisningsmæssig betegnelse for at inddrage tidssvarende forskning i sin undervisning. Heraf afledte didaktiske gevinster omfatter en øget indre motivation for både underviser og studerende. Når underviserens egen forskning bruges i undervisningen kommer underviseren desuden på hjemmebane i stoffet. Underviserens således øgede selvtillid på fagområdet (*Banduras* self-efficacy (Ulriksen, 2014)) vil gavne de studerendes læring. Men god undervisning behøver ikke være forskningsbaseret (Rottbøll, 2012), og forskningsbasering gør ikke automatisk undervisning god.

På et dybere plan er forskningsbaseret undervisning jf. Humboldts tanker (von Humboldt, 1809) imidlertid en helt fundamental egenskab ved

[1] Kommissorium for Udvalg for Kvalitet og Relevans i de Videregående Uddannelser.

universiteter, ligesom universiteter er helt fundamentale for dagens oplyste samfund (J. Kristensen, 2007; Christiansen, 2011). Samfundets borgere oplyses kun rigtigt, hvis de selv er deres egne autoriteter. En situation med fravær af givne autoriteter opstår netop når borgeren (den studerende) og underviseren (forskeren) sammen undres, stiller spørgsmål til hinanden og opnår højere indsigter. Det er i denne borgeroplysende relation, at både forskningsbaseret uddannelse (borgerens mulighed for at undres) og forskningsfrihed (friheden til hvad borgeren må undres over) indgår i universitetsloven.

Helt så højtsvævende behøver praksis ikke at være, for at forskningsbaseret undervisning stadig kan tilskrives en fundamental rolle for dagens samfundsform. Men hvor lidt forskningsbasering er da tilstrækkelig? Lad os, som et tankeeksperiment, antage at undervisningen fra dette øjeblik ingen steder på Jorden længere var forskningsbaseret. Lad universiteterne vedblive at eksistere, og deres stabe af forskere vedblive at undervise i eftertidens evigt uforanderlige curriculum: netop dette øjebliks eksisterende viden. Lad sluttelig universiteterne fortsætte med at frembringe og publicere ny viden. Efter få generationer med denne situation, ville ingen i samfundet, selv ikke kandidater fra universitets egne gange, kunne forstå indholdet af publikationerne, der i sprog og termer ville ligne noget fra en anden verden. Omvendt ville universitets forskere af pligt genfortælle det forældede curriculum i auditoriet, som var de præster i en katedral. Det oprindelige curriculum var samtidsrelevant, men manglen på opdatering ville have gjort det historisk og abstrakt, i den forstand, at det ikke ville reflektere nye indsigter. Nye kriser, f.eks. nye dødelige sygdomsepidemier svarende til HIV/AIDS, ville være uløselige. Folk ville søge nu uoplyste autoriteter. Det oplyste samfund ville bukke under.

Af tankeeksperimentet kan vi lære, at der, via forskningsbaseret undervisning, finder en væsentlig vidensudveksling til samfundet sted, hver gang en ny bachelor, kandidat eller ph.d. forlader universitet, og efterfølgende påtager sig rollen i samfundet som formidlere og anvendere af forskningsresultater (Brügge, 2012). Det er værd at bemærke, at hvis blot undervisningsmaterialet og læringsmålene, i ovenstående tankeeksperiment, blev opdateret engang i mellem, f.eks. én gang hver generation, så ville verden af i dag nok bestå. Det er altså ikke afgørende for forskningsbaseringen, hvorvidt underviseren bruger sine mest dugfriske forskningsresultater i undervisningen, eller i stedet bygger en case på en af underviserens 20 år gamle, men stadig relevante, publikationer. Det er til gengæld afgørende, at underviseren selv forsker eller har tæt kontakt til forskningen (Rottbøll, 2012), så underviseren kan vurdere nutids-relevansen af læringsmålene.

Universiteterne skal uddanne til job (K. Kristensen, 2016)

Ser man bort fra de logistiske og bureaukratiske udfordringer det er at sikre, at "ingen uddannes til arbejdsløshed", er sagen klar: arbejdsløse akademikere er udtryk for spild af samfundets ressourcer. Spild er det også, hvis universiteterne uddanner færre end de har kapacitet til, mens der er ledige stillinger. Optimalt er det for samfundet, når både alle nyuddannede akademikere er kvalificerede til de ledige stillinger, og antallet af optagne og universiteternes kapacitet er afstemt med antallet af ledige stillinger (3 og 5 år senere).

Men præcis hvilken læring kvalificerer til job? For aftageren, privat eller offentlig, kan kvalificeret ultimativt betyde, at den nyansatte nyuddannede akademiker allerede fra uddannelsen ved præcis hvordan opgaverne hos aftageren løses. Der er dog ikke nogen direkte modsætninger imellem at være således kvalificeret, og så at have tilegnet sig kompetencer ud over det netop kvalificerende. Dette forhold overses dog ofte i debatten (K. Kristensen, 2016).

Betydningen af forskning for samfundet, og dermed nødvendigvis af forskningsbaserede uddannelser, er bredt anerkendt i erhvervslivet (Dybvad, 2016), og var tilmed den oprindelige årsag til grundlæggelsen af universiteter i middelalderen (von Helmholtz, 1877). Forskningsfriheden er (Ejsing, 2015), og har i længe været (von Helmholtz, 1877; Hvid, 1999), et væsentligt omdrejningspunkt for debatten om sammenhængen mellem studievalg, læringsmål og arbejdsmarked. Mens forskningsfriheden er en hjørnesten i den germanske (humboldtske) akademiske tradition, der har det oplyste frie samfund som mål, er forskningsfriheden mindre væsentlig i den såkaldt angelsaksiske akademiske tradition. Den angelsaksiske tradition lægger større vægt på anvendt forskning og på forskning der imødekommer erhvervslivets aktuelle behov (Ejsing, 2015), og har derigennem i højere grad profit som mål.

Case og Analyse

Af ovenstående må uddrages at *universitetsundervisningen* **kan** *være både forskningsbaseret og målrettet samfundets netop-nu-behov.* Som case i denne tekst vil kandidatkurset Groundwater Geochemistry (7½ ECTS og typisk 12-18 deltagere) herunder være genstand for en analyse af i) kursets grad af forskningsbasering og ii) dets grad af, at være målrettet aftagernes aktuelle behov. Derefter vil en række didaktiske overvejelser vedr. en forbedring af kurset blive diskuteret.

Beskrivelse af kurset

Kursets læringsmål er at opnå kompetencer til at samtolke grundvandskemiske data med hydrogeologiske data. Tolkningerne kan have som mål at beskrive vandstrømning i et grundvandsmagasin. F.eks. viser tilstedeværelsen af nitrat og pesticider i et grundvandsmagasin, at i) magasinet modtager vand fra landbrugsarealer, ii) at magasinet ikke er beskyttet af et tæt lerlag, og at iii) en del af vandet må være mindre end nogle få årtier gammelt (historikken for anvendelsen af forskellige pesticider kan evt. præcisere hvor gammelt). I andre eksempler kan grundvandet have reageret med mineraler (f.eks. kalk) og/eller organisk stof på dets vej gennem de geologiske lag, hvilket igen kan bruges til at tilbagespore vandets strømningsveje når geologien (fordelingen af kalk eller organisk stof) antages kendt. Som hjælpeværktøj til både læring og tolkning bruges et computerprogram til såkaldt reaktiv stoftransport: herved kan effekten på vandkemien af specifikke geokemiske reaktioner langs grundvandets strømningsbaner testes, og modelresultatet kan sammenlignes med virkelige observationer. Kurset evalueres ved en kombination af tre skriftlige rapporter og en individuel mundtlig eksamen. De fleste vælger kurset igennem at arbejde i grupper på to-tre personer, når der ses bort fra den mundtlige eksamen.

De kompetencer, der er kursets læringsmål, er centrale i næsten al grundvandsbetinget vandforsyningssikkerhed og miljøbeskyttelse. Som sådan er kompetencerne aktuelt derfor samfundsrelevante (Halskov, 2016; Sand-Jensen, 2015; Politiken, 2016). Kandidater med kurset er efterspurgte af rådgivningsvirksomheder, vandforsyninger, myndigheder og forskningsinstitutioner.

Undervisningen tager udgangspunkt i en række cases. Rækken af cases er sådan udvalgt (jf. Wagenscheins eksemplariske princip (Ulriksen, 2014)), at de introducerer alle de grundlæggende grundvandsgeokemiske processer, og gør dette med reaktiv stoftransport som en gennemgående rød tråd. Den ældste case bygger på en snart 40 år gammel artikel af Reardon et al. (Reardon, Allison og Fritz, 1979). Den yngste case (ny) bygger på et upubliceret datasæt (2016) fra Hørup Kildeplads. De resterende cases er baserede på artikler publiceret mellem 1990 og 2014. Flertallet af artiklerne har samme forfatter som kursets lærebog (Appelo og Postma, 2005), Dieke Postma, som længe har været og stadig er en international frontfigur på kursets fagområde.

Hvor forskningsbaseret er kurset, og hvor godt uddanner det til job?

Kurset er uomtvisteligt forskningsbaseret, da det bygger på forskning med nutids-relevans. Kursets cases danner i sammenhæng grobund for meget brede kompetencer på fagområdet, hvilket kommer til udtryk gennem efterspørgslen af kandidater fra et bredt felt af aftagere. Samtidig ansættes nogle, men kun få, af kursisterne selv som forskere, hvilket illustrerer at kompetencerne er anvendelige fremadrettet i nutidens forskning. Det sidste kan ses som direkte udtryk for en, som minimum, netop tilstrækkelig grad af forskningsbasering, idet nogen blandt kursisterne viser sig i stand til at føre forskningen (og dermed oplysningen af samfundet) videre. I den anden ende af skalaen ville et mere specialiserende kursus, med en fokuseret fordybelse i en enkelt case, og med forskningsbasering i netop underviserens aktuelle emne for sin forskning, sandsynligvis føre til flere forskeraspiranter og indsnævre aftagerfeltet. I dette rum af 'forskningsbaseringsgrader' placerer kurset sig. Det brede felt af aftagere udenfor forskning antyder samtidig, at kurset uddanner godt til job.

Mens kurset altså er forskningsbaseret, så er kurset det ikke på en måde, hvor underviser og studerende sammen undrer sig over og tolker nye friske data og når nye højere erkendelser. I stedet er vægten i kurset mere på den samfundsmæssige relevans, end på interessen for systemet. De studerende får, når læringen lykkes, procesforståelse som værktøjer til løsning af samfundsproblemer, ikke blot som middel til øget dannelse og samfundsoplysning. Dette er udtryk for en mindsket germansk, og en øget angelsaksisk, tilgang. Det er i denne sammenhæng interessant, at samtlige cases bygger på litteratur skrevet i den germanske tradition. Og at underviseren selv ønsker at forske i den germanske tradition.

Ny case i kurset

For underviseren er det selvsagt ærefuldt at undervise et efterspurgt kursus. Tidens ånd3 (K. Kristensen, 2016; Ritzau, 2015; Lauridsen, 2015; Kristiansen, 2016), som eksponeres når de studerende spørger: "hvad kan det bruges til?", lægger desuden pres på underviseren til at efterstræbe det på kortere sigt samfundsnyttige. Dette er konkret grunden til, at den ovenfor omtalte nye case i kurset fra 2016 vil erstatte en case, der handlede om de alvorlige effekter på grundvandet, som minedrift kan have. Den nye case handler om vandkvalitetsudvikling i en række boringer, der forsyner København med vand og drives af Hovedstadens Forsyningsselskab (HOFOR). Et aktuelt her-og-nu-behov hos aftageren skal løses. Kursets bredde er væsentlig for graden af, hvor godt det uddanner til job, og bredden medvirker, sammen med opbygningen omkring cases, til at fastholde motivation i læringen. Samtidig er caseundervisningen med til at tydeligøre forskningsbaseringen. Disse elementer ønskes derfor bibeholdt i kurset.

Den nye case vil være betydeligt mindre omfangsrig end den tidligere. Dette bidrager til at løse et problem med stoftrængsel (Ulriksen, 2014) i kurset, som har presset mange studerende til en dybdestrategi på bekostning af parallelle kurser. Den nye case skal desuden motivere den studerende på både det indre (”jeg vil forstå vandet i min vandhane!”) og det strategiske niveau (”hvis jeg kan det her, finder jeg et bedre job!”). Et yderligere mål med den nye case er, at den skal styrke kursisternes self-efficacy, så de føler sig mere parate til faktisk at anvende deres nyvundne kompetencer fra kurset i en jobsituation.

For at øge de studerendes self-efficacy, skal den nye case være let nok til at inducere glæden ved at mestre stoffet, hvor der indtil da i kurset konstant er tilføjet væsentlige mængder stof i hver enkelt case. I relation til niveau-analysen præsenteret af Tamir (Tamir, 1989) varierer spørgsmålene i de fleste af kursets cases mellem niveau 0 (ren instruktion) til 3 (åbent spørgsmål, metodevalg og svar). Det kan imidlertid bemærkes, at selv på niveau 0 udfordres den studerende i at læse og forstå instruktionerne, som beskrives i fagets sprog og termer, og hér finde den virkelige læring sted! I den nye case vil denne type spørgsmål være lettere, fordi der er tale om gentagelse fra tidligere i kurset.

Generelt i kurset benyttes desuden en meget stram case-beskrivelsen: tætte instruktioner og delopgaver skal guide de studerende igennem ad ”den rette vej”. Men uden tæt vejledning af underviser mister de studerende selve problemet af syne (Ulriksen, 2014), og casen mister derved den motivationskraft, som skulle have styrket de studerendes læring. Tæt vejledning er tidskrævende og fører til et ressourceproblem. Dette søges kompenseret ved at simplificere kursets cases, og datamaterialet som udleveres sammen med disse, uden at det nedsætter læringsmålene. Denne optimeringsproces er ikke afsluttet.

Epilog

Nærværende tekst har forsøgt at redegøre for, at forskningsbaseret undervisning er fuldt forenelig med undervisning som, med populært ordvalg, uddanner til job. Men både uddannelsens forskningsbasering og dens evne til at føre til job kan gradbøjes. Universiteternes uddannelser er for lidt forskningsbaserede, hvis ingen kandidater efterfølgende er kvalificerede til selv at forske.

Kandidatkurset, der var genstand for analyse i del II, blev vurderet som tilstrækkeligt forskningsbaseret. Kurset karakteriseres desuden som godt til at uddanne til job, i kraft af en, i den sammenhæng, hensigtsmæssig balance mellem bredde og dybde. Imidlertid vil en særdeles ”praksisnær” (K. Kristensen, 2016) ny case blive del af kurset, som modsvar på samfundets stigende krav om at uddannelser skal føre til job. Er denne nye case så i sig selv forskningsbaseret? Ja, det er den. Faktisk styres mere end halvdelen af vandkemien i de nye (yngste) case af samme geokemiske proces, som de studerende lærer at tolke og modellere i undervisningens ældste case fra 1979 (Reardon m.fl., 1979).

Referencer

Appelo, C. A. J. & Postma, D. (2005). *Geochemistry, groundwater and pollution* (2. udg.). Amsterdam: Balkema.

Bock, M. (2011). Ny kurs for masseuniversitetet. *Politiko.dk*, *31. oktober*.

Brügge, C. (2012). Forskningsbaseret undervisning – det første offer? *UNIvers*, *11*.

Christiansen, F. V. (2011). Forskningsbaseret undervisning — baggrund og potentiale. I F. V. Christiansen, S. Horst, C. Holm & K. B. Laursen (Red.), *Forskningsbaseret undervisning – realiteter og potentialer*. Proceedings fra 10. Majkonference i naturvidenskabsdidaktik, IND’s skriftserie nr. 21. Institut for Naturfagenes Didaktik.

Dybvad, K. (2016). Vi skal leve af forskning og ny viden. *Dansk Industri*. DI Business (leder), *1. marts*.

Ejsing, J. (2015). Sparekrav tvinger CBS til at “pille ved selve universitetets sjæl”. *Berlingske*, *16. oktober*.

Halskov, L. (2016). For at sikre rent vand indfører kommune nu sprøjteforbud. *Politiken*, *3. juni*.

Hvid, M. (1999). Målet er dannelse ikke uddannelse. *Folkeskolen*, *49*.

Kristensen, J. (2007). Det moderne universitets ide og selvbeskrivelse gennem 200 år – en universitetshistorisk indledning. I J. E. Kristensen, K. Elstrøm, J. V. Nielsen, M. Pedersen, B. V. Sørensen & H. Sørensen (Red.), *Ideer om et universitet. det moderne universitets idehistorie fra 1800 til i dag*. Århus Universitetsforlag.

Kristensen, K. (2016). Tørnæs: Uddannelser skal uddanne til job. *Information, 7. marts*.

Kristiansen, C. L. (2016). Københavns Universitet skærer 500 stillinger væk. *Politiken, 3. februar*.

Lauridsen, L. R. (2015). Kornfed dumhed. *Information, 1. september*.

Laursen, U., Jensen, B. L. & Norn, M. T. (2013). Fra forskning til faktura – hvad kan vi lære af ti års forsøg på at tjene penge på forskning? *DEA-rapport*.

Politiken. (2016). Et spørgsmål, der ikke vil gå væk. *Politiken, 27. februar*.

Reardon, E. J., Allison, G. B. & Fritz, P. (1979). Seasonal chemical and isotopic variations of soil CO_2 at Trout Creek, Ontario. *Journal of Hydrology*, *12*, 355–371.

Ritzau. (2015). Regeringen vil spare milliarder på uddannelse. *Information, 28. august*.

Rottbøll, E. (2012). Ny bog: Adskil forskning og undervisning. *Information, 16. januar*.

Sahl-Madsen, C. (2011). Forskningsbasering skaber vækst. I F. V. Christiansen, S. Horst, C. Holm & K. B. Laursen (Red.), *Forskningsbaseret undervisning – realiteter og potentialer*. Proceedings fra 10. Majkonference i naturvidenskabsdidaktik, IND's skriftserie nr. 21. Institut for Naturfagenes Didaktik.

Sand-Jensen, K. (2015). Højt spil med 30 års indsats for vandmiljøet. *Politiken, 7. december*.

Tamir, P. (1989). Training teachers to teach effectively in the laboratory. *Science Education*, *73*, 56–69.

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1. udg.). Frydenlund.

von Helmholtz, H. L. F. (1877). Om den akademiske frihed ved de tyske universiteter (dansk oversættelse). I J. V. Nielsen, M. Pedersen, J. E. Kristensen, K. Elstrøm, B. V. Sørensen & H. Sørensen (Red.), *Ideer om et universitet. Det moderne universitets idehistorie fra 1800 til i dag*. (2007). Århus Universitetsforlag.

von Humboldt, W. (1809). Om den indre og ydre organisation af de højere videnskabelige læreanstalter i Berlin. I J. E. Kristensen, K. Elstrøm,

J. V. Nielsen, M. Pedersen, B. V. Sørensen & H. Sørensen (Red.), *Ideer om et universitet. det moderne universitets idehistorie fra 1800 til i dag*. (2007). Århus Universitetsforlag.

17

”Teaching-based research” as a triple-win: Student learning, partner benefits and research advancements

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Introduction: From “research-based teaching” to “teaching-based research” and back

The “research-based teaching” agenda in Geography (e.g. Healey, 2005) and beyond opens a discussion on the potentials of “teaching-based research”. In this pedagogy project, I refer to teaching-based research as student fieldwork projects, which includes collaboration with an external partner organization, and form part of and advance ongoing academic research. Other scholars have shown that engaging students in research activities in fieldwork - and specifically combining research-based student fieldwork with staff research - is strongly perceived by students to add value, stimulate interest in the subject, and improve understanding of methodologies (Fuller, Mellor, and Entwistle, 2014). Along these lines, I hypothesize that such teaching-based research is a triple-win, specifically because:

1. it improves student learning by increasing motivation through supervisor engagement, unique experiences, and collaboration with external partners,
2. it provides benefits to external partners in terms of new knowledge and work force, and
3. it integrates with and advances ongoing research, typically led by the main supervisor

With an emphasis on (a) student learning, the main objective of this pedagogy project is to assess students’ experiences with teaching-based research in order to draw relevant lessons and point out potentials and limitations. As a sub-objective, I also include responses from external partners to examine their benefits (b), combined with own experiences and reflections as supervisor in terms of research advancements (c).

With this particular focus and approach, I believe this pedagogy project can contribute to the overall debate on research-based teaching by turning it “upside-down” as teaching-based research (see also Rønn, 2015 on "Undervisningsbaseret forskning - en utopi?"). By showcasing lessons from (own) experiences with supervising student fieldwork in Cambodia, this project provides suggestions on how to better engage students in teaching-based research with mutual benefits for both external partners and the supervisor.

Data and methods: A survey, dialogues and self-reflections

I draw on own past and present supervision of students, who have conducted fieldwork on deforestation/forest protection in Cambodia during two separate periods. In the first period (around 2012) the student fieldwork was related to my PhD research in the Oddar Meanchey province, Northern Cambodia, where a community-based forest protection project was being implemented at the time by an American NGO called Pact, serving as the external partner for the student projects (see Bradley, 2009). During the second period (2015-ongoing), the Danish charity Danmission , along with a range of locally-based NGOs, served as external partners for student projects revolving around local forest monitoring and protection of the Prey Lang forest in central Cambodia.

An online survey was developed to assess student experiences after completing fieldwork. Eight out of nine invited students completed the survey. The survey contained questions about: their level of motivation and how it was affected by the setup (student-partner-supervisor); their level of learning and how it was affected by the setup; whether they felt they had contributed to academic research; whether they had felt like a benefit or burden to the external partner; and finally, how they perceived the strengths and weaknesses of the setup, and how to improve it.

Besides the student survey, dialogues with external partners, as well as my own experiences and reflections as supervisor, provide data to test sub-hypotheses (b) and (c).

Results: Motivation, learning outcomes, limitations and potentials

Below, an account of results and selected quotes from the student survey are brought forward to exemplify whether and how this particular case of teaching-based research (a) improves student learning, (b) provides benefits to external partners, and (c) advances ongoing research.

Student motivation

The responses from the students show a general high level of motivation towards their (field) study. On a 5-point scale, five students rated their motivation as ‘very high’ (highest rating), while three students rated their motivation as ‘high’. Similarly, five student stated that the setup of student-partner-supervisor ‘greatly increased motivation’ (highest rating), while three stated that their ‘motivation increased’. When explaining why and how motivation was affected by the setup, one student said:

> Det at jeg/vi var i Cambodja "via." ekstern partner, har skabt trykke rammer, og givet anledning til at engagere sig endnu mere i projektet, da netop de eksterne partnere har vist interesse i vores projekt [...]Ligeledes har det at arbejde som frivillige i en udenlandsk organisation virket motiverende for vores eget "faglige" projekt [...]blandt andet at sammenarbejdet mellem studerende/vejleder og en ekstern partner, gav os ressourcer og muligheder for at komme [af sted]

Another student noted an increased will to perform well, saying that:

> ... man ønsker at levere en bedre præstation ikke kun for ens egen forventninger men også for vejleder og ekstern partners skyld

A third student simply said that the setup ”provided support, guidance and a feeling of reassurance”, while a fourth student coupled his/her motivation with the supervisor’s engagement and experiences:

> It was great that the supervisor was very passionate about the project. Also, it was motivating that there already was a base from where my own project could develop. Mainly because it created safety, somebody to share reflections with and a foundational knowledge on the project - something to build on.

Student learning outcome Similar to and as a natural effect of the high levels of motivation, responses from the students show a perceived high level of learning. Seven out of eight rated their learning outcomes as 'very high' on a 5-point scale, while one students rated it as 'high'. Half the students stated that the setup of student-partner-supervisor 'greatly increased learning outcome', three stated that their 'learning outcome increased', while one student felt 'no effect' of the setup on his/her learning outcome, mainly because the student "tried to work as independently as possible". Other quotes support the perceived positive effect of the setup on student learning, for instance related to the collaboration with the external partner and support from the homebase in Denmark:

> At arbejde i det miljø man behandler giver et helt andet syn på projektet. Der er en ro at finde når man har et samarbejde med ekstern partner [. . .] Det giver et langt større læringsindhold.
>
> There were other people to bounce ideas off. There was a sense of 'this is worth doing and will contribute towards something'. Having a contact person in Denmark who had been in Cambodia before was very helpful, and who could help to guide the process was indispensable!

While the last part of the latter quote likely refers to the supervisor, the student also mentions "other people" in plural, indicating that the group of students (in particular in the second period, Prey Lang) shared their experiences with each other, which created a sense of joint objective and venture. I will return to this point in my own reflections, section 3.6.

Benefit or burden?

Three of the eight students stated that they had felt like 'a benefit only', three had felt like 'a benefit with some burdens attached', while two had felt 'neither a benefit nor a burden'. None of the students had felt 'more' or 'only as a burden'. Most of the students were quite rational, when asked to consider whether they had felt like a benefit or burden:

> I felt like the set up was very fair, and that the NGO had an option of saying no to hosting, therefore I didn't feel like a burden. The people who worked there were very supportive and kind, which made the experience enjoyable. It was also interesting to see how they work!
>
> Felt some of my findings could positively be used further by external partner; on the other hand obviously needed a chunk of their time and explanation.

Besides students providing new knowledge in expense of the external partners' time, an additional benefit to the external partner was raised by one student, concerning how the students could act as links between multiple partners:

> … det var positivt at der kunne gives feedback på samarbejdet med de NGO’er vi blev sendt ud i. Jeg føler jeg har fungeret som bindeled mellem den eksterne partner og endnu en ekstern partner - et allerede fungerende partnerskab bliver derved styrket ved at man hjælper hinanden.

Limitations and potentials

Finally, the students were asked to share their views on the strengths and weaknesses of the setup and how it could be improved. Some specific suggestions were aired, including preparation of tasks for the students, and feedback was given on the general coherency of the setup in time and space:

> [vi blev] videresendt til NGO’er. Her ville det ha’ været mere professionelt, hvis disse NGO’er havde en række af opgaver man kunne hjælpe med […] kunne der godt være en bedre forklaring til en eksterne partner hvilke redskaber og kunnen man ankommer med. Derudover skal det nævnes at det at der er personlig kontakt inden, under og efter med [external partner] er virkelig positivt. Det giver en helhed til projektet og motivere blot yderligere til arbejdet […] Meget professionelt at information omkring muligheden for projektet, samt samarbejdet, starter så tidligt i processen. At vejleder selv har været i felten i det respektive land samt områder giver helt klart også en positiv indvirkning da man føler sig mere sikker i felten samt at det motiverer endnu mere at vide at man bygger videre på undersøgelsen af allerede eksisterende problematikker. Meget tilfreds herfra.
>
> Det kunne være en god ide, at lave/tegne/skrive en kontrakt, liste eller lignende, hvori det fremgår hvad formålet med ens arbejde i den pågældende organisation skal ende ud i. Jeg følte at nogle overordnede formål/mål ved at arbejde i [external partner] ville have gavnet mig, og gjort et rigtig godt koncept endnu bedre.

Similarly, communication and coordination was mentioned by other students as the main weakness with the greatest potential for improving the concept:

> More communication between the parties involved, maybe in the format of regular reports (email)
>
> The main weakness from my experience was that my role was not clearly specified when I came to Cambodia […] To have a more

> clear idea of responsibilities makes it so much easier to get engage quickly. The main strength was to have a group of people in Cambodia - all involved in the same project. This created affiliation and somebody to discuss the issues with.

The sense of a common goal is emphasized here again and rounds up the survey results.

Contribution

Besides contributing to the work by the external partners (in terms of knowledge exchange, writing reports/blogs, strengthening links across partners, etc.), actual contributions to academic research, teaching and even policy is evident from this case of teaching-based research. For instance, a combination of the data from the supervisor and a student has resulted in a peer-reviewed article (Pasgaard and Nielsen, 2016), another student has given a guest lecture about her fieldwork at MSc courses on qualitative methods and rural livelihoods, respectively, and a third student gave direct input to a main policy design document (Terra Global, 2012). It should also be noted that the setup contributes to the students' personal experiences and development, and in a very direct way to their professional resume/CV.

Reflections from external partner

Continuous dialogue with the main external partner of the Prey Lang project, Danmission, provides a few reflections to be included. Head of Danmission in Cambodia expresses a great satisfaction with the setup, and is pleased that students want to engage in and help with the project. He also notes that the local partners have been very pleased with the assistance from the students. Besides, summaries of the student projects are communicated back to the main funder, Danida, as a part of the project outcome, thereby adding value to the project documentation and lessons as a whole.

Reflections by supervisor

From my point of view as the co-supervisor (2012) or main supervisor (2015/ongoing), this form of teaching-based research has several advantages, which more than makes up for the additional administration and coordination efforts (email communications, assisting with host letters and funding applications for fieldwork, etc.). First and foremost, students' increased motivation and learning outcomes are valuable and rewarding in itself. Importantly, with regard to research contribution, I view the students as my "drones" or "extended tentacles" in the field, meaning that they bring home new updated knowledge, and that they maintain or even extend my academic network. For the actual supervision, the setup allows me draw on my own and other students' experiences to a great extent. In that regard, I have tried to build and connect common experiences among students, encouraging them to share and pass on their lessons and knowledge on practical matters, in that way facilitating a sense of a common goal and joint contribution, as also mentioned by the students above. I believe that this furthers motivation and has been quite successful, mainly due to the willingness and engagement of the students themselves to build something together, also independently of my supervision (e.g. setting up shared folders and meeting on own initiative). As a final remark, I have learned that it is important to level expectations with the external partners in the early stages of the setup and throughout the collaboration in order to minimize misunderstandings and a mixing of responsibilities.

Conclusion: More than a triple win?

This pedagogical project confirms its hypotheses of increased student learning, partner benefits and advanced research, and it goes even further. It shows additional benefits of teaching-based research in terms of linking across partners, creating a common sense of aim and contribution, and contributing beyond expected outcomes. Lessons of better communication, coordination, preparation and levelling of expectations can further improve the concept.

References

Bradley, A. (2009). *Communities & Carbon. Establishing a Community Forestry-REDD Project in Cambodia.* Pact Cambodia.

Fuller, I. C., Mellor, A., & Entwistle, J. A. (2014). Combining research-based student fieldwork with staff research to reinforce teaching and learning. *Journal of Geography in Higher Education*, *38*(3), 383–400.

Healey, M. (2005). Linking Research and Teaching to Benefit Student Learning. *Journal of Geography in Higher Education*, *29*(2), 183–201.

Pasgaard, M. & Nielsen, T. F. (2016). A story of "communities": Boundaries, geographical composition and social coherence in a forest conservation project, Northern Cambodia. *Geografisk Tidsskrift-Danish Journal of Geography*, *2016*, 1–13.

Rønn, A. K. (2015). Undervisningsbaseret forskning – en utopi? *Universitetsavisen*, *Jan. 7*. Retrieved from http://universitetsavisen.dk/uddannelse/undervisningsbaseret-forskning-en-utopi

Terra Global. (2012). Reduced Emissions from Degradation and Deforestation in Community Forests - Oddar Meanchey, Cambodia. Developed by Terra Global Capital for The Forestry Administration of the Royal Government of Cambodia. Project Design Document for validation under Climate, Community & Biodiversity Standard (Version 3-0). July 26.

Part IV

Constructive alignment in course design

18

Meta intended learning outcome alignment in experimental course planning

Taking control of a week of experimental course work

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Introduction to institutional teaching of new University teachers often occurs in the context of previously established courses. Integration of new teachers into the curriculum by means of roles in established courses can be mutually beneficial. Existing courses can benefit from integrating new teachers, for example by refreshing course content and incorporating teaching enthusiasm of junior faculty. New teachers also benefit as they obtain the ability to interact with students earlier than they could if they created new courses. The addition of new courses to the study curriculum requires careful consideration and can thus be a lengthy procedure. The curricula are often crowded, which can also result in low uptake of new courses by students. Furthermore, the integration into new courses offers the opportunity for new faculty to align their course content with pedagogically well-vetted teaching by peer-to-peer feedback. This exercise can reinforce benefits for existing courses, as cutting-edge pedagogical teaching concepts that are offered to new faculty as a result of the elite university pedagogy course can be applied to holistically reinvigorate the courses across the board. A challenge for the inclusion of new faculty into existing courses can be to align the broad intended learning outcomes of the entire course (meta-ILOs), with blocks taught by new faculty that may have self-sufficient contents and ILOs (sub-ILOs). The Possibility to align the sub-ILOs of individual teaching blocks with broader course meta-ILOs specified in existing course descriptions is instrumental for a modular teaching arrangement such at Copenhagen University with limited curricular space for entirely new courses. This paper applies constructivist learning theory to a self-contained teaching module of an experimental course, while aligning the course content to meta-ILOs.

Background

Teaching defines the complex pedagogical and didactical activities by a teacher to assist student learning. Learning of complex skills or information can be incidental (e.g riding a bike), which is referred to as implicit learning. Implicit learning has undisputed effects on knowledge; however University teaching tends to avoid course designs emphasizing this type of learning. Implicit learning tends to generate pieces of abstract knowledge without necessarily clarifying the underlying thought patterns that may make more general thought patterns difficult to apply to address related questions. University teaching aims for "deep learning" of context, perspectives and knowledge. This desired learning outcome of University teaching has led to a reflection on the role of teaching in learning. Figure 18.1 illustrates how teaching is affected by the elements of teaching, making up the didactic triangle: students, content and the teacher. Through emphasis on different interfaces between the elements distinct yet mutually overlapping theoretical frameworks for teaching have been developed.

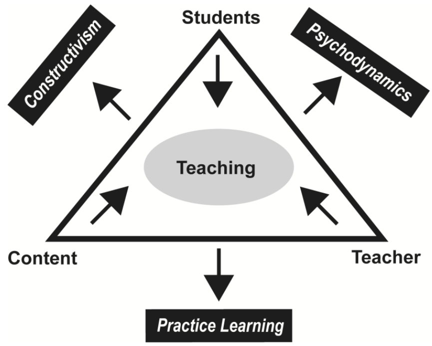

Fig. 18.1: The Didactic Triangle connects the three main elements of teaching: students, teacher and content learning (adapted from Rienecker, Jørgensen, Dolin, and Ingerslev, 2015). Different approaches to teaching are illustrated that emphasize interfaces of teaching elements. KU teaching encourages constructivism, where teachers facilitate of the students' independent content learning.

Psychodynamic learning theories highlight the interplay between teacher and student. The creation of a good learning environment and relationships is central, whereas the content is given a peripheral role. A strong intellectual bond between student and teacher can intensify learning, and good relations between students and teacher have clear positive effects on learning and career development. A psychodynamic approach can facilitate learning through the role-models, with a focus on student self-efficacy (Bandura, 1997). Effective psychodynamic teaching approaches rely on a strong intrinsic attraction of teacher and students to the content.

Practice learning theory focuses on the interaction of the teacher with the content. A teacher's expertise of the content is communicated to students by demonstrations and lecturing. The teacher adopts the role of an authority in the subject, and may instruct students to follow the example set by the procedures and contextual understanding of the teacher. Particularly for teaching skills this teaching method can be effective with small classes, however in general the students adopt a rather peripheral role that may trigger disinterest. Practice learning can be an effective way to teach best working procedures, however students may not comprehend the thought processes that had been going into the procedure development and may not be able to evaluate them contextually.

Constructivist learning theory focuses on the interface of student and content. This necessitates active participation of students with the content, and facilitating their individual or collective journey to knowledge. Teachers following constructivist learning theories rely on student activities to construct their own knowledge. The importance to incentivize active participation in the teaching cannot be underestimated, as taken to the extreme the teacher merely assists a self-driven generation of knowledge and learning by the students. If used incorrectly, this teaching theory can give students the feeling of being ignored, lead to a focus on peripheral topics or perhaps even using incomplete if not incorrect information to construct their knowledge. Constructivist teaching relies on measured interventions and restraint form the teacher to allow students the freedom to learn from their own mistakes. This freedom of students is constraint by the realities of University teaching that impose limiting regulations on: course hours, program durations, funding and equipment accessibility.

The benefits of constructivist learning include an empowerment of students to create their own knowledge based on their interest and reflection on the subject matter. This self-driven interest may go beyond limits defined by a course design that may be more focused on the communication of maximally simplified subject content in a non-specialist course. The mature treatment of student individuality and student group activities as key parts of the constructivist learning theory makes this approach to learning attractive to university teaching. To provide a framework for feedback on learning for students, and to align learning activities with their desired effects the assessment serves a crucial role in constructivism. This feat is achieved by Constructive Alignment, whereby the instruments and intentions of a course design are coordinated to effectively promote self-driven knowledge creations of students (Figure 18.2). Feedback opportunities integral to the assessment guide students, but also improve courses by allowing cutting-edge pedagogical innovations and new topics to be incorporated.

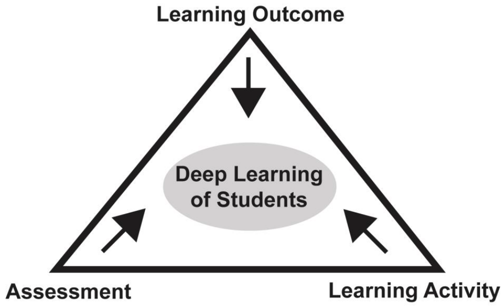

Fig. 18.2: Graphical summary of how the coordination of learning outcomes, learning activities and assessment conditions effective student learning (adapted from Rienecker, Jørgensen, Dolin, and Ingerslev, 2015). An effective coordination of the activities in the corners of the triangle aids deep learning (Biggs, 1987), and represents the core of the Constructive Alignment model (Biggs and Tang, 2007).

The course description for courses at Copenhagen University includes a definition of Intended Learning Outcomes (ILOs), the type of learning activity and how learning is assessed. The course description for NPLB15008U: Thematic Course: Experimental Molecular Biology I is given in Appendix A. A more detailed look at the course structure reveals it's segmentation in 8 blocks of a week each on certain themes related to the broad topic. The blocks are taken over by different teachers that define ILOs (sub-ILOs) for the topic covered in the block. To create a framework for constructivist student learning it is of crucial importance that the sub-ILOs are aligned with the ILOs of the entire course (meta-ILOs). Important insight into the level of student learning can be derived from usage of the Structure of the Observed Learning Outcome (SOLO) taxonomy used in courses with following a constructivist learning theory. The taxonomy evaluates the structure of layered student learning in categories assigning degrees of content conceptualization and understanding (Figure 18.3).

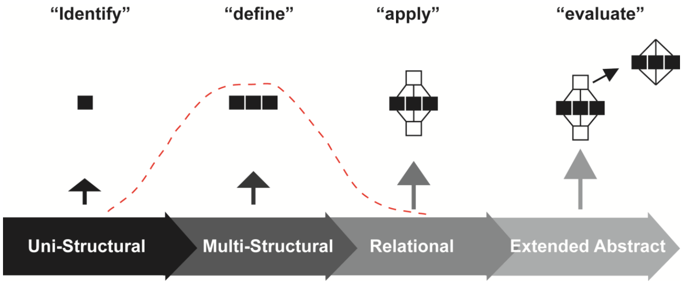

Fig. 18.3: Illustration of Structure of the Observed Learning Outcome (SOLO) taxonomy (Biggs and Tang, 2007, learning (adapted from **Rienecker15**). The illustration conceptualizes increasingly complex levels of understanding. The SOLO taxonomy represents a continuation of Bloom's taxonomy of learning objectives (Bloom, 1956). The red line represents the expected distribution of student learning level, with a focus on multi-structural learning, based on experience and SOLO taxonomy used in Appendix A.

One of my newly adopted teaching opportunities at Copenhagen University is to plan and organize the second module (module B) of 8 total modules in this experimental course. The topic of module is "RNA detection", which fits well to the defined meta-ILOs. To ensure a stable constructivist learning environment for students my role as module responsible is to align the sub-ILOs to my module to the meta-ILOs in the course description. The course is very popular with students, as it offers them the opportunity to conduct lab work in a research environment; however it aims at pre-BSc level students that often have little prior experimental knowledge. The level of prior student content familiarity and understanding is evident from the course description in appendix A, as it key verbs following SOLO taxonomy indicative of the student learning structures have been employed. Hence we should expect a student population with mainly multi-structural learning (red line, Figure 3). My function as theme organizers brings autonomy of the academic content, the learning & teaching activities and perspectives. As I am functioning as part of a larger team of theme organizers, it is crucial to coordinate two other important factors to ensure a stable and coherent constructivist learning framework for students. These two additional factors under some constraint for theme organizers are: the sub-ILOs and the Purpose & Content. Constraint on the sub-ILOs is given by the overarching meta-ILOs defined in Appendix A. Restrictions on the Purpose and Content is given by the choice of theme, in my case "RNA detection". It is the expectation of fellow teacher colleagues that I teach on the topic of "RNA detection, similarly, students expect to learn about the topic. Even though the topic of "RNA detection" is broad and leaves plenty of freedom to choose the exact academic content, some level of constraint is represented by giving students the opportunity to learn about RNA.

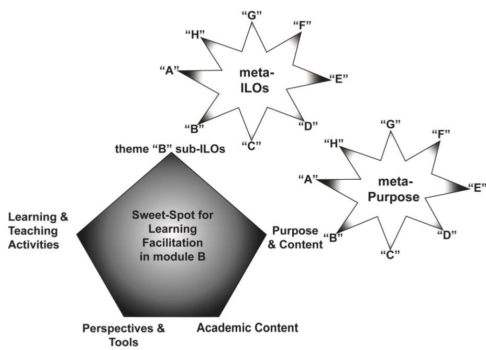

Fig. 18.4: Pedagogical Pentagram model for advanced course planning learning (adapted from **Rienecker15**). The diagram illustrates how multiple parameters influence how student learning is best facilitated by their teacher. NPLB15008U: Thematic Course: Experimental Molecular Biology I is structured in themes in 8 themes A-H. The 8-ended stars illustrated how the substructure of each individual theme in A-H is influenced by the meta-structure of the course. This applies in particular to the ILOs and the Purpose & Content edges of the Pedagogical Pentagram.

Defining meta-ILOs consistent sub-ILOs for "theme B: RNA detection"

To adapt to the general course requirements and teaching vision of the course, the ILOs of theme B: RNA detection (sub-ILOs) have to be consistent with the ILOs of the entire course (meta-ILOs). This consideration applies to the content, but also to the SOLO taxonomy adjusting ILOs to the expected types of student learners. Table 18.1 summarizes the Academic content, teaching activities & tools and sub-ILOs. The SOLO taxonomy anticipates uni-structural, multi-structural and relational learners. The meta-context of the course places theme B: RNA detection just after theme: A cloning, where an emphasis is on DNA. On day 1 of the course we will draw on the knowledge on DNA of the students, and incorporate a comparison of DNA and RNA molecules to hydrolysis. The analysis tools and methods will give students a different perspective on the focus biomolecules of the themes, and serve as reinforcement of meta-ILOs by building on learning in theme A. The duration of student time in the lab is fairly short, considering the activities have to be coordinated with up to 60 students split in two teaching labs. The sub-ILOs and academic content spans an experiment as it would be common in a research setting. We provide perspective on how these experiments are topically relevant to the students by organizing a journal club related to an exciting development in the field of RNA Biology.

Table 18.1: Planning Experimental Biology BSc course, theme "B RNA detection". The columns represent the corners of the pedagogical pentagram. The sub-ILOs of "theme B RNA detection" are given using SOLO nomenclature aligned with the appropriate stages of student learning, ranging from uni-structural to relational (see Figure 18.4).

	Academic Content	**Teaching Activities & Tools**	**sub-ILOs**
day B1	Handling Biological material for RNA preparation	Yeast wild type and rrp6Δ RNA decay pathway mutant material	Identify strains related to accompanying Journal Club
	RNA peparation	RNA handling and preparation	Define working procedures with RNA
	Measure RNA concentration	UV-VIS spectrometry of nucleic acids	Mark RNA concentration from spectral data
	Stability of RNA vs DNA	Hydrolysis of RNA and DNA	Relate RNA working procedure with stability differences compared to DNA
	TBE Agarose Gel Electrophoresis	TBE Gel preparation	Define characteristics of TBE Agarose gel electrophoresis
day B2	Visualize fragmentation of RNA vs DNA using TBE gel-electrophoresis	Perform ATBE garose Gel Electrophoresis	Apply TBE Agarose gel electrophoresis
	RNA fragmentation, polyA-selection	Purification of cellular RNA populations	Define RNA populations
	Reverse-Transcription	Conversion of RNA into complementary DNA	Identify strategies to convert RNA into cDNA
day B3	Experimental design of qPCR plate	Design of quantitative RT-PCR experiment	Mark qPCR plate design
	qPCR plate pipetting following design	Experimental design in 384-well plate format	Apply qPCR plate design
	qPCR run	qPCR machine software, run parameters	Describe processes ensuring qPCR run
day B4	qPCR pipetting, run	Experimental design in 384-well plate format	Apply qPCR plate design and run
	qPCR data handling	Analysis of experimental qPCR data	Describe qPCR data analysis strategies
	results summary	Discussion of results	Analyze qPCR

The journal club takes place early, in the morning of the 2nd course day prior to lab work. It provides a different angle for students to engage with the subject. They can prepare by reading cutting-edge literature in the time between courses unlimited from constraining course hours. The biological material analyzed in the research paper will be familiar to the students: on the 1st day, students will receive the equivalent biological material. It is our intention that the connection between lab reality and featuring of the same material in a research paper may help students relate with the provided literature and trigger their deeper interest in the topic. The progression of theme B will allow students to perform quantitative analysis of RNA species. The analysis will span different biological backgrounds, but also sub-populations of RNA from the cell by means of specific enrichment via molecular features. The analysis part will interest students, as they are given the opportunity to compare real experimental results. A central part will be devoted to the analysis of the data, and students are encouraged to explore and compare analysis methods. This comparison will feature a discussion about research ethics, as outliers in the data are expected. The teachers of theme B will submit questions for the assessment, and correct the reports. These activities alongside course feedback by the students will help to align student and teacher expectations in iteratively. One hour in the morning of a subsequent course week will bring the teachers together with the students again, where reports should be more complete and a reflection on the results can be stimulated.

Summary

The course structure at KU somewhat constrains the speed of which new courses can become favorite choices of students in their curricula. Students are nevertheless given the opportunity to learn from teaching of new faculty that may possess expertise on new topics complementary to existing courses. The cutting-edge expertise and enthusiasm of labs new to KU teaching will be unlocked for the course by involving them in course design and as teachers. The constructivist teaching approach with sub-ILO and meta-ILO structures facilitates the participation in existing courses seamlessly, and possible more time efficiently than otherwise possible. Iterative cycles of constructive alignments as integrated part of the course assessments will progressively align pedagogical approaches and content to allow deep student learning. Research teams new to KU benefit from taking part in teaching of already popular courses in the curriculum. Teaching involvement facilitates student interactions and exposure to upcoming research topics often represented by new research groups at KU can provide new career and learning opportunities for KU students. Laboratory research has some inherent psychodynamic aspects, as researchers share an often small laboratory space, where a good atmosphere and working relations are important. Students engaged in laboratory learning and research settings are also given the opportunity to reflect on if the atmosphere of a new group of KU teachers involved in teaching could stimulate their joy of learning. If a new research group was not involved in teaching, the students would be deprived of this opportunity. All in all new teaching faculty provides an important source for course innovations, however owing to a common constructivist teaching philosophy the integration of new teachers in existing course is greatly facilitated, which ultimately is of benefit to new and established teachers as well as the students.

References

Bandura, A. (1997). *Self-efficacy: The exercise control*. New York: W.H. Freeman.

Biggs, J. (1987). *Student approaches to learning and studying.* Melbourne: Australian Council for Educational Research.

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university* (3rd ed.). Open University Press/McGraw Hill.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives. Handbook I: Cognitive domains.* David McKay Company.

Rienecker, L., Jørgensen, P. S., Dolin, J., & Ingerslev, G. H. (Eds.). (2015). *University Teaching and Learning* (1st ed.). Samfundslitteratur.

A Course Description of NPLB15008U Thematic Course: Experimental Molecular Biology I

Education: BSc Programme in Biology-Biotechology

Content:
The course offers experimental platforms to acquire new skills with regard to methods in molecular biology and biotechnology. The choice of topics ensures that the students learn standard techniques relevant to molecular biology, bioinformatics, biochemistry and physiology. Additionally, the course comprises an introduction to basic concepts of ethics and philosophy of science.
The students will gain experiences in a wide-range of both basic and advanced experimental methods in molecular biology, e.g. extraction of DNA and RNA, PCR, RT-PCR, real-time PCR, in-situ hybridization, cloning, primer and vector design, transformation of prokaryotic and eukaryotic organisms, cultivations of cell cultures, heterologous gene expression, protein purification, immuno blotting, histochemical analyses, enzyme kinetics, flow cell cytometry, bioimaging and bioinformatics. A wide-range of experimental organisms is employed including bacteria, yeast, fungi, plants and mammalian cells, with an emphasis that the methods and basic scientific principles taught have general relevance.

Learning Outcome: The course mainly aims at providing both practical experience and theoretical knowledge of basic principles and methods in experimental molecular biology research in combination with an introduction to general concepts of ethics and philosophy of science within the field.

After completing the course the students should be able to:
Knowledge: Describe basic principles and analytical methods used in molecular biology research. Explain how these principles and methods can be exploited in practical experiments aimed at reaching distinct research goals.
Describe basic theoretical aspects of scientific research methodology.
Describe selected central principles of ethics philosophy of science.

Skills:

Carry out experiments using a number of general methods in molecular biology, biochemistry and cell biology.
Analyse, interpret and conclude from results acquired in the laboratory.
Summarise and present scientific concepts and own research results to fellow scientists through written and oral communications.
Interpret and discuss research in the context of theoretical and ethical principles. Use e.g IT tools in creative processes in the context of project management and presentation.

Competences: Work independently as well as together with other students to plan carry out defined experimental work.
Reflect upon the empiric basis of research within the field of biotechnology and understand and contribute to broader ethical and societal discussions on the use of biotechnology.

Literature:
Laboratory manuals including theoretical background for each practical exercise is made available on Absalon together with the research articles discussed in the journal clubs and a compendium for ethics and biotechnology. The literature changes from year to year dependent on the chosen topics.

Teaching and learning methods:
The course comprises lab exercises with written lab reports, lectures and journal clubs. The students carry out different experiments as specified in the description of the exercises(typically in the afternoon from 1pm to ca. 5pm although this may vary). The results of the exercises are discussed in follow-up sessions. The exercises are complemented by lectures and journal clubs in the mornings (3-4 days per week) which provide the theoretical background for the experiments.

Academic qualifications:
Participation in courses which provide basic knowledge in biochemistry and molecular genetics is required.

Exam: Credit 15 ECTS, Type of assessment: Written examination, 4 hours under invigilation.

Exam topics include theories and methods taught in practical exercises, journal club articles and philosophy of science curriculum.

Exam registration requirements: 5 out of 7 reports must be accepted in order to be eligible for the exam.

Aid: All aids allowed Marking scale: 7-point grading scale Censorship form: External censorship

Re-exam Reexamination is an oral examination, 30 min. If the exam registration requirement is not met, the student has to follow the course the following year as the laboratory exercises need to be followed. Criteria for exam assesment

Exam topics include theories and methods taught in practical exercises, journal club articles and philosophy of science curriculum.

19

Constructivism and learning

Active learning and constructive alignment in the Surface Geochemistry course

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Introduction

The theory of Constructivism is largely ascribed to the Swiss psychologist and philosopher Piaget, who worked on cognitive development. Based on an earlier idea of knowledge being structured in frameworks, his work on the cognitive development in children let him to propose that they learn through two fundamentally different processes: they assimilate new information into existing frameworks without the frameworks being restructured or they accommodate information by restructuring the existing frameworks to conciliate them with the new information (Piaget, 1965). From the viewpoint of education, this idea entails that the actual construction of knowledge occurs within the learner him- or herself and that the background of the learner plays a critical role in the learning. These ideas have been adopted in many contemporary theories of learning (e.g.,Bransford, Brown, and Cocking, 1999; Biggs and Tang, 2007; Illeris, 2009).

In this work, I will focus on two aspects of learning: active learning and constructive alignment, both of which are rooted in the ideas of Piaget (Biggs and Tang, 2007). The idea of active learning gained widespread attention following the publication of the report "A Nation at Risk: The Imperative for Educational Reform" in 1983. This report resulted in numerous reports and articles, such as Cross, 1987, culminating in another report "Active Learning: Creating Excitement in the Classroom" (Bonwell and Eison, 1991), which concluded:

“[. . .] a thoughtful and scholarly approach to skilful teaching requires that faculty become knowledgeable about the many ways strategies promoting active learning have been successfully used across the disciplines.” Bonwell and Eison, 1991, p. iii.

Central to the constructivist concept of active learning are that learners construct knowledge through activities using their existing knowledge as a base. The learning comes from structuring of transmitted information through activities to bring about changes in the way we perceive the world (e.g., Biggs and Tang, 2007).

The term constructive alignment stems from John Biggs’ experiences with activity based teaching, which proved successful when correspondence existed between the intended learning outcomes, the learning activities and the assessment tasks (Biggs and Tang, 2007). Thus, if we want the students to learn about cooking, we are better off if we place them in a kitchen and allow them to eat what they are making before assessing their performance at a feast. Because the students’ existing knowledge, their background, also play a factor in their learning according to the constructivist understanding of teaching, I will to some extend include this aspect in the constructive alignment as well. In other words, the intended learning outcomes has to be attainable for the students and should be aligned with their existing knowledge. Thus, a schematic representation of my extended constructive alignment could look like the one outlined in Figure 19.1.

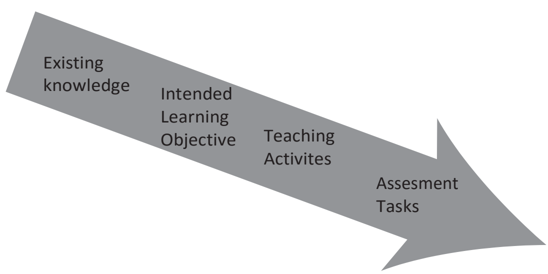

Fig. 19.1: Schematic representation of the course aspects that should be aligned.

The aim of this work is to analyse the active learning and the constructive alignment in my course Surface Geochemistry with the aim of identifying potential important improvements. In parts, the analysis will be based on feedback from students (both formal and informal) and my own observations during teaching. The formal student feedback stems from the electronic course evaluation conducted automatically at the University of Copenhagen and from oral feedback given in plenum at the end of the course, which was documented by one of the students as a written summary. Quotations from the plenum feedback refer to statements recorded by the student; these are paraphrasing of the actual discussion.

Overview of the Surface Geochemistry course

The course Surface Geochemistry is placed on the second year of the Chemistry bachelor program. The main purpose of the course is to give the students a qualitative and quantitative understanding of the most important processes taking place on surfaces in nature, because these are central to geochemistry, controlling largely the cycling of elements, for example. It is mandatory for students taking the education in Environmental Chemistry, but it attracts students from several other disciplines of science, ranging from Geology to Nanoscience, who come with highly variable seniority. In addition, PhD students from our section also take the course. This inhomogeneity in student background presents significant challenges. The course is given in English and the student workload is 7.5 ECTS. It is typically attended by 25-30 students. The course includes lectures, which are mostly given by me, as well as exercises in the form of manual calculations and computer modelling with a code called PHREEQC, which allows the students to simulate geochemical reactions. In the course structure, every lecture is followed by 2-3 hours of exercises, including breaks. In addition, 3 hours of "confrontation" are set aside for critical discussion of four Science articles, whose results are conflicting, and 6 hours of confrontation are set aside for a case study of their own choice, which is intended to result in a single page report.

I am the course responsible and have developed most of the teaching material except for the textbook and the articles used. Thus, I am free to change all aspects of the course.

Active Learning

As a result of the supervision during my University Pedagogic Course, I transformed all lectures after the first supervision day from "traditional lectures" of 45 minutes duration into "activity based lectures", where monologues from me are short (10 minutes or so) and separated by student activities of various kinds. My own impression was that these activity based lectures work well. The student feedback I have received express the same opinion, although the lectures became longer, taking time from the exercises (termed "calculations" in the quote):

"Godt med spørgsmål undervejs i forlæsningen, men dette trækker nogle gange forlæsningen ud, så måske skal man droppe nogle calculations så man får tid til små opgaver ind imellem" Feedback given by student in plenum at the end of the course, 2014

This year, I intend to change the remaining half of the traditional 45 minutes lectures into "activity based lectures". Although the activity based lectures are longer and will take time from the exercises, which are clearly also a form of active learning, I think that this is acceptable to some extend for several reasons. Firstly, my impression from feedback and my own observations is that the students manage to complete the exercises before going home, meaning that they have little preparation to do before the next teaching apart from reading. Also, the electronic evaluation in 2014 indicates that the time spent by the students was somewhat below what is expected for a 7.5 ETCS course. Thus, my plan is to take some time from the exercises to make activity based lectures that are intended to firmly establish an understanding of the important concepts in the students. Hopefully, this will allow the students to solve many of the exercises on their own with less feedback than they are getting at the moment. Nevertheless, the decrease in time allocated for exercises might mean that some students become stuck when solving them without teachers around to help. To alleviate this problem, I will stress that they can come to my office or that of the teaching assistants to get help almost any time.

Towards the end of the course, I had introduced a discussion session on the initial formation of solids from dissolved ions. The discussion session was based on four recent, high profile articles from the journal Science, which represent two conflicting viewpoints. Although Science articles are tough to read, the articles were largely based on core concepts in the course and I had prepared a reading guide, which specified what parts of the articles the students should focus on and defined terms and concepts that were new to them. To my surprise, many of the students had not read the articles. Nevertheless, we went through the session, spending time on reading and interpreting the data as well as on discussion. The session progressed well and feedback suggests that they enjoyed it:

"Diskussionen omkring de fire artikler var specielt spændende." Anonymous electronic feedback given by student in plenum at the end of the course, 2014

One of the reasons, that the session went well although the students came poorly prepared, was that the data presented in the articles was in a familiar appearance: it was either in the form of diagrams they were familiar with, or in the form of images and movies, which are vessels for information that most can relate to. However, I do want the students to work with the articles themselves, so that they can begin developing the difficult skill of extracting important information even when it is conveyed in condensed, written form. Next year I will stress that they really have to read the teaching material for this particular session.

Towards the end of the 2014 course, I asked the students to work alone or in small groups and use some of the tools they had acquired on a case study of their own choice. The results of their work were to be reported in a personal, single page report to give them the opportunity to improve their writing skills. From my impression of the reports and from the feedback, this case study was a success. On the list of good things, for example, one student simply mentions:

"Rapport" Anonymous electronic feedback given by student in plenum at the end of the course, 2014. "Rapport" was the term we used to cover the case study.

However, the exercise turned out to require a great deal of student feedback, meaning that students had to wait in line for me to have time to discuss. This occurred for several reasons and the problem can be mitigated in several ways. For example:

1. The application of the tools is not a straight forward matter and almost always involves reduction of the problem's level of complication by making simplifying assumptions. It is not easy for a student to see when an assumption is reasonable and when it is not. This is actually something that I want the students to understand better. Thus, I am contemplating having more, smaller exercises included earlier in the course to "train" them in making assumptions and critically evaluating

their impact on results. Also, this aspect should be embedded in the exercises.

2. Many students decided to work alone, meaning that the number of different subjects and problems I faced was high. To alleviate this problem, I plan to make it mandatory for the students to work in groups. Furthermore, this will allow the students to discuss the problem before asking for feedback, which I expect to increase the students learning. For example, Michael Prince points out that there is good evidence that cooperative learning increases the learning outcome at least compared to competitive learning (Prince, 2004). Student feedback also suggests that team work might be a good idea, although this opinion is not universal:

"Godt at arbejde sammen om problematikkerne, det gør ikke noget at man deler arbejdet op hvis bare alle har været med i overvejelserne" Feedback given by student in plenum at the end of the course, 2014

Thus, my conclusions regarding the active learning in the course is that it works relatively well in its current state, but that the activities could be improved and that they should be implemented in all lectures.

Constructive alignment in the course

First a couple of words on the students' existing knowledge and the constructive alignment. The highly variable background of the students presents a challenge to the teaching. To make sure that all have a platform for understanding the subjects I am teaching, the course is split in two in the first 2/3 of the first week, so that they can receive a crash course in either chemistry or geology, depending on their needs. This simple setup has worked surprisingly well. However, based on the student feedback, the crash courses should probably run an entire week, so that more subjects could be taught in a tailor made fashion to fit their background. This would mean that some aspects of chemistry that are currently being taught to the entire group could be given to the non-chemists only to avoid boring the more proficient, e.g.,:

"Kemien var lidt 'for nem' – fx. har vi allerede haft kurser i thermodynamik" Feedback given by student in plenum at the end of the course, 2014

On the other hand, the chemist could be more thoroughly introduced to minerals and solid state chemistry:

"Især mineralstrukturer skal uddybes yderligere og der skal være mere materiale tilgængeligt om emnet." Anonymous electronic feedback given by student in plenum at the end of the course, 2014

Thus, I plan to expand the crash course part to encompass one entire week.

To give an overview of the constructive alignment of the other aspects of the course, Figure 19.2 shows the overall intended learning outcomes, the learning activities, and the assessment tasks. In the figure, each intended learning outcomes have been marked with a differently coloured bar. In the learning activities and the assessment tasks, the coloured bars signify what intended learning outcome they target. Overall, there is relatively good alignment in the course. However, the red and orange text signifies elements that are not yet completely in place or are lacking altogether, i.e., places where there are challenges.

Two tasks will require a little more consideration: A. I ask the students to be able to make simplifying assumptions and estimate of the uncertainties involved in the simplification. This is not a straight forward thing to do, but I really want them to master this. Clearly, I should spend more time on this aspect in the activity based lectures and require them to use this knowledge in the exercises. In addition, I am considering using more time on the computer modelling. Because the software allows the students to simulate all the main reactions covered in the course, both in terms of thermodynamic equilibrium and reaction kinetics, it can be a formidable tool for the teaching. However, making input for the simulations to have them work as planned is somewhat complicated, in particular because I want the students to know what they are doing and be able to critically evaluate the results.

I have not yet quite figured out how to bring the students over the learning threshold of constructing sound inputs, but my current thoughts are to use more time on the simulations, both in the exercises and in the lecture activities, focusing on having the students become more slowly familiar with the program, so that i) basic concepts can be thoroughly understood before moving to more advanced capabilities and ii) the results of the simulations can be much more thoroughly explored. My intuition tells me that a more thoughtful use of the modelling program can improve the learning outcome of the course significantly and can provide them with a tool that they might be able to use to great effect later in their studies or careers.

B. I have not been able to find a textbook that covers the subjects of the course in a pedagogic manner, that efficiently facilitates understanding the topics. Consequently, I am still searching for a really good textbook. The

Fig. 19.2: Overview of the elements of the intended learning outcome, the teaching activities and the assessment tasks (including formative feedback). The intended learning outcomes have been assigned coloured bars. For the teaching activities and assessment tasks, the coloured bars signify what intended learning objectives are targeted. Thus, the teaching activity "Students activities where they apply or discuss theory" contains aspects of both intended learning objectives in the category "Knowledge". The red and orange text signifies elements that are not yet completely in place or are lacking altogether.

first couple of years I used one book, but as one student mentions in a course evaluation, the book is awful. In 2014, I changed to another book, which I have found truly useful in my research. However, this book is nowhere near as pedagogic as one could wish. In fact, many of the students from this year reported that they had cut down on the reading in the course texts altogether because they found the textbook so inaccessible. This attitude was carried over into the reading of articles, meaning that more time had to be devoted to the discussion session than originally planned. Surprisingly though, the students did rather well, suggesting that a textbook is perhaps not critical to achieving the intended learning outcomes. Thus, the problem about the book might be an opportunity: Perhaps it would be possible to have other means of preparation that are far more effective. However, this is a change I have to consider very carefully and I currently do not know exactly why they abandon reading the book. My impression from talking to the students is that the book is poor at providing context, so I plan to either supplement with additional material or to change to another, more suitable book (although this has so far proven hard to find). Eventually, I might end up compiling a compendium with smaller texts from different authors, so that it will cover the subjects in a better manner. However, it might be difficult getting all these different texts aligned in terms of nomenclature, etc. Also, such texts aimed at second year students are not easy to find. Thus, finding a solution to this problem will be on the top of my list in the time to come.

Peer feedback on project

As part of the assignment, a colleague provided feedback on this report. Although he mainly had suggestions to the textual aspects, he found the idea of having the students discuss very advanced scientific articles presenting conflicting view points an exiting, albeit demanding, manner of teaching. Based how the discussion went, I agree with his viewpoint - but if the students were nudged gently in the right directions, they were able to figure many things out themselves. My impression was that they learned quite a bit and that their confidence in their own abilities increased. I am considering having more of such discussions. For example, I have just found several errors in one of the articles, which relate directly to the content of the course. In fact, I do not think I would have noticed the errors had I not been teaching the subjects I do. I think it would be an interesting exercise to have the students identify the errors, so that they can see that scientific work may well be wrong, even when published in the most respected of journals. Finally, he was sympathetic to my problem with the textbook, suggesting with a smile that I had to write my own. I would certainly like to, but I do not currently have the time for such an effort.

Conclusions

Analysis of the active learning in the Surface Geochemistry course indicates that it works relatively well, where it is implemented. The students are active and they enjoy the discussions. The data do, however, not allow me to evaluate if it improves the learning outcome. In general, the course is constructively aligned. However, several aspects exist that could be improve on. For example, the students should be more engaged in making simplifying assumptions and discuss their implications, because this is an important intended learning objective. Finally, the textbook does not gain wide acceptance from the student and should be replaced with other teaching material. In general, this type of analysis has proven a good tool for understanding shortcomings in the course structure as a whole. In the upcoming revision of the course, I will apply the same procedure on the individual elements of the course, i.e., activity based lectures, exercises, etc.

References

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university* (3rd ed.). Open University Press/McGraw Hill.

Bonwell, C. C. & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom.* Jossey-Bass.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (1999). *How people learn: brain, mind, experience, and school.* National Academy Press.

Cross, K. P. (1987). Teaching for learning. *AARE Bulletin.*

Illeris, K. (2009). A comprehensive understanding of human learning. In K. Illeris (Ed.), *Contemporary theories of learning: learning theorists* (pp. 7–20). New York: Routledge, Taylor and Francis Group.

Piaget, J. (1965). *The origins of intelligence in children.* New York: International Universities Press Inc.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223–231.

20

Extreme alignment

Understanding the costs and risks of the assessment regime and identifying potential solutions

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Summary. This project reports presents my pedagogical research associated with the University of Copenhagen ‘Teaching and Learning in Higher Education Programme’ (Universitetspædagogikum). It draws from my experience as Course Responsible of the MSc course ‘Research Planning’ during the period end-August 2015 – end-October 2015. The report will present a case of what I claim to be ‘extreme alignment’. It begins by explaining the notion of alignment in teaching, including the role of assessment, and continues with an introduction to the course itself including its assessment regime. It then presents the costs and risks associated with such alignment, based upon my own experiences and drawing from input from the students. The report closes with suggestions on how to simplify the course structure while continuing to endeavor toward alignment.

Introduction to alignment

’Constructive alignment’ is a notion entailing particular beliefs about how learning occurs and what the teachers’ role is in learning processes. Namely, new knowledge is ‘constructed’ by students as they draw from their own experiences and capabilities, while teachers ‘construct’ learning environments that provide activities appropriate to achieving the desired learning outcomes (Biggs and Tang, 2012). In other words, teachers construct the alignment; students construct the meaning.

For instructors, constructive alignment thus encourages a “system” approach aiming to optimize conditions for quality learning and moreover, for achieving desired outcomes (Biggs and Tang, 2012, p. 1). As an approach, constructive alignment is "a powerful conceptual tool" aiming to enable teachers to evaluate "the consistency between learning objectives, learning tasks and assessment" (McLoughlin, 2001, p. 25). Biggs, 2003 points out, "The key is that all components in the teaching system - the curriculum and its intended outcomes, the teaching methods used, the assessment tasks - are aligned to each other. All are tuned to learning activities addressed in the desired learning outcomes." Clearly, alignment is an arduous ambition. Strategies toward an aligned course can thus range from insufficient to extreme.

Assessment and alignment

A challenge for teachers is to determine which of a course's tasks and activities should be subject to assessment. Assessment in large part defines what students see as important and what they spend their time on (Brown, Bull, and Pendlebury, 2013). While teaching methods should ensure that students learn what we want them to learn, "assessments should reveal how well students have learned it" (Carnegie Mellon, n.d.). For this to occur, learning objectives, instructional strategies and assessments demand alignment so as to reinforce one another. Further, if in alignment with the other components, assessments may serve not only to demonstrate learning but can potentially induce more and greater learning. This invokes questions and assumptions around student motivation, such as whether marking produces participation and moreover, around the quality of that participation. While motivation is a critical component in education, this report will bypass this concept and stay focused on alignment through assessment, with the assumption that marking has a tendency to increase student participation in a context where they would otherwise engage less. Perhaps, the ideal learning environment may be one in which assessment is obsolete (though such an ideal will typically be constrained by countless exogenous factors).

Thus what, when and how to assess is a major challenge including within an 'aligned' course. A key question then for assessment is, what kinds of tasks will reveal whether students have achieved the learning objectives (while contribute to learning)? Biggs, 2003 notes, "faulty assumptions about and practices of assessment do more damage by misaligning teaching than any other single factor." Further, "if assessments are misaligned with learning objectives or instructional strategies, it can undermine both student motivation and learning" (Carnegie Mellon, n.d.).

Introduction to Research Planning MSc. course

The MSc Research Planning (RP) course is a 7.5 ECT course offered in Block 1 under the administration of the Study Board of Natural Resources and Environment. The description is available online[1]. Broadly, RP intends to "provide tools for, and experience with, systematic design of research projects." While most research examples in the course are situated within natural and social science aspects of natural resources management, the principles are intended to "apply generally". An additional aim is the "inculcation of the values of scholarship: inquiry, reflection, integrity, open mindedness, evidence-based thinking, and collegiality."

The more specific **intended learning outcomes** of the course are explained according to 'Knowledge, Skills and Competences'. Specifically, the student should be able to:

Knowledge:

- Reflect on the quality of research design.
- Argue cogently and think critically within the parameters of a particular academic discipline.

Skills:

- Apply principles for good research design, including critical discussion of literature and problem identification, development of hypotheses and research questions, determination of data requirements, and selection of appropriate methods.
- Reflect on risks and ethical issues in relation to project implementation.

Competencies:

- Demonstrate independent learning skills necessary for the foundation of lifelong learning.
- Tackle scientific problems by collecting, analysing and evaluating appropriate qualitative and quantitative information and using it creatively.
- Display the competencies, key skills, behaviour and attitudes in relation to individual and group work required in a professional working life.

[1] http://kurser.ku.dk/course/lfkk10270u/

The teaching and learning **methods** consist of: *“Blended learning combining e-learning and classroom activities. E-learning is centered around internet-based teaching modules integrating literature studies and exercises, including computer mediated conferencing designed to allow students to interact to construct new knowledge. Classroom sessions will: (i) introduce systematic research proposal writing through presentations and theoretical exercises, and (ii) provide space for critical discussion of student presentations and development of constructive comments.”* Specific activities entail extensive individual and group work.

Assessment in the RP course is arguably extensive (or, extreme). Below is an image taken from the course information document, which students receive in Week 1:

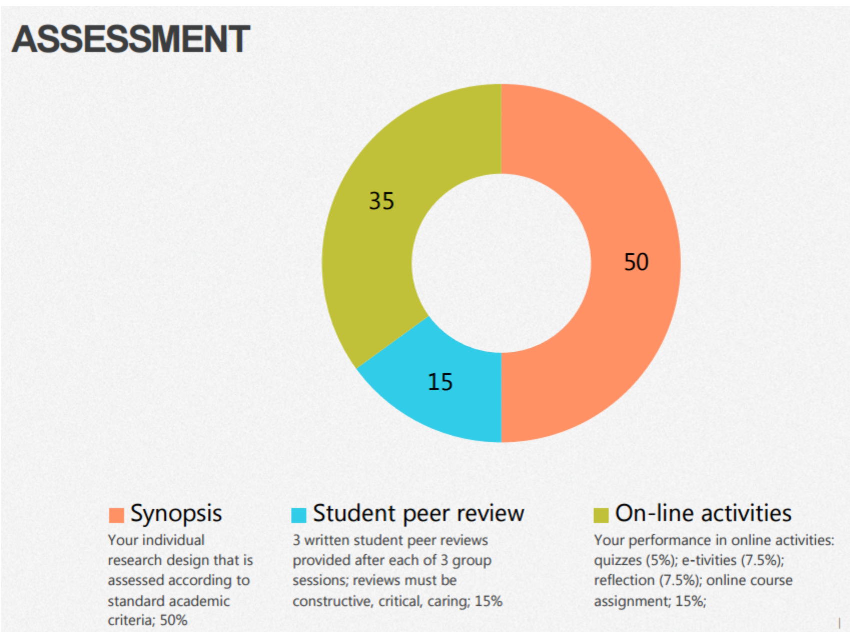

Fig. 20.1

The image above shows that students are assessed according to six different activities, namely 1) their own synopsis, 2) peer review reports, 3) online quizzes, 4) online ‘e-tivities’, 5) online ‘reflections’, and 6) an online group assignment.

Their **own synopsis** is a final written product of maximum 10 pages excluding annexes. The **peer review reports** are approximately 1-4 page, produced thrice (peer reviews occur three times throughout the course) by one student for another, providing a synthesis of all oral comments that the other student receives. The **online quizzes** follow the various online video lectures and readings. The **online e-tivities** occur during the first month and are facilitated by a KU librarian. The **online reflections** are required at the end of each week through the entire course. The **online group assignment** is a project developed throughout the course and presented toward the end of the second month.

Most of the activities listed above contain multiple points of assessment. To be precise: 1) their own synopsis– **1**, 2) peer review reports – **3**, 3) online quizzes – **5**, 4) online ‘e-tivities’ – **5**, 5) online ‘reflections’ – **7**, and 6) an online group assignment – **1**. In other words, each student is assessed exactly **22** times in the course.

While the course can be evaluated in multiple ways in relation to alignment (e.g. between intended learning outcomes and teaching methods), this report specifically examines the assessment regime. Thus the significance of the assessment regime i) in practice and ii) in relation to the intended learning outcomes, is the focus of the following section.

Understanding the costs and risks

What is the significance of such an assessment regime? To respond to this, I draw from my own recent experience as Course Responsible. Namely, such an exhaustive assessment regime as undertaken in the RP course implies significant time from the teacher – the primary impetus for the label, ‘extreme’. In the RP course, the single Course Responsible completes all assessments. This raises several questions. First, whether this time is well-spent. For instance, while class is held twice per week, the teacher uses significant ‘free time’ to keep abreast of the marking. Such free time could be used for private interactions with students – which students in this course indicate is a preferred and beneficial activity.

Further, every mark demands a level of precision that requires rigid attention by the teacher, which entails additional stress – a very real problem for many lecturers. Another obvious risk is the increased burden in responding to potential complaints from students. Indeed, every mark should be justifiable. Any and every moment of assessment can be challenged by any student, so the potential for challenges to marks is greater.

So many incidences of formal assessment may also risk the accountability of the teacher. In other words, the greater stress teachers face on a day to day basis could risk a greater number of opportunities for poor assessment. This has obvious implications too from the perspective of the students, who deserve and expect quality assessment conditions.

Student reactions

On the final day of the course or immediately after (for those unable to be present), all students (12 total) received a 13-question survey inquiring on aspects of the course assessment regime[2]. Six students responded. A summary of the results follows.

The first two questions queried the students' knowledge of the assessment regime, asking: 1) How many types of activities were assessed in this course, and 2) How many individual marks do you think your final mark is composed of? The results were that *no student* had accurate knowledge of either aspect of the assessment regime. This leads me to wonder, is it not problematic that none of them have managed to grasp what is arguably one of the most important practical aspects of the course? In other words, I interpret these results as evidence to support my belief that the assessment regime is too complex.

The following four questions inquired about feelings of having benefited from four of the six activities (reflections, e-tivities, report writing following peer review sessions, and online quizzes), selected by me as the marked activities likely to be most superfluous of the six. The value of this line of questioning will emerge in the next section, which presents suggestions for assessment regime revision. The least useful were equally found to be the reflections and e-tivities. In an extension of an examination of the value of the various course elements, questions 11 and 12 requested students to score all six marked elements in relation to how they i) supported the production of their personal research synopses, and ii) provided tools for, and experience with, systematic design of research projects (the overall course objective), respectively. Again, the students perceived reflections and e-tivities as

[2] Survey was previously in appendix but has been removed to comply with length restrictions of this anthology.

the least two useful course exercises for question 11. In question 12, reflections were scored lowest, followed by e-tivities alongside the peer review report and group assignment.

The partial rationale behind marking as noted above is to induce participation which hopefully will produce learning. To approach an understanding of the truth of this assumption in this case, Questions 5-8 inquired about feelings of *affected participation* in relation to the same four activities of questions 1-4. Specifically the questions asked, ‘To what extent do feel your participation in _________ was affected by the fact they are marked?’. The students’ participation in all activities was more affected ‘a lot’ than ‘not much’, with the exception of the e-tivities which had an even share of both responses. Though the value of such findings are questionable for a number of reasons – not least the extremely low sample size- it still appears that *participation in reflections, for instance, was likely to be undertaken only because it was marked, rather than that the activity having more significant meaning to the students*.

In discussion at the end of the class, students gave some oral feedback. Some expressed appreciation at having multiple assessments, in light of the challenges of a single examination be it written or oral. This is echoed in research showing that students in higher education value the feedback that multiple assessment points can provide- particularly when the assessment provides more than simply correct/incorrect responses (Higgins, Hartley, and Skelton, 2002). The students also provided some written comments on the assessments as well as on the formal course evaluation. In these, most students praised course elements of one-on-one time with me and the peer review process.

A way forward?

Biggs, 2003 points out, “Matching individual performances against the criteria is not a matter of counting marks but of making holistic judgments”. Based upon the reactions of the students and moreover, my own perceptions of the course, I strongly advise a reduction to the assessment regime, such as the following:

1. a personal synopsis – 1
2. a group assignment – 1
3. online quizzes – 5

In other words, each student would be assessed exactly 7 times in the course- yet the teacher will be responsible to complete assessment only twice per student, by utilizing thoughtful but *automated* online quizzes. The number of online quizzes is of course up for negotiation.

Consideration could also be given to changing the above entirely. The next Course Responsible might ask themselves, what is the value of the group assignments and need they be marked or not? Would an oral exam alongside the written synopsis be a better approach? Are online quizzes too rigid? Another option would be to make all or certain activities ‘required’ – but not marked- to be able to submit the final exam in the form of the written synopsis. The overarching issues for revision of this specific course (as any course) thus include: i) which elements are less useful vs. useless vs. harmful?, ii) which elements should be eliminated, and which should only have their marking eliminated?, and as always, iii) which elements best serve the intended learning outcomes?

Surely, it is difficult to find the right fit both for the teacher and the students. The tradeoffs between supposed increased participation, which necessitates time to mark by the teacher, against the opportunity for, for instance, more face to face time with the teacher, will have to be weighed by the next Course Responsible in Research Planning. The next Course Responsible might also consider talking with students at some stage in the course regarding the validity of various assessments, for instance asking them, which incidents of assessment contribute to the fulfillment of the ILOs and how, from their perspective?

Irrespective, it is with great conviction that I recommend a significant scaling down of the current assessment regime in this course, alongside a greater emphasis on time committed to meet the students face to face or to provide written feedback on their synopsis, which I believe serves better the achievement of this course’s intended learning outcomes. This is particularly the case as being a multidisciplinary course, I had to commit extra time to immersing myself in very different proposed research plans. Sometimes I took extra time to engage colleagues for their input as well. While I perhaps did not have to do so (and this should be established within the didactical contract at the start of the course), the more I did, the better I believe I served the students and their learning outcomes. Such engagement also facilitates more balanced feedback (pointing out the ‘goods’ as well as the ‘needs improvements’), than what a rigid correct/incorrect assessment format allows- which Brown et al., 2013 point out serves a critical motivational goal.

Concluding remarks

Though the validity of assessment structures is based in their alignment with learning, teaching and content knowledge, "the relationship is not straightforward and cannot be taken for granted" (James, 2006). Indeed, assessment structures often miss the mark in relation to a range of pedagogical aspects, from for instance new understandings of how learning occurs to the nature of the learning objectives. James, 2006 points out, "In the end however decisions about which assessment practices are most appropriate should flow from educational judgements as to preferred learning outcomes. This forces us to engage with questions of value – what we consider to be worthwhile – and, in a sense, is beyond both theory and method." To this end, I believe that the teacher's time in the RP course should prioritize direct relations with the students without being obscured by layers of more formal modes of assessment, followed by a simpler but still meaningful regime to provide the necessary mark of achievement. Such change would contribute toward moving from extreme toward balanced, or actual, alignment.

References

Biggs, J. (2003). *Teaching for quality learning at university* (2nd ed.). Buckingham: Society for Research into Higher Education and Open University Press.

Biggs, J. & Tang, C. (2012). Aligning the curriculum to promote learning. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (pp. 198–199). Boston, MA: Springer US.

Brown, G. A., Bull, J., & Pendlebury, M. (2013). *Assessing student learning in higher education*. Routledge.

Carnegie Mellon. (n.d.). Whys and hows of assessment. Carnegie Mellon Eberley Center. Retrieved from www.cmu.edu/teaching/assessment/basics/alignment.html%20Accessed%2026/10/15

Higgins, R., Hartley, P., & Skelton, A. (2002). The conscientious consumer: reconsidering the role of assessment feedback in student learning. *Studies in higher education*, *27*(1), 53–64.

James, M. (2006). Assessment, teaching and theories of learning. *Assessment and learning*, 47–60.

McLoughlin, C. (2001). Inclusivity and alignment: principles of pedagogy, task and assessment design for effective cross-cultural online learning. *Distance Education*, *22*(1), 7–29.

21

Teaching as promised: constructive alignment of the course “Plant Animal Interactions – an Evolutionary Approach”

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Background

The current project focuses on redesigning the MSc course “Plant Animal Interactions - An Evolutionary Approach”. The course is worth 7.5 ECTS and is in Block 1. It was established in 2014 and had 17 students. As the name of the course suggests, it deals with the interactions between plants and animals, particularly from an evolutionary perspective. As such, the course aims to attract students that are interested in evolutionary studies and a variety of organismal groups. The assessment of the course consisted of two online tests (30% each) evaluating students’ understanding of the subject matter, a mark on a written essay on a subject within the field of plant-animal interactions (20%) and an oral presentation of the essay (20%). However, at the end of the first year of the course, it was decided that the assessment of the course for 2015 would be: 20% for each of the two online tests, 40% for the written essay, and 20% for the oral presentation.

The content of the course was based on the textbook “Plant-Animal Interactions: An Evolutionary Approach” (Herrera and Pellmyr, 2009). However, other subjects not covered in the textbook were also included in the course. The intended learning outcomes (ILOs) of the course on the first year (Appendix 1) had to do with knowledge, skills and competences in the scientific subject of the course, as well as in scientific writing and presentation. During the first year, the course involved a total of 20 lecturers. As the course covers a wide range of plant-animal interactions, it was considered better to invite specialists in different types of plant-animal interaction that are also actively involved in research on those interactions. Most lectures were from the Natural History Museum of Denmark, University of Copenhagen and included PhD students to Professors.

In the first year, the teaching and learning activities (TLAs) included a series of lectures held by the lectures, some of which included practicals inside the classroom, as well as outdoors in the Botanic Gardens, where students were able to explore plant-animal interactions of interest. In most cases, students were asked to prepare for upcoming lectures by reading scientific articles and/or book chapters selected by the teachers.

Areas for improvement

In 2015, for the second year of running the course, I became course convenor along with Prof. Nina Rønsted who started the course. The course in 2015 had seven students, five of whom completed it (two dropped out due to personal reasons). One of my tasks as course convenor was to identify areas for improvement and to implement changes, accordingly. First, I looked at the students' course evaluations from the first year for feedback to identify aspects of the course that students were not satisfied with. Although these evaluations follow a standardised format from the faculty, they can certainly help us identify some areas for improvement. Second, I looked at the performance of students from 2014 to highlight areas in which the students did not perform well. Third, I evaluated the congruence between ILOs and TLAs in the way that the course ran in 2014. I identified three areas for improvement, all related to the idea of constructive alignment, which suggests that TLAs and assessment should align with ILOs (Biggs, 2011).

Agreement between TLAs and ILOs

The expected competences acquired from the course include being able to write in scientific style and discussing scientific articles critically. However, looking at students' performance at the written assignments from 2014, it became clear that several students did not achieve the ILOs related to this activity. Several assignments did not approach the level of the scientific standard and the scientific literature was not discussed critically. This was quite important, as the assignments counted for 20% of the grade for the course, and were planned to count for 40% in 2015. I looked at the TLAs from 2014 and realised that there were practically no TLAs dedicated to these competencies. Therefore, ILOs and TLAs were not perfectly aligned in this respect. Introducing TLAs dedicated to scientific writing and critically discussing the scientific literature to reflect relevant ILOs was the first area for improvement. This was particularly important, given the increased relative contribution of the assignments to the course grade in 2015.

Number of lecturers

The number of teachers involved in this course (20) created a teaching environment where students were potentially confused by incongruence between individual teachers' ILOs and the ILOs of the course, compromising the overall coherence within the teaching environment for this course. This was something that several students from 2014 pointed out in their feedback from 2014. Reducing the number of lecturers and increasing the coherence among lecturers was the second area for improvement.

New Course Assessment

As mentioned, the assessment of the course changed from 2014 to 2015, giving more weight to the assignment (40% in 2015 from 20% in 2014). This was done as the students reported in the feedback from 2014 that the contribution of the written assignment to the overall grade was too small compared to the effort they made to complete it. This change also meant that the online tests that evaluated the ILOs relevant to the scientific content of the course received less weight (40% in 2015 from 60% in 2014). The third area of improvement was to organise the TLAs of the course in a way that reflect this change in assessment of different ILOs, namely increase the time spent during TLAs relevant to scientific writing and decrease TLAs relevant to the scientific content. One important aspect in the new assessment was to maintain a balance between assessing the specific subject-related skills and competences and the more generic ones about presenting and discussing research in a scientific format.

Changes implemented

Agreement between TLAs and ILOs

I planned three types of TLAs to improve agreement between TLAs and ILOs, following three principles: i) plan backwards with ILOs, ii) plan using student activities, and iii) create coherence between course elements (Dohn and Dolin, 2015).

Journal club workshops

In order to create more TLAs pertaining to writing in scientific style and accessing and discussing the scientific literature, I lead two workshops discussing scientific articles that the students were already asked to read as part of the course material. These were in the form of a scientific journal club and lasted three hours each. During each workshop we discussed critically the writing styles of two scientific articles in the field of plant animal interactions – so four in total across the two workshops (Cook and Rasplus, 2003; Ellison and Gotelli, 2001; Schurr et al., 2009; Strauss and Irwin, 2004). The students were asked to read the articles prior to the workshops, so the preparation time was approximately two to three hours per workshop.

During the first workshop, I asked the students to focus on four aspects: Content, Literature, Structure, and Language. Going through these areas one by one for both papers, I asked the students to find examples of what they liked or disliked about the articles, discussing in plenum. Focussing on each example, we then all discussed what was the underlying idea for each example. What did these examples have to teach us about how one should present the content, discuss the literature, structure the manuscript and use the language in a scientific article? This was a very useful way of activating the students and getting their opinion on the principles of a good scientific article. At the end of the workshop, we summarised these points, as shown in Appendix 2. This activity was used to create clear instructions to the students for the written assignment and to help aim at the assignment's learning objectives (Jørgensen, 2015), as these points were used as success criteria for the written assignments.

In the second journal club workshop, we focussed on two different papers and went through the same points. This was done for the students to find further good and bad examples of the points in Appendix 2, but mainly to consolidate the knowledge established in the first workshop.

Scientific writing workshop

After the success criteria of the written assignment had been established, I also led a workshop on writing in scientific style. I asked the students to prepare for the workshop by choosing the subject of their assignment and writing a short synopsis of what they intended to write about. The workshop focussed on drafting the outline of a scientific manuscript. I taught the students the process of identifying the key messages (headlines) the wanted to convey in different sections of the manuscript and then making sure these headlines are presented in an order that creates a thread in their manuscript. To practice with that, I asked the students to i) identify their headlines and ii) practice with the order of their headlines to create a thread - a story. Using these, in the end of the workshop I asked them to write an abstract of what they expected their assignments to be about, following the abstract structure proposed by the journal Nature. Therefore, the output of the workshop was that the students had an abstract of their assignments that essentially represented the outline of their manuscript. This was done both to help the students with starting to write their assignments, but mainly to have them practice with thinking about drafting an outline prior to writing. The students now had clear success criteria and an outline for their assignments.

Peer-feedback workshop

The third type of TLA on scientific writing took place after the students had handed in their assignments. During that TLA, I asked students to peer-review each other's assignments. Each student received two assignments that their fellow students had submitted and was asked to provide round the table oral feedback on the success criteria presented in Appendix 2, as well as on the clarity of the headlines and thread in the assignment. The expected outcome of this workshop was twofold: First, additional to the feedback that students received on their assignments from the teachers along with their grades at the end of the course, they also received feedback from their fellow students. It was made clear prior to this workshop that this feedback did not affect the grade of their assignments, in order to create a relaxing teaching environment. Second, and most important, the didactic outcome of this workshop was that it served as a form of institutionalisation for the ILOs of the previous two types of workshops. This helped students apply previous knowledge and evaluate how well their fellow students met the success criteria, achieving understanding at qualitative levels (relational and extended abstract), according to Biggs' SOLO-taxonomy (Biggs and Collis, 1982).

Number of lecturers

The number of lecturers was reduced from 20 in 2014 to 12 in 2015. This was achieved by removing some invited lectures that were not deemed crucial for the ILOs of the course. To reduce confusion caused by having too many teachers, I taught almost a third of the lectures. The removed invited lectures were replaced by the TLAs relative to scientific writing described above. These were held every two weeks, giving the course more structure and enabling the students to see the same teacher at least on a biweekly basis. Furthermore, I was present at all classes and was able to answer questions that the teachers and students had about the coherence of a given lecture with the remaining of the course.

New Course Assessment

The new course structure was designed in a way of maximising the correspondence between assessment and TLAs. As shown on Table 1, relative contributions of assessments units and TLAs more or less correspond, although not perfectly. The online tests, assessing understanding of the scientific content of the course received more TLAs than reflected in their contribution to the grade, while the written assignment and oral presentation received fewer TLAs. However, while I was restructuring the course, I thought it would have been challenging to further reduce the TLAs relevant to the scientific content of the course, given that the course is advertised as a course in plant-animal interactions, and not a scientific writing course. The written assignment and oral presentation receive 60% of the course grade, collectively. However, these not only test a student's performance in scientific writing and presentations, but also their deep understanding in a plant-animal interaction topic. This was an interesting point to consider when evaluating how the new assessment evaluates the subject-related skills and competences and the ones about presenting and discussing research in a scientific format.

Table 21.1: Relative contributions of different assessment units of the course “Plant Animal Interactions: An Evolutionary Approach” to the overall grade and of TLAs dedicated to these assessment units to the overall TLAs of the course.

Assessment	% of total grade	% of total TLAs
Online tests	40%	54.5%
Written assignment	40%	32%
Oral presentation	20%	13.5%

Evaluation of changes

To evaluate the changes, I interviewed three of the five students after the completion of the course using the questionnaire shown in Appendix 3. In the first part of the interview, I asked students if they enjoyed the course. All students responded positively and mentioned that the new TLAs relevant to scientific writing were very interesting and provided them with transferrable skills. Two of them mentioned that having several teachers was a positive aspect of the course, because that meant they could receive lectures from researchers that were active in the fields in which they presented, in agreement with research highlighting the importance of research-based teaching (Dohn and Dolin, 2015). Then I asked them about ILOs in general and particularly about the ILOs of this course. Students reported that they always look at ILOs before signing up for a course. When I asked the students to score how well ILOs were achieved on a scale from one to ten, most ILOs received a score over 7. In the second part of the interview, we talked about the achievement of the ILOs relevant to scientific writing, as most changes at the course pertained to these ILOs. All of them, apart from “Outline future research”, received a score over 8. The students mentioned that they have encountered these ILOs in other courses, however they pointed out that this was the first time they received TLAs on this subject as part of a course that is not a scientific writing course. Students felt that the ILO “Outline future research” was not covered by any TLAs. In the third part of the interview, I asked students about the assessment of the course. Students reported that they were happy there were different assessment units (online tests, written assignment, oral presentation), as opposed to what they have encountered in other courses, where there is often just an assignment or a test. They reported that the assessment of the course reflected the time spent on TLAs during the course, although one student mentioned that the oral presentation should receive less weight. Finally, two students expressed the will to have more animal- rather than plant-related lectures.

Another way of evaluating the changes implemented was to look at the students' performance, particularly regarding the written assignment. Three of the five students received 10 or 12. Although one received a 7 and one received a 2, these students reported they appreciated the newly introduced TLAs.

Future of the course

Overall, I believe the course in its present form is improved, particularly in terms of its constructive alignment. The TLAs and ILOs are now much better aligned, and students are taught both the science around plant-animal interactions and tools relevant to presenting scientific research in written and oral form. In the future, more TLAs should be included to describe plant-animal interactions from an animal perspective, as the course is currently largely from the plant perspective. These TLAs are already being planned. TLAs teaching students how to outline future research should also be introduced. In terms of the assessment, the oral presentation should receive less weight to better reflect the time spent on relevant TLAs and the students' opinion. This change has already been implemented, and in 2016 the online tests will receive 50%, the written assessment 40%, and the oral presentation 10%, which corresponds quite well with the time spent on these assessment units (Table 1). This assessment scheme also provides a good balance between assessing content-related and more generic skills and competences acquired by the course. Finally, the course in 2015 had only five students, which allowed for a very intimate teaching experience, particularly suitable for the various workshops that were held. In larger classes, holding such workshops would require slightly altering the teaching style. However, the TLAs developed for this course can be easily transferred to larger groups, introducing group work and several points of discussion in plenum to guarantee institutionalisation across the classroom.

References

Biggs, J. (2011). *Teaching for quality learning at university: what the student does*. McGraw-Hill Education (UK).

Biggs, J. & Collis, K. F. (1982). *Evaluating the quality of learning: the SOLO taxonomy, structure of the observed learning outcome*. London: Academic Press.

Cook, J. M. & Rasplus, J.-Y. (2003). Mutualists with attitude: coevolving fig wasps and figs. *Trends in Ecology & Evolution*, *18*(5), 241–248.

Dohn, N. B. & Dolin, J. (2015). Research based teaching. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 43–62). Samfundslitteratur.

Ellison, A. M. & Gotelli, N. J. (2001). Evolutionary ecology of carnivorous plants. *Trends in ecology & evolution*, *16*(11), 623–629.

Herrera, C. M. & Pellmyr, O. (2009). *Plant animal interactions: an evolutionary approach*. John Wiley & Sons.

Jørgensen, P. S. (2015). Instructing written assignments. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 175–188). Samfundslitteratur.

Schurr, F. M., Spiegel, O., Steinitz, O., Trakhtenbrot, A., Tsoar, A., & Nathan, R. (2009). Long-distance seed dispersal. *Annual Plant Reviews*, *38*, 204–237.

Strauss, S. Y. & Irwin, R. E. (2004). Ecological and evolutionary consequences of multispecies plant-animal interactions. *Annual Review of Ecology, Evolution, and Systematics*, 435–466.

A ILOs of the course Plant Animal Interactions - An Evolutionary Approach for the year 2014.

Competences:

- *Understand the role of plant-animal interactions in the evolution of biodiversity.*
- *Evaluate the evolutionary and ecological impact of plant-animal interactions.*
- *Discuss the correlation between plant chemical defense, evolution, and lead discovery of medicinal plants.*
- *Present her/his own work (in oral and written form) at a level approaching the scientific standard.*
- *Extract, present and critically discuss in detail the results of a scientific article about plant-animal interactions*
- *Identify and explain strengths and weaknesses in scientific articles and suggest further enquiries.*
- *Outline future research.*

Skills:

- *Identify and classify types of plant-animal interaction.*
- *Describe examples of plant-animal interactions.*

Knowledge:

- *Theory and examples of plant animal interactions in an evolutionary perspective including subjects described in the course content.*
- *Examples of recent and ongoing research on plant-animal interactions using an evolutionary approach.*
- *Basic knowledge of evolutionary approaches to study plant-animal interactions.*

B Success criteria for good scientific writing arsing from journal club discussion workshop with the students.

1. Content

Present only information that is relevant to the topic and that is useful for the reader in order to understand your study system and arguments.

Identify gaps in knowledge or limitations of previous studies in the main body of the review. Synthesise those points at the very end of your essay.

2. Literature

Any important claim/statement you are making should be supported by at least one reference from the primary literature.

Discuss the literature in a critical manner. Do not just describe previous work, but explain why it is good/novel/interesting or what limitations it may have.

3. Structure

Present clear aims and objectives relatively early in your essay.

Use informative headings that tell the story of your essay.

Structure your sections in a way that they can stand alone (require minimal prior knowledge) and they are linked to previous/subsequent sections.

4. Language

Avoid using unnecessary terminology. Make sure your claim/argument is understandable without terminology.

If you are using terms, think about whether they need to be explained or not.

C Questionnaire used for student interviews to evaluate how changes were perceived by the students.

1. Overall, would you say you enjoyed this course more or less than other similar courses?

2. Can you tell me 2 things you enjoyed about the course?

3. Can you tell me 2 things about the course that could improve?

4. Do you generally look at ILO's of courses before and after?

5. Can you please look at the ILO's of the course and tell me if you think they were achieved?

6. Can you score each one 1-10?

7. From what you remember in the course, can you score each one 1-10 to correspond to the time spent in class? 1 means little time, 10 means a lot of time.

8. Now I would like us to focus on the following four ILO's.
   - Present her/his own work (in oral and written form) at a level approaching the scientific standard.
   - Extract, present and critically discuss in detail the results of a scientific article about plant-animal interactions.
   - Identify and explain strengths and weaknesses in scientific articles and suggest further enquiries.
   - Outline future research.

   For each of these ILOs, please answer the following questions:
   Do you think this was achieved?
   Is this ILOS something that you encounter in other courses?
   Do you think you gained more or less experience from this course compared to other courses?
   Can you identify any ways in which this course treated this ILO differently than other courses?
   Was this difference positive or negative?

9. To what degree do you think the assessment of the course reflects the ILO's?

10. To what degree do you think the assessment of the course reflects the time spent in class on ILO's?

11. How about other courses? Do you think the assessment of other courses reflects their ILO's and time spent on them?

12. Do you have any other comments?

22

Developing the course Nature and Landscape Politics with a focus on deep learning

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Introduction

Department of Food and Resource Economics A core characteristic of graduates from natural resources management is that in their professional career they come to work interdisciplinary in their own problem solving and through communicating and collaborating with people from other professional disciplines and educational backgrounds. Therefore, the students are trained not only in natural sciences, but also in social science theory and research methods. The course Nature and Landscape Politics (hereafter described as NLP) at Faculty of Science at the University of Copenhagen (UCPH) is an example of that. NLP is included in the Natural Resources Bachelor study program (NRB), and the aim of the NLP course is to introduce the primarily natural science student to policy analysis in the context of nature and landscape management (KU-Science, 2014 - 2015, 2015). It is intended that the students gain an understanding of stakeholders' role in nature resource management and how, institutions and structures both enable and limit policy making - all this in order to enable the students, as future professionals, to navigate and use their professional skills.

NLP is a popular course, which is mostly positively evaluated. The annual evaluations do however indicate a need for better alignment between the intended learning outcome (ILOs), teaching learning activities (TLAs), and assessment tasks (examination) in the course, as only a minority of students (totally) agree to have achieved the competencies outlined in the course description (33.3 % in 2014, 28.6 % in 2015, cf. NLP Course Evaluations 2014;2015). At the same time, a majority (totally) agreed that here was a good relationship between the teaching elements (66.6% in 2014, 70.5 % in 2015), indicating that the main challenge may not so much be in the inner consistency of the course, but more in an overall uncertainty as to what are actually the competencies they are to acquire and a sense of actually having achieved these.

This suggests a need for deeper learning, i.e. learning that goes beyond the surface (accumulation of more or less incoherent facts and details), giving rise to reflection and makes the student able to use the newly acquired knowledge to create meaningful contexts (Biggs and Tang, 2007). Additionally, students are driven by an internal motivational emphasis (Entwistle, 1981; Ramsden, 1992a). The aim of this paper is therefore to analyze the barriers and opportunities for achieving deep learning, and propose changes that can increase the students' deeper learning through improved alignment of the course.

We will address the problem from different perspectives: (1) First, we will look at the didactic challenges in achieving alignment and deep learning and identify a framework for analysis, (2) then we will briefly describe the NLP course and, (3) the students' evaluations and, based on these, (4) analyze the barriers and opportunities for deep(er) learning through constructive alignment. We will look at the changes that have been made over time as well as looking ahead and suggest proposals for change. The project will draw on different types of empirical data:

- Student evaluations – written and oral - from the course in 2014 and 2015 (NLP Course Evaluations 2014 & 2015; Boon, 2014a; Clausen, 2015a) including teacher evaluation (Boon, 2014b; Clausen, 2015b).
- Own observations and reflections from conducting the course
- Feed-back on the proposed strategy from other teachers at IFRO

The didactic challenge of teaching for deep learning

The overall didactic task for university teachers is to support and study the processes that promote learning as best as possible. 'Didactics' can be defined as the art or science of teaching (Marzano, 2007). Fundamental questions are: What should be learned? Who should learn it? Why should it be learned (purpose)? How is teaching and assessment best organized for the students to learn it? In what context should they learn it? (Ulriksen, 2014, p. 73). It is therefore important what the content is, which methods are used, what the formal terms of a teaching subject are, which teacher role the teaching involves, how teaching is documented and evaluated and how the teaching is justified in a larger context such as for instance in relation to the kind of citizen – and professional - whom the education implicitly or explicitly helps to create. In this regard education always affects and "does" something to people on both a conscious and subconscious level (Ramsden, 1992a).

Principles of deep learning

Students can take different approaches to learning. Deep and surface learning are two such approaches to learning, derived from original empirical research (Marton and Säljö 1976) and since elaborated upon (Ramsden, 1992b; Biggs, 1987; Entwistle, 1981). Students that adopt "...a deep approach to learning characteristically exhibit: an explicit intent to develop their own understanding of material (Biggs, 2003; Entwistle, 1981), knowledge, which is highly structured (Biggs and Collis, 1982; Boulton-Lewis, 1998); an ability to apply their own and other's ideas/concepts to new situations (Ramsden, 1992a), and a highly developed integration of knowledge (Biggs, 2003)" (Meyers and Nulty, 2009). In contrast, students adopting a surface approach to learning typically attempt to meet course requirements through minimal effort (Biggs, 2003). Here, students focus on 'the signs', treat 'parts' as separate, focus on 'essentials', use memorization, do not connect facts and concepts, fail to distinguish principles from examples, do not separate knowledge from everyday activity, and consider tasks as external impositions (Entwistle, 1981; Ramsden, 1992a). It follows that 'High quality' learning outcome is related to deep approaches to learning, and different key classifications have been developed to help deep approaches thrive (ibid.).

In our evaluation of the ability of the NLP course to generate deep learning among the students, we have chosen Meyer's and Nulty's (2009) five curriculum design principles for facilitating deep approaches to learning. It is a recent theoretical framework where the interactive element is central – an approach we would like to develop in the course. According to Meyers and Nulty, 2009, teaching materials, tasks and experience should all be:

i. Authentic, real-world and relevant
ii. Constructive, sequential and interlinked

iii. Require students to use and engage with progressively higher order cognitive processes
iv. Aligned teaching and learning material with each other and the desired learning outcomes
v. Provide a challenge, interest and motivation to learn.

The key focus of Meyers and Nulty (2009)'s five principles is the creation and use of a system of curriculum components that result in more active learning through student-centered learning. Student-centered learning is where the students take a central role in the educational process (Paraskevas & Wickens 2003), in contrast to traditional one-way communication where "it is supposed that knowledge is passed from the learned lecturer to the eager student" (Allan, 1999). In student centered learning, students become active participants in the learning process and engage in analysis, synthesis, evaluation and exploration of values and attitudes (Boud, Cohen, and Sampson, 2001; Sivan, Leung, Woon, and Kember, 2000).

22.1 Principles of constructive alignment

Attaining deep learning can be made more manageable through the principle of constructive alignment. Constructive alignment highlights the relationship between intended learning outcome (ILOs), teaching learning activities (TLAs) and assessment tasks, that is, methods of evaluation in terms of supporting student learning (Biggs and Tang, 2012) [Figure 22.1]. 'Alignment' can in this regard be translated as something which is in line (Ulriksen, 2014, p. 41) while 'constructive' refers to a learning that involves that the students themselves are active in the construction of their own knowledge (Biggs and Tang, 2007). A course is coherent when there is consistency between objectives of the course, the teaching and learning activities, and the ways in which students are assessed and evaluated in the course (Ulriksen, 2014, p. 41).

In a successfully coherent course, the teacher will 'construct' the inner logic of the course (Entwistle, 2009) and gives the students a way of thinking that allows 'deep learning' (Biggs and Tang, 2007; Bowden and Marton, 2004; Ramsden, 1992a). Constructive alignment takes place throughout the learning environment of the students, that is, a system, which beyond the classroom also includes the department and faculty of the university and its administrative institutions. In this paper, however, our primary focus is on the alignment and deep learning within the NLP course.

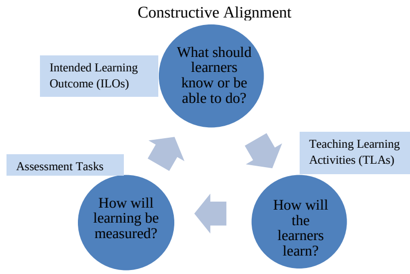

Fig. 22.1: Principle of Constructive alignment between teaching learning activities (TLAs), intended learning outcome (ILOs) and assessment tasks (examination) in a course (Inspired from Biggs, 1999).

Aims and contents of the course Nature and Landscape Politics

The NLP course provides an introduction to policy analysis applied to nature and landscape management. The aim of the course is ”to provide the students with tools (theories and methods) to understand and analyze nature and environmental politics”. The NLP course is a mandatory course in the NRB education, study direction ‘nature management’. The course is located at year two, block one. The course is typically attended by 25-35 students, mainly from the NRB. The NRB ‘nature management’ study program has aspects of problem-oriented, interdisciplinary training. Basically, however, the education is grounded in natural sciences with elements of other disciplines, which appears in for instance economics, environmental and planning law, theory of science (with emphasis on positivism), and the NLP course. The students attending are mainly trained in the positivist tradition, i.e. the assumption that we can strive towards one true knowledge of the world through principles of falsification (Pedersen and Toft, 2004). The NLP runs over nine weeks, including exam week. It is structured along a series of lectures on preselected topics related to the different phases of policy making (agenda setting, policy formulation, implementation, evaluation) and underlying theories (e.g. on power, democracy, participation, steering), exercises in the class, one half-day excursion, and group work to prepare two written essays (see below). The NLP course learning objectives are consistent with the principle of 'Constructive Alignment'. They are closely thought together with the course structure and activities, signal clearly what students need to practice in the course and what they should be assessed on in an exam situation (KU-Science 2014/2015). The students get acquainted with the course's learning objectives, form of teaching activities and exam form already when they read the course description on the course's website (KU-Science 2014/2015). All three parts are clearly formulated, and are also presented in the course's first teaching session. During the course, the overall learning objectives are deconstructed into smaller parts, which are presented at the beginning of each course lesson. The learning objectives are inspired by the SOLO taxonomy, showing the stages of a learning process (Biggs and Tang, 2007): the surface learning is taking place during the first step of the learning process where students' learning is limited to representation of facts and simple problems and then, later on, targeted the deep self-creating meaningful connections at a higher level of abstraction. The learning objectives are 'learned' through activities consisting of lectures, supported by smaller exercises and one big roleplay, text readings, group discussions and presentations. The course uses many external lecturers who relate their lectures to specific empirical and theoretical work and in the end of the course an excursion to a relevant institution (for instance a NGO or a Ministry) is included. During the course, the students work in groups to prepare two written essays, applying selected theories to a real life policy case. The essays must be handed in as a prerequisite for attending oral examination.

The exam is a 30 minute individual oral exam, preceded by drawing an exam question, and 25 minutes of preparation. The exam question are constructed so students are tested in their learning within the three overall learning objectives of the course: Demonstrate (reproduce) knowledge of policies for nature use and protection of Denmark as well as theories with which to analyze them; Apply theory to nature and landscape (environmental) policy cases – and as part of this, they are asked to refer to the case used in their essays; Compare and discuss the relevance and implications of applying different theories and methods to a selected policy case. In this sense, the NLP course is on all levels targeted to follow the EU's Bologna Directive for higher education, which divides the learning objectives in three subgroups covering knowledge, skills and competencies (European Commission 2005). In the 2015 course, some minor changes were made in order to support the interactive element. Some lectures were replaced by exercises and traditional one-way feed-back where commentaries are passed from the learned lecturer to student was replaced by a peer-to-peer response on the two written essays.

Student evaluations of the NLP course

The following is based on (1) the KU-Science course evaluations conducted by the students in 2014 and 2015 with response rates of 35 % (9 out of 26 students) and 41 % (7 out of 17), respectively; (2) oral evaluations conducted in class with participation of 20 (2014) and 17 (2015) students, respectively (NLP Course evaluation 2014; 2015). The evaluations were both conducted before the students had handed in their last essay and, thus, before exam.

It appears from the written student evaluations that most are pleased with the course. The involvement of many external lecturers with input from real life is assessed positively The same applies to the work with cases from ‘real life’ and the perception of group work, which is estimated to provide continuity and enhanced learning in the course. In general, the perception is that working on cases together with others can make complex issues more concrete and manageable. Also, most are satisfied with the part-passing of projects, so difficult material becomes rounded and evaluated along the way (NLP Course Evaluation 2014; 2015).

At the same time, only few (totally) agree in having achieved the course learning objectives (33 % in 2014, 29 % in 2015), many stating ‘neither/or’ (44 % in 2014, 71 % in 2015) or even partly disagreeing (22 % in 2014) (NLP Course Evaluation 2014; 2015). This is complemented by one third (2015) of the students finding the level being too high. At the same time, a majority did (totally) agree that here was a good relationship between the teaching elements (67 % in 2014, 71 % in 2015), i.e. aligned, but they call for less reading and more practical examples of the application of the theory (NLP Course Evaluation 2014; 2015).

The students’ rather skeptical (self-)evaluation of whether they have achieved the course learning objectives is in contrast with fact that the students ended up passing exam with an average grade of 8.3 (2014) and 9.2 (2015) respectively (Boon, 2014b; Clausen, 2015b).This indicates that at the stage of evaluation, the students are quite uncertain about their own competencies.

Overall, the evaluation reflects different needs that challenge the teaching: Students lack confidence in their own abilities to make research on the problem (finding newspaper articles, debates etc.) as well as the structuring of the essays. Ambiguity also exists towards the problematizing approach which is characteristic for the course. Some are really happy with the 'culture of debate', while others prefer to see it minimized, because they feel it is unclear what is right and wrong in accordance to the understanding of a theory (Boon, 2014a). Similarly, calls for time to go deeper into things are expressed and the term 'superficiality' is repeated (Boon, 2014a; Clausen, 2015a). This relates to the amount of topics on the subject and range of many external lecturers which, apart from being appreciated, makes it difficult for students to orient themselves. It is however also related to the study program as a whole and the amount of subjects which are not considered to be clearly inter-linked. What really seems to tie things together is the use of real life cases. As an alternative to the diversity of the topics raised at the NLP course it is suggested by the students to reduce subject-circuit from 10 to four topics and go more in depth with them (Clausen, 2015a). In relation to the oral examination some students express that they feel they do not have enough time to cover the curriculum (Clausen, 2015a).

The students responded positively to the more interactive/collaborative approaches that had been introduced in 2015 in order to increase student centered learning. For instance, a peer-to-peer approach was introduced in order to let the students comment on each-others projects – an approach evaluated positively based on arguments that it made them reflect more carefully on the meaning and inter-relatedness of themes (Clausen, 2015a). Thus, it was suggested by the students to have more peer-to-peer feedback into the course – and at an earlier stage. Also, they would like more influence on the choice of topic for their case work, and it was suggested to place the excursion earlier in the course in order to draw on the inspiration from the amount of policy problems presented here.

Barriers and opportunities for deep learning through constructive alignment

In the following we will relate our experiences to the five principles of curriculum design described by Meyers and Nulty (2009) in order to evaluate on the students' deep learning of nature- and landscape politics as we (1) look at existing initiatives taken in order to achieve deep learning and (2) consider future initiatives inspired by principles and theories on deep learning. Throughout our analysis we will pin-point some of the dilemmas of and potentials to achieve deep learning.

Authentic, real world and relevant

The NLP course includes different initiatives to make the content authentic and relevant. The use of real life policy cases, the inclusion of a wide range of external lecturers, who base their lectures on existing real-life issues, the excursion and the encouragement of the students to relate issues (for instance participation or democracy) to the students' own personal everyday life and related experiences represent a way whereby authenticity is thought into the teaching situation. Similarly, the professional dimension is brought into the course by encouraging the students to think as future professionals in their approach to the exercises.

These initiatives to create authenticity and relevance could be further strengthened. For instance the policy cases should be renewed on an annual basis to ensure their timeliness and relevance. Also the relevance of topics to the students' future work as professionals and/or their everyday life could be integrated more directly in exercises and written assignments – and how they are formulated. For instance we (as teachers) could deliberately ask students to approach a problem from the perspective of being (a future) professional with a practical policy problem to be solved, rather than the traditional, analytic (pan-optic) researcher perspective. The same approach could be used to bring students' everyday life into play. Also, role-play could potentially take up a larger part, since empathetically 'stepping into the shoes' of stakeholders could contribute with a deeper understanding for the complexities at stake. Finally, when using external lecturers there is a risk that the learning objectives are not achieved, due to insufficient coordination or misunderstandings. The risk could be reduced and alignment be improved by choosing guest lecturers specifically on the basis of the topics that the students concretely work with – including the possibility of letting students influence on who to invite and give lectures.

Constructive, sequential and inter-linked

Following a natural science tradition the course is pieced together by "blocks" to ensure that the students are introduced to some main policy topics and affiliated theories. This provides some ’safety in structure’, but it can also be so ’sequential’ that the items do not inter-link in a natural way. It therefore rests much on the teacher to create the interrelatedness between topics – for instance by reminding students about approaches from the previous lecture and through the use of group based essays centered on the same case throughout the course, hereby "tying things together".

An alternative could be to take a hermeneutic approach, working with the same topic but at increasing levels of complexity. This would require a focus on less main themes (e.g. power) which the other themes would then only serve as input to. This could give a different “flow” to the teaching of curriculum, but also new challenges of articulating the relevance of the selected topics and sub-topics in relation to each other, and in relation to the students’ future profession. Also the constructive (i.e. interactive) dimension could be strengthened. If students are invited to influence the course through their evaluation this, in itself, is an important influence. Therefore, more awareness about this influence could be created. Similarly, students could be more explicitly encouraged to select the cases for their group work essays themselves, and get inspiration by scheduling the field trip early in the course (cf. above).

Finally, parts of lectures could be replaced with student driven activities. An example could be to ask students to interpret and discuss an important graph or legal paragraph in the Nature Protection Act, rather than presenting it as a ‘truth fact’ in a lecture. In this way we could systematically go through the curriculum and consider which parts might be suitable as student activities, and something, ’we examine together’. Similarly the integration of more peer-to-peer activities into the course could help students convert their knowledge into practice, e.g. by applying peer-to-peer feed-back on the students’ case-projects. The teacher function would then become the one of facilitating the peer-to-peer process. Whilst, the open approach to learning suggested above may also raise uncertainty and anxiety among some students, creating a barrier to learning. It is therefore important as a teacher to continuously provide the students a sense of direction of learning at a meta-level, also during, ‘we examine together’ sessions.

Require student to use and engage with progressively higher order cognitive processes

As outlined above, the NLP course faces the challenge of having to introduce social science in an otherwise natural science dominated NRB curriculum. This is also recognized as a challenge in the student evaluations, and has been worked on throughout the history of the course. But as the recurrent low student scores on ‘having achieved the learning objectives’ indicate, there is also a need for a clearer communication with the students about the learning objectives and what students in their way of working and thinking can take as indications of actually having achieved them. We therefore turn our focus towards the objectives of the course:

The central learning objectives are that the students (1) demonstrate (reproduce) knowledge of policies related to nature management (e.g. related to nitrogen emissions, water conservation or biodiversity), as well as theories with which to analyze them (2) Apply theory to real life policy cases, and (3) Compare and discuss the relevance and implications of applying different theories and methods to a selected policy case.

As regards policy analysis, one approach has been to implicitly teach the course within the positivist tradition, applying policy analysis in a way that does not fundamentally challenge this view, e.g. a rational choice policy approach, with emphasis on quantitative analyses of ‘facts’ and cost-efficient ways to achieve policy goals. A second approach has been to address the political nature of not only decision-making but also implementation and evaluation, but without explicitly addressing the underlying ontological and epistemological differences. A third approach has been associated with the desire to challenge also the students’ understanding of theory of science, making them aware that there are different ways to acquire knowledge and use knowledge, and that there may also be competing forms of knowledge on the same issue, rather than one true knowledge.

Acknowledging that the course has duration of only nine weeks, the following advantages and disadvantages of the partially different aims have been considered:

Remaining implicitly within a positivistic tradition leaves time to go into the substance of concrete policies - such as for instance policy formulation, implementation and evaluation of policies to reduce nitrogen emissions. The downside is that the ’political’ aspect of politics is not addressed neither are the underlying theory of science issues, so the students’ preconceptions are not challenged in that way. However, in order to familiarize the students as upcoming professionals, to navigate in the political reality, it can in fact equip them to the extent that "numbers count". The advantage of addressing the political nature of politics is, as above, that students are equipped with skills to navigate in the political reality of nature and landscape management, not only as ‘science’ professionals, but with a view to the different interests, stakeholders and participation strategies applied. The advantage of addressing also the underlying epistemology and ontology is that the students acquire a more fundamental understanding of ‘the political’, the fundamentally different beliefs and values - both at the political level, but also into the very core of science, their own education, and therefore of what they come to represent themselves. The downside is that nine weeks are neither enough to cover both the ‘policies’ related to nature and landscape nor to enable the students to reach a deep recognition of the nature of ‘the political’.

The solution to this challenge so far has been that both dimensions are present while they have also been the subject of a priority. One such prioritization is that policies only serve the purpose as examples. Accordingly, students need not achieve a detailed picture of the current, main policies, but only the related principles. A second priority has been to select specific aspects of a policy process and related methods of analysis, with a consideration to the possible tasks the graduates will be working with in their professional careers. For example, insight into different steering instruments, implementation and evaluation is considered relevant for graduates becoming public managers in their professional life. A third priority has been to give relatively more weight to approaches which propose an instrumental use of policy analysis ’in the service of the public administration’ as compared to approaches that deconstruct what is at stake in order to uncover mechanisms of (dis-)empowerment.

In order to improve alignment in the future we propose: (1) To explicitly prioritize among the above mentioned approaches to the course, as a basis for the adjustment of the course contents; (2) To relate the epistemological questions more profoundly to students’ own life experiences, as citizens and as future professionals, hereby making complex problems more present; (3) to include a lecture that focuses on the differences between natural and social science paradigms, even it is time consuming. The experience from introducing it in 2015 and students’ evaluations thereof suggest that it help the students to better understand differences and similarities.

Aligned teaching and learning activities and the desired learning outcomes

Over the years, several changes have been made in order to align the TLA's and the ILO's in the NLP course. For instance the amount of reading material has been cut. Also, based on students' evaluations, the teachers proposed the students to work in reading groups as a replacement of some lectures. The students however declined this offer, arguing that understanding course topics was better achieved through lectures than through students' common reflection. This reflects the paradox between on the one hand being an introductory discipline where practical methods must be acquired, and on the other hand aiming at enhancing students' reflective learning - two quite different levels of competences. Supervision have also been scheduled in order to urge the students to actually use the teachers as supervisors in the group work, and weekly reading manuals for the texts have been sent out in good time.

In order to further strengthen alignment a suggestion could be that we go more deeply into developing the framework so that the students themselves relate key points and arguments from one part of the course to another. Perhaps clearer rules give more opportunity to actually participate in the game and seen from this perspective the rules might not have been clear enough in the course?

Provide challenge, interest and motivation to learn

In general the NLP course is considered challenging, interesting and motivating. As it appears from the evaluation, the challenge of achieving an inner logic of a course seems to increase when teaching concerns the teaching of one discipline, such as the epistemology and ontology of social science, to another, for instance natural science (Dich, Hansen, Christiansen, Kaltoft, and Sandøe, 2005; Gjerris, 2006). Thus, the challenge is no longer "only" to get alignment between learning outcome, teaching methods and assessment, but also that the skill level, knowledge, learning capacity of the course participants are alien to the subject being taught in the course. One of the more striking consequences is that people trained in the natural sciences tend to give the technical or scientific part of a problem attention whereas people trained in the humanistic tradition tend to be more interested in getting a broader perspective on the problem and see it as connected to other problems (Gjerris, 2006). The didactic challenge in this connection is mainly to be able to make students interested in subjects, methodologies and ways of thinking and arguing that they usually do not concern themselves with (ibid.). As teachers in NLP we aim to make natural resource management students interested in and capable of grasping rather complex philosophical and sociological concepts such as »actor«, »structure«, »democracy«, »participation«, »power«, »empowerment« and »discourse« and somehow include them in their argumentation. Finally, it is also worth considering whether it is relevant to adjust the exam. A written exam could imply a better opportunity to get around the subject in a way that helped visualize the students' deep learning.

Conclusion

In this paper we have analyzed the barriers and opportunities for strengthening deep learning through improved alignment of the course in Nature and Landscape Politics, within the education Natural Resources Bachelor, at the Faculty of Science, University of Copenhagen. Student evaluations revealed that the students were uncertain whether they had actually achieved the competencies of the course. Part of the explanation could be that the evaluation was conducted while the students were busy writing their essay and before starting to prepare for exam. Still, the evaluation revealed a need to align the course so as to ensure that the students gradually through the course build up an inner sense of efficacy related to the competencies that the course is aimed at providing them. Following Meyers and Nulty (2009)'s five guiding principles, we outlined measures already being taken to allow for deep learning, but we also suggested a number of improvements that could ideally be implemented. We also made a critical assessment of the feasibility of these, considering the framework conditions of the course. We are now planning for the course running again in September-November 2016, and we integrate our suggestions for improvement as far as possible.

References

Allan, G. (1999). Getting Students to Learn about Information Systems Project Management: An experiment in student-centred learning. *Research in Post-Compulsory Education*, *4*(1), 59–74.

Biggs, J. (1987). *Student approaches to learning and studying*. Melbourne: Australian Council for Educational Research.

Biggs, J. (1999). *Teaching for Quality Learning at University* (1st ed.). Society for Research into Higher Education and Open University Press.

Biggs, J. (2003). *Teaching for quality learning at university* (2nd ed.). Buckingham: Society for Research into Higher Education and Open University Press.

Biggs, J. & Collis, K. F. (1982). *Evaluating the quality of learning: the SOLO taxonomy, structure of the observed learning outcome*. London: Academic Press.

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university* (3rd ed.). Open University Press/McGraw Hill.

Biggs, J. & Tang, C. (2012). Aligning the curriculum to promote learning. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (pp. 198–199). Boston, MA: Springer US.

Boon, T. E. (2014a, October). Mundtlig evaluering. Natur- og landskabspolitik (Oral evaluation).

Boon, T. E. (2014b). *Natur- og Landskabspolitik LNAB10015 2014*. Evalueringsnotat fra kursusansvarlig. [Note on evaluation of the Nature and Landscape Politics course, by the course responsible].

Boud, D., Cohen, R., & Sampson, J. (2001). *Peer learning in higher education.* Kogan Page.

Boulton-Lewis, G. M. (1998). Applying the solo taxonomy to learning in higher education. In B. Dart & G. Boulton-Lewis (Eds.), *Teaching and learning in higher education* (pp. 145–176). Camberwell.

Bowden, J. & Marton, F. (2004). *The university of learning: Beyond quality and competence.* RoutledgeFalmer.

Clausen, L. T. (2015a, October). De studerendes evaluering af kurset. [Oral evaluation].

Clausen, L. T. (2015b). Natur- og Landskabspolitik LNAB10015 2015. Evalueringsnotat fra kursusansvarlig. [Note on evaluation of the Nature and Landscape Politics course, by the course responsible].

Dich, T., Hansen, T., Christiansen, S. B., Kaltoft, P., & Sandøe, P. (2005). Teaching ethics to agricultural and veterinary students: experiences from denmark. In M. Marie, S. Edwards, M. Gandini, M. Reiss, & E. Von Borell (Eds.), *Animal bioethics. principles and teaching methods*. Wageningen: Wageningen Academic Publishers.

Entwistle, N. (1981). *Styles of Learning and Teaching; an integrated outline of educational psychology for students, teachers and lecturers.* John Wiley.

Entwistle, N. (2009). *Teaching for Understanding at University – Deep Approaches and Distinctive Ways of thinking*. Palgrave MacMillan.

Gjerris, M. (2006). Breakfast at Milliways – The didactic challenges of bioethics. *Dansk Universitetspædagogisk Tidsskrift*, *1*(2), 45–52.

Marzano, R. J. (2007). *The Art and Science of Teaching.* ASCD Publications.

Meyers, N. M. & Nulty, D. D. (2009). How to use (five) curriculum design principles to align authentic learning environments, assessment, students' approaches to thinking and learning outcomes. *Assessment and evaluation in Higher education*, *34*(5), 565–577.

Pedersen, E. O. & Toft, P. (2004). Positivisme: Erfaringsbaseret viden formuleret I en logisk sprogramme. In P. Fuglsang L. & Bitsch Olsen (Ed.), *Videnskabsteori i samfundsvidenskaberne. på tværs af fagkulturer og paradigmer [theory of social sciences. across the professional cultures and paradigms]* (pp. 55–78). Roskilde Universitetsforlag.

Ramsden, P. (1992a). *Learning to teach in higher education* (2nd ed.). Routledge.

Ramsden, P. (1992b). *Learning to teach in higher education* (1st ed.). Routledge.

KU-Science. (2014 - 2015). Natur- og Landskabspolitik [Nature and landscape politics]. *Science*. Retrieved from http://kurser.ku.dk/course/lnab10015u/2014-2015

KU-Science. (2015). Natur- og Landskabspolitik [Nature and landscape politics]. *Science*. Retrieved from http://kurser.ku.dk/course/lnab10015u/2015-2016

Sivan, A., Leung, R. W., Woon, C., & Kember, D. (2000). An Implementation of Active learning and its Effect on the Quality of Student Learning. *Innovations in Education and Teaching International*, *37*(4), 382–389.

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1st ed.). Frydenlund.

Part V

Teaching heterogenous groups of students

23

Reflections about challenges of constructive alignment amongst heterogeneous masters' students

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Aims

This paper addresses and reflects upon a number of problems experienced in attaining constructive alignment in courses taken by social science masters' students who have a wide variety of disciplinary, cultural, and educational backgrounds. This is deemed worthy of attention because an implicit assumption of many university courses is that students have similar, if not identical points of departure. This can be observed from such things as descriptions of course material, course objectives, and formulations of outcomes demanded from students, as well as expected levels of student participation. This paper does not question the need for formulating explicit course objectives and demands. It does however question and problematize some assumptions concerning students found in description of course objectives and demands. My experiences of teaching question the underlying assumption. This is based on recognition that although students generally share a benchmark level entry qualification, they nevertheless are very mixed – in terms of academic ability, but also, their expectations of teachers and teaching, their aspirations concerning learning methods, their experiences with different pedagogic styles and didactic methods, and not least, the role they assign themselves as students, as well as their understandings of good and bad teachers and teaching methods. In this paper I therefore present and problematize student heterogeneity as evident across a number of student-student and student-teacher interactions and I discuss challenges and possible solutions, based on my own teaching experience, in order to fulfil constructive alignment.

Disciplinary background and case base

I teach and supervise BA and MA level students in social science. Thematically, I have mainly taught qualitative methods, theory, and case based courses in international development studies, which typically focuses on a variety of social, economic, and political challenges experienced in developing countries. A key characteristic of the courses taught and students I have supervised are that they come from all over the world. In this paper I focus specifically on experiences of teaching a methods course – Qualitative Methods in Agricultural Development (QMAD), at the Institute for Food and Resource Economics (IFRO). I have had a central role in QMAD the last 2 years and will teach it again in the autumn. Typically, I am responsible for three times three hour lectures, and three times six hour lectures. Besides, I normally supervise about three or four student groups and the writing of a group based report.

Structure

The paper is composed in the following way; first I give a brief description of the course these experiences are based upon, its objectives and composition. Then I characterise the students in terms of different disciplinary, cultural and academic backgrounds and I present concrete examples of problems experienced with constructive alignment and the "near impossibility of teaching". Thereafter I reflect on how I have endeavoured to overcome the challenges experienced, what I do when planning and teaching such a course, and reflections about adapting teaching to suit heterogeneous backgrounds of students.

The course: QMAD

QMAD aims to provide students with the skills in undertake qualitative data collection through field work related to agricultural development in developing countries.Primarily, QMAD is about learning to acknowledge the importance of explaining precisely what data you want to collect, how you will collect it, and how the collection of data may influence the object of research. Thus, the course is very much about recognising the dynamic relationships between the researcher and the researched and how the two can influence each other in often unforeseen ways. Students are expected to be active during the 12 lecture days, and they have to submit a group based written assignment that has to be presented to the class, and which has to be passed for the students to go to an individual oral exam, which marks the end of the course. Teaching is in English and the course normally attracts 45-60 students. In 2015 some 28 countries were represented. About half of the master's students were from countries outside of Europe. Additionally there are usually a handful of guest PhDs students in attendance from Africa and Asia. Teaching comprises 6 sessions of 3 hours, and 6 sessions of 6 hours which means a relatively long time spent in classrooms. Teaching comprises a range of methods including traditional lecturing, lecturing with intermittent short exercises, longer group based exercises, class based exercises, open discussions, student presentations, film showing and discussion, open Q & A sessions, and sessions of project based group work with teacher supervision. The idea with offering and planning a range of different teaching and learning environments is to stimulate student activity and encourage participation across different types of teaching forum.

Student heterogeneity

The course attracts students from four different master programmes that, as noted above come from a large number of different countries. From experience this means the teacher has to constantly manoeuvre within and between the different academic and cultural backgrounds of the students. This is in order to strike a suitable and comfortable balance between, on the one hand, teaching "as if" all students stem from the same educational programme and are all, so to speak, on the same page, and on the other, to adapt the teaching methods to those which the types of students groups are familiar with, expect, work most productively with, or feel most comfortable with. I have found that a real challenge is to appropriately adapt the teaching methods to the heterogeneity of the class but without compromising the objectives. To shed light on these challenges I give below some concrete examples.

Ontological heterogeneity

The most noticeable difference between students can be defined in terms of ontological heterogeneity between "positivists" and "social constructivists". The majority of students have a strong background in natural science based traditions with solid knowledge and skills of quantitative data collection and deductive methods. Simplified, this means they frequently come to expect the QMAD course to deliver clear cut, precise, measurable, and objective methods and "once and for all" answers to their methodological or method related queries. They may also expect clear cut theories to be introduced that can explain social realities. This group, which also cuts across geographical and ethnic boundaries, subsequently may meet up in class with unrealistic expectations of being taught "fool proof" methods that can accurately explain "real life" phenomena. It is not uncommon for members of this group to pass comments, or ask, in the following ways; 'I understand most of it, but can you give me a specific answer?' or, 'What is the best thing to do in this situation?' Consequently, student comments and questions reveal they are searching for singular and fixed answers. In reality however, the study of social phenomena and the role of the researcher means that there are rarely universal clear cut answers to social science investigations.

As result of students' 'positivist' ballast, there is therefore a risk they interpret the aims of QMAD and social science methods as confusing, together with the course objectives, content, and didactic methods employed by the lecturers - that point to acknowledging and conveying the complexity of social reality. Thus, problems experienced by students are based in assumptions about students upon which teaching is based. Overall, the differences between student backgrounds and course assumptions about students may be a cause of frustration for students from positivist traditions. This is especially the case when they are confronted with the strongly interpretative and phenomenological, process orientated traditions of much social science research.

Student uncertainty occasionally surfaces in course evaluations where they express the teaching did not provide the answers they were looking for, and that teacher explanations about 'what to do and how to do it in the field' were vague and non-committal. Similarly, lecturers may be described as indecisive or placing too much weight on research answers based on their own research experiences. Clearly, this set of problems is ontological in nature as it reveals students lack of understanding about the process of social science research. Such challenges are also difficult to solve quickly, as they requires a back to basics teaching of different approaches to the accumulation of knowledge, as well as explanations as to what knowledge is, how it is produced in social science, and what role the researcher may play in producing knowledge.

National and continental heterogeneity

The challenges of the positivist bias depicted may overlap with the nationality of the students. Allowing for the affirmation of stereotypical images of non-European students, I have found that African, Asian, and especially Chinese students may have different expectations of what teaching and learning involves, compared to European and especially Scandinavian student groups. Basically, this is an ethnic and geographical divide and expresses itself with non-Western students groups wanting more teacher based instruction and traditional forms of teacher centred lecturing. European groups meanwhile may be less interested in teacher driven instruction and demand instead an assortment of different teaching styles that carry multiple possibilities for them to develop individual competences.

For example, Chinese students frequently express either an implicit or explicit unwillingness to engage in dialogue with teachers and other students and participate in oral presentations. When they do, there is a strong likelihood they will read up from a text, not have the skill to reflect on what they have done, and will be unwilling to give and receive feedback from other students. They may appear passive and search out concrete answers that are "spoon fed" to them by the teacher. They may also have little experience with interpreting or analysing a text independently of the teacher, and may be shy in forwarding their own views or critically discussing the interpretations of others. They may not understand that there can be a large difference between a teacher disagreeing with a student's opinion, and a teacher thinking the student has produced good or poor work. Thus, this group aspires towards pleasing the teacher, not developing the skill to think independently. I have also experienced that Chinese students search out easily remembered facts and information so that it can be repeated at the exam. Hereby, they experience a dearth of deep learning commonly accompanied with an unwillingness, or an inability to participate actively in group based work. Finally, it is common that non-Western students do not have any experience with oral exams. The set of problems sketched here can also overlap with, and be made worse by, student levels of oral and written language proficiency. The worst case scenario is where the class becomes divided between, on the one hand, students with an African and Asian positivist background that expect teacher centred instruction, lack experience with critical thinking, and have a poor level of English, and on the other, European and Western students with a social constructivist background. The latter demand dynamic teaching, interactive, and modern learning methods and are used to critically assessing research processes. Finally these will also have a high command of written and oral English. As such, Scandinavian students may occupy the other end of the spectrum to Chinese. From High School, they generally have experience with group based work as well as presenting, discussing, and sparring with others from the rest of the class. There are also used to developing independent points of view from those of the teacher and may be keen to share experiences that differ from those in textbooks. This divide may thereby be termed as "conformists" vs "interactionists".

Solution – accept and engage with student heterogeneity

The "conformist" vs "interactionist" binary demands the teacher or supervisor recognises the heterogeneity of the class early on (which can be acknowledged with a basic survey of student backgrounds). Most important however is to develop a class culture where the students are encouraged and supported to express their concerns to the teacher about the direction and methods of teaching. Further, to open up for discussion I try and emphasise that there are no predefined correct answers to the topics we are discussing, and all thoughts are welcome. The aim is to create a space where students do not feel they are being judged but are encouraged to fill the space with their own views. No matter what they are, they thus provide material for broader classroom based discussions. It is also a good idea to construct heterogeneous groups and not allow either of the groupings to form homogeneous clusters. Hopefully in this way the students can learn more from each other. Having identified and discussed several challenges of attaining constructive alignment, I now present some solutions.

Solutions – focus on the process

To get around the above challenge I have found it useful to invest time in explaining the process of social science research as well as defining and presenting the specific methods. This means emphasising that social science research is very often, if not always, an iterative and intuitive process and the object of enquiry is not always clear from the very start, and it is common that the focus of attention and study changes as the research develops. At the same time, it is also necessary to devote quite a lot of time to explain that the answers to any set of social science research questions are very context specific. This means recognising and making explicit the consequences of making the choices regarding research angles, which become just as important facets of the research process as explaining and making explicit what exactly the research has found out. This stands in contrast to the position of "positivist" inclined students, who seek out concrete results , rather than concentrate on the process of getting to particular results.

Solution – be explicit about the uncertainties

In order to overcome student frustrations and confusions, I have also found that a worthy subject of class discussion is to make explicit that social science methods are generally not a subject that can be understood in real time, so to speak: it is thus expected, and students have to realise the fact, that the "aha moment" that students expect to experience may not come until late on in the course. Progress towards this realisation can be aided by turning the problem on its head and encouraging students to identify how they think specific method issues should best be solved – and how they think they could use their own competences from their own disciplinary background to tackle such problems. Although the answers they give may well be bias towards quantitative data collection, the process of getting students to acknowledge the 'messy' nature of social science is made easier by first getting them to communicate how their own disciplines would tackle the task. This often leads to the realisation that something more is needed than quantitative methods.

During the learning process I also find it vital to communicate that it is common that students may not understand what exactly it is they are expected to learn. Thus, it is not enough for students to read the course material. They also have to develop the skill to reflect on what they are doing and why which is the real learning aim. In sum, it is vital that students create and develop their own awareness of disciplinary shortcomings. It is thereby important to communicate, discuss, and share the view that social science demands time to digest and reflect upon the choices of methods. Also, it is important to make explicit that the search for scientific certainties in terms of concrete answers is often in vain in social science. Hopefully in these ways, students come to realise it is more worthy and relevant to recognise the limits and significance of the uncertainties that are related to a particular research design, than to reach a firm conclusion based on an incoherent process. Finally, it is intended that a revised version of this working paper will be distributed and discussed in class. The aim here is to make explicit the challenges I have experienced and of course acknowledge the concerns of the students that together can provide a framework for solutions.

References

Andersen, H. L. (2010). 'Constructive alignment' og risikoen for en forsimplende universitetspædagogik. *Dansk Universitetspædagogisk Tidsskrift*, *9*.

Biggs, J. (1999). *Teaching for Quality Learning at University* (1st ed.). Society for Research into Higher Education and Open University Press.

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Activating more students through blended online and in-class discussions

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This study shows that teachers in international classes can use blended online and in-class discussions to activate more students from a student group with diverse educational cultures and different preferences for mode of discussion, thereby contributing to improved learning via several mechanisms, than any one mode of discussion can do alone. This has implications for the use of discussions in courses, where blended teaching is possible.

Introduction

The aim of this study is to investigate how the educational background, personality and origin of university students affect their preference for and perception of online and in-class discussions, and to explore if an integrated use of both modes of discussion can activate more students in the collaborative learning process that takes place during discussions. The interest in student personalities and how they may affect participation in discussions and associated learning outcomes is brought about by my own teaching experiences in the Master course ‘Agricultural value chains in developing countries’ that so far is almost entirely based on class-room lectures and discussions and group work. Students from more than 20 countries follow the course each year and there seems to be a recurrent pattern in which students take most part in the in-class discussions, based on nationality and personality.

Student diversity – learning style diversity

In international study programs, university teachers meet a diverse group of students from many different countries and with different educational backgrounds. The students are influenced by pre-established knowledge and previous experiences of teaching cultures and norms of behavior and communication between students and teachers, which may vary from country to country. The result are classes of students with different preferences for learning, not only related to the educational psychological learning style categorizations, such as those by Kolb (e.g. Joy and Kolb, 2009; Yamazaki, 2005) and Entwistle and others (Manikutty, Anuradha, and Hansen, 2007; Strang, 2010), but also in terms of students' preferences for and abilities to engage with other students and teachers in collaborative efforts for knowledge acquisition, construction and application. The latter is related to the social aspects in learning, e.g. as in Vygotsky´s cognitive development through social interaction, and the social element in Kuhn's work on critical thinking, where discussions of ideas with peers are essential in knowledge building (Guiller, Durndell, and Ross, 2008). It is specifically of importance when learning is pursuit through discussions among students and with the teacher. This is often the case in social science master courses in Denmark, where students are expected to participate actively in discussions that are set in a more or less fixed frame, and often in an open atmosphere with no need for 'Sir' or 'Madam' when addressing the teacher; a situation that many foreign students are not acquainted with when taking their first course in Denmark. Most students are used to targeted discussions, where the frame for and goal of the discussion is clear and fixed. However, many discussions, especially in social science courses, are explorative and without a clear goal, which require more of the students in terms of reflection on knowledge and argumentation for support of own ideas and view-points rather than reproducing knowledge. The explorative discussions may be challenging and uncomfortable for students with backgrounds in teaching cultures with clear hierarchical boundaries between students and teachers and where students are not expected to challenge or oppose the views of the teacher.

The use of online learning environments and platforms adds a new dimension to the use of discussions in learning. Online discussions may cater more to a particular type of students who are more comfortable in written than verbal argumentation and to the more introvert and reflective students, who in general prefer to work alone, with ample time for argumentation, rather than in the more dynamic setting of a face-to-face group setting (Offir, Bezalel, and Barth, 2007; Felder and Soloman, 2000). There are many studies on online and face-to-face (f2f) discussions, either as a comparison of the two or based on a comparison of different groups of students and approaches to learning, e.g. Campbell, Gibson, Hall, Richards, and Callery, 2008; Ellis, Goodyear, Calvo, and Prosser, 2008 and Bliuc, Ellis, Goodyear, and Piggott, 2010. These and similar studies generally find that the learning outcomes from either one of the two modes of discussion depends on the students' conception of learning (cohesive or fragmented) and approach to learning (deep or surface). Very few studies – none, as far as my searches go – have looked empirically at the positive effects on learning from integrating online and f2f or in-class discussions on the same topic, creating a synergy between the two. A few, such as Guiller et al., 2008, do discuss the positive effects on learning that blended discussion may have by allowing students to carry-over discussion elements (opinions, ideas, meaning, etc.) from one discussion to the next. This transfer of elements is depicted in Fig. 24.1.

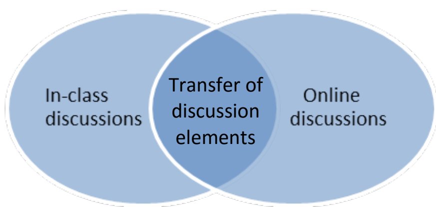

Fig. 24.1: Transfer of discussion elements from one mode of discussion to the next may facilitate better learning in blended teaching.

In this study, I focus on the blended discussions, integrating in-class and online discussions. This is done in the context of courses in international study programs as described above. My hypotheses are: H1. Students' preference for one mode of discussion over the other depends on personality and educational background in a certain culture; and H2. The use of integrated in-class and online discussions can contribute to overall higher student participation in discussions through transfer of ideas, views, statements and other elements from one mode of discussion to the next. The results of the study are expected to contribute to a better use of complementary in-class and online discussions, not least in classes with a diverse student group, such as in the course I teach.

Survey of students in international study programs

In order to obtain data on a sufficiently high number of students of different nationalities and with different personalities, I developed an online survey using the website Survey Monkey. The survey consisted of 18 closed-end questions concerning i) basic information, ii) personality, and iii) experiences of and preferences for online and in-class discussions, as well as three open-end questions regarding benefits of online and in-class discussions and experiences of how one mode of discussion may enhance and facilitate participation in the other mode of discussion. The six personality questions were Yes/No questions, inspired by extroversion / introversion personality tests. By far sufficient to reveal any depth of personality, the questions were used to distinguish two groups of students. Group 2 students (5 or 6 Yes-answers) are more often characterized by being reflective, preferring lectures and 1-on-1 conversations over discussions, and rather express themselves in writing than verbally. Group 1 students (4 or less Yes answers) have fewer of the same characteristics and are sometimes the direct opposite; active, preferring group activities and the spoken word.

The questionnaire was sent to 215 current students and recent graduates from international Master programs at the University of Copenhagen (UCPH); Agricultural Development, Sufonama, Sutrofor, Agris Mundus, and Agricultural Economics. A total of 60 students responded, of which 54 students completed the questionnaire, corresponding to a response rate of 25 %. It is a relatively low number of responses which only allows for limited, simple statistical analysis, and the results, mainly purely descriptive and carried out in Excel, are therefore best seen as tendencies in the surveyed student group that may be investigated further in a larger study.

The 54 respondents came from 26 countries from five continents, thus representing a multitude of cultures. The respondents were first divided into three groups based on nationality and culture; the Scandinavian countries and culture; other European countries and North America representing Western European cultures; and remaining countries which consisted of students from the cultural mix of Latin America, Africa and Asia[1]. Answers

[1] This may not be the best division of students, since e.g. in terms of so called high-context cultures (non-verbal behavior and covert clues are important for

to the personality questions were summarized for each of the three groups in order to gain a better understanding of differences between the groups. Students were subsequently divided into Group 1 and Group 2, as described above, for an analysis of perceptions of and preferences for online, in-class and blended discussions between the two types of students.

All nationalities and personalities prefer in-class discussions

Table 24.1 shows the number and percentages of Yes answers to the six personality questions. The Scandinavian students most often stand alone with the lowest share of students who prefer to express themselves in writing, prefer not to show work before it is finished, and tend to think before they speak. The latter is not necessarily an indication of blurting untimely, unthoughtful statements, but rather of being fast to reply without much reflection which may or may not be an advantage in in-class discussions. Overall, looking at the number of Yes answers, only 18 % of the Scandinavian students fall into group 2 (reflective, preferring individual work and the written word), while 37 % and 56 % of the Other European + N. Americans and the Latin American, Asian and African students, respectively, fall into group 2.

Table 24.1: Number of positive answers and percentage within each group for the six personality questions.

Student origin	Number	Prefer to express myself in writing	Told being a good listener	Prefer 1-on-1 conversation	Do not show unfinished work	Think before speaking	Prefer lectures > discussions	Generally prefer f2f discussions
Scandinavia	17	8 (47 %)	15 (88 %)	12 (71 %)	4 (24 %)	10 (59 %)	9 (53 %)	15 (88 %)
Other Europe + N. America	19	13 (68 %)	15 (79 %)	10 (53 %)	8 (42 %)	15 (79 %)	9 (47 %)	14 (78 %)
Others	18	12 (67 %)	15 (83 %)	13 (72 %)	9 (50 %)	17 (94 %)	12 (67 %)	14 (78 %)

When asked if they generally prefer in-class or online discussions, the majority of students in all groups prefer the in-class discussion. In terms

meaning) and in self-construal interdependent-self (surrounding social context important for self), Southern European countries are closer to some Asian and African countries than Western Europe (Yamazaki, 2005). The three groups were an easy solution based on the low number of respondents.

of involvement in discussions, receiving most responses to own discussion entries, finding the discussion most suitable for reaching learning outcomes (knowledge, skills, and competences), and generally preferring one mode of discussion, the largest share of students in all three groups answered 'in-class discussions'. The largest shares, though by far significantly higher, were found among the Scandinavian students for all questions (See Table B2 in Appendix A). The largest difference among nationalities was that the majority of students from Latin America, Asia and Africa feel most comfortable online, while more Scandinavian students feel most comfortable in in-class discussions. Table 24.2 shows the experiences with and perceptions of in-class and online discussions among students in personality group 1 and 2. Again, the largest difference is that Group 2 students feel most comfortable online, as would be expected, while group 1 students do not show a clear tendency.

Table 24.2: Percentage of respondents in each group that answers "in-class discussions" / "No difference" / "online discussions" to questions regarding their perceptions of and experience with in-class and online discussions.

Personality group	Number	More involved	Most responses to own posts	Feel most comfortable	Most suitable for learning	Overall preference
Group 1	34	(50 / 29 / 21)	(62 / 12 / 26)	(35 / 35 / 29)	(71 / 15 / 15)	(85 / - / 12)[1]
Group 2	20	(45 / 30 / 25)	(55 / 10 / 35)	(15 / 15 / 70)	(65 / 15 / 20)	(70 / - / 30)

Based on the results presented so far, Scandinavian students show less variability in their personality and in experiences with and perceptions of online and in-class discussion compared with students from outside Scandinavia. These findings are similar to the findings of De Vita, 2001 for UK, and follow the same logic; the surveyed students from outside Scandinavia are from a large number of countries with different cultures, and are thus formed through very different student socialization processes (Barmeyer, 2004). In terms of general preference for in-class discussions, neither personality type nor nationality seem to be influential. Furthermore, gender, age and number of online or blended courses did not show to have an effect on preference for one discussion over the other.

The benefits of discussions

Students from both Group 1 and 2 mention a number of common benefits for in-class over online discussions, such as faster pace, more direct and dynamic, engaging, and more personal. Also easier spontaneity, fewer misunderstandings, and generation of new and shared ideas are mentioned in both groups. Only Group 2 students mention that in-class discussions can help them train verbal discussion skills and listening, but contrary to Group 1 students, they do not mention any kind of social aspects or group interaction as being a benefit. This corresponds to their more individualistic preferences compared to Group 2 students. Flexibility and better time to reflect and formulate arguments and new ideas are among the well-known positive sides of online discussions mentioned by both groups of students. In fact, Kanuka, Rourke, and Laflamme, 2007 found that online discussions are better than other online activities for reflective thinking, hypothesis testing and acting on new knowledge, due to the better time available. Only the less reflective and more open personalities in Group 1 mention specifically – and several times – that online discussions provide time to use literature to help create arguments and give more detail to the discussion. Likely, group 2 students do not mention this as they more generally and 'by default' take the time to use literature and reflect upon it in any kind of teaching activity. Summaries of answers can be found in Appendix A.

Better outcomes from blended discussions

Around 1/3 of the group 1 students and half the Group 2 students were aware of their experiences on how one mode of discussion had enhanced and facilitated participation in the other mode. The slightly higher awareness among Group 2 students could be explained by these students generally being more reflective in a group activity, as they prefer individual work and may even be intimidated by group discussions, especially in-class. The student-quotes in Box 1 are excerpts from answers to questions regarding the benefits of blended discussions and are examples of some of the most frequently mentioned benefits.

Box 1. Student-quotes from online survey, regarding the benefits of blended discussions.

"*Because you go in depth in your material when doing online discussions you are much more prepared for the classes.*" (Brazilian student in Group 2)

"*In-class discussions are a good way to clear up doubts for the more complicated, literature-based, online discussions*". (German student in Group 1)

"*It* (online discussion) *can help break down barriers*". (Danish student in Group 1)

Fig. 24.2

Several students mentioned the use of online discussions to help them go through the literature, get additional views from other students, structure the acquired and shared knowledge, and in the process increase self-confidence, thereby providing an overall good basis for subsequent in-class discussions. The other way around; the in-class discussions are experienced as providing a good platform for brainstorming new ideas (fast, dynamic) and for attaining a better understanding of difficult terms, concepts and topics (going in-depth), before taking the new knowledge to the more structured and easier-to-navigate online discussions.

If integrated, the two modes of discussions are mutually reinforcing in a number of ways, as depicted in a simplified manner in Figure 2. When students in their preferred mode are allowed to create a discussant identity and link that identity to the acquisition, creation, and provision of knowledge in the discussion group, they may carry over this identity to the alternative mode of discussion. In-class group discussions were mentioned to help create a social and comfortable space that can be transferred to and facilitate subsequent discussions online. Online, the identity is created in the process of breaking down barriers and posting the first 'harmless' discussion entry followed by a possibly 'conflicting' entry in the discussion, where the student 'shows colors'. Online discussion entries may be made mandatory, which is technically possible in Absalon used by UCPH, so as to force all students to participate. This was mentioned by students in both Group 1 and 2 as a good way to facilitate full participation and provide insights from otherwise 'quiet' students that could also enrich subsequent in-class discussions. The mutual benefits of blended learning are not present if not planned for through a clear link from one discussion to the next. One student complained about this missing link in a course using blended teaching and had not experienced any complementarities between the two modes of discussion.

Concluding remarks and practical implications

The results only partially support hypothesis H1, as all students generally preferred in-class discussions, while non-Scandinavian students showed higher variability in their perceptions of and involvement in online and in-class discussions. A larger number of respondents would permit a better grouping of students and more insights to the effect of personality and culture. Hypothesis H2 is not only confirmed, but also expanded to include identity creation and confidence building transferred from one discussion to the other. A student-quote on the use of both online and in-class discussions provides the best conclusion:

"A combination of them is perfect!" (German student).

The results provide argumentation for careful planning by teachers to capture the mutual benefits and reinforcing aspects of blended discussions, not least in international classes. For example, an initial in-class discussion can focus on brainstorming, negotiating meaning of difficult topics, and spontaneous creation of ideas and opinions, as well as on creating a common social frame for discussions. Online platforms may then provide a more structured and literature-based discussion, while also breaking down barriers for some students. The documented online discussion may finally be rounded-off in a subsequent in-class discussion.

The results call for changes to my own course, where online discussions are not yet used. I have no doubt the use of blended discussions, with the insights from this study in mind, would facilitate a broader participation in the discussions that I often use in my teaching, to the benefit of all students in the class.

References

Barmeyer, C. I. (2004). Learning styles and their impact on cross-cultural training: an international comparison in france, germany and quebec. *International Journal of Intercultural Relations*, *28*(6), 577–594.

Bliuc, A.-M., Ellis, R., Goodyear, P., & Piggott, L. (2010). Learning through face-to-face and online discussions: associations between students' conceptions, approaches and academic performance in political science. *British Journal of Educational Technology*, *41*(3), 512–524.

Campbell, M., Gibson, W., Hall, A., Richards, D., & Callery, P. (2008). Online vs. face-to-face discussion in a web-based research methods course for postgraduate nursing students: a quasi-experimental study. *International Journal of Nursing Studies*, *45*(5), 750–759.

De Vita, G. (2001). Learning styles, culture and inclusive instruction in the multicultural classroom: a business and management perspective. *Innovations in Education and Teaching International*, *38*(2), 165–174.

Ellis, R. A., Goodyear, P., Calvo, R. A., & Prosser, M. (2008). Engineering students' conceptions of and approaches to learning through discussions in face-to-face and online contexts. *Learning and Instruction*, *18*(3), 267–282.

Felder, R. M. & Soloman, B. (2000). Index of learning styles questionnaire. Retrieved from http://www.engr.ncsu.edu/learningstyles/ilsweb.html

Guiller, J., Durndell, A., & Ross, A. (2008). Peer interaction and critical thinking: face-to-face or online discussion? *Learning and instruction*, *18*(2), 187–200.

Joy, S. & Kolb, D. A. (2009). Are there cultural differences in learning style? *International Journal of intercultural relations*, *33*(1), 69–85.

Kanuka, H., Rourke, L., & Laflamme, E. (2007). The influence of instructional methods on the quality of online discussion. *British Journal of Educational Technology*, *38*(2), 260–271.

Manikutty, S., Anuradha, N., & Hansen, K. (2007). Does culture influence learning styles in higher education? *International Journal of Learning and Change*, *2*(1), 70–87.

Offir, B., Bezalel, R., & Barth, I. (2007). Introverts, extroverts, and achievement in a distance learning environment. *The American Journal of Distance Education*, *21*(1), 3–19.

Strang, K. D. (2010). Global culture, learning style, and outcome: an interdisciplinary empirical study of international university students. *Intercultural Education*, *21*(6), 519–533.

Yamazaki, Y. (2005). Learning styles and typologies of cultural differences: a theoretical and empirical comparison. *International Journal of Intercultural Relations*, *29*(5), 521–548.

A Select results from online questionnaire

The questionnaire was sent to 215 current students and recent graduates from the international Master programs at UCPH, Agricultural Development, Sufonama, Sutrofor, Agris Mundus, and Agricultural Economics. A total of 60 students responded, of which 54 completed the questionnaire, corresponding to a response rate of 25 %. The 54 responses came from students representing 26 countries (Austria, Bolivia, Brazil, Canada, China, Colombia, Denmark, Ecuador, Ethiopia, France, Germany, Ghana, Greece, Hungary, Iceland, Italy, Mexico, Nepal, Pakistan, Slovakia, Sweden, Tanzania, Uganda, UK, USA, and Zimbabwe). Of the 54 students, 34 (63%) came from Europe and 34 (63%) were female. In Table B1 below the students are grouped by nationality as described in the table.

Table 24.3: Number of positive answers and percentage within each group for the six personality questions.

Student origin	Number	Prefer to express myself in writing	Told being a good listener	Prefer 1-on-1 conversation	Do not show unfinished work	Think before speaking	Prefer lectures over discussions
Scandinavia	17	8 (47 %)	15 (88 %)	12 (71 %)	4 (24 %)	10 (59 %)	9 (53 %)
Other Europe + N. America	19	13 (68 %)	15 (79 %)	10 (53 %)	8 (42 %)	15 (79 %)	9 (47 %)
Others	18	12 (67 %)	15 (83 %)	13 (72 %)	9 (50 %)	17 (94 %)	12 (67 %)

Based on the six Yes-No personality questions, 34 students fell into group 1 (active, preferring group activities and the spoken word) and 20 students fell into group 2 (being reflective, preferring lectures and 1-on-1 conversations over discussions, and rather express themselves in writing than verbally). As a control questions, students were asked if they were willing to participate in a follow-up group interview. Of the 20 ‘introverts’, only 3 (15%) answered yes to participate, while 15 of the 34 ‘extroverts’ (44%) would participate (difference is significant at p=0,029 in a t-test).

Table 24.4: Percentage of respondents in each group that answers ”in-class discussions” / ”No difference” / ”online discussions” to questions regarding their perceptions of and experience with in-class and online discussions.

Origin or personality group	Number	More involved	Most responses to own posts	Feel most comfortable	Most suitable for learning	Overall preference
Scandinavia	17	(53 / 24 / 24)	(71 / 0 / 29)	(41 / 29 / 29)	(82 / 6 / 12)	(88 / - / 12)
Other Europe + N. America	19	(47 / 37 / 16)	(53 / 16 / 32)	(21 / 42 / 37)	(58 / 26 / 11)	(74 / - / 21)[1]
Others	18	(44 / 28 / 28)	(56 / 17 / 28)	(22 / 11 / 67)	(67 / 11 / 22)	(78 / - / 22)
Group 1	34	(50 / 29 / 21)	(62 / 12 / 26)	(35 / 35 / 29)	(71 / 15 / 15)	(85 / - / 12)[1]
Group 2	20	(45 / 30 / 25)	(55 / 10 / 35)	(15 / 15 / 70)	(65 / 15 / 20)	(70 / - / 30)

Table B3 gives an overview of the answers to closed-end and open questions from students in two groups, based on their being mostly introvert or mostly extrovert.

Table 24.5: Overview of responses from four groups of students.

	‘Extrovert’ group 1. n=34	**‘Introvert’ group 2. n=20**
Origin and gender	Scandinavian 14/34 Female 23/34	Scandinavian 3/20 Female 11/20
What are the main benefits of a class-room discussion compared to a class room discussion?		Train verbal discussion skills, and listening skills More memorable, better learning
	Dynamic, Direct, immediate feedback , more natural, instant, flexible, engaging	Direct, immediate feedback, natural, easier progress, more active, engaging, direct feedback,
	Collaboration, Interaction, group work, group interaction,	
	Speed, spark, Energy, flow, active, lively, fast, time-saving	Faster, Effective, easier to follow
	Social aspects, social interaction, More personal, involve people	Personal, sympathy
	Body language, verbal expression, see people (deeper communication)	More expressive, see people
	Deeper understanding of subject, all info discussed=do not loose info	
	Brainstorming, spontaneity easier	Brainstorming, Spontaneity easier, new ideas,
	Follow-up Q&A’s faster, Fewer misunderstandings	Follow-up Q&A’s faster, Fewer misunderstandings, elaborations faster
	Shared outcomes easier	Shared ideas
	Inclusion, everyone’s view	More inclusive

<u>What are the main benefits of an online discussion compared to a class room discussion?</u>	Train writing skills Better time, longer reflections, time to think Flexible in time and space, Easier to understand complex topics More detailed, focused More in-depth with literature (lit): More detailed discussion due to lit. More based on literature/science, better argumentation (lit), citing Easier to compare lit. findings Learning to discuss based on lit. Easier to express ideas Easier for non-English speakers Easier to navigate discussion Overview of others' views Documentation, details kept, also for later reference Not intimidated by teacher, less exposed Includes off-campus students Students rated on content and not presence. Mandatory participation adds extra views from quiet students. Better for introverts	Train writing and reading skills, and formulation of arguments, Better time, Easier to concentrate, better reflections, Flexibility, Time to formulate arguments Better for critical thinking Easier to express ideas, express oneself Easier to navigate discussion Documentation, also for later reference Less intimidating, people open up more, less exposed Less risk of few people dominating, Forced participation (+) Better for introverts
Online discussions enhance/facilitate participation in in-class discussions?	Yes: 11 (33 %) No: 12 (36 %) Don't know: 10 (30 %)	Yes: 9 (45 %) No: 4 (20 %) Don't know: 7 (35 %)
<u>How do online discussions enhance/ facilitate in-class discussions?</u>	Online discussions' use of literature helps subsequent in-class discussions. Structured information from online discussions made a good basis for f2f discussions Works as preparation for in-class discussion (use of literature, more informed answers, basis for f2f discussions) Increased confidence in subsequent in-class discussions. Online discussions were summarized and closed in in-class sessions In-class discussion related back to earlier online discussions Brake-down barriers before f2f.	In-depth online discussion prepare you for the in-class discussions The views of other students adds to literature and thereby enhance later in-class discussions In-class discussions were great to finish online discussions.
In-class discussions enhance/ facilitate participation in online discussions?	Yes: 10 (30%) No: 12 (36%) Don't know: 11 (33%)	Yes: 11 (55 %) No: 3 (15 %) Don't know: 6 (30 %)
<u>How do in-class discussions enhance/ facilitate online discussions?</u>	Difficult terms and concepts made clear in-class before or after an online discussion. Difference of opinions between students more easily discussed in-class for later structured online discussion. In-class discussion opened a debate that was later finished more structurally online. Views not expressed satisfactorily could be repeated online.	If in-class discussion was not finished, it was continued online. The more dynamic in-class discussion make people think of new aspect that can be brought into online discussions. In-class discussion made it clear what was to be discussed online afterwards. The social aspects of in-class group discussions help to improve online discussions.
<u>Both-ways / integration of the two</u>	Summarizing an f2f discussion and putting to text in a following online discussion, saving it for later reference The blended discussions enables critical thinking	In-class discussion can be a clue or a guide for the online discussion and vice-versa. Combining the two works best. Remember points and arguments from one that can be used in the other.

25

The international classroom – a resource

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Introduction

There are just under 10% international students enrolled at University of Copenhagen (UCPH)(Københavns Universitet, 2015), and UCPH has an ongoing focus on attract international students. This focus is expressed in the 2016 Strategy for UCPH (Københavns Universitet, 2016), where the need to strengthen the international environment and the students language and intercultural skills, as well as increase recruitment and retention of the strongest international students is stressed. A consequence of this strategy will be a larger proportion of international students on the different educational programs, and in the classrooms. This more heterogeneous student group poses some challenges in relation to language, culture and expectations to teaching methods, teachers and students(Ulriksen, 2014), but may also provide the possibility to take advantage of the diversity to strengthen the teaching.

For the pharmacy educations this internationalisation has also resulted in a larger diversity in the academic background of the students at master level. Where especially the international students, does not necessarily have a bachelor in pharmacy when embarking on the MSc in Pharmaceutical Science.

In at course such as 'Pharmaceutical policy – an international perspective', it is easy to see this heterogenic student group as a resource. We as teachers can present the students for different problems and policies which are of international relevance such as access to medication, drug innovation, medication utilisation and education, and medical regulatory perspectives, as well as different stakeholder perspectives (e.g. pharmaceutical industry, patients, pharmacists). However the students can give some very valuable perspectives to the class by introducing history, situations and challenges specific for the countries and cultures they come from.

Objective

The objective of this project is to illustrate and make clear to the students that the national and cultural diversity in the classroom of 'Pharmaceutical policy – an international perspective' can be strength, if the students are willing to share their experiences from their home country and cultural background in the class. These experiences can contribute to the exploration and understanding of the different position and implication of international policies in the pharmaceutical and health area in a global setting. The secondary objective is to show that we expect the students to actively contribute in the classroom, with exactly their experiences, by asking questions, and by discussing material both with students but also with lectures.

Background

The School of Pharmaceutical Sciences offers four full time master's programmes, MSc in Pharmacy and MSc in Pharmaceutical Sciences and the two international programs MSc in Pharmaceutical Sciences and MSc in Medicinal Chemistry. The course 'Pharmaceutical policy – an international perspective' is an elective course at master level for students at the MSc in Pharmacy and two MSc in Pharmaceutical Sciences programs. The course is in English, and the students typically take the course at their third semester.

The purpose of offering the course was to accommodate a need for courses to international students on pharmaceutical policy in English and at the same time to provide the Danish pharmacy students with a course in pharmaceutical policy with an international perspective as a complement to the mandatory Danish course in pharmaceutical policy 'lægemiddelpolitik, økonomi og etik', which focus on Danish pharmaceutical policy.

The learning objectives of the course 'Pharmaceutical policy – an international perspective' are to give the students the competences to:

1. Participate in professional multidisciplinary groups and be able to contribute with a policy perspective on pharmaceuticals in a health policy context
2. Independently transfer a policy perspective to specific international, international and/or national pharmaceutical issues and/or challenges
3. Reflect and discuss the effects of policymaking on drug use on the international, national, international levels

The course include many elements to strengthen the international perspective on pharmaceutical policy which are agreement with the activities suggested to internationalise the curriculum, such as case studies from different countries, international text book, guest lectures with international experience and field trips(Carroll and Ryan, 2006).

My project – Multi-cultural group work – The country assignment

In the literature it has been point out that it is important to be clear about the objective of Internationalisation of the curriculum, both on program level, but also at course level. A series of question (see Table 25.1) to consider when internationalising the curriculum is suggested as to tool for planning and documentation (Carroll and Ryan, 2006).

Outcome	What international perspectives (knowledge, skills and attitudes) should graduates in this course, at this level, in this professional area develop?
Assessment	What assessment task(s) could students complete to demonstrate achievement of these perspectives?
Content	What international content and/or contact will students need in order to develop these perspectives?
Learning environment	What learning activities and tasks will assists learners to develop these perspectives and prepare for the assessment?
Resources	What resources (including people, online tools) are available to achieve the above?

Fig. 25.1: Aspects to consider when internationalising your curriculum. From: Leask B. Internationalisation of the curriculum: teaching and learning. In: Carroll J, Ryan J, editors. Teaching International Students: Improving Learning for All. Table 13.2.

This project will focus on the internationalisation on course level, more precisely developing a teaching activity to promote a reflective and open class culture, where students know that their independent knowledge and perspective can contribute to the overall teaching objective of the course. The five question presented above (table 25.1) will serve as a frame for this project, and overview of the application of this frame is shown in table 25.2. The starting point is the outcome of the teaching activity already stated in the objective of the paper, it is also determined that the diverse national/cultural class room (student from around the world) is the recourse to be used.

Outcome	See the relevance of individual national/cultural experiences in the context of the course material Importance of contribution to class discussions
Assessment	Group presentation to the class Discussion culture during the course
Content	Describe, reflect and discuss on differences between countries
Learning environment	International group work
Resources	Students from different countries around the world

Fig. 25.2: Overview of aspects consider in planning the teaching activity for this project.

The next two aspects from the frame considered were learning environment and content. Group work can give student who are uncomfortable in speaking in the class a better basis for participation, it also gives the opportunity for more students to be actively participants of the discussions(Ulriksen, 2014). In relation to internationalisation, multi-cultural groups can be of benefit, however it can be of even higher value, if the tasks that have to be done also support cooperation, by requiring of the involvement of different national and cultural perspectives (De Vita, 2006). To achieve this, the content of the assignment should be for the students to explain the pharmaceutical distribution system and health system in their country, as well health challenges in their country to their group. Here after the group are to compare the countries, and discuss the challenges and what they find important for at well-functioning health system.

Following assignment question was formulated for the students to discuss:

1. Comparison between the two countries – similarities and differences?

2. What are the challenges for the two countries respectively?
3. What would you prioritize if you were responsible (like prime minister or minister of health, the UN)?

A group presentation to the class was considered fit for the purpose of assessment of the group assignment, it could give the student the experience we consider their contribution relevant to course and be an opportunity for the students to engage in discussions with the whole class, with an explanations and arguments already teste in a smaller setting.

The assignment will be given in the start of the course; since part of the purpose of the assignment is to influence the students interest and understanding of active participating in discussions with own experiences throughout course. The groups are constructed by the teacher, since students naturally prefer to group up with students they know or like themselves(De Vita, 2006). Groups are to be constructed to maximise the national diversity in each group, based on our knowledge of health systems and the human development index[1]. So the each group have students representing high development countries and moderate development countries, and to the extent possible also low development countries.

In the semester where this project was conducted only 11 students signed up for the course, 6 of them Danish. The international students all came from high development countries except one from china. This made us modify the content of the assignment, to expand the international perspective beyond that of developed countries. Instead of discussion the countries represented by the students in the group, each group was given two countries to discuss. Eight countries were selected representing highly development, moderate development and low development on the human development index. Four groups were constructed, with at least one international student in each group. The countries were divided between the groups by lottery.

The instruction to the assignment was changed to include examples on which information they should find for each country, and some direction on where to find these information's, (see final assignment instruction in appendix A). The assignment was given on the second course day, and the

[1] The Human Development Index (HDI) was developed by the United Nations as a metric to assess the social and economic development levels of countries. HCI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living.

students had one and half week to work on the assignment before presenting to the class.

Evaluation

The evaluation of the students experience and outcome of the assignment was done through a focus group type of situations, at the end of the course, together with an interview of a co-teacher (the course responsible), and own observations. The student group was asked about how they experienced the group work, what they felt was the outcome of the assignment in isolation of the course and in in relation to the whole course.

Content

The students were able to see the relevance to the assignment in relation to the whole course, providing them with some tools to reflect on pharmaceutical policies form the perspectives of different countries, learning how to "attack" a country as one student expressed. It was also seen as a way to be introduced to the terms used in the field of pharmaceutical and health policy.

Both the co-teacher and I saw examples of students using the specific knowledge gained about the countries presented in the assignment in later discussions, and also examples where the students provided insight from their own country into the later class discussion. An example of this was on a discussion on the trans-pacific partnership agreement (TPP) where a student from Singapore and one from New Zealand gave examples of their own countries specific interests in relation to the TPP, were Singapore had a special interest in protection of IPP rights because of the countries many smaller innovation bio-tech companies in contrast to New Zealand which does not have a pharmaceutical industry.

The co-teacher felt that the assignment contributed to the students feeling of being a part in creating knowledge, and being taken serious.

The students found the presentation day to be a bit confusing, the four subsequent group presentations provided too much information for the students to get an overview and stay focused.

Group work

Some groups found that the mixed groups provided them with views different from what they were used to. Two groups had group members from one of the assignment countries or a neighbouring country. These groups found this to be an advantage that some of the group's members had specific knowledge, they would not have been able to find or consider looking for. However not all groups function after the intentions, one group split up the tasks in the assignment.

The co-teacher pointed out that, even if some groups only worked together in preparing their presentation, the assignment gave the students an opportunity to get to know each other early in the course.

General feedback to the course

The students were generally happy with the course, and especially field trips and guest lectures were appraised, and more field trips were suggested to improve the course. They felt the course changed their mind-set, giving them a bit more nuanced perspective on their field and problems relating pharmaceutical regulation and policies. As an example on student mentioned guidelines on pharmaceutical shelf-life, and the impact of these in low development countries, with few resources, and a weak distribution system.

Some of the international students found the teaching form very different for what they were used to, with a less informal way of speaking to each other and the teacher, and with more emphasis on class discussion. Something they, at the end of the course appreciated and felt more comfortable with participating in.

Discussion

It is difficult to say if the objective of giving the students this group work assignment in the beginning of the course was reached. The students did not give explicit statements that this assignment made them aware that the knowledge they had about their own country and culture could help give perspective to the material taught in the course, nor that if made them more conscious or likely to participate in class discussion. Both teachers and students felt that class discussions came more easily as the course passed, which cannot be ascribe to on particular exercise, by rather a development of in the class culture, as well as student and teachers being more comfortable with each other. The class only had few students (11) which might help to establish a safe environment for discussions.

Because of the low number of participants and only few international students, the originally plan for the assignment was modified. This was done by defining countries that the groups should discuss, rather than taking basis in the countries of the group participants. This decision might clouted the objective of the group assignment, forgetting that the objective was not to necessarily discuss counties with very different conditions for their pharmaceutical and health systems and interest on an international level, but to let the students user their own experiences and perspectives.

The intent of adding this group assignment to the course activities was to help the students to see that the knowledge and experiences they have could help the whole class in reflections and nuancing the discussion on pharmaceutical policy. However for some of the groups the deliberate multi-national groups did not come quite to its right, since they split up the tasks of the assignment rather than working discussion together. To strengthen the focus on the group exploration, reflections and discussions of the countries, the assignment will be modified for the next course. The assignment instruction will be amended to ensure that the focus is on the reflection and discussions, the students will also be asked to consider the situation of the two case countries in relation to their own country/countries, in this way we can still explore countries that are very despite have students from quite similar countries.

Many students found the presentation day a bit confusing, with an overload of information. To prevent this, the plan for next year will be to spread out the presentations a bit, so that the groups will present on different days based on the otherwise planed content on these days. As an example, groups with low development counties could present on the day where we have a guest lecture from Pharmacists without borders.

In the specific course the teaching outcome was to give the student an international perspective to pharmaceutical policy, and the reason for offering this course was partly to accommodate a need from international students. However even though a course does not specifically focus on providing with an international perspective on a subject, the concept of internationalisation of the curriculum could be relevant. With objective such as preparing health care professionals for the diversity they will meet as professionals, understanding the professional culture in other countries, and be able to navigate globally. Also if there are no international students, the class room will most likely to some extent be multi-cultural, with a cultural diversity also represented in the Danish society, which can be used as a resource in a course, e.g. the pharmacist or a doctor student should be able to consult patients with an ethical background that. Multi-cultural groups work as a teaching activity to explore cultural differences and the relevance of these could be applicable these types of teaching objectives.

References

Carroll, J. & Ryan, J. (2006). *Teaching international students, improving learning for all*. London: Routledge.

De Vita, G. (2006). Fostering intercultural learning through multicultural group work. In J. Carroll & J. Ryan (Eds.), *Teaching international students, improving learing for all*. Routledge.

Københavns Universitet. (2015). KU's statistikberedskab 2015 – hovedområdeopdelt. Retrieved from http://tal.ku.dk/boks1/Studienogletal_FAK_opdelt_2015.pdf

Københavns Universitet. (2016). 2016 - Strategy for the University of Copenhagen [March 2016]. Retrieved from http://www.e-pages.dk/ku/611/

Ulriksen, L. (2014). *God undervisning på de videregående uddannelser* (1st ed.). Frydenlund.

A Assignment instructions

Pharmaceutical policy – an international perspective Group assignment 1: Country assignment

You have been given two countries. For these countries, find out the following facts, and reflect on the last questions. Facts

- Population (incl. age distribution)
- Health of the population (disease burden), life expectancy,
- How is the country governed (incl. any drug agency, other health authorities)
- Income (GDP and disparities within the country)
- Costs for health care and pharmaceuticals
- Health care culture (e.g. “traditional” treatments)
- Health care system incl. insurance/reimbursement, health care workers
- Any pharmaceutical industry?
- Other things you find important/interesting... Reflections
- Comparison between the two countries – similarities and differences?
- What are the challenges for the two countries respectively?
- What would you prioritize if you were responsible (like prime minister or minister of health, the UN)?

You will present your findings on the lecture September 15th. Note that it should be sent in (on Absalon) no later than 12.00 on September 14th.

Some links you mind find useful:

- http://www.who.int/gho/countries/en/
- http://www.who.int/publications/en/
- http://www.gapminder.org/
- https://en.wikipedia.org/wiki/Health_system

Part VI

Improving feedback to students

26

Microscopy in Veterinary Clinical Pathology: Attempts to increase feedback

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Background and Problem Definition

Clinical pathology is diagnosing disease by means of laboratory analyses, commonly performed on samples of blood, urine, feces, tissue or other body fluids. Mastering clinical pathology is understanding how to interpret laboratory test results together with the patient history, clinical presentation, clinical examination and other diagnostic modalities, considering the limitations of using diagnostic markers. To use and understand clinical pathology, it is vital to understand basic anatomy, physiology, pathophysiology, pathology and internal medicine. An essential competence within clinical pathology is microscopy of blood –, cell – and urine samples.

The present clinical pathology module is a 2-week course placed in the first or second year of the professional degree (candidate) part of the veterinary medicine curriculum. The course consists of lectures, microscopy exercises, theoretical exercises, theoretical cases and preparation time. The exam consists of ten multiple-choice questions of which approximately four are based on microscopy findings. The purpose of the course is to present the students with 1) the laboratory tests commonly used in the diagnostic workup of veterinary patients, 2) the challenges associated with the use of diagnostic markers, 3) an approach to the interpretation of common diagnostic markers and 4) establishment of basic practical skills in the preparations for - and performance of microscopy of blood, urine and cells from tissue or fluids.

Over the past years students are loosing competences in basic microscopy (teachers opinion, performance at examination, students evaluations), a major learning objective of the course. This likely is a consequence of replacing microscopy exercises with virtual microscopy in previous courses like anatomy, physiology and pathology. More time is therefore needed to build up basic microscopy skills. However, during the practical microscopy days, board discussions on how to perform the microscopic evaluations take up significant time that could be spent practicing microscopy. In addition, a large part of the teacher-student confrontation time is currently spent lecturing basic knowledge fundamental to clinical pathology, subjects the students should already be familiar with. It seems however well established that passive learning in the form of lectures provides limited learning and many studies have shown that feedback is central to learning and development (Hattie, Biggs, and Purdie, 1996; Black and Wiliam, 1998).

Comprehensive teaching material is currently available in the e-learning platform (Absalon), including e-lectures, regular lecture slides, reading material, videos and handouts in form of algorithms and checklists. As home preparation sessions are integrated in the course schedule, it is a reasonable expectation that refreshing fundamental knowledge could take place at home and free-up more time for microscopy and feedback. Feedback is defined as 'information provided from an agent (e.g. teacher) regarding aspects of one's performance or understanding… and is thus a consequence of performance' (Hattie and Timperley, 2007). Feedback can largely be grouped into formative and summative feedback. Formative feedback is process-oriented and the students are provided with 'ongoing' feedback that they can reflect and act upon (Sadler, 1989). This contrast with summative feedback, which is focused on summarizing an achievement and has no immediate impact on learning (Sadler, 1989). The different effect on learning from formative versus summative feedback clearly demonstrates that it is essential for learning that the feedback is understandable, delivered at the right time and that students can act upon it (Gibbs and Simpson, 2004).

In the present project, the hematology part of the course was restructured by 'flipping' the teacher-student confrontation time away from traditional lecturing into classroom discussions and more practical microscopy. The communication was optimized with respect to learning goals, course structure, expectations, preparation time and confrontation time. The overall aim was to increase hands-on microscopy time and improve formative feedback through increased peer- and teacher-student feedback in the preparation for - and performance of hematology microscopy.

Changes Implemented

For the feedback to become meaningful, it is essential that the students understand the learning goals and 'what is expected to be understood' in all aspects of the course (Hattie and Timperley, 2007; Sadler, 1989). The feedback should aim at containing the three main essential points proposed in the feedback model by Hattie and Timperley (2007), which concern: 'Where am I going? How am I going? and Where to next?' (Hattie and Timperley, 2007). With this in mind, the course structure, learning goals and preparation expectations for all scheduled sessions were explained carefully in Absalon in advance and on the first day of the course (Appendix A-E). Basic hematology lectures were replaced by preparation sessions for the practical microscopy. This was done through: 1) A brush-up hands-on session on how to use the microscope (Appendix F), 2) a board discussion on how to perform a systematic microscopic analysis ('Preparation Microscopy'), which also included 3) an exercise of cell recognition based on pictures of cells (Appendix G). The board discussion was supplemented with hand drawn board illustrations. In respect to the one remaining 'traditional' lecture, the lecture was broken up by questions for peer discussions followed by plenum discussion. All sessions with cases, theoretical exercises and practical microscopy exercises were initiated with peer-discussions prior to plenum teacher discussions. Peer-feedback has been shown to enhance learning without necessarily increasing the teacher workload (Nicol, Thomson, and Breslin, 2014) and through peer-feedback students acquire the abilities to take ownership, to judge the quality of other's work and argue their points, which may facilitate evaluation and improvement of their own work (Nicol et al., 2014).

At the time of practical microscopy sessions there was no initial board discussion and the students spend the entire sessions making blood smears and performing microscopy. During microscopy, peer-discussion of microscopy findings was a requirement prior to teacher feedback through an existing interactive microscope-computer system. At the end of the course, the students evaluated the project by means of a questionnaire with 17 categorical questions and two qualitative questions asking for 'positive points' and 'improvement points' (Appendix H). This questionnaire along with the teacher assessment, microscopy exam results and students' exam evaluations served to evaluate the project.

Results and Discussion

Out of 32 students, 29 returned the questionnaire, which reflects an unexpected high participation rate. Based on the questionnaire, the student-perceived participation, preparation, learning gain with respect to obtaining intended learning objectives (ILOs) and sufficiency in feedback (peer as well as teacher) were very high (Figure 26.1). Even though the teacher perceived participation, discussion and feedback was increased compared to previous courses, especially in respect to peer-feedback, the general teacher perception was more moderate compared to the students. This could reflect a general mismatch in the expectations to participation between teachers and students but it may also reflect a limitation in grading the feedback in a questionnaire where you can only answer ‘yes’ or ‘no’.

The general very high ranking of feedback was surprising, as some sessions provide better framing for feedback than others. As an example, the practical microscopy sessions with computer-based teacher feedback were a high-ranking theme in the subjective part of the questionnaire. This was expected, as the system provides the students with fast feedback from the teacher and the peer-discussions prior to asking for teacher feedback provided the teachers with more time for better and more detailed answers. However, the ability to provide sufficient teacher feedback during plenum discussions of patient cases seems harder but was graded high in the questionnaire. The students generally perceived peer-feedback as very helpful, which was a positive surprise. Students themselves are not experts (Strijbos, Narciss, and Dünnebier, 2010) and they can feel uncertain of the value of the peer-feedback, as they doubt their own and fellows students expertise within a subject and ability to perform an assessment (Hanrahan and Isaacs, 2001). Perhaps the idea of peer-feedback would have been rated differently, if the students had been asked prior to giving/receiving feedback. One study showed that prior to peer-feedback, students had high expectations to the process and the competences of the peers as reviewers, but after the peer-experience the opinions were more divided (Mulder, Pearce, and Baik, 2014).

Among the positive points from the subjective qualitative answers, the major theme was scheduled time for preparation. In this context, the majority appreciated the detailed instructions on what to prepare which reflects the importance of guiding the students. This is unsurprising as it provides the students with an opportunity to build a platform of knowledge/criteria on which they will be evaluated and receive more elaborated feedback. This scenario somewhat corresponds to feedback on performance criteria, which improves the students ability to self-evaluation of the task given and their performance (Butler and Winne, 1995). However, an improvement point mentioned by several students was more realistic expectations to preparation, which likely reflects the frustration of not being able to accomplish the expected. This feeling may compromise feedback as the student's basic need to feel competent is compromised which may negatively affect the intrinsic motivation and interest (Ryan and Deci, 2000).

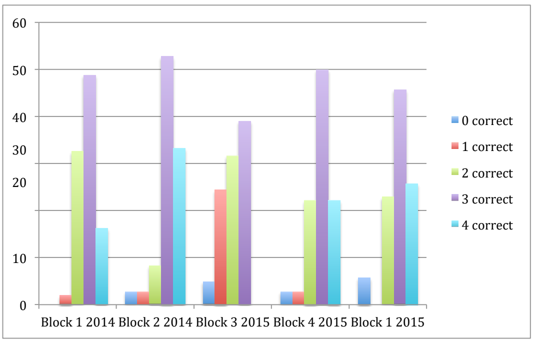

Fig. 26.1: Category questionnaire results from 29 out of 32 students. Questions are listed on the x-axis and number of answers of the categories 'yes', 'no', 'uncertain' or 'not present' are listed on the y-axis. ILOs: Intended learning outcome. FB: Feedback.

Another major positive point theme was the general course structure in respect to the combination of preparation time, e-lectures, classic lectures, board discussions, peer sessions, practical exercises and cases. This also included a noticeable appreciation of the systematic approach in performing and discussing hematologies, which illustrates an important accomplishment of the course facilitated largely by formative feedback. A standard systematic approach is a key take-away for the students, as it provides a systematic approach for them to build upon. As one student commented: ' I now for the first time know exactly what to look for and how to do it.'

The major improvement point theme of the questionnaire concerned the dislike of students being asked to involuntarily answer questions (supposedly prepared from home). This was somewhat surprising, as it was meant as a tool to activate students and provide more teacher feedback to more students. It likely reflects the delicate psychology in providing feedback within the students comfort zones and that intended constructive feedback can have the opposite effect if the students feel ‘put on the spot’ and unsafe (Yorke, 2003). This seems to reflect a feedback scenario at the ‘self level’ where students are put at risk of not fulfilling the assignment and the fear of failure dominates the opportunity to learn (Hattie and Timperley, 2007). Yang et al. 2013 define a social-affective dimension (as one of three dimensions in feedback), which relates to the students social role and emotions in the learning environment and especially negative emotions that affects the student’s identity or self-esteem can result in unproductive feedback experiences (Yang and Carless, 2013; Harks, Rakoczy, Hattie, Besser, and Klieme, 2014).

With respect to the exam, the students interestingly did not perform noticeably better than in previous blocks (Figure 26.2). The exam results also do not correlate well with the results from the questionnaire, as better performance could have been expected if the ILOs had been met to the extent reflected in the questionnaire. This again likely reflects a weakness in a questionnaire built on yes/no answers, whereas a grading on the level of ILO obtainment perhaps would have reflected a more true and informative picture of the students’ perceptions. Another downside to the questionnaire is the assumption that the ILOs could be obtained after individual sessions. This does conflict with the basic course design where the integration of preparation, lectures, board discussion, cases and practical exercises together ensures that the students meet the ILOs. A statement from one student, that the ILOs were not met right away but after some days seems to support this. It is also possible that the students would have painted a different picture had they filled out the questionnaire immediately after each session and not at the end of the course.

The exam results however do align well with the exam evaluations, though only 13 students submitted an evaluation. The exam generally was rated lower that the rest of the course and there was a general agreement that the microscopy part was too hard. It is obvious from the specific evaluation comments that they do not feel equipped in estimating e.g. normal cell counts and they did not feel confident in ruling out wrong answers. This clearly demonstrates that even though they are provided with - and appreciate the microscopy tools given during the practical microscopy sessions, they do not master the tools to their own expectations by the end of the course and they do not prioritize to spend more time practicing microscopy by own initiative. This may illustrate lack of so-called calibration, which reflects the correlation between the student's perception of own abilities and the student's true competences (Pieschl, 2009). Interestingly, the perceived usefulness of feedback has also not been found to correlate with performance (Strijbos et al., 2010), which seems to also be reflected in the present project in respect to exam performance. However, the exam performance could also reflect known scenarios where the feedback is not used (Gibbs and Simpson, 2004), not understood (Lea and Street, 1998) or not acted upon (Sadler, 1989). Presence of feedback in it self is not a guaranty for learning (Kulhavy, 1977) and it remains unknown from the present project, whether or not the teacher and students agree on the presence and the usefulness of the feedback.

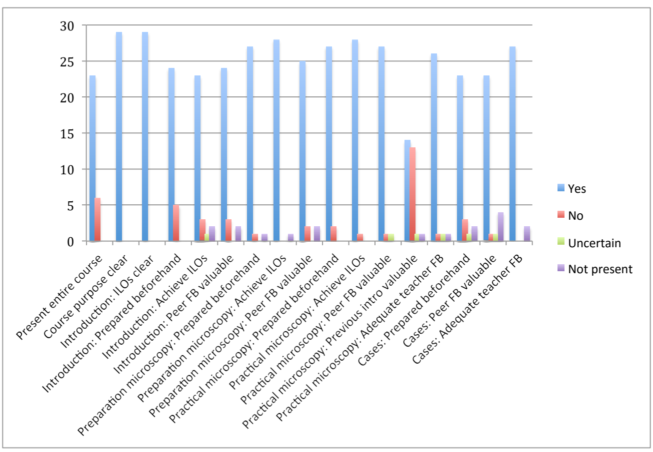

Fig. 26.2: Microscopy results from the present block (Block 1 2015) and the previous four blocks depicted as percentages of 0, 1, 2, 3 and 4 correct answers.

Conclusion and Perspectives

The results from the present project show that student-teacher time can successfully be restructured by reducing lectures and increasing students' activities without compromising student perception of learning. The changes resulted in more practical microscopy time and more feedback time. However, the project also demonstrates that there are several challenges in providing and assessing feedback, as the students' perception of feedback from the questionnaire did not correlate well with their performance and perception at the exam. One challenge seems to be a misalignment between teachers and students perceptions on when feedback is received and perhaps also when the feedback is useful. Generally, very little is known about students' perception of feedback and how this influences the learning process (Strijbos et al., 2010). It is known that tutors generally perceive their feedback as more useful than the students do (Maclellan, 2001) and teachers tend to assume that the students automatically perceive, take in and process the feedback the way they intended it. One important conclusion from the project is the appreciation from several students on the systematic approach and structure obtained at the practical microscopy sessions, which they accomplished through formative feedback. This hopefully reflects students capable of on-going self-evaluation as a foundation for deeper learning. In this respect, it is important to also keep in mind that mastering microscopy takes years of learning and perhaps even more effort on expectations in the beginning of the course might decrease the gap between perceived and obtained competences at the end of the course.

Studies of feedback tend to focus on provision of feedback from the teacher; what is provided, when is it provided and how is it provided. Few studies address how the students view the feedback (Poulos and Mahony, 2008). More clarity of the usefulness of feedback may be gained through a dialogue between students and teachers (Carless, 2006). Involving the students in designing the kind of feedback that seems helpful to them may help teachers to effectively improve the usefulness of the feedback (Yang and Carless, 2013). This task is not easily carried out considering the resources of academic staff, but continuous evaluations in regards to feedback and perhaps a better and ongoing presence of feedback in the e-learning platform could be a reasonable starting point. In the end, feedback is essential for acknowledging the need to make a change, also for the teacher.

Results from Discussion of Project with a Colleague

The colleague generally found the project good, relevant and guiding with respect to the use of feedback in future teaching. Only a few changes were implemented with respect to wording and it was added that the students do not practice microscopy enough by own initiative. More emphasize and encouragement on this part could likely be a tool and a necessity for better calibration between perceived learning and exam performance.

References

Black, P. & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: principles, policy & practice*, *5*(1), 7–74.

Butler, D. L. & Winne, P. H. (1995). Feedback and self-regulated learning: a theoretical synthesis. *Review of educational research*, *65*(3), 245–281.

Carless, D. (2006). Differing perceptions in the feedback process. *Studies in Higher Education*, *31*(2), 219–233.

Gibbs, G. & Simpson, C. (2004). Does your assessment support your students' learning. *Journal of Teaching and Learning in Higher Education*, *1*(1), 1–30.

Hanrahan, S. J. & Isaacs, G. (2001). Assessing self-and peer-assessment: the students' views. *Higher education research and development*, *20*(1), 53–70.

Harks, B., Rakoczy, K., Hattie, J., Besser, M., & Klieme, E. (2014). The effects of feedback on achievement, interest and self-evaluation: the role of feedback's perceived usefulness. *Educational Psychology*, *34*(3), 269–290.

Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: a meta-analysis. *Review of educational research*, *66*(2), 99–136.

Hattie, J. & Timperley, H. (2007). The power of feedback. *Review of educational research*, *77*(1), 81–112.

Kulhavy, R. W. (1977). Feedback in written instruction. *Review of educational research*, *47*(2), 211–232.

Lea, M. R. & Street, B. V. (1998). Student writing in higher education: an academic literacies approach. *Studies in higher education*, *23*(2), 157–172.

Maclellan, E. (2001). Assessment for learning: the differing perceptions of tutors and students. *Assessment & Evaluation in Higher Education*, *26*(4), 307–318.

Mulder, R. A., Pearce, J. M., & Baik, C. (2014). Peer review in higher education: student perceptions before and after participation. *Active Learning in Higher Education*, 1469787414527391.

Nicol, D., Thomson, A., & Breslin, C. (2014). Rethinking feedback practices in higher education: a peer review perspective. *Assessment & Evaluation in Higher Education*, *39*(1), 102–122.

Pieschl, S. (2009). Metacognitive calibration—an extended conceptualization and potential applications. *Metacognition and Learning*, *4*(1), 3–31.

Poulos, A. & Mahony, M. J. (2008). Effectiveness of feedback: the students' perspective. *Assessment & Evaluation in Higher Education*, *33*(2), 143–154.

Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55*(1), 68.

Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional science*, *18*(2), 119–144.

Strijbos, J.-W., Narciss, S., & Dünnebier, K. (2010). Peer feedback content and sender's competence level in academic writing revision tasks: are they critical for feedback perceptions and efficiency? *Learning and instruction*, *20*(4), 291–303.

Yang, M. & Carless, D. (2013). The feedback triangle and the enhancement of dialogic feedback processes. *Teaching in Higher Education*, *18*(3), 285–297.

Yorke, M. (2003). Formative assessment in higher education: moves towards theory and the enhancement of pedagogic practice. *Higher education*, *45*(4), 477–501.

A

DEPARTMENT OF VETERINARY CLINICAL AND ANIMAL SCIENCES
UNIVERSITY OF COPENHAGEN

To Students in
Veterinary Paraclinics
2015 Block 1

SEPTEMBER 2015
FACULTY OF HEALTH AND MEDICAL SCIENCES

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1870 FREDERIKSBERG C

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REF: SEC

Introduction to the Veterinary Clinical Pathology part of Veterinary Paraclinics

Welcome

Dear students,
First of all welcome to veterinary clinical pathology! We look forward to advancing your knowledge, approach and skills within veterinary clinical pathology.

What is clinical pathology?

Clinical pathology is in short laboratory diagnostics. The purpose of clinical pathology is to help diagnose disease and manage clinical cases through collection of appropriate clinical specimens and correct interpretation of laboratory data.
Correct interpretation of laboratory assays is life-long learning based on basic knowledge with respect to anatomy, biochemistry, physiology, pathology, pathophysiology, patient information and the limitations associated with the use of diagnostic markers!
You are already equipped to approach this learning.

Learning goals

1) Please make sure to carefully read the course description.
2) We cannot teach you how to interpret all diagnostic markers! ☺
The purpose of the present course is to present you with the laboratory tests commonly used in the clinic, to give you an overview of 'what markers fit where' and to give a systematic approach to interpretation of common diagnostic markers. You will learn about the challenges associated with the use of diagnostic markers and you will establish basic practical skills with respect to microscopy.

This happens through interactive lectures, practical exercises, cases, theoretical exercises and home preparation sessions.

Course structure, teaching methods and expectations

The key components of the course in veterinary clinical pathology will be:

Lectures, where we will go through the use of common assays within hematology, biochemistry and haemostasis, the background for proper validation of diagnostic biomarkers and quality control of a diagnostic laboratory.

Home preparation sessions, where e-learning modules, lectures, reading material, videos and hand-outs are made available in Absalon to enable your preparation for the practical exercises of haematology, urinalysis and cytology.

Expectations to individual home preparation sessions prior to practical exercises, cases/theoretical exercises and for some lectures will be carefully explained in separate files.

Cases and theoretical exercises, where you as students must prepare for the cases and exercises in advance in order to achieve a meaningful two-way communication with the teacher.

Practical exercises, where we will make use of our facilities to practice microscopy of hematologies, cytologies and urine samples.

Please familiarize yourself with the relevant learning material in Absalon. We expect you to always come prepared and all the learning material is available to help you prepare the various sessions.

Please also see separate schedule file in Absalon.

The program of the course is designed to allow time for preparation and the teaching is based on meaningful two-way communication for optimal active learning, thus we expect all students to be well prepared for each session! Most learning material will be available 1 week before course start at the latest.

Location

All veterinary clinical pathology teaching will be conducted in Building 1-72 on either the ground floor in our interactive microscopy laboratory (room N124) or in the auditorium on the 1st floor (room A 1151). You can enter the building from Ridebanevej 16 or Dyrlægevej 48. If doors are locked, please enter either through the basement (entrance on Ridebanevej, outside the facilities for poultry diseases) or ring the doorbell located outside Ridebanevej 16. **We meet in room N124 on the first day!**

Examination
Examination will also take place in the microscopy lab, and will be a one-hour exam for the whole Veterinary Paraclinics course (see course description for details).
We will offer an exam-simulation, also in the microscopy lab.
NOTE! To qualify for the exam, 80% course attendance is needed.

Questions
If you have questions, please do not hesitate to contact us. You can find us in Absalon and we are:

Signe E. Cremer
Assistant professor, teaching responsible (veterinary clinical pathology part)

Clara B. Marschner
PhD-student/scientific assistant

Liselotte B. Christiansen
Post doc/scientific assistant

Tina M. Sørensen
PhD-student/scientific assistant

Annemarie T. Kristensen
Professor, course responsible

On behalf of all of us and with best regards ☺

Signe

B

Veterinary Paraclinics Block 1 2015

Veterinary Clinical Pathology module — Week 43 - Oct 19-23

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-09:45	Introduction	Preparing microscopy: Blood smear evaluation	Hematology exercise	Preparation 5	Biochemistry cases and theoretical exercises
10:00-10:45	Lecture 1			Lecture 2	
11:00-11:45	Preparation 1 & 2	Hematology cases		Lecture 3	
12:00-13:00		Lunch break	Lunch break	Lunch break	Lunch break
13:00-13:45		Preparation 3	Preparation 4	Hematology exercise	Preparation 6
14:00-15:00					

Veterinary Clinical Pathology module — Week 44 - Oct 26-30

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-10:00	Lecture 4	Cytology exercise	Preparation 8	Preparation 9	Preparing microscopy: Urinalysis
10:15-11:00	Lecture 5				Urinalysis exercise
11:15-12:00	Preparing microscopy: Cytology evaluation				
12:00-13:00	Lunch break	Lunch break			Lunch break
13:00-14:00	Preparation 7	Cytology exercise			Urinalysis
14:00 -15:00					Exam simulation

Session	Title	Lecturer
Introduction	*Course structure, expectations, learning goals*	SEC
Lecture 1	*Clinical pathology and the use of diagnostic markers*	SEC
Preparing microscopy	*Blood smear evaluation*	SEC
Lecture 2	*Biochemistry*	LBC
Lecture 3	*Biochemistry*	LBC
Preparing microscopy	*Cytology*	SEC
Lecture 4	*Hemostasis*	CBM
Lecture 5	*Test Validation*	CBM
Preparing microscopy	*Urinalysis*	TMS
Cases	*Hematology*	SEC
Cases	*Biochemistry*	LBC
Theor. Exercises	*Hematology & Biochemistry*	CBM/LBC
Pract. exercises	*Hematology*	SEC/CBM
Pract. exercises	*Cytology*	SEC/CBM
Pract. exercises	*Urinalysis*	TMS/AB/CBM
Preparation 1-8	*Home study time: See seperate plans*	

SEC: Signe Emilie Cremer

LBC: Liselotte Bruun Christiansen

CBM: Clara Büchner Marschner

TMS: Tina Møller Sørensen

AB: Armina Barbovic

C

Lecture 1

Refresh your knowledge/Session subjects for preparation:

- When to use biomarkers
- Challenges associated with the use of biomarkers
- Causes of analytical errors
- How reference intervals are generated
- The difference between analytical performance and diagnostic performance
- How to use diagnostic sensitivity
- How to use the diagnostic specificity

D

Preparation 1 & 2
Structure

This is preparation for the sessions:

- Preparation Microscopy: Blood Smear Evaluation
- Hematology cases
    - Note: For the case session, you will also have to prepare the individual cases!

This will be discussed in the 'Preparation Microscopy' session:

- How to use a microscope:
    - In theory
    - Short practice of using the microscopes
- How can we perform microscopy systematically?
    - What do you do first?
    - What cell categories do we assess?
    - What do the erythrocytes look like?
    - How do we describe the erythrocytes according to:
        - Number, size, color, shape and content
    - What do the leukocytes look like?
        - Recognize: neutrophils, eosinophils, basophils, lymphocytes, monocytes
    - What changes do wee look for in the leukocytes?
        - Changes in neutrophils
        - Changes in lymphocytes
    - How do we describe the thrombocytes?

Refresh your knowledge/Subjects for preparation:

- How to use a microscope:
    - Watch the video tutorial
- Why do we perform a blood smear evaluation?
- How do we evaluate erythrocytes?
    - How do we describe changes in erythrocytes according to size, color, shape and content?
- How do we evaluate leukocytes?
    - How do we recognize the various types of leukocytes?
    - How and why do we describe changes in leukocytes?
- How do we evaluate platelets?
    - Why do we tend to forget the platelets?
- How do we evaluate anemia?
    - Why do we need to characterize the anemia?
    - Is it done the same way in dogs and cats?
- How do we evaluate the leukogram?
    - What are the different kinds of leukograms?
    - What is the purpose of grouping leukocytes according to patterns?

E

Cases in Hematology and Biochemistry & Theoretical Exercises

General Structure

Preparation:

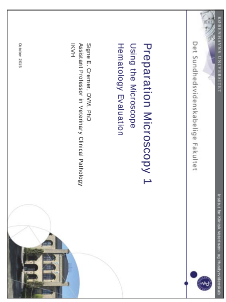
- Preparation sessions are scheduled in the course to allow time for preparation
- Cases/theoretical exercises are prepared and answered to the best of your knowledge in advance
- Cases/theoretical exercises should be answered individually

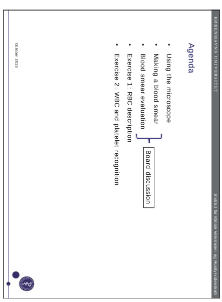
Expectations in class sessions:

- Answers will be presented by you (not a board presentation)
- Answers are discussed in plenum
- Prior to this presentation and discussion, you will sit in small groups and discuss your thoughts and answers for 5-10 min
- You will take turn presenting the answers; everyone should be prepared to present their thoughts
- Note: The most important thing is to make the effort of answering the questions and explain your thoughts. This is not a test that counts toward anything.

F

05/01/16





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Learning objectives: Microscopy

After the microscopy session you should:

- Understand how to use the microscope
- Feel comfortable using the microscope
- Be able to trouble shoot if you are having difficulties

Using the Microscope

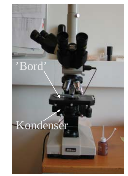
Courtesy of Annemarie Kristensen

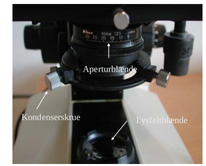
First localize:

- The oculars/eyepieces (okularer)
- The nosepiece with objectives
  (Objektiver: 4x, 20x, 40x, 60x)
- The table (bordet) and table adjusters
- The condenser (kondenser)
  - The condenser screws
  - The condenser (iris) diaphragm (aperturblænde)
- The light diaphragm (lysfeltblænde)
- The light switch
- The coarse and fine adjustment knob (grov- og finskrue)

05/01/16

Using the Microscope





Courtesy of Annemarie Kristensen

Make sure you…

- Focus the oculars
  - First the right eye, then the left eye
- Start at 4x magnification
- Raise the table to the top
- Turn the condenser diaphragm all the way to the left and place it approximately ¼ to the right:
  - Correct position between 2/3 and 1 (1 is 100% open)
- Turn the light source all the way down prior to turning on the microscope
- Use only the fine adjustment knob > 4x objective

Microscope Tutorial

Did you watch it?

Was it helpful?

https://www.youtube.com/watch?feature=player_detailpage&v=oMASHb4VyyU#t=571

Optimizing the Path of Light

(Indstilling af Køhler)

- Focus your slide using the 10x objective
- Close the light diaphragm until you see a small circle of light
- Is the circle of light in the center?
- If yes: Reopen the light diaphragm again until it exactly frames your field of view
- If no: Use the condenser screws to center the light circle and secure the screws
- Reopen the light diaphragm again until it exactly frames your field of view

Unable to Focus

- The ocular is not focused to your eyes
- The slide is upside down
- The ocular or slide are not clean
- The light path is not centered
- The condenser diaphragm is not placed correctly

Questions?

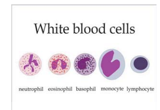
Learning Objectives: Hematology

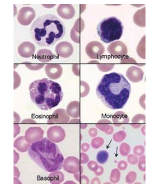
After the hematology session you should know how to:

- Prepare a blood smear
- Identify healthy and abnormal erythrocytes, leukocytes and platelets
- Perform a leukocyte differential count

Blood Smear Evaluation

Cell recognition





Exercise 1: Red Blood Cells

- Look at the cells marked with a letter
- Place the cells in the correct box in the schedule based on cell size (cytosis) and cell color (chromasia).
- Note whether or not there is presence of poikilocytosis:
  - If yes: what kind?
- Note whether or not there is presence of inclusions:
  - If yes: what kind?

Exercise 1: Red Blood Cells

	Microcytic	Normocytic	Macrocytic
Hypochromic			
Normochromic			
Polychromasia			

Exercise 2: Leukocytes and Platelets

- Look at the cells marked with a letter
- Name the cells correctly in the provided schedule

Exercise 2: Leukocytes and Platelets

Letter	Cell
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	

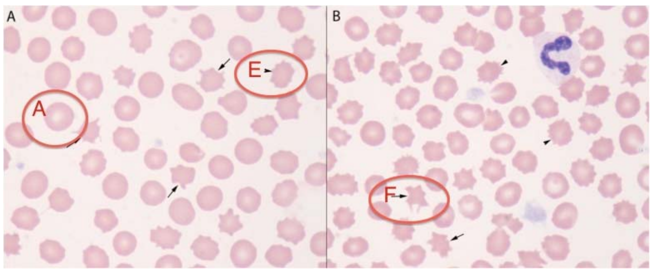
Exercise 2: Leukocytes and Platelets

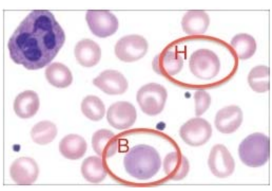
- How would you perform a manual differential count?
- How you perform a manual platelet count?

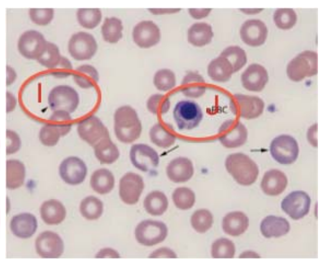
Questions?

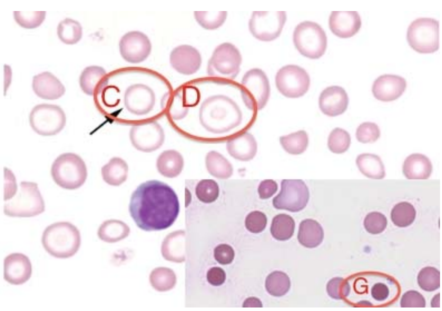
G

Exercise 1: Erythrocytes





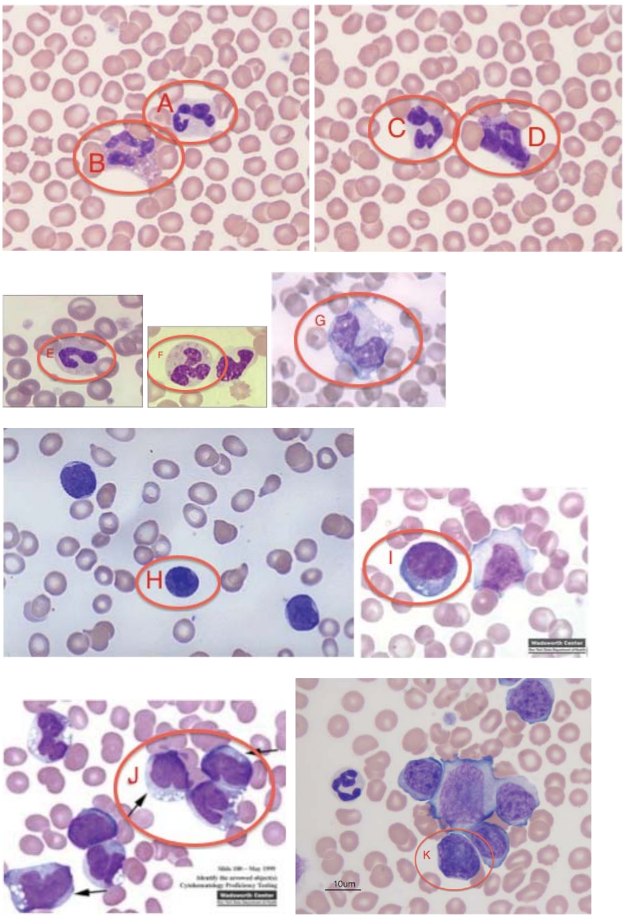


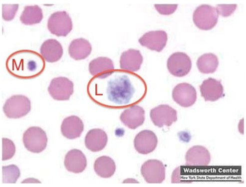


- Place the letter of the erythrocytes (circled with a red letter) in the correct box.
- Note presence of poikilocytosis
- Note presence of inclusions

	Microcytic	**Normocytic**	**Macrocytic**
Hypochromic			
Normochromic			
Polychromic			

Exercise 2: Leukocytes and Platelets

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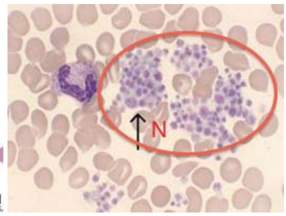
New York State Department of Health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- Name the cells correctly in the schedule below

Letter	Cell
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	

H

Spørgeskema: Pædagogikum projekt i paraklinik klinisk patologi

Signe E. Cremer

1. Deltog du i hele kurset?

Ja: ________

Nej: ________

Hvornår var du ikke til stede?:

2. Var formålet med kurset klart ved kursets begyndelse?

Ja: ________

Nej: ________

Forklar:

3. Var læringsmålene klare ved kursets begyndelse?

Ja: ________

Nej: ________

Forklar:

4. Dag 1: Kursusintroduktion og Lecture 1

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: ________

Nej: ________

Forklar:

(4. Dag 1: Kursusintroduktion og Lecture 1 fortsat)

Opnåede du de beskrevne læringsmål?

Ja: _______

Nej: _______

Forklar:

Hjalp det på forståelsen at diskutere spørgsmål med sidemakkeren?

Ja: _______

Nej: _______

Forklar:

5. Dag 2: Mikroskopi – og hæmatologigennemgang

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _______

Nej: _______

Forklar:

Opnåede du de beskrevne læringsmål?

Ja: _______

Nej: _______

Forklar:

I hæmatologigennemgangen, hjalp det på forståelsen at diskutere exercises 1 og 2 med sidemakkeren?

Ja: _______

Nej: _______

Forklar:

6. Dag 3 + 4: Mikroskopiøvelse i hæmatologi

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _______

Nej: _______

Forklar:

Opnåede du de beskrevne læringsmål?

Ja: _______

Nej: _______

Forklar:

Hjalp det på forståelsen at diskutere spørgsmål med sidemakkeren?

Ja: _______

Nej: _______

Forklar:

Gjorde det en forskel at have afprøvet mikroskopet på dag 1?

Ja: _______

Nej: _______

Forklar:

Fik du tilstrækkelig feedback fra underviserne?

Ja: _______

Nej: _______

Forklar:

7. Dag 4: Cases i hæmatologi

Havde du forberedt dig ifølge forberedelsesinstruktionerne?

Ja: _______

Nej: _______

Forklar:

Hjalp det på forståelsen at diskutere spørgsmål med sidemakkeren?

Ja: _______

Nej: _______

Forklar:

Fik du tilstrækkelig feedback fra underviserne?

Ja: _______

Nej: _______

Forklar:

8. Ris og ros

Hvad fungerer godt?

Hvad bør forbedres?

SKAL AFLEVERES LIGE INDEN PRØVEEKSAMEN

Tak for hjælpen!! ☺

27

Development of an assessment scheme for laboratory exercises in pharmaceutical education at KU

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Introduction and problem formulation

”Students learn what they think they‘ll be assessed on, not what‘s in the curriculum” (Biggs and Tang, 2012). Although laboratory exercises, both in school and at universities, are a unique setting for teaching and learning and offer an environment for students to obtain central conceptual and procedural knowledge and skills related to experimental aspects of science, students‘ performance during the lab is often not adequately assessed, e.g., often only through conventional paper-and-pencil tests (as reviewed in Lunetta, Hofstein, and Clough, 2007 and Hofstein and Lunetta, 2004). Therefore, students often perceive the laboratory as not particularly important for their learning (Hofstein and Lunetta, 2004 and literature cited herein). This project had the goal to develop and design a system for the assessment of students‘performance in laboratory exercises in pharmaceutical education at the bachelor level. The course in focus is “Evaluation of Pharmaceutical Substances” (Kvalitetsvurdering af farmaceutiske råvarer, SFABIF107U). This course is newly developed in the course of the study reform Farma2020 and will start end of January 2016. In the old form of the course the only assessment, where students got a grade on, was a written exam at the end of the course. The practical exercises in the laboratory were assessed only with “passed/ not passed”, but had no influence on the final grade. In order to pass the practical exercises, students‘ measurement results had on average to be of a certain quality (accuracy and precision $\leq$ 0.8%) and laboratory journals, experimental protocols, and reports had to be of satisfying quality. In general, “passed/ not passed” was not bound to standardized and unified criteria and the meaning of satisfying quality was not further specified and rather dependent on the teacher. In my opinion, this system has the following shortcomings:

- A low motivation especially of the good students to put extra effort into the practical exercises in order to obtain higher-than-average results. Students see the practical part of the course as not particularly relevant, since it is not part of the final grade
- Skills related to laboratory work (planning and conducting of experiments, measurement and observation, the proper management of a laboratory journal, etc.) are largely neglected in the assessment (written exam). The assessment form is not aligned with the teaching goals of the practical part of the course.
- A standardized and objective measure of how students perform in the laboratory according to clearly stated criteria is missing. The judgement as “passed/ not passed” is rather subjective (i.e., depending on the teacher) and hard to grasp for the students. Identifying strengths and weaknesses of students and giving formative feedback to students is hampered.

These shortcomings got obvious during the course last year. Students partly entered the laboratory being badly prepared. Or students with excellent measurement results got disappointed and demotivated because they didn’t get awarded for their effort. Similar problems associated with laboratory exercises and (lack of) assessment have been reported previously in literature [3, 4]. The objectives of my pedagogical project were therefore to develop and implement an assessment system for the practical exercises of the new course. Demands set on the assessment form were the following: 1) Assessment of all phases of a laboratory activity (these are after V. N. Lunetta and Tamir, 1979 I. planning and design, II. performance, III. analysis and interpretation, IV. application, see Table 27.1), 2) A clear alignment of assessment methods to ILOs of the course, 3) assessment according to clearly stated, standardized, and transparent criteria, 4) a scaled grading, which correlates with the quality of students work. These goals are planned to be realized through assessment of student laboratory journals, experimental protocols, measurement results, and reports. Since the course, where the assessment system will be applied, starts after the university pedagogy course, the following project description focuses on how I developed the assessment system and which considerations I made in choosing assessment methods and grading schemes.

Course description

An outline of the course and of the laboratory exercises are shown in Figure 27.1. The laboratory exercises include preparation and reflection of the experiments in the classroom ("klassetimer") before and after the actual laboratory work, planning and preparation of the experiment in form of a written protocol, conduction of the experiment in the laboratory, as well as writing reports. The practical part is structured into four modules, each consisting of three different experiments. These modules are followed by project work, where students independently plan and conduct the analytical verification of a pharmaceutical compound followed by writing a report. In contrast to Module 1 to 4 the project also includes peer-review of project protocols by the students. The capacity of the course is up to 240 students, which are supervised by up to eight teacher. Due to the high number of participants students work together in groups of three.

Choice of assessment methods

"Assessment is an integral part of the teaching and learning process since the main goal of education is to produce or facilitate change in learners" (Butler, McColskey, and O'Sullivan, 2005, p.21). In order to be able to measure change in student skills it is indispensable to carefully choose appropriate assessment methods. In accordance with Butler et al. (Butler et al., 2005) the following steps were followed in order to develop a meaningful assessment system: 1) Identifying intended learning outcomes (ILOs) of our course. Only if we clearly define what competencies students are supposed to obtain can we choose and design assessment forms, which can accurately test the achievement of these ILOs. 2) Choosing assessment forms, which match the ILOs of the course. 3) Choosing grading schemes, which can communicate students‘ performance and change/ improvement in a clear and understandable manner (Butler et al., 2005). Butler et al. (Butler et al., 2005) gives a detailed overview over assessment methods. Traditional assessment methods, which (in general) assess basic factual knowledge, are for example multiple choice questions, e.g., in form of quizzes and paper-and-pencil tests. Methods, which go beyond the testing of just basic facts and skills and which can assess students‘ performance and their higher-order cognitive skills and deeper understanding in a science inquiry setting, are the following performance-based assessment methods: Observing students (Informal and structured observations), soliciting information from students (interviews, self-assessment questionnaires), evaluating students work (open-ended questions, performance tasks, journals, exhibitions and projects, portfolios) (Butler et al., 2005).

Together with the course responsible and with my technical supervisor of the university pedagogy course (UP) I discussed different assessment forms. Due to time, man power, and economic constraints not all of the above mentioned assessment methods can be applied in our course. For example methods, which require the observation of each student individually over an extended period of time, are difficult to realize in our course. These methods include practical performances, which are an excellent tool to assess students‘ procedural understanding and manipulative skills in comparison to paper-and-pencil tests [4, 6, 7]. Students should not be “sampled” only once, but continuously in order to get an impression of a student‘s learning progress (Ganiel and Hofstein, 1982). This is quite resource and time intense and not practical in our course with a total number of up to 240 students and a limited number of teachers. Before a direct assessment of practical skills in the laboratory can be introduced in our course a pilot study would have to be performed in order to test the time and resources such an assessment would take. For now, measurement results (accuracy and precision) will be used to assess students‘ practical performance in the laboratory. Experiences from previous courses show that the results correlate very well with students‘ practical skills. If students choose for example the wrong pipette or read an instrument the wrong way this will be reflected through a bad accuracy and precision. Proper maintenance of a laboratory journal is an important ILO in our course, since it is an important documentation of experimental work and is for example used as a legal document in industry (Wallert and Provost, 2014). Through using it as an assessment method students appreciation of its value can be increased (Wallert and Provost, 2014). The journal will therefore be an important part of our assessment system. Further assessment methods available in our course are written reports, where students evaluate and discuss their results, as well as protocols, where students prepare their experimental work of the project (see Figure 27.1). In addition, students basic knowledge will be tested with online quizzes (multiple choice questions) before they enter the laboratory and after each laboratory session in Modul 1 to 4.

In order to be meaningful a laboratory exercise should include all of the phases of a laboratory activity (see Table 27.1) and all of them should also be assessed (Ganiel and Hofstein, 1982). Each of the phases features individual skills, which are related to the processes of science inquiry (V. N. Lunetta and Tamir, 1979). In the practical exercises of our course all of the four phases are present (see Figure 27.1) and most of the skills listed in Table 27.1 are required. In a pre-test I checked which of the chosen assessment methods (quizzes, laboratory journals, protocols, reports) can assess which skills of the four laboratory phases. As can be seen in Table 27.1 all of the phases and associated skills can be assessed.

The next step was the alignment of the assessment methods to the ILOs of our course. ILOs comprise for example conceptual and procedural understanding of the applied analytical methods, practical skills, e.g., the handling of experimental equipment, IT skills and theoretical skills like the use of statistical methods during data analysis. As an example, ILOs of the course as a whole and of Modul 1 are lisetd in Table 27.2. Since the developed assessment system shall consider all phases of a laboratory activity I tried to assign each ILO to the laboratory phase, where it is going to be promoted (see Table 27.2). After this I assigned assessment methods, which in my opinion are suitable to measure progress of students in achieving the ILOs. As can be seen in Table 27.2 all of the four phases of a laboratory activity are needed to realize the ILOs (see also Figure 27.1). Each of the desired ILOs and phases can (in principal) be assessed with one or several of the four assessment forms mentioned above. The only exception is the assessment of the peer-review process during the project, where students give feedback to each other on their project protocols. This would require individual observation of the students and is not feasible as argued above. Although active participation in the peer-review process is one criterion to pass the project this will not be assessed explicitly. A solution for this has still to be found.

Choice of assessment criteria

One objective of this project was to assess laboratory exercises in an objective and precise way, i.e., different teacher would get a similar result of their assessments. Ganiel and Hofstein showed in their study that objectivity and precision of the assessment of students‘work in the laboratory can be increased if the assessment is performed according to a list of well-defined criteria (Ganiel and Hofstein, 1982). Furthermore, only if the assessment criteria are formulated in a clear way will students understand the expectations teachers set on them and achieve the desired ILOs more easily (Butler et al., 2005). A requirement for this is that the assessment criteria match the ILOs.

For the assessment methods laboratory journal and reports I formulated therefore criteria, which match the corresponding ILOs listed in Table 27.2. Here, published lists with assessment criteria served as a starting point [4, 5, 8]. The final criteria are shown in Table 27.4 and 27.5. Assessment criteria for the laboratory journal are divided into the categories basic form, planning of an analytical determination, experimental observations and data documentation, and calculation of results. The latter three assess tasks related to phases I, II, and III of a laboratory activity, respectively. Criteria adressing the basic requirements for maintenance of a laboratory journal and data documentation are in accordance with the Procedure for Work Documentation at PharmaSchool (Faculty of Heatlh Sciences, University of Copenhagen). Besides criteria related to the basic form of the journal I included criteria, which test practical skills of the students like doing and documenting observations during the course of an experiment. One of the ILOs of particularly the project work is that students are able to plan and design analytical determinations independently, i.e., they have to choose analytical procedures and have to plan the measurement and observation. Here, higher-order cognitive skills and deeper understanding of analytical principles behind the experiment are required. These skills are specifically assessed through the journal and protocol with criteria listed under "planning of an analytical determination". Criteria chosen for the report assessment are shown in Table 27.5. As for the journal assessment the criteria are divided into several categories like data evaluation and calculations and data interpretation. These criteria correspond to important ILOs like being able to calculate the uncertainty of an analytical procedure or the use of IT and statistical methods for data analysis. Assessed skills of the students range from practical skills, e.g., the correct use of Excell, to deeper understanding of analytical principles, like the discussion of sources for a high measurement uncertainty. These tasks belong to phase III (Data analysis and interpretation) of an laboratory activity. Phase IV (Application) is assessed in the report through study questions, where students have for example to predict results by applying the analytical method to a new situation. Last but not least, students'practical performance in the lab gets indirectly assessed through accuracy and precision of the measurement results obtained during modul 1 to 4 and the project work. The corresponding assessment scheme is shown in Table 27.4. For both modul 1 – 4 and the project work the same assessment forms will be used.

Choice of grading forms

Students‘ answers to the online quizzes will be evaluated as “passed/ not passed”. Only if students pass the quiz are they allowed to enter the laboratory. For grading the above mentioned criteria belonging to laboratory journal and report I chose a system between a check list and a rubric. A checklist can be used in assessing student actions and behaviors, where a complex response is not expected (Butler et al., 2005), here for example if the laboratory journal contains certain entries or not. Rubrics on the other hand define different levels of proficiency in performing a certain task and are suitable for long and complex student responses Rubrics have the advantage that they define high-quality work and can aid students in achieving it (Butler et al., 2005). Where applicable I formulated criteria in a way that they reflect what is expected to be performance of high quality (see Table 27.3 and 5). Each criterion can be assessed with “yes”, “partly”, or “not” and assigned to a percentage score of 100, 50 and 0%, depending on if the criterion is entirely, partly or not at all fulfilled, respectively. Scores for the individual criteria within one category are averaged, weighted, and the average score of all categories is calculated. Since the categories and related ILOs possess different importance in our course, I inserted the option to put different weight on the individual categories. Also the measurement results are transformed into a percentage score (0, 25, 50, 100%) depending on in which interval the accuracy and precision of the performed measurements lies. In a final step percentage scores will be translated into grades according to the 7-trin scale. In order to pass an assessement the percentage score (and the associated grade) has to be above a certain threshold. How to best weigh the different categories and where to set the thresholds for passing the individual parts of the practical course will be discussed together with the teacher participating in the course.

Turning the developed assessment system into reality

It is planned that student laboratory journals are assessed together with the reports after each laboratory session of modul 1 to 4 and of the project. For this students are asked to add a copy of their laboratory journal into their report. This has the advantage that the teacher has sufficient time to properly read through the journal, but the disadvantage that it cannot be controlled if students really took their notes while conducting the experiment. But if time allows the journal will also be assessed directly during the lab exercises through scheduled and random observation events as described in (Wallert and Provost, 2014). Measurement results are recorded and assessed after each exercise.

In the classroom session used for preparation before the first laboratory exercise (Modul 1) the assessment criteria are going to be presented to the students. The goal is that students understand upfront what they will be assessed on. This will support that students work according to the teachers expectations and achieve the ILOs more easily (Butler et al., 2005). Furthermore, it is planned that the complexity of the assessment increases gradually during the practical part of the course. The number of categories assessed within the laboratory journal increases with each modul as shown in Table 27.4. This ensures that students can develop and improve a limited number of skills per modul before moving on to a more complex modul. This procedure was adapted from a notebook grading sequence developed by Wallert and Provost (Wallert and Provost, 2014).

The assessment and grading done in Modul 1 – 4 serves as an interim assessment. Only the grades obtained during the project work will be included in the final assessment of the course. This gives the students the chance to develop and improve their skills before they obtain a final grade on their performance. Students are assessed continuously, which assures that change and improvement of student skills are monitored and can be communicated to the students. This will contribute to the students conception, that improvement and change is a desired learning process in our course (Butler et al., 2005).

Anticipated effects of the developed assessment system

Through the introduction of an assessment of students‘ performance during laboratory exercises we hope that students value the laboratory exercises as an important and relevant part of their education. This has hopefully the effect that students prepare themselves better for the laboratory exercises. The developed assessment system assesses students‘ performance during all phases of a laboratory activity according to clearly stated and categorized criteria. This provides the students with a clear guideline on what they are assessed on and ensures that they understand what is expected from them. Furthermore, this helps the teacher to pinpoint strengths and weaknesses of a student in the laboratory and to give detailed formative feedback on specific skills, which can be improved. The use of standardized criteria will in addition enhance the objectivity and precision of the assessment process. A particular focus during this project was set on a clear alignment of assessment criteria to ILOs of the course. One expectation is that ILOs are achieved more effectively by the students. Since the grading is scaled (percentage scale and 7-trin scale) the assessment correlates with quality of a students‘ performance. This will motivate particularly the ambitious students to produce work of high quality. All in all I expect that the developed assessment system contributes to a higher learning yield through a more effective achievement of the ILOs of our course. I hope that the implementation of the assessment system will not demand more time from the teacher, but on the contrary facilitate and accelerate report and journal correction.

Perspectives

My technical supervisor of the UP suggested I should check on the realization of the anticipated effects during the new course. This I plan to do, e.g., through questionnaires distributed to the students and teachers during the course and/ or after the course. Depending on the experiences during the course criteria and thresholds for passing the exercises will be adjusted. In the future I would like to implement a direct assessment of students‘ pratical skills through direct observation in the laboratory. A practical exam developed by Chen et al. serves here as a good basis (Chen, Graesser, and Sah, 2015).

References

Biggs, J. & Tang, C. (2012). Aligning the curriculum to promote learning. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (pp. 198–199). Boston, MA: Springer US.

Butler, S. M., McColskey, W., & O'Sullivan, R. (2005). How to assess student performance in science: going beyond multiple-choice tests. *SERVE Center for Continuous Improvement at UNCG*.

Chen, X., Graesser, D., & Sah, M. (2015). Improving consistency in large laboratory courses: a design for a standardized practical exam. *Advances in physiology education*, *39*(2), 102–107.

Ganiel, U. & Hofstein, A. (1982). Objective and continuous assessment of student performance in the physics laboratory. *Science Education*, *66*(4), 581–591.

Hofstein, A. & Lunetta, V. N. (2004). The laboratory in science education: foundations for the twenty-first century. *Science education*, *88*(1), 28–54.

Lunetta, V. N., Hofstein, A., & Clough, M. P. (2007). Learning and teaching in the school science laboratory: an analysis of research, theory, and practice. In S. Abell & N. Lederman (Eds.), *Handbook of research on science education* (pp. 393–441). New Jersey: Lawrence Erlbaum Associates.

V. N. Lunetta, N. V. & Tamir, P. (1979). Matching lab activities with teaching goals. *Science Teacher*, *46*(5), 22–24.

Wallert, M. A. & Provost, J. J. (2014). Integrating standard operating procedures and industry notebook standards to evaluate students in laboratory courses. *Biochemistry and Molecular Biology Education*, *42*(1), 41–49.

A Appendices

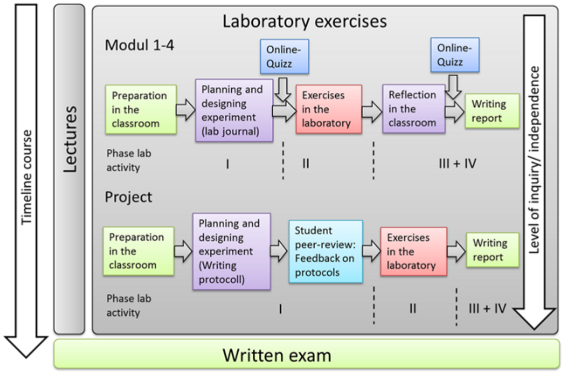

Fig. 27.1: Outline of the course "Evaluation of Pharmaceutical Substances" (Kvalitetsvurdering af farmaceutiske råvarer, SFABIF107U), where the developed assessment system for students'performance in the laboratory will be implemented. Shown are the individual parts of the laboratory exercises of modul 1 to 4 and of the project work. Numbers I – IV represent the phases of the laboratory activities according to V. N. Lunetta and Tamir, 1979.

Table 27.1: Phases of a laboratory activity and associated skills adapted from V. N. Lunetta and Tamir, 1979. In addition assessment methods of our course, which are suitable to assess the individual skills, are listed (Q: Quizz, J: Laboratory journal, P: Project protocol, M: Measurement results, R: Report, n.r. depicts skills, which are not required in our course).

Lab phase	**Skill**	**Assessment form**
I. Planning and design	Articulating questions	n.r.
	Predicting results	Q
	Formulating hypothesis to be tested	n.r.
	Designing experimental procedures and observations	J, P
II. Performance	Conducting an investigation (measurement + observation)	M, J
	Manipulating materials and equipment	M
	Making decisions about investigative techinques	J, P
	Making, organizing, and recording observations	J
	Performing numeric calculations	J, R
III. Analysis and interpretation	Processing data (transforming and graphing data)	R
	Determining qualitative and quantitative relationships	Q, R
	Explaining relationships	R
	Developing findings	R
	Discussing the accuracy and limitations of data and procedures	R
	Formulating new questions based on results	n.r.
IV. Application	Making predictions about new situations	Q, R
	Formulating hypothesis on the basis of investigative results	n.r.
	Applying lab techniques to new experimental situations	Q, R

Table 27.2: Compilation of intended learning outcomes (ILOs) of the whole course and of the practical part of the course “Evaluation of Pharmaceutical Substances” (Kvalitetsvurdering af farmaceutiske råvarer, SFABIF107U), the corresponding phase of laboratory activity (PLA, according to V. N. Lunetta and Tamir, 1979), and assessment forms matching the respective ILOs. ILOs are taken from the course description and are described in Danish. As an example only ILOs of the whole course and of Modul 1 are shown.

Part of the course	**ILO category**	**ILO description**	**PLA[a]**	**Assessment form[b]**
Whole course	Knowledge	Opnå forståelse for/redegøre for lægemiddelstoffers proteolytiske egenskabers betydning for kvantitativ bestemmelse. Omfatter pH beregninger, beregning af titreringskurve, syrestyrkens indflydelse på titreringskurvensforløb, opløsningsmidlets indflydelse på syrestyrken.	III, IV	Q, R
		Opnå forståelse for/redegøre for kvantitative ikke chromatografiske analytiske principper; titrimetri (ligevægtsbetragtninger i forbindelse med analytisk kemiske problemstillinger), spektofotometri (UV, IR og fluorescens), vandbestemmelse, elementaranalyse. Herunder redegørelse for principper og anvendelsesområde.	I, III, IV	Q, J, P, R
	Skill	Opnå Fortrolighed med at anvende den Europæiske farmakopé til udarbejdelse af analyseforskrifter baseret på Ph. Eur. standarder og generelle krav til analytiske kemisk arbejde (præcision, afvejning, korrekt brug af glasudstyr).	I, II	Q, J, P, M
		Kan anvende statistik til vurdering af de anvendte metoders validitet og pålideligheden af opnåede resultater (gennemsnit, standardafvigelse, usikkerhedsberegninger, potentielle fejlkilder, præcision, nøjagtighed, lineær regression af standardkurver herunder beregning af usikkerheden på standardkurvens skæring of hældning og beregning af usikkerheden på resultatet ved brug af standardkurven, simple statiske beregninger til vurdering af kvantitative resultater: t-test og F-test)	III	J, P
		Kan anvende IT i faglig kontekst til databehandling (Herunder brug af Excel til at beregne og afbilde trireringskurver og standardkurver samt bruge excels funktioner til beregning af standardafvigelser og gennemsnit, R og R2 ved lineær regression), til tekstbehandling (ved udarbejdelse af rapporter og protokoller) og til opslag i Ph. Eur. Online	III	J, P
	Competence	**Være i stand til selv at kunne vurdere simple analytiske problemstillinger samt udarbejde analyseforskrifter herfor**	I, II, III	J, P, M, R
		Føring af laboratoriejournal på en sådan måde, at denne til enhver tid kan tjene som dokumentation for udført arbejde.	II	J
Practical exercises				
Modul - 1	**Theoretical skills**	**At kunne anvende enheder**	III	J, R
		At kunne vurdere og angive antal betydende cifre for beregnede resultater	II, III	J, R
		At forstå koncentrationsangivelserne molaritet, molalitet, % w/w, % v/v, % w/v, ppm og ppb herunder omregning mellem disse	II, III	J, R
		At kunne skelne mellem den formelle koncentration og den aktuelle koncentration af en analyt.	III	R
		At kunne udføre støkiometriske beregninger baseret på opstillede reaktionsligninger	I, II, III	J, P, R
		At kunne vurdere et analyseresultat ved angivelse og diskussion af præcision og nøjagtighed	II, III	J, R
		At kunne beregne og vurdere teoretisk absolut og relativ usikkerhed for analyseresultater	III	R
		At forstå betydningen af absolut og relativ usikkerhed	III	R
	Practical skills	At kunne afveje korrekt	II	M
		At kunne udtage og afmåle volumina korrekt	II	M
		At kunne vælge det rigtige udstyr til udtagelse af volumen og masse	I, II	Q, J, P, M
		At kunne vurdere det anvendte udstyrs validitet	II	M
		At kunne udføre laboratoriejournal efter de for kursets gældende regler	II	J
	Statistics	At kunne beregne gennemsnit, standardafvigelse og relativ standardafvigelse af opnåede bestemmelser og anvende F-test herunder fortolkning af testens resultat.	III	R

a) Phase of laboratory activity after [5]: I. Planning and design, II. Performance, III. Analysis and Interpretation, IV. Application
b) Assessment methods: Q: Quizz, J: Laboratory journal, P: Project protocol, M, Measurement results, R: Report

Table 27.3: Assessment scheme for laboratory journals and protocols

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Vurdering laboratorie journalier**											
2	**Info**											
3	Navn studerende/ gruppe		Skabsnummer			Datum korrektur						
4	**Kriterie**		**Kriterie opfyldt**	**Score**			**Kommentar**	**Hvornår vurderet**				
5				Individuelt	Kategori	Weighting		Modul 1	Modul 2	Modul 3	Modul 4	Projekt
6	**Grundlæggende form**	Sort/blå kuglepen brugt	ja	100%	100%	1						
7		Indholdsfortegnelsen udfyldt, journalens sider dateret, nummeret, og signeret	ja	100%								
8		Titel og formål af et eksperiment præsent incl. reference til protokol (for eksempel Ph.EUR.)	ja	100%								
9		Registreringer kronologisk opført. Hvis fortsættelse af et eksperiment, reference til dette incl. sidenummer	ja	100%								
10		Ubrugte sider, dele af sider og forkerte data streget med en enkel streg. Sider må ikke rives ud. Sletninger med datum, initialer, og begrundelse, hvorfor streget.	ja	100%								
11		Alle resultater godkendt	ja	100%								
12	**Eksperimentelt forløb, observationer, og data dokumentation**	Alle kemikalier (incl. batchnummer og producent), udstyr og instrumenter fuldstændigt opført, anvendte instrumentenmetode noteret	ja	100%	100%	1						
13		Alle eksperimentelle skridt kronologisk opført incl. observationer, beregninger og resultater	ja	100%								
14		Observationer fokuserer på relevante parameter og er beskrevet detaljeret og på en forståeligt måde, afvigelser fra protokollen noteret	ja	100%								
15		Data dokumentation fuldstændig. Alle relevante data (aflæsninger, afmålinger, afvejninger, osv.) opført på en klar og vel organiseret måde, Vejestrimmel clipset ind. Sted, hvor elektroniske filer er gemt, noteret	ja	100%								
16	**Beregning resultater**	Beregningerne (koncentration/ indhold, gennemsnit, præcision, nøjagtighed, etc.) fuldstændig og korrekt (først generelle formler, efterfølgende værdier indsat)	ja	100%	100%	1						
17		Alle værdier med rigtige enheder	ja	100%								
18		Alle værdier med rigtige antal betydende cifre, koncentrationer afrundet til 4 decimaler, nøjagtighed og præcision afrundet til 1 decimal	ja	100%								
19		Endegyldige resultater understreget to gange	ja	100%								
20	**Planlægning af en analytisk bestemmelse, Forsøgsprotokol**	Teori/princip bag eksperimentet forstået (fuldstændig og korrekt beskrivelse af eksperimentets formål/ af analysemetoderne og af de kemiske principper bag disse/ af kemikaliernes funktion. Valg af analysemetoderne kan begrundes. Reaktionsligningerne fuldstændig opført)	ja	100%	100%	1						
21		Udarbedelse af analyseforskriften forståelig, fuldstændig og korrekt (Rigtig valg af udstyr og kemikalier, alle eksperimentelle trin detaljeret opført, valg af målte parameter og antal replikater korrekt). Forskrift kan direkt anvendes i laboratoriet. Forskrift er in overenstemmelse med Farmakopeens krav.	ja	100%								
22		Beregning af stofmængde, der tages i arbejde, og det forventede ækvivalensvolumen fuldstændig og korrekt	ja	100%								
23		Hensyntagen til sikkerhedsforanstaltninger	ja	100%								
24	**Helhedsindtryk**	Journalen er vel organiseret og ryddelig, alle nødvendige informationer præsente og opført på en klar måde (Journalen gør anden person i stand til at eftergøre eksperimentet)	ja	100%	100%	1						
25		Den studerende viser overbevisende kendskab til analytiske principper og deres anvendelsesområde	ja	100%								
26	**Total score**				100%	bestået						
27	**Score**	ja	100%	alle kriterie opfyldt								
28		kun delvis	50%	kriterie kun delvis opfyldt								
29		nej	0%	kriterie ikke opfyldt								
30	**Beståelseskriterium**	Bestået	Total ≥	85%								
31		Ikke bestået	Total <	85%								

Table 27.4: Assessment scheme for measurement results

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	**Bedømmelse resultater**															
2	**Gruppe**			**Skabsnummer**		**Stud. værdi**								**Bedømmelse**		
3	**Modul #**	**Eksperiment**	**Opløsning #**	**Lab. værdi**	**Enhed**	**1**	**2**	**3**	**Gennemsnit**	**Præcision**	**Nøjagtighed**	**Godkendt**		**Præcision**	**Nøjagtighed**	**Bedømmelse**
4	**1**	A	1	1.0000	M	1.0010	1.0005	0.9999	1.0005	0.06	0.0			100%	100%	
5		B	2	1.0000	M	1.0000	1.0015	0.9992	1.0002	0.80	0.0			100%	100%	
6		C	3	1.0000	M	0.9919	1.0005	0.9956	0.996	0.43	0.4			100%	100%	
7	**2**	A	1	1.0000	M	1.1501	1.0005	0.9999	1.0502	8.24	5.0			0%	25%	
8		B	2	1.0000	M	1.0000	1.0015	0.9992	1.0002	0.80	0.0			100%	100%	
9		C	3	1.0000	M	0.9919	1.0005	0.9956	0.996	0.43	0.4			100%	100%	
10	**3**	A	1	1.0000	M	1.1501	1.0005	0.9999	1.0502	8.24	5.0			0%	25%	
11		B	2	1.0000	M	1.0000	1.0015	0.9992	1.0002	0.80	0.0			100%	100%	
12		C	3	1.0000	M	0.9919	1.0005	0.9956	0.996	0.43	0.4			100%	100%	
13	**4**	A	1	1.0000	M	1.1501	1.0005	0.9999	1.0502	8.24	5.0			0%	25%	
14		B	2	1.0000	M	1.0000	1.0015	0.9992	1.0002	0.80	0.0			100%	100%	
15		C	3	1.0000	M	0.9919	1.0005	0.9956	0.996	0.43	0.4			100%	100%	
16	**Evaluering**												Modul 1	100%	100%	bestået
17													Modul 2	67%	75%	bestået
18													Modul 3	67%	75%	bestået
19													Modul 4	67%	75%	bestået
20													**Total**	**75%**	**81%**	Ikke bestået
21											**Bedømmelse nøjagtighed og præcision**					
22											Interval	Lavere græn	Bedømmelse			
23																
24											[0.0%; 0.8%]	0.0	100%			
25											]0.8%; 2.0%]	0.9	50%			
26											]2.0%; 5.0%]	2.1	25%			
27											]5.0%; ∞[	5.1	0%			
28																
29											**Beståelseskriteria til hver enkelte modul**				Max antal 0 %	Max antal 25 %
30											Bestået	Præcision og nøjagtighed		60%	1	2
31											Ikke bestået					
32											**Beståelseskriteria til modul 1-4 sammen**					
33											Bestået	Præcision og nøjagtighed		60%	1	2
34											Ikke bestået					

Table 27.5: Assessment scheme for reports

	A	B	C	D	E	F	G
1							
2	**Vurdering rapport**						
3	**Info**						
4	Navn studerende/ gruppe		Skabsnummer			Datum	
5	Modul #		Afleveringsfrist				
6	Øvelse #		Afleveringsdato				
7	**Kriterie**		**Kriterie opfyldt**	**Score**			**Kommentar**
8				Individuelt	Kategori	Weighting	
9	**Forpligtende kriterie**	Afleveringsfrist overholdet	ja	100%			
10		Rapport fuldstændig: Alle felter udfyldt, alle beregninger udført, alle dokumenter præsente (regnearker, grafer, kopi labjournal))	ja	100%			
11		Brug af IT (Reaktionsligninger skrevet med ligningseditor, Beregninger udført i Excell)	ja	100%			
12	**Reaktionsligninger**	Reaktionsligninger rigtig og fuldstændig (alle trin, pKa værdier, i ionform eller stofform)	partly	50%	50%	1	
13	**Data evaluering og beregninger**	Generelle formler præsent og rigtig (udledning af formler fuldstændig og rigtig, symboler rigtige og klare)	ja	100%	100%	1	
14		Beregningerne (koncentration/ indhold, gennemsnit, præcision, nøjagtighed, etc.) fuldstændig og korrekt	ja	100%			
15		Enheder præsente og rigtig	ja	100%			
16		Antal betydende cifre rigtig	ja	100%			
17		Grafiske præsentationer rigtig og fuldstændig (titel, skala, beskrivelse, etc.)	ja	100%			
18	**Statistik**	Korrekt anvendelse af statistik til databehandling og vurdering af	ja	100%	100%		
19	**Usikkerhedsberegning**	Udledning af generelle formler til beregning af den absolutte og relative usikkerhed fuldstændig og korrekt	ja	100%	100%	1	
20		Beregning usikkerheder fuldstændig og rigtig (relativ og absolut usikkerhed, middelværdi af de absolute usikkerheder, usikkerhed på	ja	100%			
21	**IT færdigheder**	Beregninger i Excell er klare (Række-/kolonnensymboler, brugte Excell-formler er opført, indhold af felter er beskrevet)	ja	100%	100%	1	
22		Korrekt brug af Excell-funktioner	ja	100%			
23		Korrekt brug af Word og ligningseditor	ja	100%			
24		Korrekt brug af regneark til databehandling	ja	100%			
25	**Diskussion resultater**	Resultater uddybend diskuteret (kvalitet af resultater, mulige fejlkilde, fordele/ ulemper af analysemetoden, forslag til forbedringer). Studerende demonstrerer dybere forståelse af emnet	ja	100%	100%	1	
26	**Studiespørgsmål**	Besvaret rigtig	ja	100%	100%	1	
27		Uddybend besvaret/ diskuteret	ja	100%			
28		Studerende kan anvende eksperimentelt viden til nye problemstillinger, kan forudsige resultater	ja	100%			
29	**Helhedsindtryk**	Rapport er vel organiseret og ryddelig	ja	100%	100%	1	
30		Den studerende viser overbevisende kendskab til analytiske principper og deres anvendelsesområde, til anvendelse af statistik og IT til databehandling, og kan uddybend diskutere resultater.	ja	100%			
31	**Total score**				93%	bestået	
32	**Score**	ja	100%				
33		nej	0%				
34		partly	50%				
35	**Beståelseskriterium**	Bestået	Total ≥	85%			
36		Ikke bestået	Total <	85%			

28

Planning learning and teaching activities

– the case of the MSc course ”Solving complex management problems”

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Introduction

In this paper I describe the development of the MSc course (7,5 ECTS, elective course) ”Solving complex management problems” (which I plan to suggest to the Department of Food and Resource Economics as a new course). This course is designed for students interested in implementing strategies to adapt to climate change, as well as enhance food security; efficiently using natural resources while reducing CO_2 emissions; driving processes to support the establishment and development of sustainable, local initiatives (e.g. green communities and food networks); and ensuring that nature and its richness are used in a sustainable balance between ecology, economy and society. In the course I will teach students a range of approaches known as Problem Structuring Methods (PSMs) that were designed to address and make progress with complex and uncertain problem situations that involve multiple (conflicting) stakeholders and issues. Those situations are also called “wicked” because it is often not clear what the problem is and how it can be resolved (Rosenhead and Mingers, 2001; Franco and Montibeller, 2010). Such problem situations typically occur in the practice of natural resource management, climate change, environmental sustainability and sustainable development, for which PSMs can be useful. For instance Hjortsø, 2004 used PSMs to support public participation and decision making in natural resource management; White and Lee, 2009 for developing sustainable cities (Bristol in UK in the specific case) through the formation of a sustainability network for the city and production of an outline of a sustainability charter; and Gregory, Atkins, Burdon, and Elliot, 2013 for improving the management of marine biodiversity at a multi-user coastal side in the UK.

Scholars have recently reported their experience with teaching PSMs to students, as well as the challenges they face in teaching PSMs (e.g. Ackerman, 2011; Carreras and Kaur, 2011; Córdoba-Pachón, 2011; Hindle, 2011). In my teaching – I have been teaching PSMs for 5 years in two different courses – I have also experienced those challenges.

In this paper I focus on the challenges of teaching PSMs and describe how I will address them by planning learning and teaching activities in the course ”Solving complex management problems”. I suggest and plan the implementation of learning and teaching activities by drawing and reflecting on PSM and educational literature, as well as my own experience in teaching PSMs and discussions with my colleagues concerning the planning of the course. Focusing on how to address challenges in teaching PSMs through learning and teaching activities is important in order to: (i) enhance students' motivation to actively engage in the activities; (ii) improve learning outcomes for students; (iii) enhance students' abilities and motivation to apply PSMs in practice (e.g. in their academic and professional careers); and (iv) contribute to supporting and improving teaching practice in the PSM community and other disciplines that use PSMs.

Teaching problem structuring methods

Problem structuring methods (PSMs) have been developed to assist stakeholder groups in addressing 'messy' – complex and uncertain – problem situations through participatory and interactive conversations and building of mostly qualitative models on e.g. flipcharts (modelling; Fig. 28.1) (Rosenhead and Mingers, 2001; Franco and Montibeller, 2010). Conversations and modelling are typically facilitated by an expert, external to the stakeholder group, within workshops (Ackermann, 1996; Huxham & Cropper, 1994). Based on stakeholders' expression of perceptions the facilitator builds models (graphical representations usually on flipcharts) representing the problem situation of common concern. Building models helps stakeholders (i) articulate, structure, define and analyze the problem situation; (ii) better understand and learn from the problem situation; and (iii) make joint decisions and achieve agreements on actions for alleviating the problem situation and making progress (Rosenhead and Mingers, 2001;

Franco and Montibeller, 2010). The family of PSMs includes, for instance, Strategic Options Development and Analysis, Strategic Choice Approach, Soft Systems Methodology and the Viable Systems Model (Rosenhead and Mingers, 2001; Mingers, 2011).

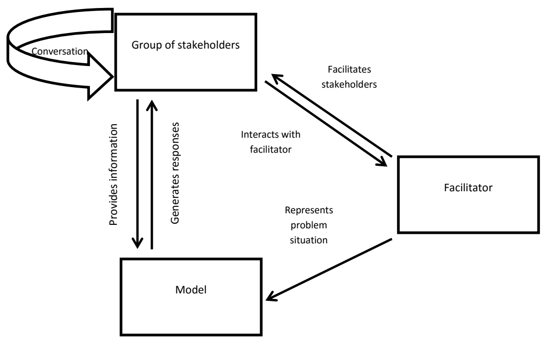

Fig. 28.1: The iterative process of facilitated and model-supported group conversation (adapted from Franco and Montibeller, 2010, p. 495)

Scholars have recently reported and discussed their experience with teaching PSMs to students through the use of modules (including seminars and lectures), case study approaches, laboratory settings and simulations, and group discussions and exercises; literature study, guest speakers, illustrating examples from own and others' experience, reflection, and apprenticeship (e.g. Ackerman, 2011; Carreras and Kaur, 2011; Córdoba-Pachón, 2011; Hindle, 2011). In reporting their experience scholars (e.g. Ackerman, 2011; Carreras and Kaur, 2011; Córdoba-Pachón, 2011) have also highlighted challenges they face in teaching PSMs, such as:

- giving students confidence in not being able to 'solve' the problem and not having the 'right' answer; helping students recognize that for instance helping stakeholders to better understand the problem is also valuable and encouraging students to feel comfortable with the mode of applying PSMs; highlighting the potential of using PSMs for addressing complex and uncertain situations through group dialogue instead of mathematical, optimization techniques;

- teaching methods (e.g. how to build models) as well as facilitation skills (e.g. manage group dynamics, active listening, asking questions) that support students in applying PSMs; teaching facilitation is particularly difficult because much of what a facilitator does while managing workshops is tacit and under articulated, thus difficult to transfer to students;
- teaching theory as well as practice (theory/concepts and methods) covering a broad range of material within the time allocated;
- helping students learn how to deal with complexity rather than reducing it to its elements and trying to address them in turn, and with stakeholders continually changing their understanding of the problem, thereby continuously changing the graphical representation of the problem situation; helping students feel comfortable in dealing with richness and messiness of complex and uncertain problem situations;
- providing students a learning context which resembles the real-management world.

In my teaching – I have been teaching PSMs for 5 years in two different courses (Technology Assessment and Animals and Sustainability; in the form of single lectures) – I have also experienced those challenges. Within ”Solving complex management problems” students will learn about PSMs to solve complex and uncertain problem situations – that are related to the practice of natural resource management, climate change, environmental sustainability and sustainable development – through group dialogue, and how to apply those approaches in practice (in a workshop-format with a group of stakeholders).

Learning and teaching activities

In this section I describe learning and teaching activities – that I identified by drawing and reflecting on PSM and educational literature, as well as my own experience in teaching PSMs and discussion with colleagues on planning my course – aimed at improving learning outcomes. I plan to implement those learning and teaching activities in order to anticipate and deal with the aforementioned challenges of teaching PSMs. Different learning and teaching activities that help achieve the intended learning outcomes of ”Solving complex management problems” can be suggested, specifically:

Learning and teaching activity	**Intended learning outcome**
Lectures and reading assignments	List, describe, explain theory, methodology, techniques and approaches
Group discussions	Apply participation and oral communication in practice
Group exercises in class and group project work (to be submitted in a written format by the end of the course)	Collaborate in interdisciplinary teams; analyze and understand complex settings and issues; propose and manage solutions; formulate, plan and implement projects; design, lead and manage group processes to tackle problem situations; discuss and collaborate to reach consensus; identify suitable approaches to address particular problems; and communicate in a written format
Feedback sessions with peers and the teacher on group exercises and project work	Any of the intended learning outcomes above can be addressed depending on the group's specific needs and wishes for feedback

In the following I specifically outline how I plan to carry out feedback sessions and group work. Feedback and group work are particularly important in the context of ”Solving complex management problems” because they help students monitor their progress and development as learners and members of a group; identify challenges and possibilities for improvement necessary for learning and successfully completing the course; address the challenges in learning how to use PSMs outlined above; and enhance the chances of producing quality work and perform at the exams.

Feedback sessions

In the course ”Solving complex management problems” I plan to organize sessions in which formative feedback is given to students. Formative feedback is particularly useful for enhancing student's learning because it is based on forward-looking reactions to accomplished products and those that still need to be finalized (Rienecker and Bruun, 2015). Below I describe three opportunities (inspired by of Edinburgh, 2010) for using formative feedback, which I plan to implement in my course.

Self-assessment of group work

In my course groups of students design and formulate a project report to be handed in prior to the exams. At the beginning of the project I give students two self-assessment forms – based on the learning outcomes of the course, project requirements and academic practice, which they can use to continuously assess and discuss their own progress within the groups. The forms consider skills to manage the process of group work (A1) and the content and structure of the final project report (A2), thus allowing for the challenges in teaching methods as well as facilitation skills, and theory as well as practice to be addressed. The students are encouraged to use the forms for continuously assessing their own performance and share and discuss it with other members of their groups in order to identify opportunities for adaptation and improvement at individual as well as group levels. While and after assessing progress students are welcome to ask me for feedback on their assessment and progress, which is either given online (in a written format), during face-to-face discussions or through audio-records (that can be replayed by students; students have the opportunity to audio-record my oral feedback e.g. with their mobile phones). The students are given the opportunity to choose a form of feedback and are also encouraged to specify which aspects and parts of the assessment/progress my feedback should address.

Teacher's written feedback on the project report

If specifically asked by the students I also provide written feedback on selected parts of the project report (when other types of feedback are not meeting the intended learning outcomes of specific groups). My written feedback aims at outlining opportunities for improvement by spotting gaps and providing theoretical, methodological and/or practical guidance illustrated with examples from my practical and academic experience. Overall, the suggested improvements prioritize two or three points that the students can feasibly make progress on. When necessary my written feedback also addresses the challenges of teaching PSMs mentioned above.

The groups are in charge of clarifying when such feedback is needed, contacting me and indicating in advance which comments they would find most helpful. Students are encouraged to discuss and reflect on my comments across groups in class time assigned for project work (e.g. what my comments might mean, why they might be important and how they might be acted upon).

Peer-feedback of group work

Peer-feedback of group work comprises a mid-project and an end-project session, within which two groups present and comment on each other's project work. During a one hour session one group presents its work, project status and need for feedback (students are encouraged to specify what they need feedback on) to the peer-group and the teacher, followed by feedback by the peer-group and the teacher (30 min. per group). Feedback may also, depending on the group's need for feedback, be based on the self-assessment forms (A1 and A2). Then the groups switch roles. The feedback sessions are supervised by the teacher. Groups are encouraged to specify which aspects and parts of the work the feedback should address, and to continue the feedback sessions independently either face-to-face or online after the sessions (also after reading each other's work). When necessary and depending on the group requirements the feedback also addresses the challenges of teaching PSMs mentioned above.

Group work

In the course "Solving complex management problems" I plan to combine lectures in which I introduce different PSMs and how they are applied in practice with group exercises in which students apply those PSMs (or parts of them) for addressing assigned problems and delivering specified products. Additionally, groups of students apply PSMs for addressing a complex and uncertain problem situation of their choice (in agreement with the teacher), and write and submit a project report. In planning and carrying out group work I draw on literature describing problem-based and project-organized teaching (e.g. Krogh and Wiberg, 2015), group work (e.g. Christensen, 2015) and teaching PSMs (e.g. Ackerman, 2011).

The learning outcome of group work depends on students' ability to collaborate, which can be enhanced by establishing a collaboration framework in advance, describing how collaboration should take place (Krogh and Wiberg, 2015). In my course a collaboration framework is developed by each group for writing the project report according to the concept of 'student directed' organization. Student groups, thus, set independently their agenda, manage and define their project, and take ownership by defining and processing group issues. Each group is required to send a written collaboration framework to the teacher by mail (by Tuesday of week 5), to which feedback (e.g. on the content of the framework and the process of the group work) is provided depending on the group's specific need for feedback (Krogh and Wiberg, 2015). The collaboration framework must include the following aspects and deliverables:

Content of the project	one-pager describing the problem situation the group will address based on key-words related to the definition of complex and uncertain problem situations; which approach the group will use for addressing a particular problem situation, why the group has chosen the approach and what is the aim of applying it
Mode of facilitation	facilitation by one or different members in turn; names
Timeframe	literature review, application of PSMs, writing of project report
Tasks and deadlines	who is doing what and by when
Workshop	from week 5 each group is required to independently (outside class hours) apply the chosen approach to address the problem situation within a facilitated workshop, which is audio- and video-recorded. The audio- and video-records will be used for presenting the project work in class including aspects of group facilitation, group dynamics, building and analyzing models, as well as challenges and benefits of using the selected approach

I acknowledge that the suggested learning and teaching activities have not yet been implemented in the course, however I based my argumentations on PSM and educational literature, as well as my own experience in teaching PSMs and discussions with my colleagues concerning the planning of the course.

References

Ackerman, F. (2011). Getting "Messy" with Problems: The Challenges of Teaching "Soft" OR. *Informs Transactions on Education*, *12*(1), 55–64.

Ackermann, F. (1996). Participants' perceptions of the role of facilitators using group decision support systems. *Group Decision and Negotiation Journal*, *5*(1), 93–112.

Carreras, A. L. & Kaur, P. (2011). Teaching Problem Structuring Methods: Improving Understanding Through Meaningful Learning. *Informs Transactions on Education*, *12*(1), 20–30.

Christensen, G. (2015). Group work. In J. D. L. Rienecker P.S. Jorgensen & G. Ingerslev (Eds.), *University teaching and learning* (pp. 189–199). Samfundsliteratur.

Córdoba-Pachón, J. R. (2011). Abstracting and Engaging: Two Modes of Systems Thinking Education. *Informs Transactions on Education*, *12*(1), 43–54.

Franco, L. A. & Montibeller, G. (2010). Facilitated modelling in operational research. *European Journal of Operational Research*, *205*(3), 489–500.

Gregory, A. J., Atkins, J. P., Burdon, D., & Elliot, M. (2013). A problem structuring method for ecosystem-based management: The DPSIR modelling process. *European Journal of Operational Research*, *227*(3), 558–569.

Hindle, G. (2011). Teaching Soft Systems Methodology and a Blueprint for a Module. *Informs Transactions on Education*, *12*, 31–40.

Hjortsø, C. N. (2004). Enhancing public participation in natural resource management using Soft OR – an application of strategic option development and analysis in tactical forest planning. *European Journal of Operational Research*, *152*(3), 667–683.

Huxham, C. & Cropper, S. (1994). From Many to One – and Back. An Exploration of Some Components of Facilitation. *Omega*, *22*(1), 1–11.

Krogh, L. & Wiberg, M. (2015). Problem-based and project-organised teaching. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed., pp. 215–227). Samfundslitteratur.

Mingers, J. (2011). Soft OR comes of age – but not everywhere! *Omega*, *39*(6), 729–741.

of Edinburgh, U. (2010). Enhancing feedback: Ideas, strategies and case examples. Accessed: 22-02-2016. Retrieved from http://www.enhancingfeedback.ed.ac.uk/staff/resources.html

Rienecker, L. & Bruun, J. (2015). Feedback. In L. Rienecker, P. S. Jørgensen, J. Dolin, & G. H. Ingerslev (Eds.), *University teaching and learning* (1st ed.). Samfundslitteratur.

Rosenhead, J. & Mingers, J. (2001). *Rational analysis for a problematic world revisited. problem structuring methods for complexity, uncertainty and conflict*. John Wiley & Sons Ltd.

White, L. & Lee, G. J. (2009). Operational research and sustainable development: Tackling the social dimension. *European Journal of Operational Research*, *193*(3), 683–692.

A Self-assessment of group work – management of the process

This form is useful for continuously assessing, adapting and improving your own skills and those of the group to manage group processes. Please use this form to assess YOUR OWN, personal performance in managing the process of the group work. You are encouraged to share and discuss your assessment with the other members of your group.

SKILLS	EXCELLENT ATTAINMENT OF CRITERIA	Excellent = 5	V. good = 4	Good = 3	Acceptable = 2	Poor = 1	FAILURE TO ATTAIN CRITERIA
Collaborative, Interactive and Supportive skills	Creates a safe environment; encourages free exchange of ideas; respects others' roles/responsibilities; empathic to other members; listens actively; contributes with own perspectives; excellent at negotiation and conflict resolution.						Very critical of others; makes minimal guarded contributions only; insensitive to others; speaks too much and does not hear others' contributions especially if they conflict; confrontational or denies conflict.
Leadership skills	Excellent contribution to ideas, defining objectives, shaping and planning work; builds and motivates the team.						Makes no significant contribution to ideas, defining objectives, shaping and planning the work; no attempt to encourage others.
Implementation skills	Outstanding ability to put ideas into action; evidence of extensive self-directed learning; can be relied upon to complete and on time.						No significant contribution to implementation of plans; very limited evidence of self-directed learning; work brought back to the group is low quality, incomplete or late.
Evaluation skills Adaptability	Demonstrates reflective practice; evaluates progress and results; adapts in light of evaluation or changing circumstances.						Does not evaluate progress or results; finds it difficult to adapt plans even when progress is poor or circumstances alter.

Table 28.1

B Self-assessment of group project report – content and structure

Before you hand in your final project report, please as a group give a rating of how confident you are that you have met each of the criteria: (C = Completely confident; P = Partially confident; N = Not at all confident) and adapt your report accordingly

	C	P	N
Addressed the problem situations throughout the report?	□	□	□
Described problem situation from a holistic perspective?	□	□	□
Clarified need for problem solving and application of PSMs?	□	□	□
Achieved match between problem situation to address and choice and description of PSM(s)?	□	□	□
Choice of PSM(s) justified and explained?	□	□	□
Organized it clearly with structure appropriate to problem situation?	□	□	□
Synthesized a range of material into a coherent whole?	□	□	□
Provided applicable recommendations to client and justified?	□	□	□
Checked for spelling and grammar?	□	□	□
Written in an appropriate academic style (references, citations, structure)?	□	□	□

Table 28.2

29

Evaluating the impact of peer feedback on student presentations

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Summary. The aim of this project is to restructure the course *Cognitive Science 1* that I taught in autumn 2015 at the Humanities faculty at the University of Copenhagen. In particular, given my reflections on last year's evaluation, I wanted to increase the benefit of student oral presentations by evaluating the effectiveness of peer assessment.

The effect was evaluated through a questionnaire in the middle of the course, overall peer feedback response rate, the course evaluation and a focus interview at the end of the course. Peer feedback was overall considered beneficial, but enough time needs to be allocated for it during class.

Introduction

Peer assessment has been increasingly used in higher education. There is evidence in the literature that students benefit when provided opportunities to give feedback to, and receive from, their fellow students.[1] For instance, peer feedback processes help "to develop skills such as critical reflection, listening to and acting on feedback, sensitively assessing and providing feedback on the work of others. Students can learn not only from the peer feedback itself, but through meta-processes such as reflecting on and justifying what they have done" Liu and Carless, 2006. However, peer assessment needs a supportive classroom climate McMillan, 2013.

Peer assessment comes in many different forms McMillan, 2013 (chapter 22): quantitative (involving students in grading), qualitative (giving rich

[1] http://www.enhancingfeedback.ed.ac.uk/staff/resources/involvingstudents.html

feedback), or both. It can be used as tool for feedback both in offline (in class) or online (e-learning) scenarios, and involve either formative or summative assessment, or both.

The aim of this project is to evaluate the effect of restructuring the course *Cognitive Science 1*, in particular, assessing the effectiveness of peer assessment on student oral presentations. I focus on qualitative peer feedback as formative assessment tool.

Description of the course

The course is a compulsory Master level course running in block 1 for first-year Master students of IT & Cognition at the Faculty of Humanities. The aim of the course is twofold: i) to provide an introduction to research areas related to Cognitive Science (Language, Learning, Vision, Memory); ii) to equip students with the ability to present research papers in computational cognitive science.

In each class, a group of students is responsible for presenting a research paper. This is directly linked to and prepares them for the exam, which is oral, however, presentations are individual. During the 30 minutes exam, the student presents a research paper, followed by a discussion.

Evaluation of last year's class

The evaluation of the course of the previous year (2014)—as I've obtained by going through the feedback obtained from the official evaluation form—indicated three major issues:

1. limited benefit of student presentations,
2. very different expectations of students to the content of the class, and
3. non-coherent presentations of topics.

Consideration for restructuring the class

In order to address the issues outlined above, I tried to restructure the content of the class (addressing points 2 and 3), and added peer assessment (point 1), as discussed next.

The content was made more coherent by planning the entire class ahead of time. This was not possible last year because I was given only two weeks to prepare the class (which contributed to point 3). Coherence can be also improved by always setting a lecture into the 'big picture' (why do we touch upon this now? How does it relate back to the overall course?). Related to this is to link content to the course outcomes and the overall study program, inspired by *constructive alignment* Biggs and Tang, 2007. I have implemented this during class by motivating every new topic and putting it more explicitly into the broader perspective, i.e., by making references to similar topics discussed in other courses in the program (vision processing, scientific programming, or follow-up classes like language processing 2), or linking back to prior content. Also, when guest lecturers were involved I was always present and I briefed them before their lecture on related topics that we have already seen in class. This overall approach of 'setting the scene' worked very well as gauged from direct feedback obtained from the students during the course, which is an invaluable resource of information to improve one's own teaching.

Reducing non-coherence provides an indirect mechanism for aligning expectations. Diverging expectation were less of an issue this year, most probably due to the better planning. In addition, last year's course content was overloaded (e.g., the inclusion of hands-on practical exercises at the beginning of the class, now entirely diverted to other compulsory modules that focus on hands-on material). These observations support the importance of constructive alignment during the entire teaching phase, from planning a course to the actual final assessment.

As became clear from last year's evaluation, the students felt there was only limited benefit from student presentations. As discussed by Goering Goering, 2003, major issues that arise from student presentations are: i) students underestimate what it takes to prepare a good presentation; ii) students are not engaged to learn from their peers.

Therefore, this year the entire second lecture was devoted to a discussion of how to give a good research talk, to prepare the students for the following presentations. This was part of the implicit 'didactical contract', which was set in the first two lectures. In addition, peer assessment was used.

After each presentation, the students were given 5 minutes to complete the peer evaluation form (online form). The peer feedback was non obligatory and anonymous. Students had to present papers twice. During the first round the focus was on presenting the article in a concise manner (content and delivery). In the second round, every group was instructed to add a critical remark/reflection. This change was also reflected in the peer assessment form, by adding questions and comments on how the critical assessment was incorporated and discussed (the final peer assessment form is in the appendix; it was inspired by a template from a course at the University of Edinburgh[2]). I hypothesize that if peer feedback is successful, then the response rate will remain stable throughout the course.

Implementation

In order to evaluate the effect of the strategy the following data was collected in the course run in 2015 (there were 26 students in the first class, two dropped after the second lecture, hence, $n = 24$):

- questionnaire after the first five presentations (first half of groups) to evaluate the on-going peer assessment; 76% of the present students participated;
- a focus interview at the end of the course; 4 participants volunteered, we assume that they belong to the more engaged students and are thus not representative for the course as a whole.
- the overall course evaluation as an optional online questionnaire;

Furthermore, the following data was available after the course:

- collected peer assessments,
- response rate,
- class attendance.

29.1 Analysis and Results

Questionnaire

The results from the questionnaire show a positive effect of peer feedback (Figure 29.1):

- 81% felt that they did learn very much or a lot from their classmates' presentations
- a clear majority, i.e., 62%, thought that it is beneficial to have peer feedback

[2] http://www.inf.ed.ac.uk/teaching/courses/dnlg/presentations/peer-review-form.ps

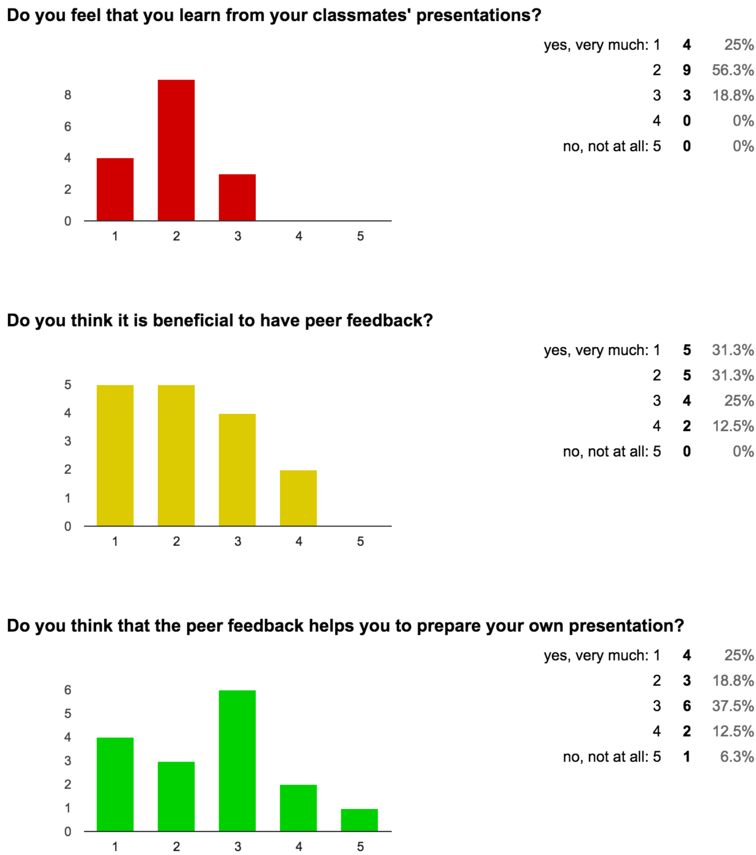


Fig. 29.1: Feedback after first set of presentations.

- whether peer feedback helps to prepare the student's own presentation was not as clear; still 43.8% said it helps, 18.8% said it does not, while 37.5% gave a neutral response.

The following two excerpts are responses to the open question of what works well / does not work well with peer feedback:

> *I think it works well to comment on the content of the presentations, and the format of slides, but not to comment on stuff like how nervous people were. I do not think that this will help anyone to be*

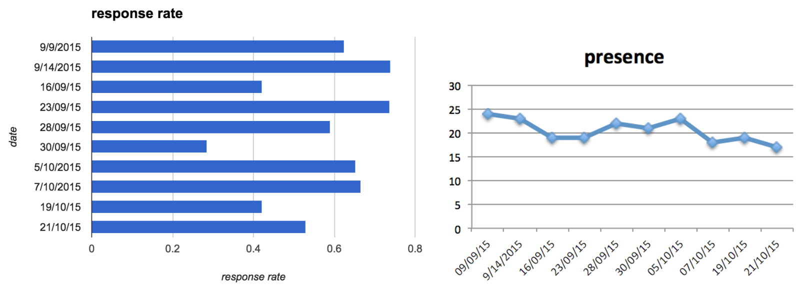


Fig. 29.2: a) Response rate in peer feedback. b) Presence in class.

less nervous the next time. You also mentioned that the new survey will focus more on content, which is very good :)

Some of the comments touch upon the issue of timing:

Usually there is not a lot of time left to give feedback in the end. It would be nicer to have 5 minutes after a presentation to give the feedback but usually the timing does not work out that fine.

In fact, in two lectures, i.e., 16/09 and 30/09, there was no time left at all to give feedback in class. This mainly explains the large drops in response rate, as shown in Figure 29.2 (left).

Participation and response rate

Figure 29.2 (right) shows class attendance. Although presence was not obligatory, students followed the class on a regular basis. Only two students dropped out after the first two lectures. There was a slight drop for the last two lectures after the autumn break (two students indicated beforehand that they would not be able to attend).

The response rate remained on a relatively constant level. The response rate during the first lecture was 62%. On average over all 10 sessions, the response rate dropped to 57%. However, if we disregard the the two classes where time fell short (16/09 and 30/09), the average response rate is 62%. Thus, the response rate remains stable, which supports the positive feedback of peer feedback.[3]

[3] We do not discuss the overall collected peer assessment scores that students gave to their peers, but note that there is no significant correlation between scoring and response rate ($\rho = .19$).

Course evaluation

Unfortunately only a single student provided feedback on the course through the faculty-issued course evaluation form, thus the following provides only a very biased picture. This again shows that it would be better to allocate time in class to gather the feedback.

The standard course evaluation form includes only one question on benefit of student presentations. I briefly discuss its outcome next.

The student indicated to have attended 100% of the lectures, and was extremely satisfied with the subject, reporting a high benefit of student presentation (gave a score 2 out of 5, where 1 is very high). The student felt that the presentations help to build up confidence for the exam:

> *It is nice that we were divided into groups at the start of the semester. I think the student presentation part of the course has been very nice (even though it is bit intimidating presenting a scientific paper in front of the class, but I guess that helps build some confidence for the oral exam).*

Focus group feedback

Four students volunteered (2 Danish participants and 2 from abroad). The 1:1 interviews were held in December 2015, a month after the end of the course. All of the students agree that it is beneficial to give student presentations in the first semester, i.e., “to bring everyone on the same level", or “to practice for the exam". However, the benefit of learning from (listening to) student presentation was mixed, i.e., “it really depends on who is presenting it", or, “I didn’t gain so much from the presentations, because I was only listening and not forced to work with the material itself". Despite this, all students liked the peer feedback. One of them liked the feedback from the second round more, where the focus shifted towards content. Most of the students liked the fact that the feedback is in written form and especially appreciated the comment section. One suggestion regards: “[peer feedback] is beneficial, but maybe pick out a point or two on which the feedback will focus on". The students appreciated having a lecture devoted to presentation skills in the beginning of the course.

Exam

From the $n = 24$ students, 22 attempted the exam in January 2016 (one student followed the entire course although he didn’t need credits, and one student was absent due to illness). I felt that the students were overall very well prepared, some of them delivered excellent presentations and engaged it a discussion at a very high level. All 22 student passed the exam (last year, two students failed at the first attempt). This further supports the effectiveness of the many considerations taken into account for this year's class.

Conclusions

This project evaluated the effect of peer assessment on student oral presentations during a first-year Master levels course. Peer feedback was perceived to be beneficial, and response rate remained on average constant. One concrete pedagogical challenge in peer feedback is allocating sufficient time for feedback.

In addition, an important pedagogical lesson that I have learned during the course of this project is that many of the issues that may arise during teaching all go back to *misalignments*. Its consequences manifest themselves in many different forms, from diverging expectations, reduced engagement, disturbed climate in the classroom, which in turn might hinder feedback, to, ultimately hampered student efficacy and learning. It is thus of major importance to plan a course well ahead, get to know the students in the first weeks, set the didactical contract and link expected outcomes, content and assessment.

References

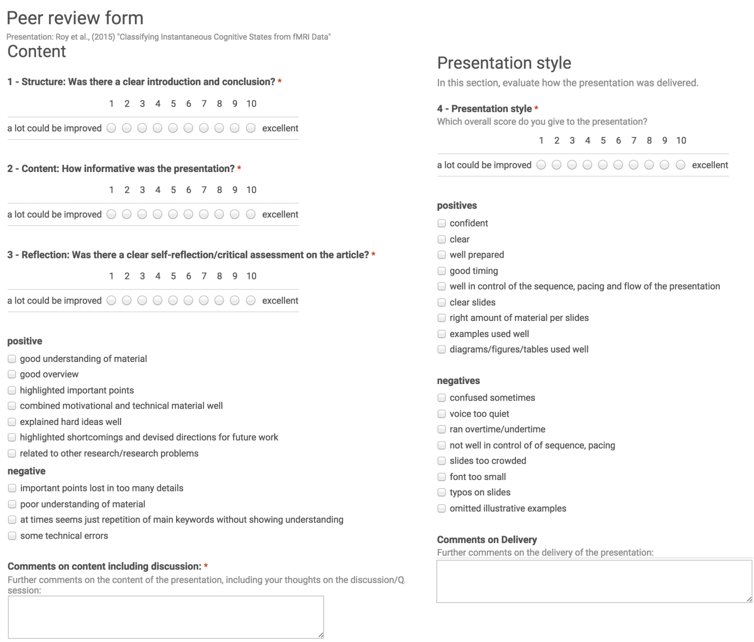
Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university* (3rd ed.). Open University Press/McGraw Hill.

Goering, L. (2003). Planning student presentations.

Liu, N.-F. & Carless, D. (2006). Peer feedback: the learning element of peer assessment. *Teaching in Higher education*, *11*(3), 279–290.

McMillan, J. H. (2013). *Sage handbook of research on classroom assessment*. SAGE Publications, Inc.

A Appendix



Peer review form

Presentation: Roy et al., (2015) "Classifying Instantaneous Cognitive States from fMRI Data"

Content

1 - Structure: Was there a clear introduction and conclusion? *

1 2 3 4 5 6 7 8 9 10

a lot could be improved ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ excellent

2 - Content: How informative was the presentation? *

1 2 3 4 5 6 7 8 9 10

a lot could be improved ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ excellent

3 - Reflection: Was there a clear self-reflection/critical assessment on the article? *

1 2 3 4 5 6 7 8 9 10

a lot could be improved ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ excellent

positive

- ☐ good understanding of material
- ☐ good overview
- ☐ highlighted important points
- ☐ combined motivational and technical material well
- ☐ explained hard ideas well
- ☐ highlighted shortcomings and devised directions for future work
- ☐ related to other research/research problems

negative

- ☐ important points lost in too many details
- ☐ poor understanding of material
- ☐ at times seems just repetition of main keywords without showing understanding
- ☐ some technical errors

Comments on content including discussion: *

Further comments on the content of the presentation, including your thoughts on the discussion/Q session:

Presentation style

In this section, evaluate how the presentation was delivered.

4 - Presentation style *

Which overall score do you give to the presentation?

1 2 3 4 5 6 7 8 9 10

a lot could be improved ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ ◯ excellent

positives

- ☐ confident
- ☐ clear
- ☐ well prepared
- ☐ good timing
- ☐ well in control of the sequence, pacing and flow of the presentation
- ☐ clear slides
- ☐ right amount of material per slides
- ☐ examples used well
- ☐ diagrams/figures/tables used well

negatives

- ☐ confused sometimes
- ☐ voice too quiet
- ☐ ran overtime/undertime
- ☐ not well in control of of sequence, pacing
- ☐ slides too crowded
- ☐ font too small
- ☐ typos on slides
- ☐ omitted illustrative examples

Comments on Delivery

Further comments on the delivery of the presentation:

Fig. 29.3: Peer feedback form used in the second half of the class.

Part VII

Student motivation and learning

30

Om jura, ønsker, drømme og håb og om at walke the talk

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University of Copenhagen

Juraundervisningens problem

En ukendt skribent af bloggen *Kaffe-Café* skriver om sit jurastudie:

> Som studerende kan det være overordentlig svært at holde fokus på den boglige indlæring – specielt op til eksaminerne hvor der skal læses utroligt mange 100-siders kedelig teori. Man bliver simpelthen så forfærdelig tung i hovedet af at sidde time efter time og stirre ned i de støvede gamle bøger. Hvis man er jura-studerende skal man igennem side efter side med paragraffer, juridiske ideer og gennemgang af tidligere sager osv.. Det bliver simpelthen for kedeligt i længden. (http://kaffe-cafe.dk/jura-undervisning-pa-podcast).

Det er ikke en af mine studerende, tror jeg, men udsagnet virker ikke overraskende på mig. Højesteretsdommer, professor og dr. jur. Jens Peter Kristensen skriver tilsvarende i en kronik i Jyllandsposten fra 2012: *Mange ældre jurister kan fortælle, at de i deres studietid syntes, at jurastudiet var en ørkenvandring"*. Jens Peter Kristensen fortsætter dog

> Men bagefter – da de skulle bruge uddannelsen i det virkelige liv – kom de ud af ørkenen og ind i oasen. Jura viste sig at være særdeles spændende. Sådan er det, fordi jura handler om alle sider af menneskelivet. Alle livsforhold har en juridisk side. [. . .] Juraen handler om menneskenes liv fra vugge til grav. (se http://jyllands-posten.dk/debat/kronik/ECE4872829/Er+jura+kedeligt%3F+)

Det, Jens Peter Christensen skriver, er utvivlsomt rigtigt. Juraen handler om menneskers liv fra vugge til grav. Hvorfor opleves retsregler og juraundervisning så ofte som uvedkommende eller kedelig? Det er et kerneproblem jeg har arbejdet med de senere år, og det følgende beskriver nogle af de overvejelser jeg har haft omkring min undervisning, nogle af de steder jeg har hentet inspiration til undervisningsudviklingen og det fokus jeg har forsøgt at lægge, for at komme ”ørkenvandringen” og ”den kedelige teori” til livs. Det som jeg kalder kerneproblemet, har mange facetter og ansigter og derfor også mange mulige løsningsstrategier. Min egen analyse identificerer tre væsentlige aspekter, som jeg har prøvet på forskellig vis at adressere:

- Det bliver let pligtstyret for de studerende – ikke behovsdrevet.
- Der kommer let fokus på lovgivningens regler – ikke virkelighedens problemer.
- Det kommer let fokus på de studerendes undervisningssituation – ikke menneskers livssituationer.

Om pligtstyret undervisning og lærer-induceret motivation

Der er meget fokus på sammenhæng mellem erhvervslivets behov for arbejdskraft med kompetencer, uddannelsernes mål, kursernes rolle i uddannelsernes mål, eksemernes rolle i forhold til kursernes mål og delmål, lektionernes mål, de enkelte opgavers mål, osv. Det er vigtigt med målstyring og alignment, og jeg har selv gjort en stor indsats for at forstå og integrere alle målene til en lang sammenhængende kæde på de kurser jeg er med til at planlægge og undervise på.

Men, alt det gode arbejde med alignment har flere bagsider. En af dem er, at det levner meget lidt plads for de studerendes egne selvoplevede mål og behov. De studerendes mål for deres eget liv der hvor de er lige nu, ligger ikke altid indenfor den etablere mål-kæde fra uddannelsesstart til arbejdsliv. Vi mister altså let det drive og den motivation der ligger i, at et kursus umiddelbart kan opfylde nogle af de studerendes egne mål, ønsker og behov. En del at undervisningstiden bruger vi så på at få de studerende til at forstå at de har behov for den viden vi kommer med. Vi bruger tid på at ”gøre det relevant” for de studerende, det som vi underviser i.

Det påvirker undervisningssituationen negativt, tror jeg, at vi nogle gange både skal give de studerende de problemer de skal arbejde med, forklare dem relevansen af problemerne, og hjælpe dem med at løse dem. Det berømte Kirkegaard-citat om at man må tage udgangspunkt i den man gerne vil undervise eller hjælpe kan på sin vis rammesætte problemet:

> At man, naar det i Sandhed skal lykkes En at føre et Menneske hen til et bestemt Sted, først og fremmest maa passe paa at finde ham der, hvor han er, og begynde der.

Hvordan kan vi nærme os den situation i juraundervisningen?

Om regelfokus i modsætning til fokus på den reale virkelighed

Siden den verdensberømte danske retsfilosof Alf Ross satte sit præg på den danske retskultur, har retsdogmatik – dvs. retsregler og deres indhold – været tillagt en afgørende vægt i arbejdet med retten. Vi betoner at jura ikke er det samme som moral eller sund fornuft. Vi bruger den blindede Justitita som billede på ambitionen om en nøgtern, retfærdig og ikke-følelsesmæssig retsorden. Titlerne på vores kurser angiver implicit også, at retsregler er det primære fokus. Kurset med titlen *Miljø- og planlovgivning* er et godt eksempel. Der er fra dag 1 både hos de studerende og os undervisere helt naturligt først og fremmest fokus på lovgivning og retsregler. Den juridiske metode opøves primært med hensyn til at identificere og anvende de rette retsregler.

Men den, der skal tage stilling til et andet menneske handlinger, f.eks. en dommer eller en kommunal sagsbehandler, står i virkeligheden i en langt mere nuanceret og komplekst situation end blot overfor et spørgsmål om, hvorvidt handlingen falder ind under den ene eller anden lovregel. Juraen vedrører den enkeltes liv i relation til fællesskabet – fordelingen af pligter og rettigheder, kompetencer og magt. Retsreglerne er kun vigtige, fordi de betyder så meget for de her ting i fællesskabet, fordelingen af pligter og rettigheder, kompetencer og magt og menneskers liv. Det er den oplevede virkeligheds problemer, der er det betydningsbærende for mennesker - Ikke reglerne i sig selv. Hvordan kan den oplevede virkelighed blive omdrejningspunktet for juraundervisningen?

Om undervisning i modsætning til det levede liv

Traditionel juraundervisningen lider ligesom meget anden traditionel undervisning af at være fjernet fra virkeligheden. Det bliver ikke mere end hvad det er – nemlig undervisning. På et af mine kurser har jeg brugt den samme opgave i flere år til at belyse reglerne om anmeldelse af jordflytninger. En del af opgaven lyder således:

Blandt borgerne i Hillerød er der både initiativ og virkelyst. Hansen er gået tidligt på efterløn efter et 22-årigt hårdt arbejdsliv som gymnasielærer i matematik. Han har nu god tid til at lægge stenene om i sin indkørsel på Stenholtvænget 10 i Hillerød. Han får 1,0174926 m3 jord til overs, og aftaler med sin gode nabo Major D. Umber at køre jorden over i dennes have på Håndværkervænget 15. Hansen kender alle regler til punkt og prikke, og da de bor i byzone, anmelder han flytningen til Hillerød Kommune. Hansens kone Realisabet siger, at det da ikke kan være nødvendigt.... Hvem har ret – Hansen eller konen?

De fleste der enten har undervist eller modtaget undervisning, kender formen. Læreren – som her er mig – prøver at være lidt morsom i konstruktionen af opgaven. Den gode tanke er at det skal være lidt fornøjeligt for de studerende at arbejde med de her regler om anmeldelse af jordflytninger. Nogle studerende leger da også med på legen, og skriver i deres besvarelse sætninger som *Enhver ved da at konen altid har ret.* De fleste skriver dog bare en simpel besvarelse.

Men grundlæggende er opgaven en fallit. Den signalerer flere negative ting – f.eks. at emnet anmeldelse af jordflytninger ikke er vigtigere for mig eller andre, end at jeg kan latterliggøre det. Den signalerer også, at det er vigtigere, at de studerende kender reglerne, end at de kan vurdere en virkelig situation. Endelig så viser den, at jeg via min kommunikation til dem gennem opgaven hellere vil benytte lejligheden til at fortælle dem en vittighed end involvere dem i en væsentlig problemstilling. Opgaven er super velegnet til at illustrere stoffet og regelanvendelsen. Men, den drejer sig 100 % om undervisning og ikke om levet liv. Hvordan kan undervisning da blive andet end undervisning?

Det store pædagogiske problem

Som jeg ser det, er de væsentligste problemer ved undervisning altså ikke de teknisk prægede problemer. Det er ikke et spørgsmål om nøje tilrettelagte didaktiske forløb. Det er ikke et spørgsmål om taxonomier og progression, deltagerforudsætninger eller lektionsplanlægning. Selvfølgelig betyder de ting rigtig, rigtig meget for en velfungerende undervisning, men det er langt hen ad vejen nogle praktikaliteter der forholdsvist let kan arbejdes med via modeller og skabeloner udviklet af en selv eller andre.

Den vanskelige, men også den mest spændende tankemæssige udfordring, er for mig at flytte samværet med de studerende fra et samvær om pligtstyret undervisning i retsregler til et virkelighedsnært og behovsdrevet samvær om livssituationer. Her ophæves skellet mellem kurset og juraen som disciplin på den ene side og så dem vi er og det liv vi lever på den anden. Her sker der en sammensmeltning af metode og materie, fag og form, budskab og budbringer.

Virkelighedens drama ind i auditoriet – autencitet, nærvær og engagement

Mit fag, jura, er et spørgsmål om menneskers gøren og laden, om liv eller død, retfærdighed, hævn, idealer og magt, aspirationer og håb – ikke om love og §§. Det er det, der skal være det bærende element i undervisningen. Og sådan er det også i højere grad blevet, jo mere jeg har arbejdet med det. Først og fremmest bygger jeg nu undervisningen op om konkrete sager med virkelige mennesker involveret. Ikke anonymiserede, ikke konstruerede, ikke sager afgjort i højesteret af advokater og dommere, men sager om almindelige menneskers ønsker og genvordigheder.

Der er altid meget mere på spil for de involverede, end det juraen reducerer tingene til. Det er det ”mere” der gør juraen relevant for mennesker. Det er det ”mere” jeg kredser om og bygger min undervisning op på at de studerende skal se – ikke ved at sige det og forklare det, men ved prøve at lade at sagerne og situationerne og min egen tilstedeværelse vise og formidle det, ved sympati med og indlevelse i de impliceredes situation.

Hegnet i Riisskov kalder jeg en af sagerne. Her vil en kvinde så forfærdeligt gerne slippe af med kommunens læhegn på nabogrunden. Sådan et ønske kan gøre juraen vigtig - Et menneskes drøm. En mængde beslutninger truffet af andre mennesker over et vældigt tidsspand har ført til, at der i dag ikke er aftensol i hendes have. Vi ser på sagen. Læser hendes brev til Naturstyrelsen og sagsbehandlerens svar. Sagen er nærværende fordi vi kan leve os ind i hendes situation - Og sagsbehandlerens, Christian Bell, der sidder i et studenterjob hos styrelsen. Og kommunens skovfoged, der har plantet læhegnet som en del af et skovrejsningsprojekt. Kvinden hedder Bente Koldby og vi kan se huset på Google street-view. Der er drømme på spil her – også om hvordan tingene ”bør være”. Ønsker til tilværelsen som haveejer i Danmark og vores fælles system for hvordan det afgøres hvad man må og ikke må, hvem der skal leve på sol- og skyggesiden og hvem, der er forpligtet til hvad. Vi synes alle sammen noget om Bente, Christian, læhegnet, skovrejsningsprojektet og alt det andet.

Hegnet i Riisskov er en god sag der bringer virkelighedens drama ind i auditoriet. Filosoffen Spinoza skriver i sin bog om etik, at vejen til indsigten i Gud går igennem indsigten i det singulære - Det unikke menneske og den øjeblikkelige hændelse (Ljungstrøm, 2000, p. 3). Her har casestudiet sin enorme værdi (Krogh, Stentoft, Emmersen og Musaeus, 2013, Kapitel: Casebaseret undervisning). Hegnet i Riisskov er et svar på hvordan den oplevede virkelighed kan blive et omdrejningspunkt for juraundervisning.

Sammenhængen mellem fag, fokus og formidling - Walk the Talk

Man kan beskrive tingene på et slide, men man kan også vise det og være det. Walk the Talk, som det kan formuleres.[1] Hvis jeg nu siger at vi skal være færdige med Jansens problem inden pausen for at følge min plan for den pågældende undervisningsgang, så gør jeg jo pausen vigtigere end Jansens problem, og de ønsker og håb til hvordan fremtiden skal se ud, som de implicerede i Jansens sag har. Pausen bliver også vigtigere end de studerendes indsigt. En pause skal jo ikke være vigtigere end at forstå hvorfor et menneske i Skive ikke kan realisere sin drøm.

Og rigtig mange drømme er på spil i jura – det skal de studerende opleve. Drømme om at blive rig eller fange en fisk i sin egen sø eller bo i et hus med havudsigt, redde en næsten uddød sommerfugl eller drikke en stille øl på sin terrasse - i solen og ikke i skyggen af naboens elmetræ. Det er dem, der er vigtige. Ikke pensum og pauser. Mit engagement som underviser skal ligge i det vigtige. Og det vigtige er først og fremmest den virkelighed, der gør undervisning nødvendig.

Jura uden følelsesmæssigt engagement er ligegyldigt. Det bliver kun til en avanceret form for sudoku. Indsigt hos de studerende kræver også deres følelsesmæssige engagement, og følelsesmæssigt engagement bygger på oplevelse, fællesskab, stemning, nærvær, autencitet og intention. Det har jeg ingen referencer på, men det kunne man sikkert finde. Retsfilosoffen Alexander Carnera Ljungstrøm skriver det på den her måde: *Mennesket tænker ikke kun med hovedet, men også med kroppen, det vil sige med sansninger, følelser og fantasien.* (Ljungstrøm, 2000, p. 11). Man kunne tro han skrev det i relation til pædagogik og undervisning, men han skriver om retsfilosofi. Der er altså i virkeligheden i jura en tæt forbindelse mellem fag og formidling.

[1] http://www.knowyourphrase.com/phrase-meanings/Talk-the-Talk

Fra et helt andet fagligt ståsted har vi pædagogen Bjarne Wahlgreen, der har arbejdet med og skrevet om voksenpædagogik i mange år. Han peger i en opsummering af forskningsresultater på de tre forhold ved underviseren, der har størst indflydelse på de studerendes efterfølgende evne til at anvende det de har lært. En af dem er underviserens personlige engagement i læreprocessen (Wahlgren, 2010). Hvis underviseren har opbygget troværdighed og interesse for den lærende, er der større sandsynlighed for at den lærende anvender det, der læres, skriver han. De studerende skal altså også mærke, at jeg gerne vil hjælpe dem med den indsigt, de kompetencer og den dedikation der skal til for at realisere deres drømme. Det vil jeg gerne. Jo flere vi giver en god uddannelse, så de kan realisere deres drømme, jo bedre tror jeg det vil gå vores blå planet og os der lige nu bebor den. Det er altså mit engagement i virkelighedens problemer, og i de studerendes virkelighed, der kan gøre undervisningen til andet end undervisning.

Behovsdreven undervisning – Her står vi, du og jeg

Det at flytte undervisningen fra den etablerede mål-kæde og lige linje fra skoleliv til arbejdsliv styret af relativt centraliserede afgrænsninger af hvad der er vigtigt for de studerende og samfundet, er meget vanskeligt, oplever jeg. De studerende er jo ikke i deres arbejdsliv endnu, og vi forbereder dem – groft sagt – til noget som vi først skal bruge tid på at overbevise dem om kommer.

En af Danmarks helt tidlige og dengang banebrydende pædagoger Vilhelm Rasmussen har skrevet om skolen:

> Man fjernes fra tingene. Man står oftest kun overfor dem, som nyder, ikke tillige som frembringer. Industrien omgiver os med en hærskare af ting, som vi ikke rigtigt forstår og i hvert fald ikke selv har tildannet. [. . .] Hele vort liv teoretiseres, og vores førsteåndsbeskæftigelser bliver færre og færre og derfor mere ensformige.[2]

Hvordan kan de studerendes liv og problemer her og nu blive omdrejningspunktet for deres juraundervisning?

Der er et uafprøvet potentiale i problemorienteret projektarbejde på mine kurser. Erfaringerne viser at der er afgørende forskelle i motivationen for at løse et problem, alt efter om det er de studerende eller andre, der har

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[2] Citatet er omskrevet og gengivet af Stig Broström & Hans Vejleskov i bogen Dannelse, udvikling, erfaring, selvvirksomhed (Broström & Vejleskov, 2008).

defineret problemet (Krogh og Wiberg, 2015). Jeg er ikke der endnu med min undervisning. Mit bedste bud i den kursusramme, jeg arbejder i, er at lukke op for alle de studerendes input – uanset hvad det drejer sig om. Også spørgsmål, der falder udenfor kursets emnekreds. Hvis jeg er heldig så kommer der en sag fra en studerende, der kan bruges som case for alle på kurset. Ellers må diskussionen af de studerendes private sager overvejende lægges udenfor undervisningen. Det oprigtige engagement i de studerendes individuelle sager, er imidlertid med til at skabe en positiv spiral af gensidigt engagement i faget, oplever jeg.

Opsamling

Mit pædagogiske projekt er ikke en kritik af den mere modelbaserede pædagogik med struktureringen og udviklingen af læringsmål og læringssituationer, læringsmiljøer og læringsstile. Men, det er et slag for den mere intuitive og personlige formidling. Udtrykket ”Det levende ord”, som stammer fra Grundvigs tanker om en skole der bygger på at mennesker taler med hinanden, indkapsler måske sigtepunktet for den her undervisningsudvikling meget godt. Selvfølgelig skal der være en plan, et program for dagen, en struktur for opbygning af viden og indsigt på kurset og i de enkelte lektioner, men det her projekt har haft fokus på noget andet – nemlig det, der sker i fælles engageret nærvær. Education is not the filling of a bucket, but the lighting of a fire siger et velkendt og ofte brugt citat fra den irske poet William Butler Yeats. Men det ikke for mig målet i sig selv. Det er den enkeltes deltagelse i samfundslivet derimod. *Vi lever i en kompleks og foranderlig verden, og det vi betegner ”det praktiske liv”, kalder på en stillingtagen, som universitetet må gøde jorden for at nuancere, berige, stimulere og aktivere*, skriver retsfilosoffen Ljungstrøm (Ljungstrøm, 2000, p. 16). Jeg er helt enig, og det er derfor de her ting er værd at bruge sin energi på.

Referencer

Brostrøm, S. & Vejleskov, H. (2008). *Dannelse, udvikling, erfaring, selvvirksomhed*. Frydenlund.

Krogh, L., Stentoft, D., Emmersen, J. & Musaeus, P. (2013). Casebaseret undervisning. I L. Rienecker, P. S. Jørgensen, J. Dolin & G. H. Ingerslev (Red.), *Universitetspædagogik* (s. 201–214). Samfundslitteratur.

Krogh, L. & Wiberg, M. (2015). Problem-based and project-organised teaching. I L. Rienecker, P. S. Jørgensen, J. Dolin & G. H. Ingerslev (Red.), *University teaching and learning* (1. udg., s. 215–227). Samfundslitteratur.

Ljungstrøm, A. C. (2000). *Retslære/retsfilosofi – en introduktion*. Det samfundsvidenskabelige fakultets reprocenter.

Wahlgren, B. (2010). *Voksnes læreprocesser*. Akademisk Forlag.

31

How much reality is enough for students to learn?

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Introduction

Every pharmaceutical industry has to delivery an effective and safe drug product. Therefore, there are strict requirements for drug manufacturing with a quality control at its each stage. It means that all process operations during drug production are well-controlled and protocolled according to new norms that are frequently updated. In addition, there is quite often a rule that each subsequent operation during drug manufacturing cannot be initiated without approval the previous step by the selected authority. When pharmaceutical industry people hire new employees, they would like to get persons, who are at certain level familiar with new norms and requirements for drug manufacturing and who are able to easily implement that in practice.

However, a part of the current teaching material (drug production protocols) in the 2015 fall course ‘Drug production’ (‘Lægemiddelfremstilling’) (Bachelor level course, total amount of students is 190, duration of the course is 1 semester) has not been updated to the existing norms and requirements at the pharmaceutical industry nowadays.

The objective of the project was to find out how much reality in the teaching documents is enough for students to learn the subject. The aim was focused on clarifying the extent of the connection needed between the teaching material and the real life in order to assist in student becoming well-educated and at the same time career market-attractive. The overall goal was to prepare an updated version of the drug production protocol that could be used as a new teaching material in the future.

Implementation of the project

People at the pharmaceutical industries had been contacted to get help with the adaptation of educational documents before the implementation of the project. A part of the teaching material such as good manufacturing practice (GMP) documents for preparation of suppositories was rewritten in accordance with the suggestion from the industry experts. Two new versions were prepared: one was done in a way to be as close as possible to the real life (later on *fully-industrial* version) and another one (later on *semi-industrial* version) was an intermediate product between fully industrial version and existing one (later on old version). Two versions (the old one was part of the teaching material) were given to the students randomly in the middle of the course. However, students did not know which version they got. Three groups of the students per each version (in total 9 groups of 2 people) were selected. Six groups out of nine were asked to follow new instructions within their laboratory practice. The last three groups acted as control and used the old version during their lab work. At the end of the day, the feedback forms were given to the students to be filled out right away (one form for each student). The questionnaire covered the following two themes: (1) students' compliance with the document and (2) students' performance evaluation by themselves. Particularly, the students' opinion about the length, structure, relevance and understandability of the educational material was questioned. In addition, students were asked about their feeling & attitude if other course-mates had to evaluate their performance and, vice versa, if they had to assess work of other students. For instance, students could act as quality assurance personal by approving other students' work. All drug production protocols were written in Danish and students filled them in Danish. The feedback forms were constructed in English and students replied mostly in English. The feedback forms together with the filled drug production protocols were collected and analyzed.

Results

Compliance with the document

The students were most satisfied with the length, structure and details of the *semi-industrial* document. They liked the layout and the colors. The majority of the students found *fully-industrial* version too long and too structured.

The students pointed out that some questions/details could be omitted, because they are of minor importance. The pupils mentioned that the layout of the first page of the drug production protocol in both new versions is different from what they used that caused some confusion to them and would take for them some time to get used to. Some students replied that they would like to see more details and structure in the old version, whereas others were fine with the length and details of the existing document. One student mentioned that the teacher was very helpful when students were following the old version. In all three versions, there was missing the correct information about the cleaning of the production apparatus, because all versions of the drug production protocol refer to the standard operating procedure (SOP) that is out of date. Most students found it useful to write down all process parameters and have double check over them, because it prevented them from making any mistakes. In addition, it helped students to remember what to do and when to do. Although, students found it weird to have double check over some procedures such as ‘Fremtag skåle med afvejet API og hjælpestoffer’ and ‘Noter støbetemperatur når udtapning’ that *semi-industrial* and *fully-industrial* versions contain. Most of the students reported that it took around 10 minutes to fill in the old version. They filled the forms while doing the preparation of the suppositories. It took much longer time for students to complete the *fully-industrial* version. Most students, who used the *old* and *fully*-industrial versions, replied that they do not know if the drug production protocols are similar to the one used in the pharmaceutical industry, because they have never seen them. However, they pointed out that it would be misleading if the versions are not similar. The students, who filled in the *semi-industrial* version, were more positive about its similarity to the industrial. However, one student marked that it cannot be alike, because it is too simple and different.

Performance evaluation

All students had very positive attitude about other students evaluating their work (accepting or declining the drug production document), because they felt more secure about their work when other students had checked that. In addition, they found it as a good opportunity to discuss some unclear points before the final evaluation that will be performed by the responsible teacher. They found it useful to talk with each other, because both sides learn something by doing that. However, the pupils pointed out that they are absolutely fine when their course-mates check them as long as they know what they are doing. In spite of that, some students replied that they would learn more if the teaching staff in the lab would check their drug production protocol, because the teachers are more professional and have more experience, so it is more comfortable when they do the job. In addition, the students pointed out that the teaching staff usually has more focus on their document. The rest students did not feel any difference, who accepts their work. One student stated that it will be time-consuming if the students would search/wait for the teacher to get the work approved. However, the scholars mentioned that students from both sides have to be kind to each other. In addition, the teaching staff has to be available if the students cannot find the solution. Most of the students said that they learn and understand more when they have to 'teach' others, because the students who act as teachers have to know exactly what they are doing. However, the students do not like to be the 'bad guys' by pointing out other students mistakes, because it creates discomfort situations.

By evaluating the new documents, filled by students, there were three types of mistakes present. The first one was related to the absent of the approving signature from the 'teaching' student that can be related to the fact that the students did not have to sign anything in the old document. The second mistake was due to students' carelessness and/or misunderstanding. Particularly, two groups mixed up the place, where to put the batch number for the used ingredients. However, forgetting the batch number is quite a common mistake regardless the type of the version. The last type of mistake was related to the protocolled parameters that were outside the established limits. For instance, the measured temperature was outside the allowed range. However, the students continued drug production, because they did not have instructions what to do if that happens. Definitely, this type of information has to be added to the new updated version.

Discussion

Nowadays group work is a common university teaching method. However, students' learning outcome greatly depends on the interpersonal group dynamics (Christensen, 2015). If people within a group are able to collaborate and communicate with each other, then the group work is a very positive, progressive pedagogical working method. When the communication within the students in the group does not work or they cannot divide their work efficiently, then it is difficult to overcome difficulties together and delivery the work of good quality in the defined time frame. In this project, most negative answers about the compliance with the teaching material (any version) came in general from the students, which groups did not function very well. It was seen the most with the groups, who had to fill in the long *fully-industrial* version, which differ most from the existing one. The lack in communication could be due to the fact that groups were formed from the students that were being excluded or ended up in unfortunate position (Christensen, 2015). However, disability to allocate tasks between the group members could happened in the groups formed from friends, where all people have usually the same interests and are good in one thing and try to avoid the tasks outside their ‘comfort zone’.

University education aims at delivering well-educated, independent and confident students, who are able for critical thinking. However, the *old* document requires the presence of teaching staff to be able to complete the task correctly. In that sense, updated versions allow students to work by themselves, because the documents are more structured and detailed.

The students were not familiar with the new versions beforehand. It took time for students (both who had to fill in and who had to check) to get used to them. This could be one of the reasons, why students would prefer teaching staff over other course-mates to check their work (especially, the *fully-industrial* version). Giving the new versions to the students before the lab might decrease students’ discomfort. In addition, exchanging completely the existing materials for all labs with the new versions could easily have an effect on the students’ opinion about their preferences (teacher or course-mate) for checking their documents.

Conclusions

Semi-industrial version was accepted most by the students, whereas the old version lacks some essential information and the full-industrial version seems to be too long and too detailed. The majority of students feel fine when they have to evaluate and ‘teach’ other students, because they learn and understand more by interacting with each other. The revised semi-industrial version was prepared that can be used as a future teaching material.

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References

Christensen, G. (2015). Group work. In J. D. L. Rienecker P.S. Jorgensen & G. Ingerslev (Eds.), *University teaching and learning* (pp. 189–199). Samfundsliteratur.

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Teater som undervisningsform på universitetet

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Abstract

Aktiv deltagelse, fysisk aktivitet, tryghed i læringsrummet og humor er alle elementer der øger indlæring hos studerende på universitetet. Teater indbefatter alle disse elementer, og dette blev testet som undervisningsform på en 7 timers endags case om fosfor binding i jord hos en klasse af 5. semesters miljøvidenskab- og naturforvaltningsstuderende. Udfaldet var at de studerende var meget positive overfor teater som undervisningsform, både i forhold til øget forståelse og interesse for stoffet, samt til at huske stoffet bedre.

Introduktion

Aktiv deltagelse øger indlæringen hos studerende (Prince, 2004). Mange tiltag bliver implementeret i undervisningen for at øge aktiv deltagelse af de studerende. Generelt er det påvist at varierede undervisningsformer, altså hvor flere undervisningsformer bliver kombineret giver den største aktive deltagelse, og dermed øger indlæringen af stoffet for de studerende. Dette forstås ofte som klassisk forelæsning kombineret med små regneøvelser, diskussionsgrupper, o.lign. Som kontrast viser monoton undervisning at ofte resultere i manglende engagement fra de studerendes side.

Manglende aktiv deltagelse fra de studerende kan skyldes forskellige ting, f.eks. dårlig engagement fra underviserens side, manglende forberedelse fra de studerendes side. En væsentlig årsag er at de studerende føler sig utrygge for at skulle deltage aktiv foran de andre studerende og underviseren. Humor resulterer ofte i en afslappet og tryg situation, som kan medvirke at de studerende der normalt ikke deltager aktivt kommer på banen.

Fysisk aktivitet har vist at øge indlæringen i alle aldre (Bangsbo, 2011). Dette er forklaret ved at fysisk aktivitet har vist at forbedre kognition i forhold til problemløsning, logisk tænkning, rumopfattelse, sproglige færdigheder, arbejdshukommelse, selvopfattelse og opmærksomhed. Derfor kan fysisk aktivitet øge indlæring på universitetet.

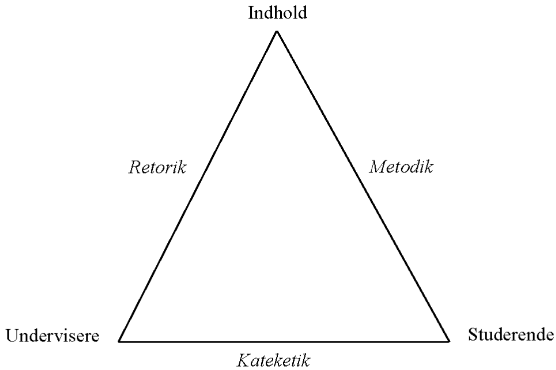
Teater som undervisningsform, hvor de studerende selv spiller med, indbefatter oftest fysisk aktivitet og kræver aktiv deltagelse af de studerende. Denne undervisningsform skulle derfor være ideel for indlæring på universiteterne, men er ikke en ofte anvendt undervisningsform. Derudover er teater sjovt, hvilket kan yderligere være en positiv oplevelse for de studerende, der derved øger deres tryghed i situationen samt motivation og oplevelse af læringen. Derfor er min hypotese at teater som undervisningsform kan øge de studerende engagement, interesse, forståelse, samt erindring om stoffet hvis de studerende har det sjovt samtidig med at de lærer. Dette gælder især i forbindelse med andre undervisningsformer, og specielt på lange kursusdage.

Problemformulering

Kan teater som undervisningsform øge indlæring hos universitetsstuderende?

Pædagogisk teori

Med udgangspunkt i den didaktiske trekant indenfor pædagogik, er der tre grundlæggende elementer i en undervisningssituation; undervisere, studerende og indholdet. I kontakten til de studerende (kateketik) er det vigtigt at skabe et forhold der bygger på respekt og tryghed. Underviserens formidling af indholdet (retorik) skal lægge grobund for forståelse (metodik) hos de studerende. Og de studerende skal kunne anvende den viden som underviseren har formidlet.



Figur 32.1: Den didaktiske trekant.

Jeg ville afprøve teater som metodik for indlæring, hvor de studerende skulle skuespille et stykke på baggrund af den viden jeg havde forelæst omkring fosfor binding i jord. Og det var derfor en øvelse i at anvende den viden de havde opnået gennem forelæsningen for at øge indlæringen. Ideen med at det samtidig var meningen at det skulle være sjovt, skulle gerne motivere de studerende til at sætte sig ind i stoffet og reflektere over det. Dette skulle også efter hensigten skabe den trygge kontakt mellem underviser og studerende, samt studerende imellem, for at de studerende ville have mod til at reflektere og arbejde med indholdet ved at anvende det på en ny måde.

Et EU studie omkring effekter af undervisningsteater og drama på studerendes indlæring viste at inkorporering af teaterundervisning hæver den generelle kvalitet af uddannelser på alle uddannelsesniveauer (DICE Consortium, 2010). Jeg har kun kunnet finde studier om at anvende teater i undervisningen der skildrer elever i folkeskolen eller gymnasium, og ikke studier med universitetsstuderende. Dog vil jeg mene at det er de samme mekanismer der aktiveres ved alle læringsniveauer, jf. den didaktiske trekant. Anvendelse af drama i naturvidenskabsundervisning i folkeskolen har vist at læringsprocessen bliver aktiveret ved at en elev selv er en aktiv rolle i elevens læring (McGregor et al. 2014). Desuden aktiverer drama en kreativ, kritisk og refleksiv tænkning, samtidig med at drama tilbyder muligheder for at udveksle meninger og ideer med de andre elever (McGregor, Anderson, Baskerville og Gain, 2014).

Teater som undervisningsmetode kræver en grundig teoretisk gennemgang af stoffet inden teateret bliver introduceret. De studerende skal kende teorien bag inden, og skal videregive deres viden og forståelse af stoffet gennem teater til de andre studerende ved at skuespille stoffet. Det kræver at de studerende virkelig forstår det de laver. Forståelsen øges når man selv skal give viden videre, og det er netop det de studerende skal ved at skuespille et teaterstykke om et fagligt emne for sine medstuderende. Teater fremkalder en situation hvor der rejses spørgsmål, dermed kan åbnes for flere synsvinkler, forskellige tankegange eller modsatte holdninger og adfærd. Ideen var at alle skal lave teater om det samme emne, så de bedre kan forholde sig til de andres teater, da en hypotese er at de i vid udstrækning kun vil lære det emne de selv arbejder med.

Fremgangsmåde

Jeg undersøgte teater som undervisningsform i en 7-timers endags case om fosfor i Temaet i Natur, Miljø og Samfund for 5. semester studerende. Inden udførelsen af at anvende teater med de studerende, afprøvede jeg teaterstykket på mine kollegaer.

Den 7-timers endags case havde jeg opdelt således: 2 timer forelæsning; 1 time regneøvelser; 1 time frokost; 1 time teater (0,5 time forberedelse; 10 min fremvisning (2 grupper)); 2 timer gruppearbejde og diskussion.

I teaterstykket skulle de studerende spille et scenarie hvordan fosfor binding i jord afhænger af pH ændringer. I forelæsningen om morgenen havde jeg givet teorien om fosfor i jord, så teaterstykket skulle virke som en forståelse af det materiale de havde fået gennemgået.

Evaluering af idé

Effekten af at bruge teater som undervisningsform blev evalueret mundtligt samt ved at uddele et evalueringsskema på dagen efter at de havde udført teater. Udfra dette kunne ses om det umiddelbart havde været en succes at benytte teater. Evalueringsskemaet og de studerendes besvarelser findes som Bilag A.

Resultater

Efter at have afprøvet teaterstykket med mine kollegaer, lærte jeg at mine kollegaer syntes det var sjovt og lærerigt. De foreslog at jeg lavede 2 teaterstykker, det oprindelige og et follow-up stykke, idet at de var lidt usikre i starten men havde lyst til mere efter at de havde fremvist stykket for de andre kollegaer.

På selve undervisningsdagen gav både mundtlig og skriftlig evaluering i form af evalueringsskemaerne på dagen positive respons. De studerende syntes både det var sjovt, læringsrigt, og en god idé at lave noget anderledes i kombination med mere traditionelle undervisningsformer. De studerende var meget mere engagerede end mine kollegaer. De var meget kreative, og meget spørgelystne under forberedelsen. Det fik dem til at reflektere over nogle af problemstillingerne som de ellers ikke havde gjort ved at arbejde med indholdet på mere traditionel vis.

Diskussion

I et interview med en studerende jeg gennemførte inden teaterundervisningen gav mig indtrykket af at teater som undervisningsform ville blive modtaget af de studerende som ”fjollet” og useriøst. Jeg valgte dog at prøve det af alligevel, og det viste sig at de studerende tog rigtig godt imod det og endda 78% af de studerende svarede i evalueringsskemaet efterfølgende deres teaterforestilling at de var enige i at de ville have mere af denne aktivitet i andre fag.

Jeg har indset at mange studerende ikke er aktive i undervisningen da de er bange for at dumme sig foran deres medstuderende og underviseren. Dette bliver der ikke sat meget fokus på i den daglige undervisning efter min overbevisning. Leg og uhøjtidelighed er begge med til at nedbryde den mur af utryghed mellem mennesker (både mellem studerende og underviser og studerende imellem), og derved ser jeg disse elementer som centrale i undervisningsbilledet. De studerende syntes generelt at teater som undervisningsform var sjovt, og at det øgede deres forståelse samt refleksion over stoffet. En studerende skrev i evalueringsskemaet at vedkommende normalt ikke var til teateraktiviteter og lignende, men at denne aktivitet havde været sjov og at vedkommende troede at aktiviteten vil få ham/hende til at huske stoffet bedre. Jeg mener at der generelt er for lidt humor i hverdagen og at humor netop kan bruges til at nedbryde mure. Men det skal benyttes sådan at underviseren lægger op til at de studerende selv skaber det sjove. Teaterstykket skal udformes på en måde så ingen tvinges til noget de ikke har lyst til; f.eks. ved at inkorporere passive roller eller flere af den samme rolle så der er en følelse af opbakning fra andre studerende. Jeg vil helt klart prøve at inkludere aktiviteter der benytter humor mere i undervisningen.

På længere sigt, da teater kan skabe en afslappet situation hvor de studerende er aktive i timerne foran andre, kan teater medvirke til at de studerende opnår større selvtillid og efterfølgende tør at deltage mere aktivt i andre undervisningssituationer.

Udarbejdelse af et teaterstykke kræver en del forberedelse fra underviserens side, og de studerende kan jo kun spille en meget lille del af pensum for at det giver mening. Så man kunne argumentere for at det giver en negativ cost-benefit analyse i form af hvor meget forberedelse det kræver af underviseren i forhold til hvor meget de studerende indlærer. Men det kræver altid meget forberedelse før en undervisningstime, og hvis udkommet af teaterstykket er at de studerende får lært stoffet endnu bedre, samt at det vækker en større interesse for faget, mener jeg at det er stærkt velargumenteret at bruge teater som undervisningsmetode.

Konklusion

Teater som undervisningsform var en positiv oplevelse som jeg helt sikkert vil benytte igen. De studerende var meget positive omkring det, og det er en ideel måde at dykke ned i et emne hvor de studerende kan reflektere ekstra meget over en lille (vigtig) del af pensum. Specielt fungerer det godt som led i en lang undervisningsdag med den fysiske aktivitet og den legende tilgang til læring.

Referencer

Bangsbo, J. (2011). Fysisk aktivitet og læring – en konsensuskonference. København: Kulturministeriets Udvalg for Idrætsforskning. Hentet fra http://www.sundskolenettet.dk/wp-content/uploads/2015/02/Rapport_fra_konsensuskonferencen.pdf

DICE Consortium. (2010). The DICE has been cast. A DICE resource – Research findings and recommendations on educational theatre and drama. Budapest, Hungary. Hentet fra http://www.dramanetwork.eu/

McGregor, D., Anderson, D., Baskerville, D. & Gain, P. (2014). How does drama support learning about the nature of science: contrasting narratives from the UK and NZ. I C. P. Constantinou, N. Papadouris & A. Hadjigeorgiou (Red.), *Nature of science: history, philosophy and sociology of science* (s. 22–33). Proceedings of the ESERA 2013 Conference: Science education research for evidence-based teaching and coherence in learning: Part 6. European Science Education Research Association.

Prince, M. (2004). Does active learning work? a review of the research. *Journal of engineering education*, *93*(3), 223–231.

A Evaluering af teater aktivitet på P case i Tema: Natur, Miljø og Samfund

Min baggrund er **4** miljøvidenskab **2** naturforvaltning **3** andet
9 besvarelser, 12 deltagende på teater.
Sæt kryds efter hvor enig du er i udsagnene:

	1 Meget uenig	2 Uenig	3 Hverken enig eller uenig	4 Enig	5 Meget enig	0 Ved ikke	Gennemsnit score	% enighed
Aktiviteten var sjov				5	4		4.44	89
Aktiviteten var udfordrende		2	2	5			3.33	67
Aktiviteten var relevant			1	7	1		4.0	80
Aktiviteten hjalp til at øge min forståelse af stoffet			1	5	3		4.22	84
Aktiviteten fik mig til at reflektere over stoffet			1	5	3		4.22	84
Aktiviteten øgede min interesse for stoffet			5	2	2		3.66	73
Aktiviteten gav mig mod til at deltage mere aktivt i undervisningen			5	4			3.44	69
Jeg tror at aktiviteten vil få mig til at huske P jordkemi bedre		1	2	3	3		3.88	78
Jeg vil gerne have mere af denne aktivitet i andre fag			3	3	2	1	3.88	78

Figur 32.2

Uddybende udtalelser eller forslag til aktiviteten:
Godt med aktivitet sent på dagen, hvor man er træt i hovedet. Godt at kom-

me op at stå. Friskt pust
Normalt absolut ikke fan af teaterstykke eller lign. Men det var helt ok.
Man kunne i princippet udvide med mange forskellige scenarier
Det var et friskt pust, så man lige vågnede igen
God fysisk aktivering, men ikke stort/enormt fagligt udbytte.
Generelt er formidling godt for at øge forståelsen.