Assessment of changed exam form in Veterinary Paraclinics

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Introduction

A deep learning approach to student learning can be a significant positive factor affecting the quality of student learning (Biggs, 1988). A deep approach to learning enhances the students' engagement and results in improved analytical and conceptual thinking skills when examining new facts and ideas critically by linking the new knowledge and tying it into existing cognitive structures (Biggs, 1988; Rienecker et al., 2015). In contrast, a surface learning approach includes accepting new facts and ideas uncritically and the facts are learned as isolated, unconnected items. A surface approach to learning can be utilized by students when studying simply to pass an exam (Biggs, 1988; Rienecker et al., 2015).

Changes to a learning environment can improve the quality of student learning outcomes and the impact can be measured by a Study Process Questionnaire (Biggs, 1987). In addition, evaluations can help to highlight areas of strength but can also identify areas in need of improvement.

Evaluations and adjustment of the learning environment in higher educations is not only a local desire, as in this study, but also a political desire. This is evident in the Bologna process starting in 1999, which aims to strengthen quality assurance processes at European universities and is continued until 2020 (Christiansen et al., 2015; ESG, 2015), and in the European Commission, which aims to equip students with knowledge, skills and core transferable competences to succeed after graduation, within a high quality learning environment (Council, 2018).

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The aim of this project was to assess a changed exam form in the veterinary master course Veterinary Paraclinics at the University of Copenhagen and thereby a change in the learning environment. The form of exam was changed from a one hour multiple-choice exam without supplies to an online ongoing multiple-choice test with supplies and no upper limit for attempts to answer. The hypothesis was that a change in the examination form would improve the learning environment towards deep learning, and that the students would focus on the understanding and importance of the teaching and not on surface learning in order to pass the exam. The expectation was that the new examination form would also encourages deep learning skills while at the same time students would possess the same root knowledge as students passing the former multiple-choice test.

Materials and Methods

The course Veterinary Paraclinics is a four week extensive course at the first year of the veterinary master programme at 7.5 ECTS point (Appendix A). The course consists of two parts - Veterinary clinical pathology and Veterinary microbiology and is taught four times a year in block 1, 2, 3 and 4. Veterinary students attending the course in block 3 and 4 in the spring 2019 participated anonymously in this study. Two exam forms were evaluated; a one hour multiple-choice exam without supplies where the results were compared with previously marks the year before and a new online multiple-choice exam including increased numbers of questions, summative and formative feedback and no upper limit of attempts to answer. In addition the learning environment in the course was evaluated by a voluntary two factor study process questionnaire and a focus group interview.

Multiple-choice exam

The multiple-choice exam has been used until 2018 and consisted of 20 questions divided equally in two parts, reflecting the two part structure of the course, and also included practical analyses in the laboratory. The exam lasted one hour and no supplies were allowed. The exam was previously located one week after finished teaching with the possibility to study extensive for the exam. The criterion to pass the exam was a minimum of 12 correct answers and at least five correct answers present in both parts of the test. In this study, the multiple-choice exam was voluntary to the students, and

placed the penultimate day of the course. The passing rate of the students in this study and the mean scores of the two parts of the exam were calculated and the results were compared to the results from the year before when the exam was mandatory.

New online multiple-choice exam

The new online multiple-choice exam was mandatory to the students and consisted of 83 online questions located on a central leaning platform at the University of Copenhagen. The questions were grouped by themes and were accessible during the attendance of the course in the order of the teaching of the themes. The questions could be answered several times with no upper limit of attempts and included practical analyses in the laboratory. All questions were required to be correct to pass the exam. After completion of a themed group of questions an immediately summative feedback was provided (correct /not correct) and in the main part of the questions a box including formative feedback were available (Figure 6.1). If one or more answers were not correct in a group of questions all questions in a group should be re-answered to be able to pass the group of questions. The test form was introduced in the beginning of the course and it was emphasized that the questions were an important leaning tool. Several questions were formulated to test at a high taxonomic level such as to analyze or to assess. In addition more than one correct answer was possible in some of the questions (Figure 6.1).

Questionnaire

To evaluate the learning environment in the course with a changed examination format in Veterinary Paraclinics a two factor study process questionnaire developed and revised by Biggs *et al.* (Kember et al., 2001) was translated from English to Danish and modified to be relevant for this particular course (Appendix B). The questionnaire was anonymous and voluntary. The students answered by using a 5-point Likert scale ranging from 'always true of me' to 'only rarely true of me'. The distribution of the scores were tested by the D'Agostino & Pearson normality test, mean / median and standard deviation / 25% and 75% percentiles were calculated and to test if a difference between deep and surface learning approach was present, an unpaired t-test or non-parametric Mann-Whitney test was performed depending on Gaussian distribution. In addition the difference of deep and surface study

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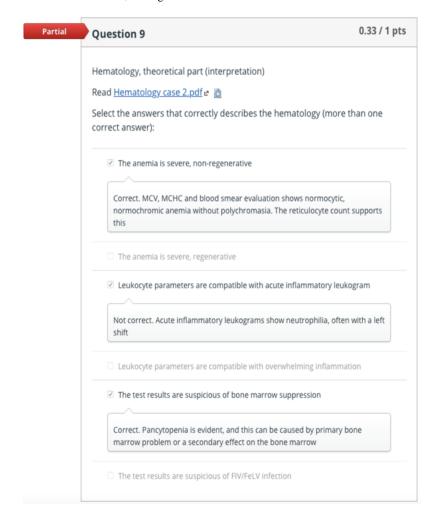


Fig. 6.1. Example of a question and answers in the online exam including summative and formative feedback.

scores was calculated for each student. The significance level was set to 0.05. The questionnaire was selected based on the demonstration of having good psychometric properties and being simple and applicable.

Focus group interview

Students in block 3, spring 2019, were encouraged to participate in a focus group interview after returning the multiple-choice tests and questionnaires evaluating the two different test forms and the learning environment in the course Veterinary Paraclinics.

Results

The participation rate was high in both block three and four and 38 students (81%) out 47 performed the voluntary multiple-choice test exam and returned the questionnaires. Twelve students participated in the focus group interview.

Multiple-choice exam

The passing rate of veterinary students performing the multiple-choice exam was high and 35 students out of 38 (92%) of the veterinary students passed the multiple-choice test exam. The year before when the multiple-choice test was mandatory all students passed. Overall the mean of correct answers in the two parts of the exam were 6.7 and 7.5 respectively in 2019. This constitutes a slight decrease when compared to the year before which were 7.9 and 8.0 respectively.

New online multiple-choice exam

All students passed the new online multiple-choice exam after the end of the course in Veterinary Paraclinics. Not all students had passed the new online multiple-choice exam at the day of evaluation of the one hour multiple-choice exam and questionnaires, since the students participated on the penultimate day of the course and it was not mandatory to have fulfilled the online multiple-choice before the end of the course.

Questionnaire

The sum of the questionnaire resulted in a higher mean score of studying by a deep approach with a score of 30 compared to studying by a surface approach at a score of 22 (Table 1) and a significant difference was present

between deep and surface learning (p<0.0001) (Figure 6.2). Studying by a deep approach was further sub-divided into studying with a deep motive or a deep strategy; deep motive scored higher at 16 compared to deep strategy at 14. Studying by a surface approach was in addition subdivided in the same groups and the opposite result was present as studying by a surface strategy scored higher (13) compared to studying by a surface motive (9).

The number of students having higher scores of a surface approach compared to deep approach was low (n=7) and the differences between the two categories ranged from -16 to 25 with a mean of 7.5 and standard deviation of 9.7 (Figure 6.3).

	Deep			Surface		
	Ap- proach	Deep Motive	Deep Strategy	Ap- proach		Surface Strategy
mean	30	16	14	22	9	13
SD	6,0	3,5	3,3	5,6	2,7	3,5

Table 1. Mean and standard deviation (SD) of the scores of Deep Approach, Surface Approach, Deep Motive, Deep Strategy, Surface Motive, Surface Strategy from a questionnaire fulfilled by 38 veterinary students at master level in the course Veterinary Paraclinics at the University of Copenhagen, Denmark.

Focus group interview

The students were asked to compare and explain the learning environment in the present Veterinary Paraclinics course compared to other courses with similar ECTS points, but with a mandatory multiple choice exam similar to the exam they voluntary participated in; and to compare the two different exam forms the multiple choice exam without supplies and the online multiple choice exam. The statements of the students are summarized and grouped:

 When online tests are mandatory it is the desire to learn and the time spent to learn is freely administered and you encourage yourself to use more time - in contrast to multiple choice where you relax in the beginning of the course, study extensively towards the end of the course to root learning and forget the knowledge after the exam is passed.

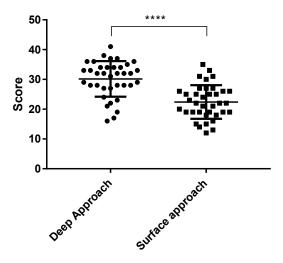


Fig. 6.2. The scores of deep and surface approach of studying by veterinary students evaluated by a revised two factor study process questionnaire. Means and standard deviations are illustrated by lines and whiskers. A significant difference between the groups is present p<0.0001 (****).

- The teaching environment with the online exam encourages you to fit known knowledge from the past to the new knowledge from the present course.
- You make more effort and actively involve yourself in the teaching with the online exam during the course in contrast to be passive during the course and learn root knowledge to a multiple choice exam
- You learn to learn you do not learn to pass an exam later
- The online tests increases the room for learning
- You can focus on understanding of the content of the teaching and not on how is the questions are worded in a multiple-choice exam
- You have the possibility to understand the connection between the learning objectives and if you fail a question in the online exam you learn of the failure you do it over and you perform better
- You have the possibility to know what is right and wrong and not only "you have passed the exam"
- The online test encourage to further studying not only root learning

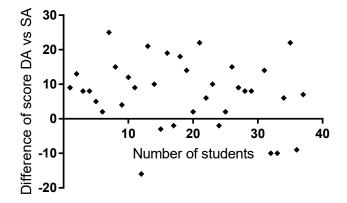


Fig. 6.3. The difference of scores between deep and surface approach of studying of veterinary students evaluated by a revised two factor study process questionnaire. Seven students had a negative difference implicating the seven students had a higher score of surface approach to studying (SA) compared to deep approach (DA) to study.

- The student are themselves responsible for their own learning
- You are responsible yourself but it can be hard if you have had an intensive semester behind and you can more easily become lazy
- Multiple-choices can encourage to even broader studying because you do not know what subject exactly to prepare for both multiple-choice and online multiple-choice will be the best
- Stress towards an exam have been eliminated you can focus on the teaching instead
- Your learn to reflect which is good for both humans and veterinarians
- The learning environment have encouraged students to perform more practical exercises without being mandatory in the course because it can be relevant later in the clinics

Discussion

Veterinary students at the course of Veterinary Paraclinics had an overall high passing rate of the multiple-choice exam. The passing rate score was though slightly decreased compared to the year before, where the exam was mandatory. In addition, the mean scores of the two parts of the exam also decreased slightly. The decrease can be explained by the difference in study preparation before the exams. The students in this study did not have a dedicated week to study for the exam, but voluntarily participated on the penultimate day of the course with the knowledge gained throughout the course. In addition, part of the students had not completed the online multiple-choice tests since the course was not finished. A factor which cannot be excluded in this study is that the students did not gain the equivalent knowledge as the students the year before, but since the passing rate was still high and the course was not finished, this is considered not to be a marked concern. In addition, students in this study have gained an additional working strategy with focus on deep learning through working with the online tests of how to find relevant scientific literature, extract the knowledge and place it in a specific context.

The new online multiple-choice exam form encouraged the students to increased studying and interest for the subjects of the course by a deep learning strategy. The students felt that there was an alignment between the course, the form of exam and being a veterinarian, which promotes good teaching environment (Horst & Ingerslev, 2015). The results from the questionnaire supported the statements of the students as a higher score of deep learning approach compared to surface learning approach was present, and the motive of deep studying was high. In addition only seven students had a higher score for surface approach compared to deep approach to study. The students state that "You learn to learn - you do not learn to pass an exam later", "The online tests increases the room for learning", "Stress towards an exam have been eliminated – you can focus on the teaching instead" and "You learn to reflect which is good for both humans and veterinarians".

Some students also stated courses with multiple-choice exams without supplies can have benefits as "Multiple choices can encourage to even broader studying because you do not know what subject exactly to prepare for – both multiple-choice and online multiple-choice will be the best" and "You are responsible yourself – but it can be hard – if you have had an intensive semester behind and you can more easily become lazy" suggesting that if you are not forced to study for a multiple-choice exam you will become more lazy. These positive statements regarding multiple-choice exam do not overcome the positive statements of the online exam in the opinion of the author, and it will be the role of the teacher to inspire and show personal interest in the subject being taught and engage students in active learning,

relate new material to what students already know and thereby enforce a deep learning strategy (Horst & Ingerslev, 2015). Also the online tests can allow students to make a wrong answer and learn from it. This was underscored by statements of students formulating "You have the possibility to understand the connection between the learning objectives and if you fail a question in the online exam you learn of the failure - you do it over - and you perform better "and "You have the possibility to know what is right and wrong and not only "you have passed the exam"". These two statements were also in line with results from Khan et al. 2001 (Khan et al., 2001) demonstrating that feedback is important to boost confidence that your knowledge is correct. This is very important for veterinarians, since a wrong choice made in good faith can have dire consequences for the treated patients.

Conclusion

Veterinary students at the course Veterinary Paraclinics study primarily by a deep approach and an online multiple choice exam promotes a positive learning environment. The students retain a high passing rate in a multiple-choice exam without supplies without having studied intensively for the exam. The results of this study substantiates that a change of examination form founds a deep learning strategy of veterinary students in Veterinary Paraclinics and future developments of exam questions and feedback will be emphasized.

Results from Discussion of Project with a Colleague

The colleague generally found the project good, relevant and guiding with respect to the use of a new online exam form in future teaching. A few changes were implemented with respect to evaluation of the results of the questionnaires and were illustrated by figure 6.2.

References

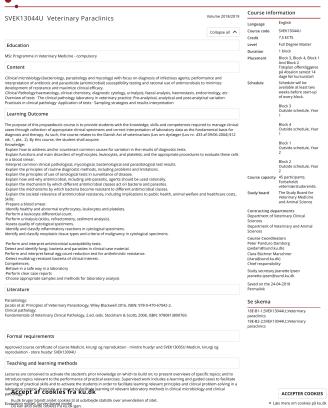
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A Course description

Veterinary Paraclinics - 2018/2019 12/09/2018 11.57





http://kurser.ku.dk/course/svek13044u/2018-2019

Remarks	
Lectures, theoretical and pra	octical exercises, case-study work.
Feedback form	
Collective Continuous feedback during	the course of the semester
Sign up	
Self Service at KUnet This course is not available f	or credit transfer students and other external students.
Exam (SVEK13044U)	
Credit	7,5 ECTS
Type of assessment Exam registration	Continuous assessment Examination during the course. Examination will consist of assessment of the knowledge obtained during the course, through written short answer questions and multiple choice. In order to obtain the course certificate students have to: - Participate at least 80% of the course in both clinical microbiology and clinical pathology
requirements	Pass the examination in clinical microbiology Pass the examination in clinical pathology Without aids
Aid	passed/not passed
Marking scale	No external censorship
Censorship form	No ensorship. More than one examiner.
Criteria for exam assesme To achieve the grade passed	nt l, the student shall (in an adequate level) be able to:
Knowledge: Explain how to address and Explain functions and main in a blood smear.	/or counteract common causes for variation in the results of diagnostic tests. disorders of erythrocytes, leukocytes, and platelets; and the appropriate procedures to evaluate these cells
Interpret common clinical p	athological, bacteriological, mycological and parasitological test results.
	itine diagnostic methods, including problems and limitations. of serological tests in surveillance of disease.
Explain how and why antimi	icrobial, including antiparasitic, agents should be used rationally.
Explain the mechanism by v	which different antimicrobial classes act on bacteria and parasites.
Explain the mechanisms by Explain the societal relevant	which bacteria become resistant to different antimicrobial classes. te of antimicrobial resistance, including implications to public health, animal welfare and healthcare costs
Skills:	co of animinal double resistance, including implications to passic resisting animinal venture and reconstruct costs.
Prepare a blood smear.	
 Identify healthy and abnorn Perform a leukocyte different 	nal erythrocytes, leukocytes and platelets.
-Perform urinalysis (sticks re	fractometry, sediment analysis).
Assess quality of cytological	specimens.
Identify and classify inflamn	natory reactions in cytological specimens. tic tissue types and criteria of malignancy in cytological specimens.
Identity and classify neoplas	tic tissue types and criteria of malignancy in cytological specimens.
Perform and interpret antim	nicrobial susceptibility tests.
Detect multidrug-resistant b	
	fungi and parasites in clinical case material legg count reduction test for anthelmintic resistance.
Competences:	togg count toucount to the united to source.
Behave in a safe way in a lat	boratory
Perform clear case reports Choose appropriate sample	s and methods for laboratory analysis
Workload	
Category	Hours
Lectures	Hours 26
Theory exercises	20
Practical exercises	40
Preparation	90
Exam	3
E-Learning	18
Total	207
∢ Tilbage	
Hvis du har spøresmål til kur	rset, skal du henvende dig til din lokale studieadministration.
TIVIS GO TIGIT SPECESTITICI GI KOI	see, som de nerverde dig in diri toware seducadriii instructori.

B Spørgeskema - Veterinary Paraclinics

Dette spørgeskema indeholder spørgsmål som omhandler din egen opfattelse af dine studiestrategier, og hvordan du oftest studerer. Brug så vidt muligt dine strategier i kurset Veterinary Paraclinics som kontekst.

Der er ikke nogen korrekt måde at studere på. At studere afhænger af, hvad der passer til hvert individs egen læringsstil og det emne der studeres.

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Derfor er det vigtigt, at du svarer så ærligt som muligt på dette spørgeskema. Hvis du mener, at et svar vil være forskelligt afhængigt af det konkrete emne som din studieproces fokuserer på, så angiv det svar der virker mest vigtigt for dig.

Besvar spørgsmålene ved at angive bogstaver fra A til E på linjen lige efter spørgsmålet. Hvert bogstav står for følgende udsagn:

- A Dette er aldrig eller næsten aldrig sandt for mig
- B Dette er nogle gange sandt for mig
- C Dette er sandt for mig i cirka halvdelen af tilfældene
- D Dette er ofte sandt for mig
- E Dette er altid eller næsten altid sandt for mig

Vælg det mest passende svar til hvert spørgsmål, og følg din umiddelbare reaktion. Sid ikke og tænk længe over hvert spørgsmål. Ofte er din første indskydelse den bedste. Svar på alle spørgsmålene.

Alle svar er anonyme og du skal derfor ikke bekymre dig om, at skulle give et godt indtryk med dine svar.

Mange tak for din hjælp!

SPØRGSMÅL.

1.	Jeg føler, at det til tider giver det mig en følelse af dyb personlig tilfredsstillelse, når jeg studerer.
2.	Jeg er først tilfreds, når jeg har arbejdet så meget med et emne, at jeg kan danne mine egne konklusioner
3.	Mit formål er at bestå Veterinary Paraclinics kurset ved at studere/arbejde så lidt som muligt
4.	Jeg studerer kun grundigt, hvad der bliver nævnt til forelæsninger eller hvad der står i kursusbeskrivelsen.
5.	Jeg føler, at stort set hvilket som helst emne i Veterinary Paraclinics kurset er meget interessant, når jeg får sat mig ind i det
5.	Jeg synes, at de fleste nye emner i Veterinary Paraclinics kurset er interessante, og jeg bruger ofte ekstra tid på at finde yderligere information om emnerne
7.	Jeg synes ikke, at Veterinary Paraclinics kurset er interessant, og derfor holder jeg min arbejdsbyrde på et minimum.

8.	Nogle ting lærer jeg ved at læse/øve dem igen og igen indtil jeg kan dem udenad, også selv om jeg ikke forstår dem
9.	Jeg synes, at det nogle gange kan være lige så spændende at studere akademiske emner, som at læse en god skønlitteratur bog eller se en god film
10.	Jeg tester mig selv i vigtige emner, indtil jeg forstår det fuldstændigt.
11.	Jeg synes, at jeg kan løse de fleste tests ved at lære nogle vigtige pointer udenad, i stedet for at prøve at forstå meningen
12.	Generelt studerer jeg kun, hvad der præcist bliver angivet som forberedelse, da jeg synes det er unødvendigt at gøre noget ekstra.
13.	Jeg studerer intenst, fordi jeg synes at emnerne er interessante
14.	Jeg bruger en god del af min fritid på at finde mere information om interessante emner, som er blevet diskuteret i Veterinary Paraclinics kurset
15.	Jeg synes ikke, at det er fordelagtigt at forstå et emne i dybden. Det forvirrer og spilder tid, når alt hvad man behøver, er at have kendskab nok til emnerne til at kunne bestå kurset.
16.	Jeg mener, at underviserne ikke skal forvente, at studerende bruger en markant mængde af deres tid på at læse og forstå litteratur, som alle ved at eksamens-testene ikke vil fokusere på.
17.	Når jeg møder op til undervisningen i Veterinary Paraclinics har jeg typisk nogle spørgsmål, som jeg gerne vil have svar på
18.	Jeg bestræber mig på at gennemse det meste af det foreslåede forberedelsesmateriale som lægges ud i forbindelse med forelæsningerne i Veterinary Paraclinics
19.	Jeg kan ikke se en mening med at lære stof, som sandsynligvis ikke vil indgå i eksamens-testene
20.	Den bedste måde at bestå eksamens-testene på, er at prøve at huske svar på de mest sandsynlige spørgsmål