

# Implementation of an E-learning teaching module supports active learning and improves understanding of the regulation of estrous cycle in domestic species.

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## Introduction

Veterinary students struggle to understand reproductive physiology due to the large species variation in endocrine regulation of the estrous cycle.

Understanding this subject is difficult when using available texts in books. Attending lectures and classes does not improve the student's performance. In addition, retention of knowledge in later parts of the study appears to be relatively limited.

Therefore, an interactive on-line module on the comparative biology of the estrous cycle of the cow, sow, mare, bitch and queen has been developed for bachelor students in Veterinary Medicine.

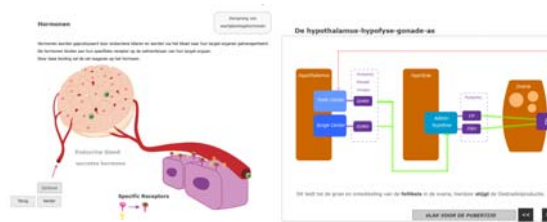


Figure 2: Basic principles of production and action of hormones and an example of their possible function in the hypothalamus-pituitary-gonadal axis.

H1.		H2.		H1 & H2	
De oestrische cyclus		Het functioneren & disfunctioneren van de voortplantings-orgaan in relatie tot de cyclus.		Casus/kliek	
Algemeen	General	Algemeen			
Rund	Cow	Rund	Rund	C1	C2
Varken	Pig	Varken	Varken	C1	C2
Paard	Horse	Paard	Paard	C1	C2
Hond	Dog	Hond	Hond	C1	
Kat	Cat	Kat	Kat	C1	
Chamoeschrijfgand		Chamoeschrijfgand			

Figure 1: Sections and subsections of the e-learning module and also start screen of the module. Students can start the module at any point. H1 and H2 = Sections 1 and 2 respectively; each consisting of a general chapter and a chapter per species: cow, sow, mare, bitch and queen. H1&H2 = Section 3 with representative clinical cases

## Aim

When students have taken the e-learning module they have knowledge of and insight in:

- the endocrine and paracrine regulation of the estrous cycle.
- the similarities and differences in regulation of the cycle in the five veterinary relevant species cow, sow, mare, dog, and cat.
- the relation between anatomical, physiological and hormonal changes and behavior during the estrous cycle.



Figure 4: In knowledge clips the clinical examination procedure in different species is shown. Afterwards, questions with a feedback option are presented.

## Evaluation of the e-learning module

Third year Bachelor students (n=220) were asked to fill out a questionnaire after the course, using a 1-5 Likert scale rating.

Table 1: Percentage of time spent per student when using the module. Overall response rate is 96.5% (193/220)

	< 3 hours	3 hours	> 3 hours
Time spent	6%	27%	67%

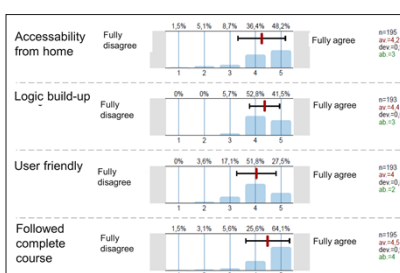


Figure 5: Student survey on usability.

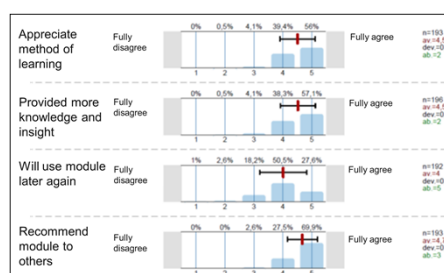


Figure 6: Student survey on appreciation.

## Materials & Methods

The E-course consists of three main sections (Fig. 1). Each section includes interactive modules, integrated knowledge clips, clinical instruction movies, interactive graphics and quizzes with back and forward immediate feedback.

Section 1 provides insight in general principles of hormones (Fig. 2), the regulation of these hormones, their role in the estrous cycle and their effect on the reproductive organs.

In the species-specific chapters, students have to actively simulate the hormonal changes during the cycle (Fig. 3). Section 2 addresses physical examination of reproductive organs in relation to the estrous cycle (Fig 4). Section 3 presents representative clinical cases.

The student is encouraged to actively participate when taking the module. In the module the subject material is presented using different formats, making it more comprehensible for the student. Levels of acquired knowledge is tested by quizzes.

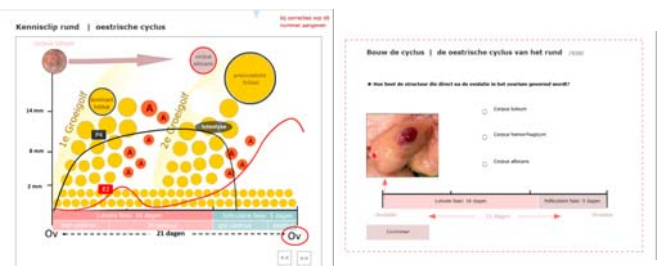


Figure 3: Example of an animation of the follicular wave concept in cow with an accompanying quiz.

## Conclusion: Implementation of the e-learning module was very successful!

- The e-learning is highly appreciated as a comprehensive studying method.
- Most students spent more than 3 hrs on this topic, table 1.
- Better prepared students during classes.
- Significantly improved understanding of the estrous cycle as indicated by overall improved test scores.
- Strong demand for similar e-learning modules on other topics in reproduction.